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Abstract[*]

Violence has a striking gender pattern. Men are more likely to be attacked by a stranger, while women experience violence mostly from their partners. This paper estimates the costs of violence against women in terms of intangible outcomes, such as women's reproductive health, labor supply, and the welfare of their children. The study uses a sample of nearly 83,000 women in seven countries from all income groups and all sub-regions in Latin American and the Caribbean. The sample, consisting of 26.3 million women between the ages of 15 and 49, strengthens the external validity of the results. The results show that physical violence against women is strongly associated with their marital status because it increases the divorce or separation rate. Violence is negatively linked with women's health. The study shows that domestic violence additionally creates a negative externality by affecting important short-term health outcomes for children whose mothers suffered from violence. To obtain the child health outcomes, the study employs a natural experiment in Peru to establish that these effects appear to be causal. Finally, the paper presents evidence indicating that women's education and age buffer the negative effect of violence against women on their children's health outcomes.

JEL classifications: 13, I12, J16
Keywords: Domestic violence, Female labor supply, Children's health, Latin America

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1. Introduction

Violence has a striking gender pattern. Men are more likely to be attacked by a stranger than by a person from their "close circle of relationships" (Kurg et al., 2002). Women suffer violence mainly from their husbands or intimate partners. Londoño and Guerrero (2000) and Heinemann and Verner (2006) show that household violence against women, or, domestic violence, is among the most pervasive types of violence in Latin America and the Caribbean (LAC), while the World Health Organization asserts that interpersonal violence is a major challenge to global public health.

This paper uses large household-level datasets from several countries in LAC to estimate the intangible costs of domestic violence on the health, marital status, and employment of women and on the welfare of their children. The paper has three main advantages over the existing literature. First, most studies focus on just one country (e.g., Morrison and Biehl, 1999; Díaz and Miranda, 2009). These studies employ different sampling strategies and methodologies, making it difficult to compare their findings. This study overcomes these limitations by using data from a standardized questionnaire applied to five countries in the region. It uses the module on domestic violence included in the Demographic and Health Surveys (DHS) of Colombia, the Dominican Republic, Haiti, Honduras, and Peru. The sample size—over 83,000 participants—represents about 26.3 million women between the ages of 15 and 49. It allows the study to cover countries in all sub-regions of LAC and to cover all income levels. This is the most comprehensive study of the intangible costs of domestic violence in the region.

Second, given the intangible and non-lethal effects of domestic violence, this paper evaluates the costs of domestic violence on women with respect to a wide array of outputs, including marital status, employment, health status, and contraceptive use, which are contained in the DHS. Women affected by domestic violence may also be limited in their ability to care for their children. Children growing up in households where there is violence among intimate partners can suffer from behavioral and emotional problems, as discussed by Pollack (2004). There is also evidence suggesting that domestic violence has effects on child mortality and morbidity, including from malnutrition and diarrheal diseases (WHO, 2011). Thus, a fundamental contribution of this study is that it includes variables that measure the welfare of children with respect to the set of intangible outcomes.

The DHS has provided a unique opportunity to use standardized questions about the mortality of children and infants and health measures, e.g., birth weight, height, weight, anemia, and prevalence of diarrheal diseases, in addition to educational attainment and enrollment. Focusing on the effect of domestic violence on women's outcomes and on their children's welfare expands the scope of the intangible costs of domestic violence in LAC.

The paper by Aizer (2011) is related to this work. Aizer focused on the effect of domestic violence on the least studied consequence of children's health. Aizer used data from California to show that physical violence during pregnancy creates a negative externality. This study expands Aizer's work in two critical dimensions. First, it focuses on all aspects of physical violence, whereas Aizer's work only measured extreme violence that resulted in hospital admissions. In particular, this study uses four measures of physical violence where severe or extreme violence is only one possibility. Second, the study explores the effects of violence on outcomes that go beyond birth effects. The DHS allowed study of the effect of violence on the number of prenatal visits, birth weight (the measure used in Aizer, 2011), vaccinations, and anemia for all children under age six.

There is a third important advantage of this paper compared to the existing literature in LAC. Recent papers have shown that domestic violence decreases with non-labor income (Bobonis et al., 2012, and Angelucci, 2008) and increases with emotional cues (Card and Dahl, 2011). These factors make identification of the costs of domestic violence extremely difficult. For example, finding a negative association between violence and female employment may not be considered a true cost of violence. This occurs because women in low-income households are more likely to experience domestic violence and, at the same time, are less likely to be employed. Thus, it is important to isolate the effect of violence on female employment from all other possible confounding factors.

The study uses a natural experiment to overcome this problem using a case study. Starting in 1999, Peru created women's centers with the explicit goal of reducing domestic violence. The program started with only 13 centers in the first year, but now has over 140 centers covering all 24 regions of the country. The study contributes the spatial and temporal rollout of the creation of these centers as an exogenous source of variation for the prevalence of violence against women. This method compares the relationship between female employment and violence, but only where the variation in the prevalence of violence is driven by the existence of

a center in the locality. This method yields identification of the true cost of domestic violence on the wide set of intangible outcomes even after accounting for unobserved heterogeneity.

This paper is divided into seven sections, including this introduction. The next section presents a brief review of the main theoretical models linking intra-household bargaining, violence, and marriage. Section 3 describes the DHS data in detail and the measures of domestic violence used in this paper. Section 4 presents the correlates using all Latin American countries. It shows that violence against women is strongly correlated with marital status and women's health, and that it creates a negative externality by affecting the health outcomes of children. The methodology for using the creation of the women's center in Peru as a valid exogenous source of variation is presented in Section 5. The findings, which suggest that the effects on short-term health outcomes of children are causal, are discussed in Section 6. Section 7 summarizes the findings and concludes.

2. Household Models and Domestic Violence

Traditional economic models, which presuppose the existence of rational agents and full information, cannot explain domestic violence. In these models, violence never takes place because agents are fully informed of the cost of their acts and are aware of their strengths and the strengths of the other parties. Traditional household models, where there is a unique decision-maker, cannot explain violence either. If the household's utility function is assumed to be unitary, there is no conflict, as this requires more than one party with different preferences.

Nevertheless, domestic violence exists. The rates for domestic violence in LAC countries are not homogenous, and in some countries violence affects almost 40 percent of women between ages 15 and 49. This section briefly describes the structure of household models that address domestic violence and explores their main predictions and limitations.

Models of domestic violence usually consider two individuals—husband and wife—where one of them uses violence against the other. There are two main motivations for the use of violence. First, men have possibly heterogeneous preferences for violence. Second, men can use violence as a mechanism to influence their wives' behavior (Bowlus and Seitz, 2006) or to extract transfers from their wives' parents (Bloch and Rao, 2002). Women receive disutility from abuse and can respond to domestic violence by divorcing their spouses. The divorce decision is usually modeled as unilateral and is assumed to be a decision made by women. These models

assume that there are gains from marriage in the form of access to public goods or through exploitation of economies of scale. An example of a public good in these settings is the quality of the children.

The simplest models predict that, when the out-of-marriage value for women is higher, violence against them is reduced. This prediction was tested and validated by Aizer (2010), who showed that domestic violence against women is lower in areas where the gender wage gap is reduced in the United States. La Mattina (2012) found that women who married after the 1994 genocide in Rwanda in provinces where there were fewer men than women were more likely to experience domestic violence. In both cases, the outside option affects domestic violence by altering the relative wages or the sex ratio.

Another important prediction of these models is that violence should lead to higher divorce rates. Bowlus and Seitz (2006) found evidence that favors this hypothesis. Using retrospective data from the United States and a structural model, they showed that women's behavior is responsive to the presence of violence. In particular, they found that women that experienced an abusive relationship were more likely to be divorced than women in non-abusive marriages. These findings are contrary to the common perception that women have great difficulty leaving abusive marriages. Furthermore, divorce might be more difficult in countries where it is costly due to legal costs or societal norms.

The household models often ignore the impact of violence on children. If the spouses internalize the negative effect of violence on the health of children who witness the violence among the adults, the likelihood of violence will be reduced. Whether this reduction comes from changes in the incentives of the husband or the wife will depend on how much they value their children. This internalization, however, is not currently present in these models.

