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Domestic violence, decision-making power, and female employment in Colombia

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Abstract

Using data from the Colombian Demographic and Health Survey, I document a positive association between intimate partner violence against women and the likelihood of women's employment. This finding persists when I exploit the husband's own childhood experience of abuse as a source of plausibly exogenous variation for the incidence of domestic violence. To explore potential mechanisms underlying this association, I use a mediation analysis in the presence of intermediate confounders. I find suggestive evidence that a woman's decision-making power—measured by active input in household and healthcare decisions—as well as a measure for willingness to divorce are likely mediators. I argue that abused women may hold jobs to increase their economic independence and potentially exit abusive relationships.

Keywords Domestic violence · Employment · Women's decision-making power · Colombia

JEL classification I10 · J16 · J22

1 Introduction

The World Health Organization reports striking findings on the prevalence and effects of violence against women. Almost one-third of all women worldwide who have been in a marital relationship have experienced physical or sexual violence perpetrated by their male partners (World Health Organization 2013). Most of these women report serious physical and mental health consequences, which include

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permanent injuries, pregnancy-related complications, and impaired social functioning. In Latin America and the Caribbean, according to the World Health Organization estimates, between 23.7 and 40.6% of ever-partnered women report some experience of physical domestic violence. Colombia is one of the countries in the region where violence against women is highly prevalent; in 2010, 37% of Colombian women reported physical or sexual spousal abuse over their lifetime, as well as several physical and psychological consequences associated with it (Profamilia 2011). Domestic violence also affects labor market outcomes: victims reported that spousal violence affected their performance in daily activities and their labor productivity.

In this context, it is crucial to understand the effects of domestic violence against women,[1] given its large economic and social costs (Carrillo 1992; Heise et al. 1994; Morrison and Orlando 1999; UNICEF 2001). There is still, in particular, little rigorous evidence on the employment effects of domestic violence in the context of a developing country. This paper, therefore, aims to fill this gap in the household economics literature. Using cross-sectional data, I use instrumental variables to estimate the relationship between reporting having experienced domestic violence (DV) and women's employment. To gauge a better understanding of this relationship, I explore the role of women's decision-making power using a causal mediation analysis.

The limited account of rigorous empirical analysis of the relationship between domestic violence and labor market outcomes responds to the potential complexity of the interconnection between both outcomes. The causality can go either way, with mixed descriptive evidence supporting both directions. A large group of empirical studies focuses on the determinants of spousal violence, including female employment. For instance, Aizer (2010) exploits variation in industry-specific labor demand and finds that decreases in the male–female wage gap reduce violence perpetrated by domestic partners. In that line, Bhattacharyya et al. (2011) suggest that boosting a wife's economic status generates struggle within the household and leads to more violence. In another study, Heath (2014) focuses on access to factory jobs and finds that women with low bargaining power face increased risk of domestic violence upon entering the labor force. More recently, Henke and Hsu (2020) expand on Aizer's study and find that women's labor market opportunities shield them from DV by increasing their bargaining power.

Few studies investigate the consequences of DV. Research has documented a variety of abusive tactics that a husband may use to interfere with his wife's employment. The available empirical evidence suggests that violence against women is related to higher rates of female unemployment (Lloyd 1997; Lloyd and Taluc 1999) or women working fewer hours (Meisel et al. 2003; Swanberg and Logan 2005; Tolman and Wang 2005). Other studies, on the contrary, find that spousal violence appears to lead to increased labor market participation (Farmer and Tiefenthaler 2004) or more hours of work (Staggs and Riger 2005). Studies in Latin America and the Caribbean are similarly inconclusive; some find that abused wives are more likely to work (Agüero 2013; Morrison and Orlando 1999), while others

[1] In the context of this paper, domestic violence is always directed against women. The terms "spousal violence" and "domestic violence" are used interchangeably in this paper.

find that they are more likely to exit the labor force (Rios-Avila and Canavire-Bacarreza 2017).

The main contributions of this study are twofold. First, I show that the association between DV and woman's employment is positive and that this result persists after using the plausibly exogenous variation in the husband's own childhood experience of domestic violence as an instrumental variable for DV. Women victims of domestic violence may decide to stay away from home and seek employment more actively to reduce their vulnerability by improving their economic situation. My findings support this hypothesis, as reported spousal violence does not prevent women from being active in the labor force: women who experience DV are 22.7 percentage points (or 35%) more likely to work than women who do not. I acknowledge that the husband's childhood experience of violence is not a perfect instrument because of some remaining concerns about its excludability or monotonicity. To check for the robustness of my results to potential violations of the exclusion restriction, I employ the test proposed by Nevo and Rosen (2012). This test allows me to relax the exclusion restriction assumption and bound the estimates for the parameter on DV. I find that my IV estimate may be a lower bound for the actual association between DV and women's employment. I also relax the monotonicity assumption, following De Chaisemartin (2017), and find that even if this assumption were to be violated, I would be estimating a local average treatment effect for a sub-group of compliers.

