

Absent Laws and Missing Women

Can Domestic Violence Legislation Reduce Female Mortality?

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Abstract

This study contributes to the literature on legal institutions and determinants of adult mortality. The paper explores the relationship between the presence of domestic violence legislation and women-to-men adult mortality rates. Using panel data for about 95 economies between 1990 and 2012, the analysis finds that having domestic violence legislation leads to lower women-to-men adult mortality

rates. According to conservative estimations, domestic violence legislation would have saved about 33 million women between 1990 and 2012. The negative relationship between domestic violence legislation and women-to-men adult mortality rates is robust to several checks and also confirmed using the instrumental variables approach.

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Absent Laws and Missing Women: Can Domestic Violence Legislation Reduce Female Mortality?

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1. Introduction

In an influential article in 1990, Amartya Sen noted that over 100 million women were missing.¹ Sen emphasized the role of economic and legal protection as critical to saving women and improving their well-being. Domestic violence – also known as intimate partner violence – is the most direct and aggressive method of lowering the status of women in every regard. The costs to society are considerable. Data from nine countries (the United States, Australia, the United Kingdom, Nicaragua, Chile, Uganda, Morocco, Bangladesh, and Vietnam) indicate that the economic cost of intimate partner violence is typically between 1 to 2 percent of GDP. Similarly, the economic cost of domestic violence in the EU25 has been estimated at about €16 billion in 2006 (Duvvury et al. 2013). It is worth noting that these cost estimates are on the conservative side, given the severe underreporting of domestic violence. For instance, Palermo et al. (2013), using data from 24 countries, find that gender-based violence is 14 times higher than the number of incidents estimated from combined formal sources, 25 times higher than estimates from police reports, 67 times higher than estimates from medical facilities, and 33 times higher than estimates from social services sources.

The barrage of statistics above mask the actual nature of what these events entail. Consider the case study of Maria de Penha Fernandes in *Women, Business, and the Law 2016: Getting to Equal* report (World Bank 2015). Maria was shot by her husband in 1983, and two weeks after she returned from the hospital, he attempted to electrocute her. These two consecutive murder attempts left her paraplegic. When a law on domestic violence was finally approved in Brazil in 2006, it was named the Maria de Penha Law. The emotional and psychological consequences this entails is easily lost in the numbers. A good portion of female

¹ <http://www.nybooks.com/articles/archives/1990/dec/20/more-than-100-million-women-are-missing/>

homicide victims are products of domestic violence. Looking at the United States, in 2011, 61 percent of female homicide victims were wives or intimate acquaintances of their killers.² The situation is perhaps worse in developing countries that tend to have weaker institutions and limited enforcement mechanisms.

A substantial literature exists on the drivers of overall adult mortality rates (see for example, Cutler et al. 2006 and Kavanagh 2015). In contrast, there is hardly any research on the determinants of women's mortality rates, let alone the impact of domestic violence legislation on women's mortality rates. Furthermore, the literature on legal institutions has mainly focused on labor market outcomes for women (see for example, Amin and Islam 2015, Weichselbaumer and Winter-Ebmer, 2007). In this study, we attempt to fill this gap in the literature by exploring the relationship between the presence of domestic violence legislation and the women-to-men adult mortality rate. Our choice of women's mortality rate relative to men as an outcome variable has a distinct advantage of washing away spurious correlations due to broader factors responsible for improving the mortality rates of both women and men. We utilize recent data from the Women, Business, and the Law 2016 report (World Bank, 2015). The relationship between domestic violence legislation and women's mortality rates is in much need of empirical validation as there is both a good argument for and against any effect being uncovered. On the one hand, the specific mention of domestic violence legislation may reduce women's mortality through various channels outlined in the conceptual framework (section 2). On the other hand, there may be little enforcement of such legislation thereby debilitating any impact the law may have on the prevalence of domestic violence.

² See for example, Violence Policy Center (2013).

Using panel data for 95 economies between 1990 and 2012, we find that the presence of domestic violence legislation does indeed lead to lower women-to-men adult mortality rates. The results are robust to various factors, including overall economic development, quality of health care provision, prevalence of diseases, the broader institutional and legal environment, as well as omitted variables that do not vary over time or across countries as captured by country and year fixed effects. We also exploit the role of human rights conventions in generating legislation to instrument for the presence of domestic violence legislation. Our main findings are confirmed with the Instrumental Variables (IV) approach. Based on our findings, millions of women could have been saved annually since 1990 had domestic violence legislation been implemented.

In the broader literature, several studies have explored the relationship between factors that raise women's status and women-specific outcomes. Some studies have explored the effect of women's employment and education on abuse suffered from their husband and distribution of resources within the household (Bowlus and Seitz, 2006; Vyas and Watts, 2009). Studies have also explored the effect of women's status in terms of political agency, education, and labor force participation on infant mortality rates (Bhalotra and Clots-Figueras, 2014; Gakidou et al., 2010; Zakir and Winnava, 1999).

The remainder of the paper is organized as follows: Section 2 presents the conceptual framework, section 3 presents the data and main variables, Section 4 presents the baseline empirical results, section 5 presents the Instrumental Variables approach, section 6 provides the magnitude of the effects, while section 7 concludes.

2. Conceptual Framework

The theoretical foundations of the determinants of domestic violence in economics are rooted in models of intra-household decision making processes. The initial literature assumed that households maximize a joint utility function, obviating any conflict between members of the household (Becker 1981). However, later models incorporated differences in preferences over the allocation of resources between members of the household. These bargaining models allow for conflicts between members of the household and seem to better capture the reality of intra household decision making processes than the earlier models (see for example, Thomas 1997).