3. Domestic Violence in the Demographic and Health Surveys

To estimate the intangible costs of domestic violence in LAC, the study uses the Demographic and Health Surveys (DHS) as its main dataset.[1] The DHS are nationally representative cross-sectional surveys that have been conducted in developing countries since the mid-1980s. For the surveys, women between the ages of 15 and 49 answer questions that include their birth history, fertility preference, socio-economic characteristics, marital status, employment status, and

[1] The data can be downloaded free of charge, after registration, from http://measuredhs.com.

occupation. Starting in the early 1990s and becoming widespread by the end of that decade, the DHS have included a special module with questions about domestic violence that are consistent over time and across countries. All women are asked whether they experienced threats or mental or physical abuse from their current or previous partners.

In the LAC region, the domestic violence module is available for the following countries and years: Bolivia (2003 and 2008), Colombia (2000, 2005, and 2010), Dominican Republic (1999, 2007), Haiti (2000, 2005), Honduras (2005), Nicaragua (1998), and Peru (2000, 2004-2008 and 2009-2011). Because Bolivia and Nicaragua had questionnaires that included a limited number of questions about violence, these two countries were dropped from the final sample. Also, to facilitate the comparison across countries, the study employs the latest DHS in each country, as they all belong to the sixth phase of the DHS rounds. The final sample size yielded more than 83,000 observations representing approximately 26.3 million women.[2] This study is the first to use such a large dataset for the LAC region to estimate the costs of domestic violence. The countries included in the analysis are spread over all sub-regions, including Central and South America and the Caribbean, and across all income levels in LAC, including low-income, lower-middle income, and upper-middle income.

The DHS capture three types of domestic violence. Questions on emotional, sexual, and physical violence are asked to women in a union at the time of the survey or before. Only women who were never married or never cohabitated are excluded from the sample. The Appendix of this report shows how the selected sample differs from its counterparts who were not included in the domestic violence module. Women excluded from the sample were younger, had fewer children, and were more educated.

This paper focuses exclusively on physical violence.[3] The DHS measures physical violence in at least four ways. First, women are asked if they experienced any of the following violent acts from their spouse or partner:

a. Spouse ever pushed, shook or threw something.
b. Spouse ever slapped.
c. Spouse ever punched with fist or something harmful.

[2] Peru is the only country in LAC that has a continuous DHS where the survey is conducted quarterly instead of every five years.
[3] The other types of violence are left for future papers.

d. Spouse ever kicked or dragged.
e. Spouse ever tried to strangle or burn.
f. Spouse ever threatened with knife/gun or other weapon.
g. Spouse ever attacked with knife/gun or other weapon.
h. Spouse ever physically forced sex when not wanted.
i. Spouse ever forced other sexual acts when not wanted.
j. Spouse ever twisted arm or pulled hair.

The first measure counted the number of violent acts a woman experienced. The second measure created a binary variable equal to one if a woman experienced at least one of these acts, and zero otherwise. The third and fourth measures come from direct questions that ask if a woman experienced any severe violence or if she suffered any less severe violence compared to the above list. Binary variables were created to capture whether the women responded in the affirmative to these questions, separately.

Figure 1[4] shows that Peru and Colombia have the highest rates of physical violence. The proportion of women who reported experiencing an act of physical violence from the above list is close to 40 percent in Peru. This number is slightly lower for Colombia. For the Dominican Republic, Haiti, and Honduras, the rate is below 20 percent. Close to one out of five women in Peru reported severe violence, with smaller rates for all other countries.

Four measures for domestic violence were used to evaluate their effect on several intangible costs, including women's labor force participation, contraceptive use, visits to health centers, and the effects on the welfare of their children.[5] For children, the set of outcomes included nutritional status as measured by birth weight, height, weight, and anemia status, as well as vaccinations for children younger than six at the time of the survey.

Table 1 shows the difference in the characteristics and outcomes of women who experienced any act of physical violence compared to those who did not. While the complete set of variables is not available for all countries as shown by the differences in sample size by outcome, this set provides a broad picture of the intangible costs of domestic violence. For most outcomes there is a statistical difference between women affected by violence and their

[4] Figures and tables appear at the end of this paper.
[5] Recent articles have used DHS data to study the labor supply of women and show that the information is reliable (e.g., Agüero and Marks, 2008 and 2011, and Agüero, Marks and Raykar, 2012).

counterparts who were not. These differences can hardly be considered evidence of the causal effect of violence on these outcomes because several confounding variables could be affecting the likelihood of domestic violence and, thus, the outcomes shown in Table 1. The next section presents a methodology to reduce the possible biases produced by these confounding variables.

4. Correlates of Domestic Violence in Latin America and the Caribbean

4.1 Methodology

To estimate the effect of violence against women on intangible outcomes the following equation was used:

$$(1) \qquad Y_{ij}=\beta DV_{ij}+\delta X_{ij}+\alpha_j+e_{ij}$$

where Y_{ij} is an intangible outcome from the set of outcomes described above for woman *i* (or the children of women *i*) who lives in country *j*. DV_{ij} is a measure of domestic violence described in the previous section so β is the parameter of interest. It is important to know that these measures of physical violence are asked only if the woman is alone during the interview. This feature increases the validity of these responses, as it minimizes the bias that could come from fear.

The regression includes a set of variables (X_{ij}) allowing us to control for women's age, education level, location (urban/rural), and others. The inclusion of this set of controls will increase the consistency of the estimates.

Furthermore, equation (1) includes country fixed-effects (α_j) to account for possible time-invariant unobserved characteristics, such as cultural differences or attitudes toward the role of women in each society, as well as possible framing issues varying by country. Finally, there are estimates of heteroskedasticity-consistent standard errors clustered at the primary sample unit level. All estimates include the DHS sample weights specific for the domestic violence module. In the next section is a presentation and discussion of the results of estimating equation (1) using DHS data from Colombia, the Dominican Republic, Haiti, Honduras, and Peru.

4.2 Violence and Women's Outcomes

Table 2 shows the association between physical violence and the set of women's outcomes. We consider four main outcomes for women: contraception use, marital status, health, and employment. For each specific outcome, four regressions were run using the four measures of physical violence described in Section 3. Consider, for example, the marital status outcome

where the dependent variable takes the value of one if a woman is no longer with her husband or partner because she is divorced or separated. Column (3) shows that when a woman experiences an additional act of physical violence she is four percentage points more likely to be separated or divorced. This is a large effect as it increases the separation rate by 25 percent compared to the mean. Women who experience any type of physical violence are 83 percent more likely to be divorced than their counterparts who did not experience this violence (Column 4). The largest results were found for severe violence, which increases the divorce rate by 132 percent.

These findings are consistent with the models of household bargaining discussed in section two. In those models, the main predictor of the effect of domestic violence is the termination of the marriage. The results here validate these predictions, even in the more conservative societies included in the sample.

Table 2 also shows that the association between physical violence and contraceptive use is present only when the violence is severe. The use of modern contraceptives such as the pill, intrauterine devices, injections, diaphragms, condoms, and female sterilization is positively associated with physical violence.

The table also shows important negative associations with women's health. In particular, women who experience any type of physical violence have lower hemoglobin levels, or blood count adjusted by altitude and location. The link seems to be concentrated at the bottom of the distribution, as the anemic rate increases by 9 percent with any violence and increases by 15 percent with severe physical violence (Columns 3 and 4, respectively). There was no effect on women's weight.

Women's height was included in Table 1 as a placebo test. Given that women's height is determined by her nutritional intakes from birth until adolescence, this measure of health should not be correlated with the physical violence that occurs after marriage, after controlling for age, education, urban location, and country of birth. Finding such a correlation will suggest that domestic violence as measured in this paper is capturing other unobserved variables affecting women's health and therefore biasing the findings. The results from Table 1 are reassuring. There is no statistical correlation between women's height and any of the measures of physical violence. Furthermore, the estimated parameters are very small, as they are less than half of a centimeter.