This paper also contributes to the literature on the economics of the family and on women's empowerment by exploring the role of women's decision-making power. Domestic violence could become a push for those victims who seek greater levels of economic autonomy to be able to leave an abusive relationship. That is, wives may need to increase their power within the relationship and gain control of their decisions to increase their ability to escape domestic violence or, at least, lessen its intensity. To provide an exploratory assessment of the role of decision-making power, I conduct a mediation analysis accounting for a mediator that is potentially endogenous, following Dippel et al. (2017). With this method, I am able to calculate the direct effect and indirect effects of DV on employment. I specifically explore the mediating effect of three measures of decision-making power (final say on large household purchases, daily household purchases, and healthcare decisions) and of a measure of willingness to separate, since this also comes from increases in a wife's outside options. I find suggestive evidence that the association of DV with employment consists of a large effect that runs through a woman's say in household decisions or through her desire to leave an abusive relationship. The result for willingness to separate suggests that abused women who have considered divorcing their husbands may work more, and is also in line with Johnson and Skinner (1986) who find that women seem to increase hours of work before the separation in response to higher probabilities of divorce.

The rest of this paper is organized as follows: Section "Data" describes the 2010 Colombian Demographic and Health Survey data. Section "Empirical framework" explains the empirical methods and discusses the identification strategy. I present results in Section "Results," and conduct robustness checks in Section "Results under weaker IV assumptions." I explore the role of women's decision-making power and willingness to divorce in Section "The role of women's decision-making power." Section "Concluding remarks" provides concluding remarks.

2 Data

The 2010 Colombian Demographic and Health Survey (DHS) provides demographic, socio-economic and health information for women and children and is representative of the population at the national level and for urban and rural areas in all departments.[2] The DHS is a three-stage stratified cluster sample that covers all but the two most sparsely populated departments in Colombia. The DHS also provides detailed information on domestic violence for the female population aged 15–49 years who are currently married or cohabiting. The DHS selected 52,952 women for the domestic violence module, but women who had never been married or in a de facto union, as well as divorced and widowed women, were all excluded by the DHS team during this part of the survey.[3] Of the 33,728 women finally interviewed, 8200 were married more than once and 25,528 were married only once. Given that the domestic violence module of the questionnaire refers to abuse by the current or previous male partner without distinction, I focus on the sub-sample of women who have been married or cohabited only once. This is because, in the data released by the DHS, it is not possible to obtain any information on previous marital unions. This sample of 25,528 partnered women consists of 8180 married women and 17,348 women living in cohabitation. Although most of the women in the sample are not legally married, I refer to these couples as husband and wife, for convenience.

Table 1 reports summary statistics for the dependent and explanatory variables used in this study. The final sample consists of 17,810 women for which I have information on their own and their husbands' characteristics, employment situation and domestic violence exposure and experience.

2.1 Domestic violence in the DHS data

Domestic violence (DV) inflicted by husbands is measured using the modified Conflict Tactics Scale (CTS) (Straus 1979; Straus et al. 1996). The DHS team elicits information on domestic violence by administering this set of questions to one randomly selected woman in each household. They also obtain informed consent from the respondent at the beginning of the interview, and remind the respondent throughout the interview of the confidentiality of their responses.

I use one dummy variable for reported DV: "Physical DV."[4] This variable indicates whether the woman experienced physical spousal abuse in the past 12 months. That is, whether a husband: (1) pushed, shook or thrown something at her; (2) slapped her; (3) punched her with fist or something harmful; (4) kicked or dragged her; (5) tried to strangle or burn her; (6) threatened her with knife/gun or other

[2] The DHS program is funded by the U.S. Agency for International Development (USAID). Departments are the main political divisions of the country. Colombia is divided into 32 departments and a capital district, Bogota.

[3] Another 1.06% of women were also excluded from the DHS because they could not be safely interviewed in private. Not being able to characterize this excluded part of the sample may be of concern if these women are affected the most by DV.

[4] For the rest of this document, any mention of domestic violence refers to physical violence against the wife.

Table 1 Characteristics of women in sample ($N = 17{,}810$)

Variable	All women	DV victims (14.03%)	Non-victims (85.97%)	Difference in means	p value for t-test of diff in means
Husband ever pushed, shook or threw something	11.91	84.86			
Husband ever slapped	7.62	54.29			
Husband ever punched with fist or something harmful	1.98	14.14			
Husband ever kicked or dragged	2.82	20.08			
Husband ever tried to strangle or burn	0.87	6.19			
Husband ever threatened with knife/gun or other weapon	1.32	9.43			
Husband ever attacked with knife/gun or other weapon	0.53	3.75			
Husband ever physically forced sex when not wanted	2.64	18.79			
Wife's mother ever beaten by husband	35.01	48.65	32.79	15.86	0.00
Wife mistreated by parents in childhood	21.55	21.16	21.61	−0.45	0.70
Husband mistreated by parents in childhood	31.90	52.68	28.51	24.16	0.00
Work in past 12 months	65.05	68.65	64.46	4.20	0.00
Wife's work in past 12 months was paid	95.67	95.92	95.62	0.30	0.63
Wife decides on use of money earned by her	98.72	97.03	99.00	−1.97	0.00
Wife earns about the same or more than partner	28.61	25.73	29.09	−3.36	0.01
Quintile 1 of household wealth	20.34	21.68	20.12	1.56	0.16
Quintile 2 of household wealth	19.36	22.34	18.87	3.47	0.00
Quintile 3 of household wealth	19.10	22.03	18.62	3.41	0.00
Quintile 4 of household wealth	20.59	19.71	20.73	−1.02	0.37
Quintile 5 of household wealth	20.62	14.24	21.66	−7.42	0.00
Urban residence	75.28	75.43	75.25	0.18	0.88
Wife's age group: 15–25	21.71	32.16	20.00	12.15	0.00
Wife's age group: 26–35	34.72	34.90	34.69	0.21	0.87