A key insight that emerges from the above literature is that the bargaining power of a household member depends on his or her threat point, defined as the level of utility the member gets in case the bargaining process ends in disagreement.³ The higher the household member's threat point, the greater the influence of the household member on household decisions. The threat point which determines bargaining power is affected by a number of factors. One important set of factors is "extra household environmental parameters" (McElroy, 1990), a term that captures such features as parental wealth, non-wage income, and the legal underpinnings governing marriage and divorce, as well as other social and legal characteristics, such as the existence of domestic violence legislation (Branisa et al., 2013).

Consider for example, how households decide on the consumption level and violence with husband's utility increasing in violence and the wife's utility decreasing in violence (Aizer 2010). The process involves the husband and wife maximizing their joint utility and bargaining over its

³ In the context of bargaining between husband and wife, the disagreement could imply divorce ("divorce model") or that the two remain in marriage but play a non-cooperative Nash equilibrium ("separate spheres model"). Both these scenarios are used in the literature. Of course it is unlikely that divorce is a credible threat for every conflict that may arise between husband and wife.

distribution based on their respective threat points. Factors that improve the wife's threat point or bargaining power decrease the degree of violence exerted by the husband in the bargaining outcome. The factors that tend to improve the wife's threat point, as discussed above, include employment, education, access to social services (Farmer and Tiefenthaler, 1996) and of course social and legal institutions. Most models operate on this basic framework, adding nuances or by switching to non-cooperative models (see Koc and Erkin, 2012 for an overview). It is reasonable to expect that domestic violence legislation, if enforced, increases the threat point of the wife given that she will have the full support of the legal system.

There are a myriad of ways in which domestic violence legislation can improve bargaining power and outcomes for women, potentially reducing their mortality rates. For example, in terms of bargaining power or threat level as discussed above, the enforcement of domestic violence legislation would provide women with an option for recourse. It allows them a path to leave hostile circumstances. Beyond bargaining power, domestic violence legislation may encourage reporting of such cases, providing useful information that may play an important role in raising awareness of the issue, potentially triggering policies that complement domestic violence prevention policies (Allen, 2007). Furthermore, the presence of domestic violence legislation may legally bind governments to be more responsive to cases of domestic violence, possibly improving accountability and increasing provision of public services that both deter domestic violence and assist victims of domestic violence.

Taking a step back, within the larger framework, the importance of domestic violence legislation is linked to the importance of institutions in general. The literature on institutions has grown in significance. Institutions play an important role in dictating the development trajectories of economies. Institutions shape interactions by setting appropriate behavior. They set the rules

that determines who is empowered, and who is disempowered. While the early institutions literature focused on property rights, the more recent literature has indicated that a wider range of institutions can play an important role in societies (Rodrik, 2008), especially for health outcomes (Kavanagh, 2015). For instance legislation such as equal treatment laws have been found to improve women's labor market outcomes (Amin and Islam, 2015; Weichselbaumer and Winter-Ebmer, 2007). Domestic violence legislation is an important component in legal institutions that may shape the status and treatment of women in the economy. Of course, if domestic violence legislation lacks enforcement, it is unlikely it will have any correlation with women's mortality rates.

The inclusion of laws regarding domestic violence may be a relatively more powerful tool in curbing women's mortality due to domestic violence. Although theoretical models have highlighted the importance of economic empowerment such as labor force participation and pay for women to avoid domestic violence, the empirical findings have been mixed. Some studies have found that cash transfers to women or women's labor force participation may actually increase the degree of domestic violence they face, with large transfers increasing the aggressiveness of the husband (Angelucci, 2008; Chin, 2012; Eswaran and Malhotra, 2011). Regardless, the indication is that economic empowerment alone may not be sufficient, and it may have to go hand in hand with institutional and social empowerment. Thus, the provision of domestic violence legislation may play an important role in accentuating existing factors that empower women.

To disentangle the relationship between domestic violence legislation and the women-to-men adult mortality rate, several factors that may influence the mortality rate have to be considered, which motivates our empirical specification (for a review see Cutler et al., 2006). Our panel data estimation method eliminates time invariant country features as well as annual global

shocks from affecting our results spuriously. However, the problem of endogeneity cannot be ruled out completely. To raise our confidence against endogeneity, we control for a number of additional factors motivated by the existing literature. For instance, richer nations are found to have better health outcomes given the availability of resources (Pritchett and Summers, 1996). Hence, we control for GDP per capita levels across countries. However it is unlikely that income or wealth is the only reason for difference in mortality rates, since even countries with stagnant incomes have experienced considerable increases in life expectancies (Cutler et al., 2006).

Another crucial determinant of mortality rates is the quality of public health. Public health encompasses macro-factors such as public works, including building or improving sanitation systems, as well as micro-factors such as vaccinations. According to one estimate, water purification alone in the first third of the twentieth century can explain 50 percent of the mortality reduction in the United States (Cutler and Miller, 2005).

As expected, measures of women's economic empowerment - including education, labor force participation, and positions of authority - have been associated with positive health outcomes (Bhalotra and Clots-Figueras, 2014; Gakidou et al., 2010; see Vyas and Watts, 2009 for a review). The relationship between democracy and health outcomes is mixed. Democratic institutions may also improve health outcomes if governments are held more accountable for the well-being of the population (Besley and Kudamatsu, 2006). However, in some cases democracies may still have poor health outcomes depending on whether or not the elites exert undue influence (Acemoglu and Robinson, 2005). Finally, urbanization and population density are found to account for important factors related to mortality, including density of health services as well as disease transmission. Initially, urbanization was detrimental for mortality rates due to the easy spread of diseases. Of course, more recently, urbanization goes hand in hand with better access to health care.

3. Data and Main Variables

Our main data source is the World Bank's Women, Business, and the Law database⁴ and the World Development Indicators (WDI). This is complemented with other data sources mentioned below. Our main specifications as well as the IV specification take advantage of the panel nature of the data by including both country and year fixed effects. The sample is an unbalanced panel of up to 95 countries for which data are available.⁵ The time period covered is 1990 to 2012. The equation we estimate is as follows:

$$Y_{it} = \alpha + \beta X_{it} + \mu Z_{it} + YFE + v_i + u_{it}$$

Subscripts i, t denote the country and year, respectively. Y is the dependent variable, X is our main explanatory variable for domestic violence legislation. Z is the vector of various controls that vary across countries and years. YFE and v_i denote year fixed effects and country fixed effects respectively; u_{it} is the error term.