Finally, the study explored the association with female employment. The results indicate that women experiencing domestic violence are more likely to work. This result may sound counterintuitive. Consider again the strongest result reported so far. Domestic violence increases the divorce rate. Thus, part of the effect of violence on women's labor supply is going through changes in her marital status. The results in Table 1 capture the reduced form effect. If there were controls for marital status, lower effects for domestic violence on female employment might be seen.

This is done in Table 2. It presents the results of a regression as in equation (1) with and without controls for marital status. Column (1) reproduces the estimates from Table 1 when no controls for marital status were included. In column (2), these variables were added to the main specification. For all measures of physical violence, the association between violence and female employment is smaller when controls for marital status are added. In some cases, the parameters are reduced by close to 50 percent. Thus, given the estimation of reduced form equations and given the high association between marital status and female employment, it is important to be cautious about the results for labor-related outcomes. Furthermore, it is possible that the observed estimates are capturing a reverse causality effect. A recent paper, for example, used a randomized control trial where women were randomly allocated to work in the flower industry in Ethiopia. The paper asserts that employment opportunities increase violence against women because men feel threatened by the gains in control earned by their wives (Hjort and Villanger, 2012).

4.3 Violence and Children's Outcomes

The models discussed in Section 2 focused on the decision-making process between spouses and left alone the effects on children. It is possible, however, that domestic violence has a negative externality if it affects children and not only women. Table 4 explores this possibility by regressing a large set of children's outcomes on each of the four measures of physical violence. As explained in Section 3, these outcomes are restricted to children younger than six, allowing exploration of whether domestic violence affects the human capital accumulation of children before they go to school. This topic is extremely relevant, as a growing literature in economics identifies early childhood as the most sensitive period in people's lives (e.g., Almond and Currie, 2011).

The results suggest a strong negative association between physical violence against women and the health of children. These negative effects take place even before birth. Children are less likely to have had the required four or more prenatal visits while in utero if their mothers experienced physical violence. Children are more likely to have had diarrhea in the last 15 days and they tend to have lower weight. Furthermore, the effects are not limited to short-term outcomes. Table 4 includes two measures of longer-term indicators. First, violence against their mothers reduces the likelihood that children have received vaccines, with the measles vaccine being the most excluded. Second, children born to a mother who experienced physical violence are shorter than those whose mother did not experience physical abuse. These findings suggest an important presence of negative externalities from domestic violence against women.

These results represent an important contribution. As discussed by Aizer (2011), previous calculations of the costs of domestic violence have not considered the external costs associated with children's health. Aizer explored the effect on the birth weight of children born to women who are the victims of violence while pregnant and that led to hospital admissions in the United States. However, as she stated, this is a limited and extreme situation because several acts of violence will not require a hospital admission and might not occur during pregnancy. These results suggest that externalities are not limited to violence leading to hospital admissions and have effects beyond the birth of the child.

5 Estimating the Causal Effect: A Case Study from Peru

As described in the introduction, recent papers have shown that income, wealth, and emotional cues have a significant influence on domestic violence. Thus, if these variables are not included in a regression equation such as (1), it is possible that estimates of β are biased. For example, income and wealth could simultaneously affect the likelihood of domestic violence and the employment possibilities of women. In this case, estimates of β, even after controlling for all the variables included in equation (1) could be biased due to the difficulty of separating the effects of violence from other unobserved confounding effects. This section proposes a methodology that uses a "natural experiment" from Peru to overcome this problem.

The *Centros Emergencia Mujer* (or CEM) are public centers that have the goal of providing care and preventing cases of domestic violence, free of charge. The program was created in March 1999 by the Peruvian *Ministerio de la Mujer y Desarollo Social* (MIMDES).

The number of centers grew from 13 in the first year to 40 in 2004. However, the widest expansion was observed between 2007 and 2010: from 49 CEMs to over 110 distributed across all 24 regions of Peru, and by March 2012, there were 149 centers nationwide. The CEM's expansion across time and space is used as an exogenous source of variation in the prevalence of domestic violence.[6]

The study matched the presence of a CEM in a district based on its date of creation with the Peruvian DHS surveys that contain a domestic violence module (2000, 2004-2008 and 2009-2011) using the district information included in the DHS. It takes advantage of the fact that the expansion of CEMs coincides with the DHS years, especially given that the surveys were conducted quarterly from 2004 to 2011. This is shown in Figure 2. This creates two sources of variation. First, at any point in time, there is cross-sectional variation in the exposure to CEMs. Second, there is variation across time because localities that gained a CEM did so during different years. This spatial and time variation was exploited and re-estimated the effect of domestic violence on all the intangible outcomes where the prevalence of the violence is affected by the presence of CEMs in the locality due to the strong emphasis on prevention.[7]

Formally, for the case of Peru, equation (1) was modified as follows:

$$(2) \qquad Y_{ijt}=\beta\, E[DV_{ijt}|Z_{ijt}]+\delta X_{ijt}+\alpha_j+\gamma_t+\eta_{jt}+e_{ijt}$$

Note that the *j* subscript refers to areas within Peru rather than countries (as in equation (1)) and takes advantage of the repeated cross-sections to add a time dimension indexed by *t*.[8] The main difference between equation (1) and (2) is the inclusion of $E[DV_{ijt}|Z_{ijt}]$, representing the predicted prevalence of domestic violence (DV_{ijt}) obtained from Z_{ijt}, which, in turn is estimated from equation (3).

$$(3) \qquad DV_{ijt}= \pi Z_{ijt}+\theta X_{ijt}+\alpha_j+\gamma_t+\eta_{jt}+u_{ijt}$$

Equation (3) constitutes the first stage in a two-stage, least-squares estimation (2SLS) and equation (2) is the second stage that uses the predicted values of DV_{ijt}. Specifically, Z_{ijt} is a

[6] The complete list of CEMs by district, including their date of creation, can be obtained from http://www.mimp.gob.pe/files/PROGRAMAS%20NACIONALES/PNCVFS/estadistica/directorio_cem_2012.pdf (accessed on June 7, 2012).

[7] CEMs are responsible for conducting workshops, training sessions, seminars, and conferences focusing on prevention, and they have hired and trained several facilitators to reach a larger share of the women in their communities.

[8] The DHS are repeated cross-sectional surveys, so it is not possible to add individual fixed-effects.

vector that includes an indicator variable equal to one if there is a CEM in the locality *j* of woman *i* at time *t* in addition to interactions with age and survey year. Thus, vector Z_{ijt} is the instrument.

To be a valid instrument, Z_{ijt} must be strongly correlated with the DV_{ijt} ($\pi \neq 0$). Evidence from MIMDES suggests that the prevalence of domestic violence has been affected by the creation of CEMs (MIMDES, 2007). This study expands upon this evidence by estimating equation (3) and testing whether $\pi \neq 0$, as expected.

It is important to note that the use of CEMs as a viable exogenous source of variation requires a change in the way domestic violence is defined. In the Peruvian DHS, it is possible to separate whether acts of domestic violence took place in the last 12 months or before that. Thus, given the recent creation of the CEMs, their effect on recent violence can only be studied 12 months prior to the survey. Likewise, there is a limit on the set of child outcomes to those reflecting short-term health because they are the most likely to be affected by the introduction of CEMs.

Also, the existence of a CEM must impact the intangible outcomes only through its effect on domestic violence and not directly. To avoid the problem generated by the non-random allocation of CEMs locality, fixed effects are included, given the repeated cross-sectional nature of the Peruvian DHS. These fixed effects allow an accounting for all the time-invariant, unobservable and observable, characteristics driving the creation of CEMs in each locality. That is, the results will not be biased even if CEMs were located in poorer or coastal areas or if the MIMDES might have decided to create these centers in areas where the attitudes toward women were the least or most favorable.

The presence of CEMs could have a direct effect on the welfare of children if these centers also focus on children. This is not the case in Peru. Violence against children is assigned to a different institution (*Defensoría Municipal del Niño y el Adolescente*, DEMUNA) and their presence in a district is unrelated to the creation of a CEM. DEMUNAs are created by the district or local government, while CEMs are created by MIMDES, or the national government. Furthermore, a possible test of the external validity of the 2SLS methodology is to check whether the presence of CEMs is predicted by previous outcomes. This is done in Table 5.