Table 1 continued

Variable	All women	DV victims (14.03%)	Non-victims (85.97%)	Difference in means	*p* value for *t*-test of diff in means
Wife's age group: 36–49	43.57	32.94	45.31	−12.36	0.00
Wife's ethnicity: no ethnicity	86.14	83.62	86.55	−2.93	0.00
Wife's ethnicity: indigenous	4.31	5.42	4.12	1.30	0.02
Wife's ethnicity: Afro-Colombian	9.49	10.96	9.25	1.71	0.04
Wife's ethnicity: other	0.07	0.00	0.08	−0.08	0.01
Wife's education: no education	1.53	1.67	1.50	0.16	0.60
Wife's education: incomplete primary	11.50	12.33	11.37	0.96	0.25
Wife's education: complete primary	13.96	15.10	13.77	1.33	0.16
Wife's education: incomplete secondary	21.29	26.52	20.44	6.09	0.00
Wife's education: complete secondary	28.38	26.27	28.72	−2.45	0.04
Wife's education: higher	23.34	18.11	24.20	−6.09	0.00
Any children aged 5 or less at home	41.67	48.20	40.60	7.60	0.00
Wife has final say on own health care	76.53	81.17	75.78	5.39	0.00
Wife has final say on making large household purchases	21.02	25.53	20.28	5.24	0.00
Wife has final say on making household purchases for daily needs	41.34	44.68	40.80	3.88	0.00
Wife has considered separating in past 12 months	24.69	69.14	17.43	51.71	0.00
Husband's age group: 15–25	10.79	16.50	9.86	6.63	0.00
Husband's age group: 25–35	30.95	36.11	30.11	6.00	0.00
Husband's age group: 35–49	45.06	37.72	46.25	−8.53	0.00
Husband's age group: 50–65	12.54	9.19	13.09	−3.90	0.00
Husband's age group: 65+	0.65	0.48	0.68	−0.21	0.31
Husband's age group: unknown	0.00	0.00	0.00	0.00	–

Table 1 continued

Variable	All women	DV victims (14.03%)	Non-victims (85.97%)	Difference in means	*p* value for *t*-test of diff in means
Husband's education: no education	2.65	2.63	2.65	−0.02	0.96
Husband's education: incomplete primary	14.43	17.85	13.87	3.98	0.00
Husband's education: complete primary	16.60	17.26	16.49	0.76	0.45
Husband's education: incomplete secondary	42.68	43.91	42.48	1.43	0.31
Husband's education: complete secondary	3.76	6.08	3.39	2.69	0.00
Husband's education: higher	19.48	11.99	20.70	−8.71	0.00
Husband's education: unknown	0.39	0.28	0.41	−0.13	0.30
Husband currently working	94.16	93.46	94.27	−0.80	0.24

Source: 2010 Colombian DHS

weapon; (7) attacked her with knife/gun or other weapon; or (8) physically forced sex when not wanted.

In the sample, about 14% of women reported having experienced physical/sexual abuse in the past 12 months. Women indicated various acts of violence against them during the survey. Of the abused women, 84.9% reported having been pushed or threw something, 54.3% having been slapped, 20.1% having been kicked or dragged, and 18.8% having been sexually abused. Threats of abuse with weapons and actual attacks with weapons are less frequent at 9.4 and 3.8%, respectively.

This survey is also informative of inter-generational events of domestic violence. About 35% of all women in the sample report that, during their own childhood, their fathers had beaten their mothers at least once. This proportion is larger for abused women (48.7%) than for non-abused women (32.8%). Some women also experienced domestic violence during childhood: 21.6% were mistreated by their parents. This proportion is similar for abused and non-abused women. Although no information is reported for whether the husband's father beat his mother, about 32% of wives report their male partners were mistreated during childhood. A closer examination indicates that 53% of the husbands who abuse their wives were also mistreated children. For non-abused women, this proportion is 28.5%.

2.2 Work situation of women in the DHS data

Although the DHS is not a comprehensive labor force survey, it collects data on the labor market status of women by inquiring about the following: (1) current work status (including work in own and family-owned businesses); (2) work status in the past 12 months if not currently working; and (3) whether the woman has ever worked if she did not work in the past 12 months.

In this sample, about 65.1% of wives are currently working or worked at least one month in the 12 months prior to the survey. For this study, I focus on the woman's work status now and in the past 12 months.

The DHS data for Colombia allows for some characterization of the work performed in the past 12 months. Most women are paid for their work: 95.7% received cash or in-kind payments. In this sample, almost all women decide on the use of money they earn: 98.8% decide either by themselves or in agreement with their partners. About 78% decide by themselves how to use their work payment. Relative to their husbands, only 28.6% of these women earn about the same or more money than them.

Unfortunately, it is not possible to determine from the DHS data the timing of employment and spousal violence: it is unknown whether the woman was working before the first event of DV or whether she started to work after being abused.

A closer examination by DV status indicates that abused wives tend to work more than non-abused wives (68.7% vs. 64.4%). However, they seem to have less decision-making power over the money they make (97% vs. 99%) and to earn more than their husbands in a smaller proportion (25.6% vs. 29.1%).

2.3 Control variables

In this study, I also include control variables that affect both the likelihood of employment and the likelihood of domestic violence. Household wealth is calculated using the wealth index computed by the DHS team. I also control for differences between urban and rural households. Department fixed effects are also included to control for the average differences in departments in any observable and unobservable predictors.[5] By including these fixed effects, I have reduced the threat of omitted variable bias in my estimations. Wife-specific variables include her age, ethnicity, and education. Husband-specific variables include his age, education, and work status. Refer to Table 1 for the summary statistics of these variables.