Ideally, the dependent variable would be adult mortality rate due to domestic violence, however the data for this variable are scarce and unreliable due to gross underreporting. Thus, we use the overall mortality rate, which biases our results downward especially if domestic violence has a low prevalence. However, domestic violence legislation may have far-ranging effects on women's empowerment and thereby mortality beyond just domestic violence, giving some support

⁴ <http://wbl.worldbank.org>

⁵ List of countries: Algeria, Angola, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Benin, Bolivia, Botswana, Burkina Faso, Burundi, Cambodia, Cameroon, Chad, Chile, Colombia, Congo, Dem. Rep., Congo, Rep., Costa Rica, Côte d'Ivoire, Denmark, Djibouti, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Equatorial Guinea, Ethiopia, Fiji, Gabon, Georgia, Ghana, Guatemala, Guinea, Guyana, Haiti, Honduras, Indonesia, Iran, Islamic Rep., Ireland, Kazakhstan, Kyrgyz Republic, Lao PDR, Lebanon, Lesotho, Liberia, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Morocco, Namibia, Nepal, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Rwanda, Senegal, Sierra Leone, Slovak Republic, Slovenia, South Africa, Sri Lanka, Sudan, Suriname, Swaziland, Sweden, Syrian Arab Republic, Tajikistan, Tanzania, Thailand, Togo, Tunisia, Uganda, Ukraine, Uruguay, Uzbekistan, Venezuela, RB, Vietnam, Yemen, Rep., Zambia, and Zimbabwe.

to the use of overall adult mortality rates.⁶ Thus, the dependent variable we use is (log of) ratio of women's to men's adult mortality rate (henceforth, women-to-men adult mortality rate). The data source for the variable is the WDI. Using the ratio of women-to-men adult mortality rate has the advantage that it eliminates economy-wide or macroeconomic factors common to both men and women's mortality from spuriously affecting our results. The mean value of the dependent variable equals -0.37 and the standard deviation is 0.28. Across country-year, the variable ranges between 0.07 (Bangladesh, 1990) and -1.10 (Belarus, year 2008).

While the women-to-men adult mortality rate has some advantages, it does not tell us whether women's mortality rate in absolute terms is increasing or decreasing with domestic violence legislation. In other words, it does not tell us if an improvement in the women-to-men adult mortality rate is due to an improvement in women's adult mortality rate or due to worsening of men's adult mortality rate. Hence, as a robustness check, we do report results using the absolute women's adult mortality rate as the dependent variable. This equals the (log of) the adult mortality rate for women taken from WDI. The mean value of the variable equals 5.2 and the standard deviation equals 0.62.

Our main explanatory variable is a dummy variable equal to 1 if the country has domestic violence legislation and 0 otherwise. The data source for the variable is the Women, Business, and Law database, where the UN definition of domestic violence is followed. Within this definition, domestic violence encompasses physical violence, emotional or psychological violence, sexual violence, or financial or economic violence (see World Bank 2015 for details). The mean value of the dummy variable equals 0.31, implying that on average in any given year about 31 percent of

⁶ In a number of instances the Women, Business, and the Law database shows the far-reaching consequences of restrictions against women embedded in countries' laws. For instance, it shows that the larger the number of discriminations against women found in the law, the lower the secondary school enrolment rates of girls relative to boys and the lower the female labor force participation rates.

the sample has domestic violence legislation while the remaining 69 percent does not. The variable shows substantial variation over time for the countries under study. For example, at the beginning of our time period, 1990, only one country had domestic violence legislation compared with 51 at the end of the study period, 2012. This is indicated in table 1 where we present the number of countries with domestic violence legislation in our sample. As a robustness check, we take into account lagged effects of the explanatory variable by reporting results with one year lagged values of the domestic violence legislation variable.

In our baseline model, the panel specification allows us to control for all time invariant country features as well as the annual global shock to the dependent variable. In order to further raise our confidence against this problem, we control for a number of additional factors (see section 2 for motivations for the controls). Another layer of defense is provided by the use of the IV estimation method (discussed in detail in section 5).

A formal definition of the various controls is as follows. The overall income level is a broad proxy measure for a number of factors that could affect the health, longevity and hence mortality rate of men and women. Whether such factors affect women more than men is a moot point. However, there is some evidence to suggest that growth and development may benefit the relatively less privileged sections of society more, which happen to be women as far as the mortality rate is concerned. For example, the growth literature documents catching up by the relatively poor countries (convergence) while the literature on access to finance suggests that smaller and less financially connected firms benefit more from overall financial development than larger and better connected firms (see for example, Beck et al. 2005). We filter out such factors from affecting our results by controlling for (log of) real GDP per capita (constant USD, 2005). The data source is WDI. We complement this with the control for the annual growth rate (%) of

real GDP per capita⁷ under the assumption that recent spurts in growth could have additional effects on overall quality of health and mortality rates in the country. The variable is taken from WDI.

Next, we control for the level of urbanization in the country and the density of population as these factors have often been linked to the availability of health services and disease transmissions. For urbanization, we use the percentage of population in the country that lives in urban areas. Population density is defined as total population divided by the total land area (in square kilometers) of the country. The data source for both these variables is WDI.

Participation in the labor market provides women with financial freedom, income and an outside option that improves their bargaining power within the household. Hence, such participation is likely to improve women's standard of living, leading to lower mortality rates. To filter out this factor from affecting our results spuriously, we control for the ratio of women's to men's labor force participation rate, where participation rate is defined as the percentage of women and men above 15 years of age that are part of the labor force. The variable is taken from WDI.