There the presence of a CEM is regressed in the district against a large set of the characteristics of the districts at baseline, that is, the 2000 DHS. The table shows that women's

and children's characteristics at baseline do not predict the future creation of a CEM. All of the variables are uncorrelated with the future location of a center. One exception is worth mentioning. As shown in Table 5, urban areas are more likely to have a center in the future, so in all our specifications we control for this variable.

6 Results from Peru: Short-Term Health Outcomes

6.1 Do CEMs Affect the Levels of Violence against Women?

Table 5 shows that the presence of a center cannot be predicted by the baseline variables, thus, the creation of a center could serve as a valid exogenous source of variation for domestic violence. Table 6 complements its validity by showing that the incidence of recent episodes of domestic violence is correlated with the presence of a center in the district. However, younger women are more likely to experience violence in the 12 months prior to the survey compared to older women (DHS Report, 2011). Thus, the age of a woman at the time of the opening matters for violence, in addition to the location and year that the center was created.

This relation is shown in Figure 3, which plots the predicted likelihood of experiencing violence in the 12 months prior to the survey based on women's age using a local polynomial estimator. Furthermore, this relationship is estimated separately for districts with a center at the time of the survey, and districts without a center. The results provide a visual validation of the use of CEMs as an instrument. In both sets of districts, the likelihood of recent violence decreases with age. However, the gradient is steeper for districts with CEMs (green line)compared to those without them—red line. Women in districts with a center also have a lower propensity to suffer from violence. The confidence intervals for these two lines, not shown in the graphs, clearly suggest that the differences are significant, statistically speaking.

Table 6 presents a regression equivalent of Figure 3. This table shows the results of regressing the likelihood of experiencing violence in the last 12 months against the presence of a CEM in the district, its interaction with age, and its interactions with age and survey year, after controlling for women's education, age, and location fixed-effects. These findings show that the presence of a CEM in the district alters the probability of suffering from domestic violence by reducing the chances, especially for younger women, which is consistent with the previous discussion.

6.2 The Effect of Violence on Intangible Outcomes

This section instruments for violence against women using the presence of a CEM and its interaction with age and year to estimate the causal effects of violence on intangible outcomes of children's short-term health. Figure 3 showed that the instrument had an effect on the variable of interest. Figure 4 presents a graphical representation of the reduced-form regression. In particular, the predicted hemoglobin levels of a child are plotted against the mother's age, using a local polynomial for districts with and without CEMs. The graph shows that for all ages of the mother, children living in districts with centers have higher hemoglobin levels than their counterparts living in districts without centers. Combining Figures 3 and 4 provides graphical evidence that domestic violence has a negative causal effect on the short-term health outcomes of children.

Table 7 shows the OLS and GMM estimates of domestic violence on all the intangible children outcomes.[9] For example, the OLS estimates in Column 3 show a negative relationship between recent violence and the probability that a child suffered from diarrhea 15 days prior to the survey. In particular, children whose mother experienced domestic violence are 15 percentage points more likely to have diarrhea. The GMM estimate (recall that instrument *Z* is a vector as shown in Table 6 and not just a variable) supports this negative relationship, suggesting that it is indeed causal (Column 4).[10] As expected, the probability the instruments are weak is rejected as shown by the p-value of the F-statistic from the first stage (Column 5).

Column 6 shows that the null hypothesis cannot be rejected that the efficient and consistent estimators are equal to each other using the Hausman test. This is true for all the other outcomes as well. This suggests that the OLS estimates are unlikely to be biased.

The study also explored whether the effects of the violence are heterogeneous. Table 8 shows the results. Column 2 indicates that the effect of violence on the likelihood of diarrhea

[9] There is an important difference between the set of outcomes included in Table 7 compared to those in Table 4. For instance, as described before, using all the Latin American and Caribbean countries does not allow separation between recent and past experience of violence, unlike the Peruvian DHS. Thus, the prenatal and birth data for Table 6 cannot be used given that violence is measured for the 12 months prior to the survey. To do so, the sample of children would have to be limited to younger than 24 months, which implies a large decline in sample size with its expected losses of power for the estimates.

[10] In all IV estimates, the parameters represent a local average treatment effect (LATE) that could possibly be different (larger) than the average effect, as women whose behavior is changed by CEMs are not the "average" women in the sample. This is, for example, the case of height for age. However, by construction, the LATE is closer to the impact sought by policy makers, therefore the IV estimates are extremely relevant. However, there is nostatistical evidence in support of the IV estimates except for height for age.

decreases with the education levels of the mother by 0.6 percentage points per year of schooling. Thus, education seems to act like a buffer of the effect. Similar buffering effects are found for the probability of receiving a measles vaccine. Column 3 of Table 8 indicates that living in an urban location does affect the impact of the domestic violence. Finally, Column 4 shows that age of the mother also serves as a buffering mechanism, but for only two outcomes: hemoglobin levels and measles vaccinations. These findings suggest that there are heterogeneous effects. However, they seem to be concentrated on a few selected health outcomes.

7 Conclusions

This paper uses a rich and standardized module of domestic violence included in health surveys to show that domestic violence is highly prevalent in Latin American and Caribbean countries. It shows that the prevalence of domestic violence is highly associated with changes in marital status, as predicted by several models of household bargaining. This type of violence is also negatively linked to women's health as measured by hemoglobin and anemia rates. Furthermore, the paper shows that the effect of domestic violence is not limited to the direct recipients of the abuse. There is strong evidence of negative externalities. Children whose mothers suffered from physical violence have worse health outcomes. Unlike previous studies, this study shows that externalities are not limited to violence leading to hospital admissions and have effects beyond the birth of the child.

Using the spatial and time variation in the expansion of centers for women addressing domestic violence issues in Peru, this paper shows that the effects appear to be causal. These findings suggest that the impact of domestic violence affects the human capital accumulation or health of the next generation of workers. The study provides suggestive evidence that the mother's education and age tend to buffer the negative effects of domestic violence.

This paper constitutes the most comprehensive analysis about the true intangible costs of domestic violence in the region. There are, however, some remaining questions. For instance, how is the negative externality that affects children generated? As discussed by Pollak (2004), it is possible to construct a model of intergenerational transmission of violence. Women who suffer violence from their partners might treat their own children with violence as well. Benavides (2012) finds support for this intergenerational transmission of violence in Peru. Future work

should test whether this channel is an important mechanism explaining the negative effects on children's health from violence against their mothers.

Another critical issue that should be explored in future research is the set of possible mechanisms behind the observed effect of the presence of the women's centers and the reduction in recent domestic violence. Theoretical models of household bargaining predict that shelters for battered women such as Peru's CEMs should increase women's bargaining power at home and reduce the likelihood of violence (e.g., Tauchen and Witte, 1995; Farmer and Tiefenthaler, 1996). In particular, Farmer and Tiefenthaler (1996) argue that women's centers allow women to send a signal to their husbands regarding their outside options. Future work should examine whether this is an important mechanism for countries in Latin America.