Having mentioned the main variables used in this study, I now characterize the women who were excluded from the sample and their differences with respect to those women included. This allows for a better understanding of the relationship between the sample and the general population of women included in the DHS data. Supplementary Appendix Table A1 shows the characteristics between women married once and women married more than once. To be consistent with the statistics presented in previous paragraphs, I provide summary statistics for those observations that have non-missing information on their employment situation and their exposure and experience of DV. Relative to the sample available in the DHS data (23,018 women), I do not use 5208 (20.6%) observations that correspond to women married more than once. The two groups of women differ in most characteristics, as shown with the tests for the differences in means. For instance, women married more than once report events of domestic violence in a larger proportion (36% vs. 23%). The proportion of married-more-than-once women working in the past 12 months is also larger (70% vs. 65%), but they tend to be paid and have control over their money in a similar proportion as that for only-once-married women.

3 Empirical framework

3.1 The equation of interest

The first contribution of this paper lies in the econometric estimation of the relationship that runs from domestic violence to women's employment. This section discusses the equations to be estimated and the identification strategy used in an attempt to provide an unbiased estimate.

Let L_{ir} be a dummy variable that indicates whether a woman is currently working or worked in the past 12 months. The first equation to be estimated in this paper is:

$$L_{ir} = \alpha + \mathbf{X_{ir}}'\Phi + \beta \cdot DV_{ir} + \theta_r + \epsilon_{ir} \quad (1)$$

where the subscripts denote individual i in department r. DV_{ir} is a dummy variable that indicates whether the woman reported being a victim of DV in the past 12 months; $\mathbf{X_{ir}}$ is a vector of individual and spousal characteristics including wife's

[5] Departments are the first administrative division in Colombia. There are 32 departments, including the capital city of Bogota.

and husband's age and educational attainment, wife's ethnicity, husband's work status, quantiles from a wealth index, and a dummy for urban residence. The θ_r term denotes department fixed effects that are included to address potential bias due to unobserved heterogeneity across departments. The ϵ_{ir} term is an error term with mean zero. If DV is exogenous with respect to employment, the estimate of β represents the average treatment effect (ATE) of DV on women's employment status.

Because some of the husband's information could be missing, I also include a dummy variable indicating whether his education is unknown to the wife. It cannot be assumed that the missing information on the husband is unrelated to his wife's employment status. Therefore, I include this missing indicator as a regular control in both the first and second stage equations.

I estimate Eq. (1), weighting each observation with the associated probability weights provided in the data. Given the binary nature of the dependent variable, my use of OLS means that every equation estimated in this paper is a linear probability model (LPM). In estimating a LPM rather than a logit or a probit model, I follow the recommendations of Angrist and Pischke (2008). The primary benefits of using a LPM are: (1) LPM does not rely on distributional assumptions required by the logit and probit specifications; and (2) LPM does a much better job than probit models at handling a large number of fixed effects. The primary drawback to using a LPM is that it produces errors that are heteroscedastic. I use robust Huber–White standard errors in all estimations in order to address this concern. These standard errors are further clustered at the primary sampling unit level,[6] given the sampling scheme, to account for further sources of heteroscedasticity within sampling units.

The primary objective of this paper is to assess whether DV affects women's employment, as discussed in the introduction. Since DV is likely endogenous to a woman's employment, the next section discusses the identification strategy used in this paper.

3.2 Identification strategy

DV is unlikely to be exogenous in Eq. (1). Three sources of endogeneity are of particular concern. The first source is the potential for reverse causality or simultaneity: an improvement in a wife's employment opportunities or an increase in her labor income may lead her husband to inflict violence on her. The second source is unobserved heterogeneity or non-random selection into violent relationships based on unobservable characteristics. Unobserved variables such as social norms or characteristics of the wife and her partner can influence both domestic violence and female employment, so that DV and employment can be correlated even if the former does not have a causal effect on the latter. For example, husbands' characteristics such as drug or alcohol use or involvement in crime may directly affect the wife's decisions to work and directly lead to DV. The third source of endogeneity is measurement error, which is particularly driven by under-reporting of incidents of

[6] Primary sampling units (PSU) are the first stage of selection in a multi-stage sampling procedure. In the DHS data, these units typically correspond to an enumeration area or a segment of an enumeration area. In this sample, there are 3965 PSUs.

domestic violence in survey data. Any of these sources of endogeneity will cause DV to be correlated with the error term in Eq. (1).

The identification strategy used in this paper relies on the use of an instrumental variable (IV). To produce consistent estimates, this variable must be conditionally correlated with reported DV, but uncorrelated with the error term in Eq. (1). The first assumption, that the IV is correlated with DV, can be ascertained using a test of the null hypothesis that the instrument has no explanatory power with respect to the endogenous variable. The result of this test is presented in Section "Results." The second assumption, or the exclusion restriction, requires that the IV affects women's employment only through DV. This restriction is not directly testable but this section discusses its validity in this context.