While women's participation in the labor market is an important factor increasing women's empowerment, it is by no means the only determinant. Greater education and political representation are also likely to be important in this regard. To this end, we use two controls. These include number of years of education among women aged 25 or above (lagged by one year) relative to men, and the proportion of seats in the lower house of the parliament that are held by women. The data source for the education variables is Gakidou et al. (2006) and Inter-Parliamentary Union (IPU) for women in parliament. We also include the quality of democracy as measured by Polity 2 variable taken from Marshall et al. (2013). One possibility here is that electoral compulsions may

⁷ The growth rate is computed from GDP per capita figures in constant local currencies.

force better functioning democracies to cater to women's needs; further, democratic institutions provide an easy channel for women to demand their rights. However, it is also possible that greater channels of protest and influence on policy making offered by democratic institutions may block reforms aimed at improving women's well-being or hamper their effective implementation.⁸

Last, we focus on various indicators of health taken from WDI that are likely to have a direct effect on mortality. First, we control for the ratio of women-to-men (aged 15-24) affected by HIV. Second, we control for two separate measures of immunization among children; that is, percentage of children in the age of group of 12-23 months that are immunized against DPT and against measles. Third, we control for the overall quality of public health services proxied by the (log of) health expenditure per capita, PPP adjusted and in constant 2011 international dollars. Finally, we control for the percentage of population that has access to improved sanitation to capture the overall cleanliness and disease environment in the country. Summary statistics of all variables are provided in table 2. Correlations between the variables are provided in table 3.

4. Empirical Results

Regression results are provided in tables 4 to 6. Tables 4 contains results for our baseline specification using a panel estimation method. Table 5 contains results for some extensions of the baseline specification. IV regression results are provided in table 6. All the specifications discussed below control for year fixed effects while the remaining controls are progressively included.

In column 1 of table 4, we present simple OLS estimates with year effects, excluding any additional controls. The OLS results reveal a quantitatively large and statistically significant negative relationship between domestic violence legislation and women-to-men adult mortality

⁸ Amin and Djankov (2014) provide an overview of the related literature.

rate. The estimated coefficient value of domestic violence legislation equals -0.222, significant at the 1 percent level. The estimate implies that having domestic violence legislation is associated with a reduction in women-to-men adult mortality rate of about 20 percent of the initial level. Note that this reduction in women-to-men adult mortality rate is permanent and implies women's lives saved year after year. The implied cumulative effect over a long period of time is noticeable. For example, consider the case of Armenia, which did not implement any domestic violence legislation between 1992 and 2012. Our estimate implies that if domestic violence legislation were implemented by Armenia in 1992, total number of adult women in 2012 would be higher by about 471,000 or about 43 percent of the total number of adult surviving women in 2012. This is a large number of lives that could have been saved in both absolute and relative terms. We discuss the implication of the magnitude for the whole sample in section 6. We would like to caution here that the above estimate is on the higher end of the range as later results show much smaller although still large impacts of domestic violence legislation.

Exploiting the panel feature of the data, we control for country fixed effects in column 2 of table 4. The estimated coefficient value of domestic violence legislation does decline (in absolute value) from -.222 above to -.022 (column 2). However, it is still negative, large and statistically significant at the 1 percent level. The coefficient value implies a decrease in the women-to-men adult mortality rate by about 2.2 percent of its initial level associated with the implementation of the domestic violence legislation.

The sharp decline in the estimated coefficient value in the previous paragraph suggests that cross-country differences in domestic violence legislation and women's mortality are perhaps more important than differences over time for a single country. Of course, it is also possible that the cross-country differences in domestic violence legislation may be spuriously picking up

differences in other macro variables such as the quality of health care, culture and social institutions, etc. Using country fixed effects eliminates such potential spurious effects, giving us estimates for the relationship between domestic violence legislation and the women-to-men adult mortality rate that are on the conservative side.

In column 3, we add to the specification above all the remaining controls except for public health expenditure (% of GDP) and the proportion of seats held by women in the lower house of the parliament. These two controls are added to the specification later in column 4 as their inclusion causes a substantial loss in sample size from 2,032 to 1,359 observations. Regression results in column 3 show that there is some decline (in absolute value) in the estimated coefficient value of domestic violence legislation when the various controls are added to the specification. That is, the coefficient value declines in magnitude from -0.022 (column 2) to -0.016 (column 3). However, the coefficient value is still negative, large and statistically significant at the 5 percent level. It implies a decline in the women-to-men adult mortality rate of about 1.6 percent associated with domestic violence legislation. Taking the case of Armenia, the estimate implies that adult women's population in the country would be higher by over 34,000 or over 3 percent of total number of adult women in 2012 if Armenia had implemented domestic violence legislation in 1992. Controlling for the remaining two variables – public health expenditure and proportion of women in the lower house – does not have much effect on the results, with the estimated coefficient value of domestic violence legislation variable decreasing slightly from -0.16 above to -0.14, significant at the 10 percent level (column 4).

We experimented with two other robustness checks or alterations to the base specification. First, to account for any delay in the impact of domestic violence legislation on women-to-men adult mortality rates, we lag our domestic violence legislation variable by one year. Regression

results are provided in columns 1 and 2 of table 5. These results show that with all the controls discussed above including country and year fixed effects in place, lagging the domestic violence legislation variable by a year only improves our results, although only slightly so. That is, the estimated coefficient value of the variable equals -0.17 when lagged by one year (column 2, table 5) compared with -0.16 (column 3, table 4) without the lag. Note that the former estimate is statistically significant at the 5 percent level.