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Table 1. Main Statistics by Violence Prevalence							
	Experienced any physical violence from partner?						Mean
	No			Yes			test:
Variables	N	Mean	SD	N	Mean	SD	P-value
Women's characteristics							
Number of children at home	57168	2.041	1.550	25926	2.12	1.448	0.000
Age	57168	33.011	8.854	25926	33.833	8.693	0.000
Years of schooling	57168	7.599	4.839	25926	7.58	4.357	0.596
Urban	57168	1.428	0.495	25926	1.356	0.479	0.000
Age at first marriage	57168	19.538	4.762	25926	18.964	4.357	0.000
Women's outcomes							
Uses contraceptives	57168	0.649	0.477	25926	0.687	0.464	0.000
Uses modern contraceptives	57168	0.55	0.498	25926	0.585	0.493	0.000
Not living with partner	57168	0.131	0.338	25926	0.245	0.430	0.000
Height (cm)	43761	153.7	6.513	20377	153.5	6.265	0.000
Weight (kg)	43775	61.6	12.596	20381	62.0	12.203	0.000
Is anemic	23267	0.226	0.418	8686	0.248	0.432	0.000
Hemoglobin levels	21775	13.13	1.730	8105	13.309	1.844	0.000
Body Mass Index	43724	26.0	4.876	20369	26.3	4.730	0.000
Underweight	43724	0.038	0.192	20369	0.03	0.170	0.000
Overweight	43724	0.534	0.499	20369	0.562	0.496	0.000
Obese	43724	0.187	0.390	20369	0.192	0.394	0.095
Currently works	56471	0.531	0.499	25491	0.637	0.481	0.000
Children's outcomes							
Height-for-age z-scores	21069	-0.857	1.216	8174	-0.893	1.144	0.021
Weight-for-height z-scores	21071	0.157	1.071	8174	0.146	1.020	0.418
Had at least four prenatal visits	25688	0.854	0.353	10445	0.84	0.367	0.001
Birth weight (grs)	19396	3265	629.0	8137	3242	615.9	0.006
Was vaccinated	6524	0.907	0.290	2932	0.928	0.258	0.001
Received measles vaccine	25286	0.669	0.471	10254	0.696	0.460	0.000
Received first polio vaccine	25158	0.907	0.290	10185	0.911	0.285	0.232
Received first DPT vaccine	25337	0.911	0.285	10252	0.92	0.272	0.011
Had diarrhea	25308	0.325	0.738	10206	0.416	0.812	0.000
Hemoglobin level	9232	10.97	1.450	3225	10.978	1.439	0.792
Is anemic	10705	0.405	0.491	3865	0.388	0.487	0.062
Source: Author's estimates based on DHS data from Colombia, Haiti, Honduras, Dominican Republic and Peru.							

Table 2. Correlates between Physical Violence and Women's Outcomes						
			Measures of physical violence			
		Mean of depen-	Number of	Any physical	Any severe	Any less severe
Dependent variable	N	dent variable	violent acts	violence	violence	violence
	(1)	(2)	(3)	(4)	(5)	(6)
Uses contraceptions	83094	0.661	-0.0015	-0.0027	-0.0384***	-0.0042
			[0.0009]	[0.0064]	[0.0083]	[0.0064]
Uses modern contraceptions	83094	0.561	0.0021	0.0153**	-0.0096	0.0145**
			[0.0014]	[0.0072]	[0.0084]	[0.0069]
Marital status: no longer	83094	0.167	0.0393***	0.1389***	0.2201***	0.1351***
living together			[0.0034]	[0.0158]	[0.0188]	[0.0148]
Anemic	31953	0.232	0.0084*	0.0208*	0.0345**	0.0216*
			[0.0043]	[0.0125]	[0.0158]	[0.0122]
Hemoglobin level	29880	13.178	-0.0233*	-0.0560*	-0.0589	-0.0628**
			[0.0129]	[0.0297]	[0.0464]	[0.0306]
Body Mass Index	64093	26.116	-0.0027	0.0495	0.0505	0.0376
			[0.0142]	[0.0600]	[0.1254]	[0.0574]
Underweight	64093	0.036	-0.0007	-0.0024	-0.0040*	-0.0016
			[0.0005]	[0.0017]	[0.0021]	[0.0017]
Overweight	64093	0.543	0.0001	0.0037	0.0051	0.0051
			[0.0015]	[0.0064]	[0.0077]	[0.0067]
Obese	64093	0.188	-0.0011	-0.0005	-0.0031	-0.0008
			[0.0011]	[0.0054]	[0.0094]	[0.0047]
Weight (kg)	64156	61.737	-0.0099	0.0744	0.0675	0.0583
			[0.0404]	[0.1626]	[0.3179]	[0.1504]
Height (cm)	64138	153.65	-0.0043	-0.0415	-0.046	-0.0207
			[0.0142]	[0.0613]	[0.0829]	[0.0517]
Currently works	81962	0.564	0.0148***	0.0592***	0.0833***	0.0578***
			[0.0013]	[0.0055]	[0.0072]	[0.0056]

Note: Robust standard errors clustered by regions within countries in brackets. * significant at 10%; ** significant at 5%; ***significant at 1%. Each cell represents a different regression that included survey year, age, years of schooling, urban location, country and region fixed effects and number of children living at home.
Source: Author's estimates based on DHS data from Colombia, Haiti, Honduras, Dominican Republic and Peru.

Table 3. Physical Violence and Women's Employment		
	Dependent variable: Women currently works	
Measures of physical violence	(1)	(2)
Number of violent acts	0.0148***	0.0076***
	[0.0013]	[0.0015]
Any physical violence	0.0592***	0.0338***
	[0.0055]	[0.0057]
Any severe violence	0.0833***	0.0423***
	[0.0072]	[0.0072]
Any less severe violence	0.0578***	0.0328***
	[0.0056]	[0.0054]
Controls for marital status	N	Y
Observations	81962	
Mean of dependent variable	0.564	

Note: Robust standard errors clustered by regions within countries in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Each cell represents a different regression that included survey year, age, years of schooling, urban location, country and region fixed effects and number of children living at home.
Source: Author's estimates based on DHS data from Colombia, Haiti, Honduras, Dominican Republic and Peru.

Table 4. Correlates between Physical Violence and Children's Outcomes						
			Measures of physical violence			
Dependent variable	N	Mean of dependent variable	Number of violent acts	Any physical violence	Any severe violence	Any less severe violence
	(1)	(2)	(3)	(4)	(5)	(6)
Had diarrhea in the last 15 days	31789	0.350	0.0259***	0.0904***	0.1182***	0.0890***
			[0.0036]	[0.0122]	[0.0199]	[0.0133]
Hemoglobin level	12457	10.972	0.0013	-0.0015	-0.0311	-0.0202
			[0.0156]	[0.0395]	[0.0703]	[0.0393]
Anemic	14570	0.400	0.0036	0.0082	0.0235	0.01
			[0.0042]	[0.0131]	[0.0157]	[0.0123]
Four or more prenatal visits	31548	0.851	-0.0055***	-0.0205***	-0.0197**	-0.0207***
			[0.0012]	[0.0051]	[0.0083]	[0.0052]
Birth weight (grams)	24050	3268.2	1.8028	0.0572	-6.652	5.0611
			[2.5635]	[10.4376]	[16.3926]	[10.4117]
Was vaccinated	7603	0.904	-0.003	-0.0176**	-0.0069	-0.0187**
			[0.0018]	[0.0078]	[0.0120]	[0.0083]
Received measles vacccination	31640	0.676	-0.0034**	-0.0088*	-0.0156***	-0.0109**
			[0.0014]	[0.0052]	[0.0054]	[0.0053]
Received first polio vacccination	31446	0.909	-0.0005	-0.0058	0.002	-0.0059
			[0.0012]	[0.0040]	[0.0063]	[0.0042]
Received first DPT vacccination	31681	0.913	-0.001	-0.0036	-0.0042	-0.0043
			[0.0010]	[0.0042]	[0.0054]	[0.0042]
Weight-for-height z-score	29245	0.154	-0.0095*	-0.0476***	-0.0300	-0.0455***
			[0.0053]	[0.0171]	[0.0279]	[0.0169]
Height-for-age z-score	29243	-0.867	-0.0107**	-0.0276	-0.0826***	-0.022
			[0.0042]	[0.0190]	[0.0256]	[0.0196]

Note: Robust standard errors clustered by regions within countries in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Each cell represents a different regression that included survey year, age, years of schooling, urban location, country and region fixed effects and number of children living at home. Regressions for children's outcomes (except for anthropometrics) also include age in months of the child as fixed effects.
Source: Author's estimates based on DHS data from Colombia, Haiti, Honduras, Dominican Republic and Peru.