The instrumental variable I use for reported DV is a dichotomous variable that indicates whether a woman reports that her husband was mistreated or regularly beaten by his parents or stepparents as a child. The identifying assumption is thus that husband's own childhood experience of domestic violence is uncorrelated with ϵ_{ir} in Eq. (1). The second-stage equation is:

$$L_{ir} = \alpha + \mathbf{X_{ir}}'\Phi + \beta \cdot \widehat{DV_{ir}} + \theta_r + \epsilon_{ir} \tag{2}$$

where $\widehat{DV_{ir}}$ denotes the predicted probability of DV conditional on the instrument Z_{ir} and $\mathbf{X_{ir}}$, obtained from the first-stage regression of DV on the husband's own childhood experience of domestic violence and the control variables included in Eq. (2), which is given by:

$$DV_{ir} = \alpha_1 + \mathbf{X_{ir}}'\Pi + \rho \cdot Z_{ir} + \varphi_r + \mu_{ir} \tag{3}$$

where Z_{ir} is a dichotomous variable for the husband's own childhood experience of domestic violence, μ_{ir} is an error term with mean zero, and all other variables are defined as above.

If the instrument has conditional predictive power for DV and satisfies the exclusion restriction and the monotonicity assumption (which are discussed below), the IV estimate of the coefficient β is a local average treatment effect (LATE) of reported DV on women's employment, i.e., the increase in the probability of work (as measured by the dependent variable) due to DV for those couples for whom a husband being abused by his parents during childhood induces a change in DV. This is the treatment effect on the group of "compliers." In this application, compliers are couples in which the husband's DV propensity is affected by his experience of abuse as a child. The compliers group is a subset of all couples, and it is impossible to determine whether the effect of DV estimated for this group is the same as that for the population as a whole.

The husband's childhood experience of domestic violence has predictive power for DV, and thus satisfies the "relevance" assumption in this setting, for various reasons. Children who are exposed to domestic violence have higher levels of internalizing (depression, anxiety) and externalizing (physical aggression) behaviors and post-traumatic stress disorder (Evans et al. 2008; Graham-Bermann et al. 2012). Further, some studies suggest that childhood exposure to domestic violence becomes a risk factor for being a victim and/or perpetrator of violence later in life, both in developed (Whitfield et al. 2003) and developing countries (Martin et al. 2002). Previous studies for Colombia (Assaad et al. 2017; Friedemann-Sánchez and

Lovatón 2012) show that a partner's experience of violence against him as a child is highly associated with the incidence of domestic violence in adulthood.

One argument for why the instrumental variable proposed in this paper is likely to satisfy the exclusion restriction is that it affects a husband's potential engagement in violent behavior long before the couple's formation, as supported by the studies on inter-generational transmission of abusive behavior mentioned in the previous paragraph. Therefore, with the inclusion of appropriate controls for household socioeconomic characteristics, it is plausible that a husband's childhood experience of violence is uncorrelated with unobserved variables affecting the wife's current employment status. It is still possible that the correlation between Z_{ir} and ϵ_{ir} is non-zero due to the effect of assortative, endogenous matching, i.e., husbands and wives choose each other on the marriage market (Ackerberg and Botticini 2002). I include in the regression various controls for the wife's and husband's characteristics that are variables on which the matching may occur such as their education, their age and the occupation of the husband. The inclusion of these variables increases the likelihood that the exclusion restriction holds. In Section "Potential violation of the exogeneity of husband's own childhood experience of domestic violence," however, I provide estimates of the effect of DV on female employment after relaxing the exclusion restriction, following the methodology proposed by Nevo and Rosen (2012).

The estimated treatment effect could be different from the effect for the couples where the husband would be violent either way (the "always takers") or the couples where the husband does not commit DV whether exposed to violence as a child or not (the "never takers"). "Defiers" would be cases where the man turns out violent if he was not exposed to violence as a child, but if he were exposed he would be peaceful in his marriage. Perhaps being exposed to violence makes him commit to never being violent. The empirical evidence, however, suggests that the potential for a husband consciously choosing to avoid perpetuating violence as an adult, despite being abused as a child, may be ruled out in most cases (Flake and Forste 2006; Friedemann-Sánchez and Lovatón 2012; Kishor and Johnson 2004; Whitfield et al. 2003). This evidence further suggests that I can rule out the existence of "defiers" and that the monotonicity assumption is likely to be satisfied.[7] Nonetheless, the fact that not all children who are exposed to violence grow up to commit violence and many are committed against violence suggests that monotonicity would not hold. Following De Chaisemartin (2017), I show in Section "Local average treatment effects under weak monotonicity" that the 2SLS estimator is still valid, even under the presence of defiers, provided the "compliers-defiers" condition is satisfied. Such condition states that if a subgroup of compliers represents the same percentage of the population as the group of defiers, and that both subgroups have the same LATE, then 2SLS estimates the LATE of the remaining part of compliers. This subgroup of remaining compliers is known as "surviving-compliers."

Though instrumenting for DV using the husband's childhood experience of domestic violence can mitigate simultaneity as a source of endogeneity, it does not fully address endogeneity coming from measurement error in reports of domestic

[7] The instrument may have no effect on some individuals, but all those who are affected are affected in the same way, so that all individuals who change their treatment status as a result of a change in the instrument either get all shifted into treatment, or get all shifted out of treatment.

Table 2 2SLS estimates for the likelihood of women's employment

	Linear probability model	
	OLS	2SLS
Dependent variable: work in past 12 months	(1)	(2)
Physical DV in past 12 months	0.068***	0.227***
	(0.012)	(0.074)
Constant	0.292***	0.253***
	(0.051)	(0.053)
Mean of dependent variable	0.650	0.650
First-stage *F*-stat		231.612
Montiel–Pflueger *F*-stat		257.172
R-squared	0.110	0.097
Department fixed effects	Yes	Yes
Household's controls	Yes	Yes
Wife's controls	Yes	Yes
Husband's controls	Yes	Yes
Observations	17,810	17,810

Standard errors in parenthesis, clustered at the PSU level. Wife's controls: age, ethnicity, education, presence of children age 5 or less in the household. Husband's controls: age, education, work status. Household's controls: urban/rural, wealth quintile

Significant at ***1%; **5%; *10%

Source: 2010 Colombian DHS

violence. In this regard, note that throughout my analysis, I am careful to talk of the relationship between reported DV, as opposed to actual DV, and employment status.