The second alteration we consider is replacing as dependent variable the (log of) the ratio of women-to-men adult mortality rate with the (log of) absolute level of adult mortality rate for women. Commensurate with this change, we replace as controls the ratio of women-to-men labor force participation rate, number of years of education and prevalence of HIV with their corresponding absolute levels for women. Regression results are provided in column 3 of table 5. These show a substantially stronger negative relationship between domestic violence legislation and absolute women's adult mortality than what we found above for the women-to-men adult mortality rate. That is, with all the controls mentioned above included in the specification, the estimated coefficient value of the domestic violence legislation variable equals -.046, significant at the 5 percent level. This is much larger in magnitude than the coefficient value of -.016 we found above for the women-to-men adult mortality ratio in our base estimates (column 3, table 4). Regression results for domestic violence legislation are only marginally stronger if we use lagged values of the domestic violence legislation dummy (column 4, table 5).

For the various controls, we find mixed results. That is, higher income level or GDP per capita, greater proportion of population with access to improved sanitation facilities, and greater percentage of children that are immunized against measles are associated with significantly lower (at 10 percent of less) adult mortality rate among women alone and also relative to men. Greater

education among women relative to men is also significantly associated with lower women-to-men adult mortality rate. However, there is no significant relationship between the absolute level of adult women's mortality rate and the number of years of education of women. What this suggests is the presence of gendered effects of education in that education matters for women more than for men as far as mortality rates are concerned. Similarly, higher population density, better quality of democracy and greater percentage of children with immunization against DPT are all significantly associated with a higher women-to-men adult mortality rate. However, like education, these variables show no significant correlation with the absolute level of women's adult mortality rate. In contrast, higher prevalence of HIV among women is significantly associated with higher absolute women's adult mortality rate but there is no such relationship between the prevalence of HIV among women relative to men and women-to-men adult mortality rate. One interpretation here is that while HIV prevalence among women adversely affects their mortality rate, this adverse effect spills over to men as well.

5. Instrumental Variables Approach

According to World Bank (2015), over the last 25 years, there has been a precipitous rise in the number of economies adopting domestic violence legislation. The report suggest that the increase has been largely driven by international and regional human rights conventions. Thus, we instrument domestic violence legislation using three instruments. The instruments include the ratification of the optional protocol of the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW), the ratification of the convention of Bélem do Pará, and the Maputo protocol. The optional protocol for CEDAW was effective in the year 2000 and established complaint and inquiry mechanisms for the original CEDAW. It has been used for issues

such as domestic violence. The Bélem do Pará convention, also known as the Inter-American Convention on the Prevention, Punishment, and Eradication of Violence against Women, is a regional convention that was adopted in 1994 within the Organization of American States. The Maputo protocol, also known as the Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa, was adopted by the African Union in 2003.

There are two important points to note. First, the year of the conventions is not necessarily the year when they are ratified. Ratification dates may vary considerably by country. Each of our instruments takes the value of 0 for the years the relevant protocol is not ratified and 1 for the years it is ratified. Second, there is a possibility of violating the exclusion restriction condition of instruments given that some of these conventions go beyond just domestic violence and especially to areas related to the labor market. However, this is unlikely to pose much problem for our estimation since we already control for labor force participation rate and it does not show much correlation with our dependent variable. More importantly, there is evidence to suggest that the protocols have limited direct effects (that is, other than through domestic violence legislation) on gender specific outcomes including gender-based violence. Take the optional protocol for CEDAW for instance. The UK government found that by 2008 the Protocol had hardly been used by NGOs (Murdoch, 2008). Furthermore, the complaints mechanism is found to be lengthy and lacks transparency (MacKinnon, 2004; Sokhi-Bulley 2006). Thus, it is reasonable to expect that economies that ratify the protocols and change their laws accordingly are more likely to influence women-to-men adult mortality rates than economies that ratify the protocol but do not enact laws. If this is the only dimension by which protocols affect the prevalence of gender-based violence, then it is likely that the exclusion restriction condition is not violated. Furthermore, there are other campaigns that may have been influential in changing laws, such as the UN Secretary-General

campaign “UNITE to End Violence against Women” in 2008, however these are typically one-time events and thus they get absorbed in the year fixed effects in our estimates.

The IV regression results are contained in table 6. Panels A and B provide the first and second stage IV results, respectively. Column 1 contains results with contemporaneous domestic violence legislation dummy values and the same for all the instruments. Column 2 contains the same with one year lagged values of the domestic violence legislation dummy as well as all the instruments.

As predicted, the first stage IV results confirm a positive relationship between the domestic violence legislation dummy and the three instruments. However, this relationship is significant for only two of the instruments - Belem do Bora convention ratification (significant at 1 percent level) and CEDAW ratification (10 percent level). The third instrument, Maputo Convention ratification, is also positively correlated with domestic violence legislation but this relationship is not statistically significant (at the 10 percent level). This is the case using both the lagged and contemporaneous values of domestic violence legislation variable and the instruments. Collectively, the three instruments predict about 48 percent of the variation in domestic violence legislation. The F statistic for the excluded instruments equals 34 for contemporaneous values of domestic violence legislation (Panel A, column 1) and 36 when using the lagged values (Panel A, column 2). Both these F-statistics are significant at the 1 percent level and well above the minimum recommended level of 10. In other words, our instruments perform well in predicting domestic violence legislation dummy. Further, the first stage IV results easily pass the over-identification test based on Hansen’s J statistic. This implies that we cannot reject the null hypothesis about the exogeneity of the instruments at the 10 percent level or less.

The second stage IV results confirm the findings in the panel estimation that domestic violence legislation is strongly negatively correlated with the women-to-men adult mortality rate. With all the controls discussed above included in the specification, second stage IV results yield a coefficient value of $-.072$ for contemporaneous domestic violence legislation variable (Panel B, column 1) and -0.082 when using lagged values (Panel B, column 2). Both the coefficient values are large and statistically significant at the 5 percent level. According to the more conservative former estimate, women's population in Armenia in 2012 would be higher by about 14 percent (of its level in 2012) if Armenia had implemented domestic violence legislation in 1992. We would like to mention here that our IV estimates for the domestic violence legislation variable are considerably higher than what we found in our panel estimations. One interpretation here is that measurement errors with the domestic violence legislation variable perhaps stemming from implementation problems are more important than reverse causality or omitted variable bias problem.