Table 5. Future Presence of Centers in the District and Variables at Baseline	
Variables	Coefficient
Women's characteristics	
Number of children at home	-0.0051
	[0.0088]
Age	0.0005
	[0.0023]
Years of education	0.002
	[0.0027]
Urban area (=1)	0.0810*
	[0.0425]
Age at first marriage	0.0038
	[0.0033]
Uses contraceptives	0.0537
	[0.0642]
Uses modern methods	-0.0399
	[0.0481]
Divorce/separated	0.0083
	[0.0465]
Height	0.0191
	[0.0167]
Weight	-0.025
	[0.0219]
Anemic (=1)	-0.0514*
	[0.0300]
Hemoglobin level	-0.0151**
	[0.0074]
BMI	0.0661
	[0.0552]
Underweight	-0.1083
	[0.1161]
Overweight or more	-0.0302
	[0.0476]
Obese	-0.0198
	[0.0708]
Currently works	0.0203
	[0.0192]
Child's characteristics	
Height-for-age z-score	0.0043
	[0.0096]
Weight-for-height z-score	0.0087
	[0.0086]
Four or more prenatal visits	-0.0028
	[0.0243]
Birth weight (grams)	-0.0000137
	[0.0000185]
Was vaccinated	0.1457
	[0.1121]
Received measles vacccination	-0.0527*
	[0.0277]
Received first polio vacccination	-0.0617
	[0.0693]
Received first DPT vacccination	-0.0543
	[0.0834]
Had diarrhea in the last 15 days	0.0036
	[0.0182]
Hemoglobin level	0.0046
	[0.0066]
Anemic	0.0204
	[0.0348]
Observations	534
Mean of dependent variable	0.075

Note: Robust standard errors clustered by district in parenthesis.
* significant at 10%; ** significant at 5%; ***significant at 1%.
Dependent variable: future presence of a women's center in the district.
Source: Author's estimates based on Peruvian DHS from 2000.

Table 6. Violence in the Last 12 Months and the Presence of Women's Centers			
Variables	Coefficient		Std Error
Women center (=1)	0.0752	***	(0.0263)
Center=0 * Age	0.0010		(0.0023)
Center=1* Age	-0.0014		(0.0028)
Center=0* Age*year=2005	-0.0080	***	(0.0017)
Center=0* Age*year=2007	-0.0067	***	(0.0022)
Center=0* Age*year=2008	-0.0044	***	(0.0015)
Center=0* Age*year=2009	-0.0056	***	(0.0014)
Center=0* Age*year=2010	-0.0054	***	(0.0013)
Center=0* Age*year=2011	-0.0060	***	(0.0013)
Center=1* Age*year=2005	-0.0087	***	(0.0019)
Center=1* Age*year=2007	-0.0033		(0.0028)
Center=1* Age*year=2008	-0.0042	*	(0.0023)
Center=1* Age*year=2009	-0.0057	***	(0.0019)
Center=1* Age*year=2010	-0.0044	***	(0.0016)
Center=1* Age*year=2011	-0.0059	***	(0.0017)
Mean of dependent variable	0.2282		
N	35,125		

Note: Robust standard errors clustered by district in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%. Dependent variable: woman experienced violence in the last 12 months. Other controls include survey year, women's age, years of schooling, urban location, age in months of the child and region fixed effects.

Source: Author's estimates based on Peruvian DHS from 2000 and 2004-2011.

Table 7. Domestic Violence and Children's Outcomes in Peru						
		Mean of depen-			P-value	
Dependent variable	N	dent variable	OLS	GMM	First stage	Hausman
	(1)	(2)	(3)	(4)	(5)	(6)
Had diarrhea in the last 15 days	35068	0.341	0.1506***	0.3984*	0.000	0.313
			[0.0146]	[0.2241]		
Hemoglobin level	22434	11.088	-0.0552*	-0.6053	0.000	0.254
			[0.0286]	[0.4768]		
Anemic	24519	0.396	0.0178*	0.0955	0.000	0.601
			[0.0094]	[0.1693]		
Was vaccinated	7053	0.944	0.0028	-0.0743	0.001	0.299
			[0.0063]	[0.0722]		
Received measles vacccination	34973	0.655	-0.0180***	-0.0367	0.000	0.857
			[0.0059]	[0.0837]		
Received first polio vacccination	34846	0.909	-0.0006	0.0842	0.000	0.242
			[0.0039]	[0.0589]		
Received first DPT vacccination	34542	0.893	-0.0014	0.0692	0.000	0.170
			[0.0041]	[0.0480]		
Weight-for-height z-score	32812	0.330	-0.0609***	0.047	0.000	0.944
			[0.0192]	[0.3179]		

Note: Robust standard errors clustered by district in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Each cell represents a different regression that included survey year, age, years of schooling, urban location, age in months of the child and region fixed effects. P-values refer to F-statistics for the significance of excluded instruments in the first stage (column 5) and Hausman test where the null hypothesis is that the efficient and consistent parameters are equal.

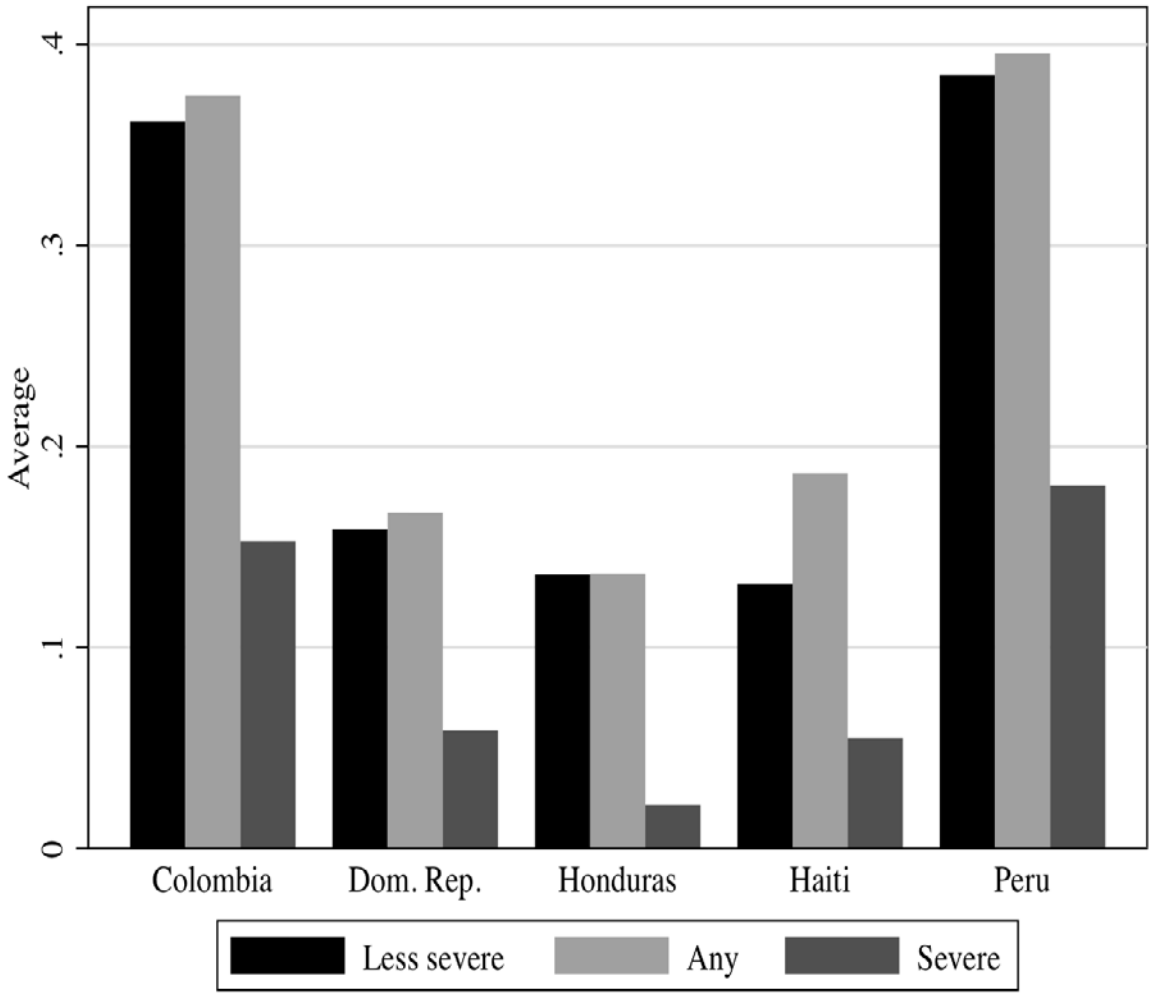
Source: Author's estimates based on Peruvian DHS from 2000 and 2004-2011.