4 Results

The main empirical results are reported in Table 2. Demographic characteristics such as age, ethnicity, educational attainment and household wealth[8] are included to capture earnings potential that may affect a woman's decision to work. I include fixed effects for the department of residence and a dummy for urban residence to control for different labor demand conditions. Husband's characteristics (age, educational attainment and work status) are also included to control for other potential factors that impact employment by affecting the costs and benefits of working relative to not working.

As a baseline, I first estimate the probability that a wife works, treating DV as fully exogenous, using a linear probability model (LPM) to estimate Eq. (1). The OLS results from the linear probability model are presented in column 1 of Table 2. I find that being physically abused by a husband in the past 12 months appears to

[8] Household wealth is measured with the DHS wealth index readily available in the dataset and calculated using the methodology of Filmer and Pritchett (2001).

increase the likelihood that a wife currently works or has worked in the past 12 months by 6.8 percentage points. Because of the potential endogeneity problems discussed in Section "Empirical framework," these results should be considered to be (conditional) associations between women's employment and DV, and so they cannot be given a causal interpretation.

In an effort to provide an unbiased estimate of the potential effect of DV on women's employment, I rely on two-stage least squares estimation. For this, husband's childhood experience of domestic abuse is used to instrument DV. As with the LPM, I control for wife's and husband's characteristics, and cluster the standard errors at the primary sampling unit level. Instrumental variable results from the estimation of Equation (2) suggest that DV is significant and positively affects women's employment (see Table 2). The experience of any event of physical spousal violence increases the likelihood of work by 22.7 percentage points, and this estimate is significant at the 1% level. This is roughly a 35% increase relative to the mean of 65.1%.[9,10]

Results from regressing the indicator for DV on the instrument and various controls, the first stage of the 2SLS analysis, are shown in Supplementary Appendix Table A3. Having a male partner who was abused by his parents as a child increases the probability of experiencing DV by 12.4 percentage points, or 86%.

These IV estimates of the effect of DV on women's employment are much higher than the OLS estimates. When considering the magnitude of these results, it is important to keep in mind that IV estimates a local average treatment effect (LATE). This is the effect of DV on the likelihood of employment for wives in couples in which the husband's DV propensity is affected by his experience of abuse as a child.

This estimation strategy allows me to conduct two tests on the validity of the instrument. The first test is whether the instrument has sufficient explanatory power in the first stage equation. The *F*-statistics for the instrument in the first stage for any experience of DV, shown in Supplementary Appendix Table A3, is well above the threshold level of 10 for an instrument not to be considered weak.

For a second test of the strength of the instrument, I use the procedure proposed by Montiel Olea and Pflueger (2013), which is appropriate to test for weak instruments with one endogenous regressor. This test also allows for errors that are not conditionally homoscedastic and not serially uncorrelated. Upon testing the instrument in the regression where any experience of DV is the endogenous variable, I obtain an effective *F*-stat of 257.2 with a bandwidth threshold of 5% and a 2SLS critical value of 37.4. These test results suggest rejection of the null hypothesis of weak instruments.

[9] For full estimation results, please refer to Table A2 in the Supplementary Appendix.

[10] To give this estimate some perspective, forced displacement in Colombia leads displaced women to work eight more hours per week and their wage rates are 1.8 times higher than their rural counterparts (Calderon et al. 2011). Displaced women are also about 5.1 percentage points, or 14%, more likely to work following displacement. Compared with interventions on employment, a randomized evaluation of the youth training program "Jovenes en Accion" shows that female trainees' probability of paid employment 19–21 months after completing the program increased by 6.8 percentage points (12%) relative to the control group (Attanasio et al. 2011). The positive effect of the program was substantially larger for female work in the formal sector, with an estimated increase of 6.9 percentage points (35%).

I conduct three additional analyses to better understand the relationship between inter-generational events of abuse and wife's employment, and how the effect of DV changes depending on the job situation of the husband.

Two dichotomous variables define inter-generational events of domestic abuse: "the wife was mistreated by her parents during childhood," and "the wife's mother ever was beaten by her husband." In these data, the wife's experience of violence in childhood is not highly correlated to a wife's mother's exposure to intimate partner violence (with a phi coefficient of 0.07). Similarly, a wife's experience of domestic violence in childhood does not seem to be highly correlated with a husband's experience of abuse in childhood (with a phi coefficient of 0.03). However, the correlation between the variables for wife's mother ever beaten and for husband mistreated in childhood is higher with a phi coefficient of 0.20. These results suggest that there could be some correlation between the characteristics of the wife's childhood household and her own household in adulthood, which affect her likelihood of work. Thus, I have included them as control variables in the estimation of equation (2). Results in Supplementary Appendix Table A4 suggest that the mother's experience of abuse is positive and statistically significant for the regression of work on DV. The magnitude of the coefficient on DV, however, does not change and the estimated effect on work continues to be of about 23 percentage points.

Since a husband's work status could impact his abusive behavior and also the woman's decision to work, I interacted DV with husband's work status to see how the effect of DV depends on the work status of the male partner. The coefficient on the interaction term is negative and significant at the 10% level. Thus, for a small share of husbands working, the effect of DV on work is about 30 percentage points; whereas for a large share of men working, the effect of DV is about 7 percentage points. These results are presented in Supplementary Appendix Table A5.