6. Magnitude of the Effects

Based on the findings above, we can provide a range of estimates for the number of women that could have been saved annually in the sample of 95 economies if domestic violence legislation had been implemented throughout 1990 to 2012 period. The methodology for obtaining these estimates is provided in the annex and rests on the assumption that domestic violence legislation has little or no effect on men's adult mortality rate. We use three estimates to calculate the number of deaths among women. The first is based on our base country fixed effects model with controls as the low end of the range of the estimates. The second is obtained from a country fixed effects model with no controls, which provides mid-range estimates. Finally, the IV model provides the

high-end estimates. These estimates are provided by year in columns 1, 2 and 3 respectively in table 7. The low range estimates range from a low of 0.85 million women saved in 2012 to a high of 1.76 million women saved in 2002. The corresponding figures for midrange estimates are a low of 1.17 million women in 2012 to a high of 2.43 million women saved in 2002. Finally, using the high-end estimates, we have a range of 3.82 million in 2012 to 7.94 million in 2002. Even if these are overestimates, they are substantial figures especially considering the possibility of the millions of women that can be saved over time by just a simple alternation or introduction of new laws. Aggregating over all the years and countries in the sample, our most conservative estimate (column 1, table 7) suggests that about 33 million women would have been saved if domestic violence legislation had been implemented in all the sampled countries at the beginning of the study period.

7. Conclusion

Women make up more or less half of the world's population. Laws and institutions that improve the well-being of almost half of the world's population warrant attention and deserve priority. In this study, we uncovered a significant beneficial effect of the presence of domestic violence legislation on the women-to-men adult mortality rate. Our findings indicate that tens of millions of women could have been saved had countries in our sample implemented domestic violence legislation much earlier than 1990, the first year of the period covered by the study. The absence of domestic violence legislation may have resulted in a massive waste of human life that is hard to justify on moral grounds, quite aside from the economic losses associated with such premature mortality.

While this study is a first step towards understanding how institutions protect women, we are hopeful that it will encourage further research, especially at the micro-level where exogenous

shifts in legal institutions could be used to identify specific changes in laws that are of particular importance to women and their well-being. A number of exciting questions remain to be answered. For example, why is it that the introduction of legislation protecting women from domestic violence is such a relatively recent phenomenon, with only a small handful of countries having such legal protections in place as recently as the early 1990s? Why is it that some countries have domestic violence legislation and others do not? That is, what are the drivers of domestic violence legislation and what accounts for the uneven geographic distribution of such legislation? Further, it is possible that domestic violence legislation may work in tandem with other factors such as women's education level or the socio-cultural-political environment in determining women's mortality. That is, what are the factors that complement or substitute domestic violence legislation as far as the impact on women's mortality rates is concerned? Such studies can help better understand how institutions, especially legal institutions, contribute to the well-being of the less privileged sections of society, particularly women.

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Table 1: Domestic violence legislation⁹

Year	Number of economies with domestic violence legislation	Total no. of economies in the sample
1990	1	68
1991	1	71
1992	1	77
1993	3	79
1994	6	88
1995	9	88
1996	16	90
1997	19	91
1998	21	91
1999	24	94
2000	27	94
2001	29	94
2002	29	94
2003	32	94
2004	35	94
2005	39	95
2006	40	95
2007	45	94
2008	47	93
2009	53	93
2010	50	87
2011	52	86
2012	51	82

⁹ The variation in the total number of economies over time is due to data gaps. Thus, the sample we use is an unbalanced panel. We opted to use an unbalanced panel as it allows us to considerably expand and maximize the sample size.

Table 2: Summary statistics and data sources

Variable	Obs	Mean	Std. Dev.	Min	Max	Source
Log of Women adult mortality	2032	5.20	0.62	3.76	6.60	World Development Indicators
Log of Women over Men adult mortality	2032	-0.37	0.28	-1.10	0.07	World Development Indicators
Domestic violence legislation (dummy)	2032	0.31	0.46	0.00	1.00	Women, Business and the Law
Population density (people per sq. km of land area)	2032	89.33	139.39	1.78	1188.41	World Development Indicators
Urban population (% of total)	2032	46.37	21.06	5.42	94.80	World Development Indicators
Labor force participation rate, women (% of women population ages 15+)	2032	52.84	18.35	9.70	90.80	World Development Indicators
Log of real GDP per capita (constant USD, 2005)	2032	7.25	1.31	4.82	11.12	World Development Indicators
GDP per capita growth (annual %) based on constant LCU	2032	2.32	6.45	-47.31	142.07	World Development Indicators
Polity II score of democracy	2032	2.18	6.09	-10.00	10.00	Marshall (2013), Center for Systemic Peace
Improved sanitation facilities (% of population with access)	2032	56.45	30.33	2.80	100.00	World Development Indicators
Prevalence of HIV, women (% ages 15-24)	2032	1.49	3.32	0.10	22.80	World Development Indicators
Prevalence of HIV, women over men (% ages 15-24)	2032	1.30	0.60	0.13	3.56	World Development Indicators
Labor force participation rate, women over men	2032	0.68	0.22	0.12	1.06	World Development Indicators
Years of education, women ages 25 plus (one year lag)	2032	4.98	3.37	0.27	13.68	Gakidou et al., 2010
Years of education, women over men ages 25 plus (one year lag)	2032	0.72	0.25	0.15	1.27	Gakidou et al., 2010
Immunization, measles (% of children ages 12-23 months)	2032	78.10	18.68	15.00	99.00	World Development Indicators
Immunization, DPT (% of children ages 12-23 months)	2032	78.23	19.69	10.00	99.00	World Development Indicators
Log of health expenditure per capita, PPP (constant 2011 international \$)	1631	5.35	1.16	1.81	8.59	World Development Indicators
Percentage of seats held by women in the lower house of the national parliament	1430	14.45	10.04	0.00	56.30	Inter-Parliamentary Union (IPU) Research from authors and the Women, Business and the Law team
Belem do Para economy ratified	2032	0.16	0.37	0.00	1.00	Research from authors and the Women, Business and the Law team
CEDAW optional protocol ratified	2032	0.23	0.42	0.00	1.00	Research from authors and the Women, Business and the Law team
Maputo convention ratified	2032	0.08	0.27	0.00	1.00	Research from authors and the Women, Business and the Law team