Table 8. Heterogenous Effects by Education, Location and Age

		Heterogenous effects by:		
Variables	N	Mother's education	Urban area	Mother's age
	(1)	(2)	(3)	(4)
Had diarrhea in the last 15 days	35068	-0.0065 **	-0.0324	-0.0015
		(0.0030)	(0.0273)	(0.0019)
Hemoglobin level	22434	-0.0015	0.0193	0.0083 **
		(0.0075)	(0.0549)	(0.0038)
Anemic	24519	0.0010	0.0026	-0.0025 *
		(0.0024)	(0.0179)	(0.0013)
Was vaccinated	7053	-0.0003	-0.0063	0.0005
		(0.0014)	(0.0145)	(0.0009)
Received measles vacccination	34973	0.0022 *	-0.0093	0.0017 **
		(0.0012)	(0.0111)	(0.0008)
Received first polio vacccination	34846	0.0000	0.0010	0.0003
		(0.0008)	(0.0080)	(0.0005)
Received first DPT vacccination	34542	0.0001	-0.0051	0.0010
		(0.0010)	(0.0082)	(0.0006)
Weight-for-height z-score	32812	-0.0010	0.0192	0.0036
		(0.0046)	(0.0339)	(0.0029)

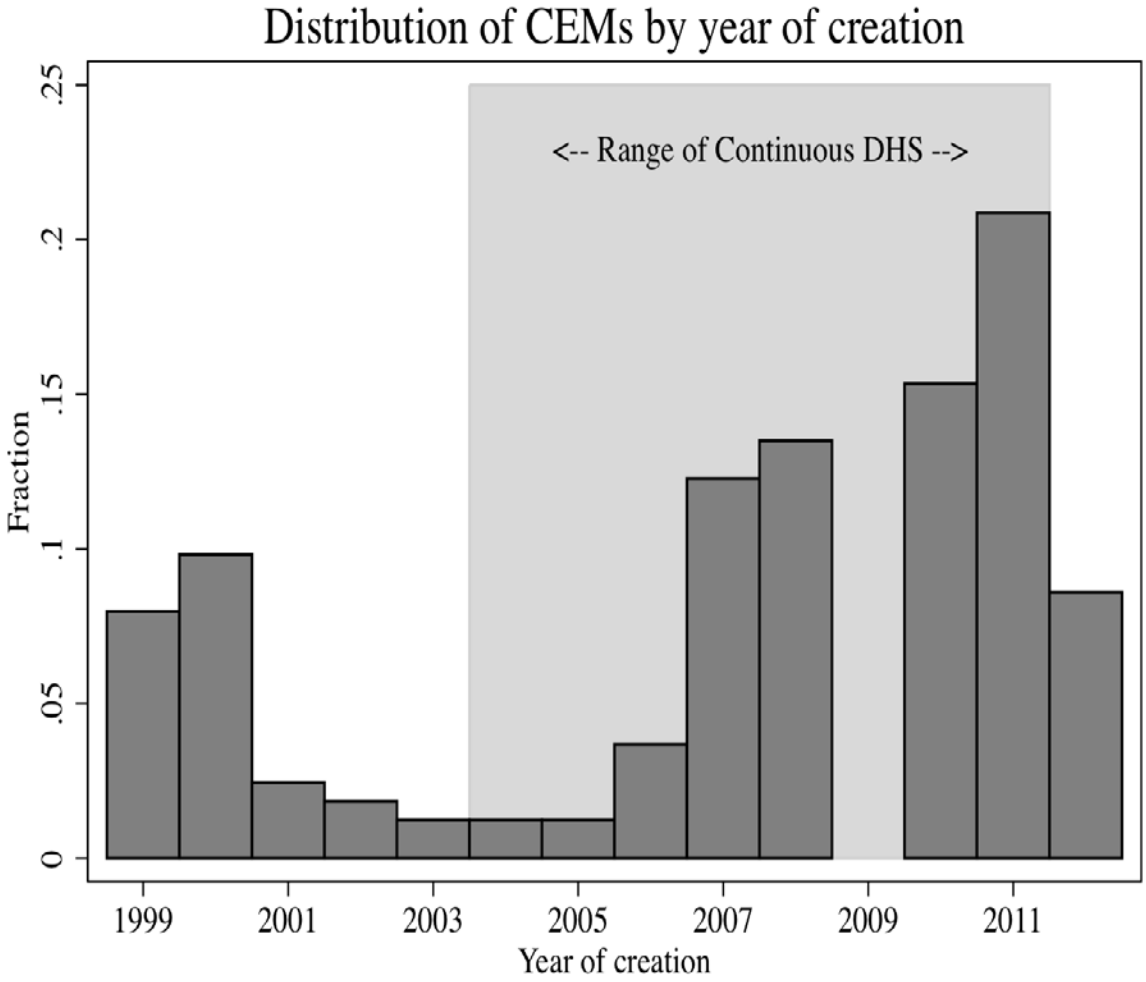
Note: Robust standard errors clustered by district in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%. Each cell represents a different regression that included survey year, age, years of schooling, urban location, age in months of the child and region fixed effects in addition to an indicator of domestic violence in the last 12 months.
Source: Author's estimates based on Peruvian DHS from 2000 and 2004-2011.

Figure 1. Prevalence of Physical Violence by Country



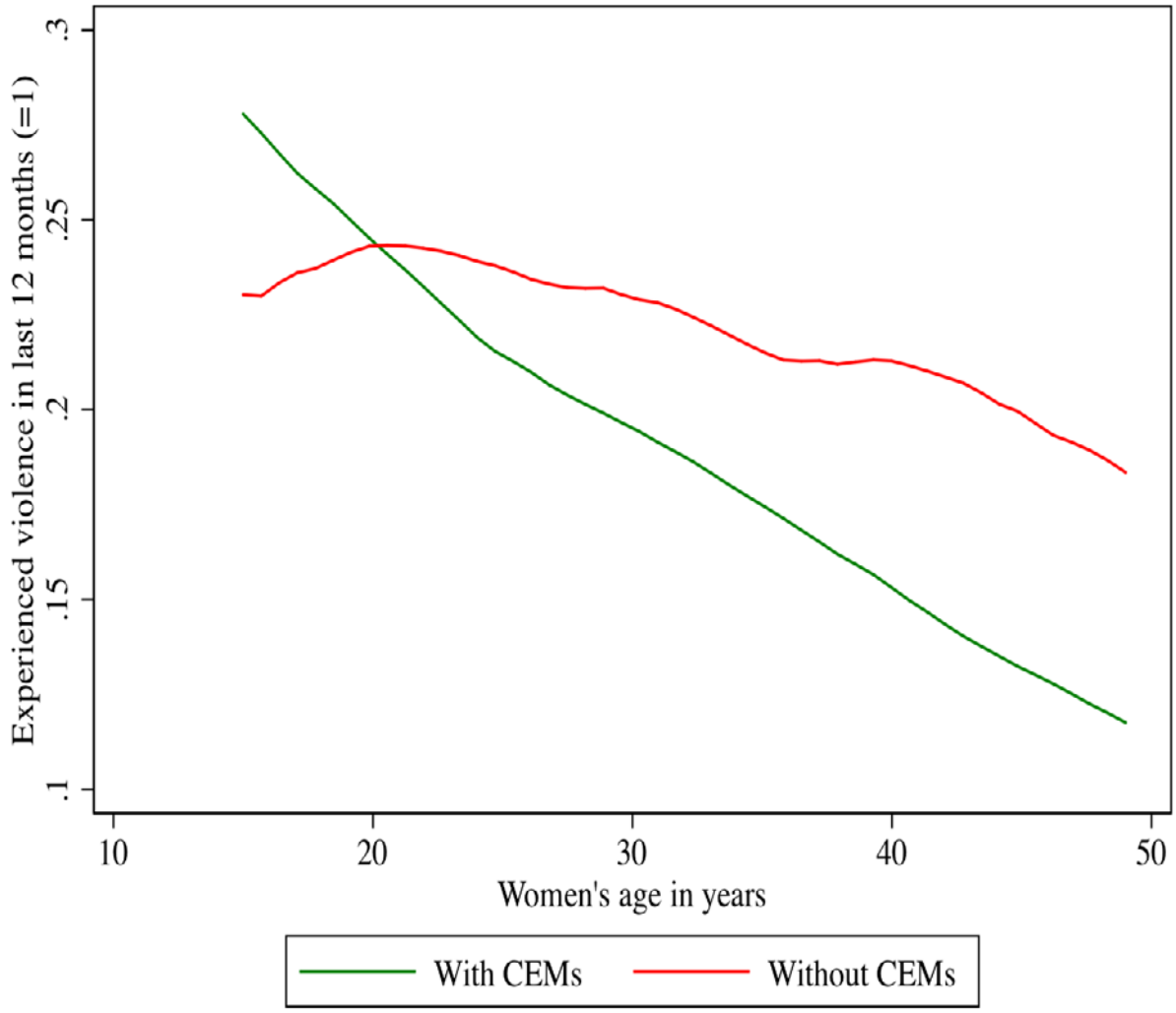
Note: See text for definitions of these measures of violence.
Source: Author's estimates based on DHS data from Colombia, Haiti, Honduras, Dominican Republic and Peru.