Domestic violence can also be experienced with different intensity. I create an intensity index by counting the different types of physical and/or sexual aggression to which the respondent was exposed in the past year. Results presented in Supplementary Appendix Table A6 suggest that a more intense experience of domestic abuse increases the likelihood of work by 8.7 percentage points.

5 Results under weaker IV assumptions

This section discusses how potential violations of the IV assumption may affect my estimates of the relationship between DV and female employment, and provides estimates of the local average treatment effect (LATE) when I relax either the exclusion restriction or the monotonicity assumption.

5.1 Potential violation of the exogeneity of husband's own childhood experience of domestic violence

The instrument, whether the husband was abused during childhood, may fail to satisfy the exclusion restriction because the husband's experience with violence in childhood may be directly correlated with the wife's labor status in other ways, mainly via assortative matching. Assortative matching does not have to work through

a direct impact of husband's childhood experiences on his wife's employment. It could work through his choice of wife, i.e., a man with certain childhood experiences chooses a wife who has certain personality traits that also have an effect on her employment. This constitutes a potential threat to the exclusion restriction assumption upon which the validity of the instrument depends. The regression, however, includes a variety of husband's and wife's observable characteristics that partly control for assortative matching. These variables are: age; ethnicity; educational attainment; and husband's occupation and job status. The inclusion of controls for household socioeconomic status also support the exclusion of the husband's own childhood experience of violence from the wife's labor status equation.

In this section, I implement the imperfect instrumental variable approach developed by Nevo and Rosen (2012) to relax the exclusion restriction assumption and bound the estimates for the parameter of interest.[11] To estimate the bounds of the DV potential effect, I use 2SLS with standard errors estimated using the bootstrap.[12] My estimation results indicate that the lower bound for the coefficient on DV is 0.227.[13] Thus, when I relax the exogeneity assumption, the likely effect of DV on women's employment is still positive and larger than the effect estimated with OLS.

5.2 Local average treatment effects under weak monotonicity

It is likely that not all children who are exposed to violence grow up to commit violence and many are committed against violence suggesting that monotonicity would not hold. De Chaisemartin (2017) shows that the 2SLS estimator still estimates a local average treatment effect (LATE) under a weaker condition than monotonicity.[14] This estimator is valid provided that the LATE for compliers is not too different than the LATE for defiers.

In Supplementary Appendix B, I show that under weak monotonicity my estimate of 22.7 percentage points on the relationship that runs from DV to female employment could potentially be a LATE.

6 The role of women's decision-making power

In this section, I study the role of women's decision-making power in explaining the positive relationship between of DV and women's work. In order to increase their ability to escape domestic violence, wives may need to increase their power within the relationship by gaining control of their decisions and earnings. This behavior is

[11] The methodology is summarized in Supplementary Appendix A.

[12] Controlling for other covariates in IV regressions is often important because the assumption of exogeneity may hold only after conditioning on all exogenous variables. In the Nevo and Rosen approach, the assumptions on the correlation structure do not change for the more general version of the model where there are additional covariates.

[13] The estimations of the bounds were obtained with the -imperfectiv- Stata command.

[14] Please refer to Supplementary Appendix B for details.

consistent with the game-theoretic model of Farmer and Tiefenthaler (2004), which includes a threat point that is increasing in a woman's income and other outside opportunities.[15] To achieve this, abused women may be more likely to work.

In explaining why the estimated effect of DV on employment may be positive, Tolman and Wang (2005) suggest that paid work may empower women to be economically autonomous and to have the power to leave abusive relationships they would otherwise be dependent upon. Abused women may decide to stay with their abusers because they do not have the economic resources to survive without them. By working, however, they may be able to acquire the financial means they need to be able to escape the violence. This behavior is consistent with evidence documented in the psychology literature. Qualitative studies show that women see in employment a way to exit abusive or coercive relationships (Lloyd 1997).

I explore two specific dimensions of decision-making power: household purchases and health care decisions. For the first dimension, I have two variables in the DHS data: "Wife has final say on daily household purchases" and "Wife has final say on large household purchases." For the second dimension, the variable available in the data is "Wife has final say on own health care decisions."

Another possible mediator is a woman's willingness to separate. If, theoretically, women's decision-making power comes from their outside option, then decision-making power is still a channel in the results, which are explained by a willingness to divorce, since this also comes from increases in their outside option. Because they may want to leave, abused women may be more likely to work to be able to leave their abusive partners.

To gain a better understanding of mediating role of these measures of decision-making power, I employ a method recently developed by Dippel et al. (2017) that allows the identification of direct effects in the face of intermediate confounders.[16,17] The authors propose an instrumental variables framework to gauge: (1) the effect of the endogenous treatment on both the intermediate and the final outcome variable; and (2) the effect of the intermediate variable on the final outcome. They show that the same instrumental variable being used in the estimation of the effect of the endogenous variable on the final outcome provides exogenous variation that is useful to evaluate the effect of intermediate outcomes on final outcomes.[18]

Estimates from this mediation analysis are reported in Table 3.[19] To begin with, I will focus on the willingness to separate mediator. The implied magnitude of the indirect effect is 0.25, the coefficient on "Willingness to Separate in past 12 months" from the equation for direct and indirect effects (see Appendix C). This effect is statistically significant: using Generalized Method of Moments (GMM) estimations, I find a z-statistic of 2.7 and a p value of 0.008. The direct effect of DV on women's

[15] If an increase in a woman's threat point increases her chances of leaving and lowers the violence when she stays, then she would seek employment to improve her alternatives.