Table 3: Correlations

	Log of women-to-men adult mortality rate	Domestic violence legislation (dummy)	Log of Population density	Urban population (% of total)	Labor force participation rate, Women over Men	Log of years of education, Women over Men ages 25 plus	Log of real GDP per capita	GDP per capita growth	Polity II score of democracy	Improved sanitation facilities (% of population with access)	Prevalence of HIV, Women over Men (% ages 15-24)	Immunization, measles (% of children ages 12-23 months)	Immunization, DPT (% of children ages 12-23 months)
Log of women-to-men adult mortality rate	1.00												
Domestic violence legislation	-0.31	1.00											
Log of Population density (people per sq. km of land area)	-0.18	0.07	1.00										
Urban population (% of total)	-0.49	0.33	-0.19	1.00									
Labor force participation rate, women over men	0.19	0.04	0.07	-0.31	1.00								
Log of years of education, women over men, ages 25 plus	-0.62	0.40	0.01	0.50	0.00	1.00							
Log of real GDP per capita	-0.50	0.37	-0.15	0.76	-0.25	0.59	1.00						
GDP per capita growth	-0.07	0.04	0.06	0.01	0.04	0.05	0.08	1.00					
Polity II score of democracy	-0.25	0.46	0.09	0.33	0.03	0.40	0.37	0.00	1.00				
Improved sanitation facilities (% of population with access)	-0.77	0.34	0.11	0.63	-0.34	0.66	0.71	0.10	0.22	1.00			
Prevalence of HIV, (% ages 15-24), women-to-men ratio	0.60	-0.31	-0.20	-0.41	0.34	-0.33	-0.33	-0.05	-0.24	-0.55	1.00		
Immunization, measles (% of children ages 12-23 months)	-0.57	0.37	0.18	0.40	-0.17	0.62	0.45	0.13	0.24	0.68	-0.47	1.00	
Immunization, DPT (% of children ages 12-23 months)	-0.52	0.34	0.21	0.36	-0.16	0.58	0.43	0.13	0.25	0.64	-0.44	0.93	1.00

Table 4: Base regression results

Dependent variable:	Log of women-to-men adult mortality rate			
	OLS	Country FE	Country FE	Country
	(1)	(2)	(3)	(4)
Domestic violence legislation	-0.222*** (0.039)	-0.022*** (0.008)	-0.016** (0.008)	-0.014* (0.008)
Log of population density (people per sq.km of land area)			0.112* (0.057)	0.027 (0.056)
Urban population (% of total)			-0.002 (0.002)	-0.003** (0.002)
Labor force participation rate, women over men			-0.038 (0.101)	-0.085 (0.102)
Log of years of education, women over men ages 25 plus (one year lag)			-0.330* (0.195)	-0.252 (0.182)
Log of real GDP per capita			-0.032** (0.016)	-0.032** (0.016)
GDP per capita growth (annual %) based on constant LCU			0.00003 (0.000)	0 (0.000)
Polity II score of democracy			0.002** (0.001)	0.001 (0.002)
Improved sanitation facilities (% of population with access)			-0.002** (0.001)	-0.001 (0.001)
Prevalence of HIV, women over men (% ages 15-24)			0.011 (0.010)	-0.005 (0.007)
Immunization, measles (% of children ages 12- 23 months)			-0.001** (0.000)	0.0002 (0.000)
Immunization, DPT (% of children ages 12-23 months)			0.001* (0.000)	0.0005* (0.000)
Health expenditure, public (% of GDP)				0.002 (0.004)
Percentage of seats held by women in lower house of national parliament				-0.0002 (0.000)
Constant	-0.325*** (0.025)	-0.360*** (0.010)	-0.455 (0.307)	-0.122 (0.281)
Year Effects	YES	YES	YES	YES
Country Effects	NO	YES	YES	YES
Sample	1990-2012	1990-2012	1990-2012	1997-2012
Number of observations	2,032	2,032	2,032	1,359
Adjusted R2	0.103	0.058	0.177	0.193

note: *** p<0.01, ** p<0.05, * p<0.1. Huber-White robust standard errors in brackets.

Table 5: Robustness checks

Dependent variable:	Log of women-to-men adult mortality rate		Log of women's adult mortality rate	
	(1)	(2)	(3)	(4)
Domestic violence legislation			-0.046** (0.018)	
Domestic violence legislation (one year lag)	-0.021** (0.009)	-0.017** (0.009)		-0.050*** (0.018)
Log of population density (people per sq.km of land area)		0.111* (0.057)	0.052 (0.170)	0.048 (0.171)
Urban population (% of total)		-0.002 (0.002)	-0.001 (0.004)	-0.001 (0.004)
Labor force participation rate, women over men		-0.029 (0.100)		
Labor force participation rate, women (% of women's population ages 15+)			0.0004 (0.003)	0.0001 (0.003)
Log of years of education, women over men ages 25 plus (one year lagged values)		-0.335* (0.194)		
Log of years of education, women ages 25 plus (one year lagged values)			-0.037 (0.240)	-0.050 (0.238)
Log of real GDP per capita		-0.032** (0.015)	-0.152*** (0.049)	-0.153*** (0.049)
GDP per capita growth (annual %) based on constant LCU		0.00002 (0.000)	0.0004 (0.001)	0.0003 (0.001)
Polity II score of democracy		0.002** (0.001)	0.002 (0.002)	0.002 (0.002)
Improved sanitation facilities (% of population with access)		-0.002** (0.001)	-0.005** (0.002)	-0.005** (0.002)
Prevalence of HIV (% ages 15-24), women-to-men		0.011 (0.010)		
Prevalence of HIV, women (% ages 15-24)			0.030*** (0.010)	0.030*** (0.010)
Immunization, measles (% of children ages 12-23 months)		-0.001** (0.000)	-0.002*** (0.001)	-0.002*** (0.001)
Immunization, DPT (% of children ages 12-23 months)		0.001** (0.000)	0.0003 (0.001)	0.0003 (0.001)
Constant	-0.359*** (0.010)	-0.459 (0.305)	6.616*** (0.646)	6.629*** (0.646)
Year Effects	YES	YES	YES	YES