Figure 2. Distribution of Women's Centers by Year



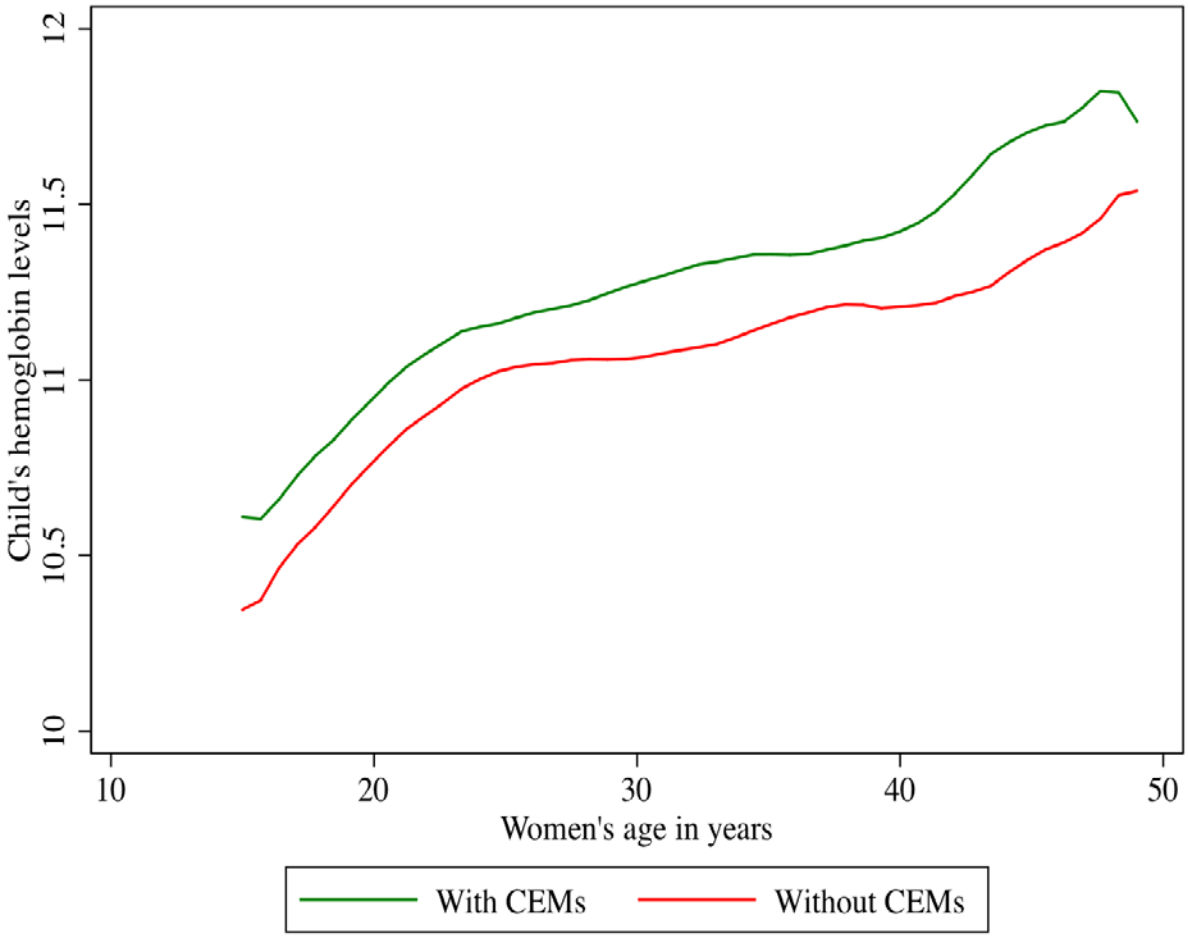
Source: Author's estimates based on CEM data.

Figure 3. Recent Domestic Violence in Places with and without Women's Centers, by Age of the Woman



Note: The lines are estimated with local polynomials.
Source: Author's estimates based on Peruvian DHS from 2000 and 2004-2011.

Figure 4.Child Nutrition in Places with and without Women's Centers, by Age of the Woman



Note: The lines are estimated with local polynomials.
Source: Author's estimates based on Peruvian DHS from 2000 and 2004-2011.

Appendix Table 1. Main Statistics by Inclusion in the Sample						
	Included in the domestic violence sample?					
	No			Yes		
Variables	N	Mean	SD	N	Mean	SD
Women's characteristics						
Number of children at home	69975	0.776	1.354	83094	2.066	1.519
Age	69975	24.817	10.006	83094	33.267	8.813
Years of schooling	69975	8.749	4.606	83094	7.593	4.694
Urban	69975	1.343	0.475	83094	1.405	0.491
Age at first marriage	23237	18.692	4.327	83094	19.359	4.647
Women's outcomes						
Uses contraceptives	69975	0.293	0.455	83094	0.661	0.474
Uses modern contraceptives	69975	0.257	0.437	83094	0.561	0.496
Not living with partner	69975	0.066	0.249	83094	0.167	0.373
Height (cm)	37271	154.4	6.685	64138	153.7	6.436
Weight (kg)	37291	55.3	11.025	64156	61.7	12.474
Is anemic	20553	0.237	0.425	31953	0.232	0.422
Hemoglobin levels	18645	13.172	1.810	29880	13.178	1.764
Body Mass Index	37241	23.2	4.292	64093	26.1	4.831
Underweight	37241	0.135	0.341	64093	0.036	0.185
Overweight	37241	0.268	0.443	64093	0.543	0.498
Obese	37241	0.07	0.255	64093	0.188	0.391
Currently works	68562	0.434	0.496	81962	0.564	0.496
Children's outcomes						
Height-for-age z-scores	8328	-0.565	1.256	29243	-0.867	1.197
Weight-for-height z-scores	8331	0.226	1.117	29245	0.154	1.057
Had at least four prenatal visits	12644	0.821	0.383	36133	0.85	0.357
Birth weight (grs)	9586	3249	684.1	27533	3258	625.3
Was vaccinated	4250	0.867	0.339	9456	0.914	0.281
Received measles vaccine	12274	0.611	0.488	35540	0.677	0.468
Received first polio vaccine	12344	0.876	0.329	35343	0.908	0.289
Received first DPT vaccine	12371	0.87	0.337	35589	0.914	0.281
Had diarrhea	12279	0.389	0.792	35514	0.351	0.761
Hemoglobin level	2069	10.771	1.529	12457	10.972	1.447
Is anemic	2650	0.409	0.492	14570	0.4	0.490

Source: Author's estimates based on DHS data from Colombia, Haiti, Honduras, Dominican Republic and Peru.