[16] Intermediate confounders are consequences of DV that also affect the intermediate outcome (willingness to divorce) and final outcome (employment).

[17] To explain this methodology and its application, I rely on the causal language used by the authors. I, however, am not claiming that my results are causal.

[18] Details of the procedure are explained in Supplementary Appendix C.

[19] The estimations were obtained with the -ivmediate- Stata command.

Table 3 Effect of mediator and DV on work

	(1)	(2)	(3)	(4)
Equation for the total effect				
Dependent variable: work past 12 months				
Physical DV in past 12 months	0.213***	0.213***	0.213***	0.213***
	(0.058)	(0.058)	(0.058)	(0.058)
Equation for direct and indirect effects				
Dependent variable: work past 12 months				
Physical DV in past 12 months	−0.035	0.024	0.02	−0.18
	(0.037)	(0.017)	(0.021)	(0.272)
Willingness to separate in past 12 months	0.249***			
	(0.094)			
Wife has final say on own health		0.189**		
		(0.081)		
Wife has final say on daily household purchases			0.193**	
			(0.092)	
Wife has final say on large household purchases				0.393
				(0.473)
Department fixed effects	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
Wife controls	Yes	Yes	Yes	Yes
Husband controls	Yes	Yes	Yes	Yes
First stage *F*-statistic (T on Z)	407.04	407.04	407.04	407.04
First stage *F*-statistic (M on Z|T)	227.9	34.43	17.71	0.850
Observations	17,810	17,810	17,810	17,810

Standard errors in parenthesis, clustered at the PSU level. No sampling weights were used in these calculations. Female's characteristics: age, years of education, ethnicity. Husband's characteristics: age, years of education, work status. Household characteristics: wealth quintile group, urban/rural area

Significant at ***1%; **5%; *10%

Source: 2010 Colombian DHS

work that is unrelated to willingness to separate is given by the coefficient on "Physical DV in past 12 months" from the equation for direct and indirect effects. This estimated effect of—0.04 implies that the total effect mostly comes from the indirect effect. My mediation analysis thus shows that the total effect of DV on employment consists of a large indirect effect that runs through the desire to leave an abusive relationship and a moderating direct effect that runs through DV itself.[20]

Regarding the results for the three measures of decision-making power, I find that the coefficient on DV (the direct effect) is not statistically significant once we control for the effect of any of them. This implies that the total effect mostly comes from the indirect effect of either having the final say on healthcare decisions or having the

[20] In Colombia, there are 9 reasons to legally ask for divorce, being domestic violence one of them. No laws or norms were introduced in Colombia after 2005 that may explain a surge in the willingness to separate in 2009/10. I, however, acknowledge that willingness to separate may be capturing factors such as policies that facilitate divorce, which mostly affect the proportion of legally married couples (45%).

final say on daily purchases, considering that final say on large purchases is not statistically significant. The significant effect of these two additional mediators is a result consistent with the mediation role of willingness to separate formerly discussed.

7 Concluding remarks

This paper estimates the relationship between reported experiences of physical spousal abuse and women's employment. Two sources of endogeneity are of particular concern in this paper: reverse causality and unobserved heterogeneity. In an attempt to deal with these sources of endogeneity, I employ an instrumental variables approach. I use as an instrument for DV a variable that indicates whether a husband was mistreated by his parents as a child. I find that any event of physical violence against the wife is associated with a 22.7 percentage-point increase in the likelihood of employment. Thus, the incidence of DV does not restrain women from being active in the labor force. I acknowledge that the methodological issues in the estimation of the relationship between DV and employment affect any causal interpretation of my results. It may well be that the positive association that I estimate in this paper follows the predictions of a model of instrumental violence, such as those of Anderberg and Rainer (2013). These predictions indicate that an improvement in relative wages—which induce women to look for work and enter employment—could increase the prevalence of domestic abuse if husbands use violence as an instrument to obstruct their wives' employment.

The evidence presented in this paper may support the hypothesis that women behave strategically in their labor market decision-making and seek employment to improve their outside alternatives when faced with domestic violence, as suggested by Farmer and Tiefenthaler (2004). To explore whether a woman's decision-making power mediates the positive association between DV and employment, I use the mediation analysis method of Dippel et al. (2017), which accounts for potential intermediate confounders. I find suggestive evidence that measures for decision-making power and willingness to divorce are likely mediators. This is, paid work may empower women to be economically autonomous and enable them to leave abusive relationships.

That the DV measures used in this paper are self-reported poses another problem. The DHS program attempts to minimize the underreporting and measurement error of these variables by "building rapport with the respondent, ensuring privacy, providing the respondent with multiple opportunities for disclosure […] not only by asking them many different times about any experience of violence, but also by asking them about many different forms of violence" (Kishor and Johnson 2004). Despite this, my estimates of the association between DV and female employment should be interpreted cautiously. Still, despite the number of caveats to the results presented, this study sheds new light on the impact of domestic violence on female labor market decisions.

Future research might address the important methodological issues mentioned in this paper by providing not only more robust measures of DV, but also by collecting longitudinal data. These data would allow for the study of the causal effect of DV on

the transitions in and out of the labor market, which also requires being able to observe the full work history of a woman, as well as her history of intimate partner violence.

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Compliance with ethical standards

Conflict of interest The author declares that they have no conflict of interest.

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