Country Effects	NO	YES	YES	YES
Sample	1990-2012	1990-2012	1990-2012	1997-2012
Adjusted R2	0.057	0.177	0.408	0.409

*** p<0.01, ** p<0.05, * p<0.1. Huber-White robust standard errors in brackets. Sample size: 2,032.

Table 6: Instrumental Variables Regression Results

	(1)	(2)
Panel B: Second stage IV regression results		
Dependent variable: Log of women-to-men adult mortality rate		
Domestic violence legislation (IV)	-0.072** (0.016)	
Domestic violence legislation (one year lagged values)		-0.082** (0.038)
Log of population density (people per sq. km of land)	0.082 (0.059)	0.073 (0.061)
Urban population (% of total)	-0.003 (0.002)	-0.003 (0.002)
Labor force participation rate, women over men	-0.024 (0.105)	0.017 (0.110)
Log of years of education, women over men ages 25 (one year lagged values)	-0.465** (0.232)	-0.506** (0.243)
Log of real GDP per capita	-0.028* (0.015)	-0.029* (0.015)
GDP per capita growth (annual %) based on constant	0.0001 (0.000)	0.0002 (0.000)
Polity II score of democracy	0.002*** (0.001)	0.002*** (0.001)
Improved sanitation facilities (% of population with)	-0.001 (0.001)	-0.001 (0.001)
Prevalence of HIV, women over men (% ages 15-24)	0.006 (0.011)	0.006 (0.011)
Immunization, measles (% of children ages 12-23)	-0.001* (0.000)	-0.001* (0.000)
Immunization, DPT (% of children ages 12-23)	0.001 (0.000)	0.001* (0.000)
Year and Country fixed effects	Yes	Yes
Panel A: First stage IV regressions		
Dependent variable:	Domestic violence legislation	Domestic violence legislation (one year lagged)
Belem do Para convention ratified	0.423*** (0.075)	
CEDAW optional protocol ratified	0.110* (0.056)	
Maputo protocol ratified	0.038 (0.089)	
Belem do Para convention ratified (one year lagged)		0.427*** (0.078)
CEDAW optional protocol ratified (one year lagged)		0.113* (0.058)
Maputo protocol ratified (one year lagged values)		0.037 (0.09)
Other controls (as above)	Yes	Yes
Number of observations	2,032	2,032

F-statistic (first stage)	34	36
Hansen J statistic (over identification test of all	0.073	0.136

note: *** p<0.01, ** p<0.05, * p<0.1. Huber-White robust standard errors in brackets.

Table 7: Estimate of women deaths due to lack of legislation

	Low	Mid	High
year	Country fixed effects full model	Country fixed effects - no controls	Country fixed effects - IV estimates
1990	1,358,352	1,867,734	6,112,584
1991	1,397,500	1,921,563	6,288,752
1992	1,464,194	2,013,266	6,588,871
1993	1,526,605	2,099,082	6,869,724
1994	1,598,998	2,198,622	7,195,489
1995	1,626,556	2,236,514	7,319,500
1996	1,642,093	2,257,878	7,389,418
1997	1,675,169	2,303,358	7,538,263
1998	1,688,822	2,322,130	7,599,697
1999	1,733,565	2,383,651	7,801,040
2000	1,743,712	2,397,604	7,846,704
2001	1,733,742	2,383,895	7,801,838
2002	1,764,437	2,426,101	7,939,968
2003	1,743,630	2,397,492	7,846,336
2004	1,515,810	2,084,238	6,821,143
2005	1,385,061	1,904,458	6,232,773
2006	1,368,155	1,881,213	6,156,698
2007	1,176,966	1,618,328	5,296,345
2008	1,160,917	1,596,261	5,224,127
2009	1,118,693	1,538,204	5,034,121
2010	978,199	1,345,023	4,401,894
2011	935,608	1,286,461	4,210,237
2012	849,051	1,167,445	3,820,730
Total	33,185,835	45,630,521	149,336,252

Annex: Calculation of women's deaths due to the absence of domestic violence legislation

For the equations below, F is the women's adult mortality or the number of death among adult women per 1,000 of adult women's population; M is men's adult mortality or the number of deaths among adult men per 1,000 of adult men's population; Law is a binary variable indicating the presence of domestic violence legislation; and β is the estimated effect of Law on women-to-men adult mortality rate (F/M).

From estimations:

$$\frac{d \ln(F / M)}{dLaw} = \beta \quad (A1)$$

Using quotient rule:

$$\frac{d(F)}{dLaw} * M - \frac{d(M)}{dLaw} * F = \beta * F * M \quad (A2)$$

$$\frac{d(F)}{dLaw} = \beta * F + \frac{d(M)}{dLaw} * \frac{F}{M} \quad (A3)$$

Assuming that domestic violence legislation has no or infinitesimal effect on men's mortality rates, we obtain:

$$\frac{d(F)}{dLaw} * = \beta * F \quad (A4)$$