

Understanding Intimate Partner Violence: Supplemental Appendix

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1 Cross-national correlates of IPV

The World Health Organization (2021) report on prevalence of violence against women provides an opportunity to describe how survey-based estimates of IPV vary across countries and with often-studied political, social, and economic national-level features. While there are a number of articles that undertake cross-national analyses of IPV, these have usually been based on estimates for much smaller sets of countries. The WHO report put together comparable estimates for more than 150 countries, whereas past cross-national analyses have usually had 30-60 countries with data, usually heavily drawn from a single region, often sub-Saharan Africa (e.g., Cools and Kotsadam, 2017; Yount et al., 2020).

We wish to stress that what follows is intended as *purely descriptive* of patterns, and not explanatory. The OLS regressions reported in Table 1 in no way provide estimates of average causal effects of the covariates. They are merely summarizing conditional-mean relationships. Our intention is simply to take advantage of the WHO estimates to report on how IPV rates vary across countries with features such as income per capita, democracy, regional groupings, predominant religion or religious heritage, and few other national-level features suggested by research on IPV (and for which there is usable data).¹

There are many other covariates one might want to consider. Here we are just trying to describe how this broad measure of IPV varies with some frequently considered national-level features that are (a) suggested, directly or indirectly, by theory or evidence in the literature we reviewed; but (b) we have not seen examined for broad cross-national patterns in the literature. For example, while there is research on democracy and gender equality (e.g., Inglehart and Norris, 2003), there is very little on the question of whether democracies have less, more, or no difference in reported rates of IPV, comparing countries at similar levels of income.

Table 1 shows the results. Measures and coding concerns are described below. We begin by summarizing what we find.

Per capita income is remarkably strongly related to reported IPV rates, “explaining” (in the purely correlational sense) 63% of the variation in the bivariate regression of column 1. Adding region

¹We report the usual standard errors and “significance” tests, but note that these do not have the usual meaning in a purely descriptive analysis. There is no “hypothesis testing” going on here. Instead, the t statistics can be understood as indicators of the partial R^2 between Y and given covariate X , thus a number that combines both slope and tightness of fit. (In a multivariate regression of Y on several covariates, the t statistic for covariate X can be written as the square root of $(n-1)R_X^2/(1-R_X^2)$, where R_X is the correlation between Y and X after orthogonalizing both with respect to the other covariates. So t -statistics are increasing functions of the partial correlation and the size of the sample.)

indicators reduces the coefficient on income by about 25%, but the relationship remains strong. Income does not simply stand in for region, a “black box” variable that nonetheless encodes a lot of common culture and history.

Not shown, but if we look at the within-region relationships between income and IPV, we find negative relationships in every region, with the strongest in Asia and MENA, while there is almost no relationship within sub-Saharan Africa. In part because of smaller samples, “significance” obtains only for Asia and MENA (and caution is advisable on the latter due to so many missing MENA countries – more below).

In column 2, the omitted regional category is Asia. The results indicate that, after adjusting for income, Asia, MENA, and sub-Saharan Africa have fairly similar rates, while Western and Eastern Europe/former Soviet Union, and Latin America have lower rates. The difference for Western and Eastern Europe is substantial, at around 40% lower. These patterns do not change much when we include religion indicators (which overlap to some degree with regions), if anything becoming more pronounced for Europe/FSU and Latin America.

Column 3 introduces a binary measure of political democracy, using > 5 on the Polity 2 scale for 2018. Even adjusting for income and region, we see about 15% lower IPV rates reported on average in democracies. Not shown, but if we look region by region, we find negative coefficients on democracy in every region (including adjusting for income), all of similar sizes though not “significant” with the reduced samples.² So there is an interesting, fairly consistent tendency for democracies to have somewhat lower reported IPV rates, even conditional on income and region.

Column 4 introduces indicators for world religions, with Christianity as the omitted category. See below for discussion of the coding. In short, this is the plurality historical religion, which in 91% of cases covers a majority of the population. Christian-plurality countries have notably higher average IPV levels than the others, with a particularly large difference from countries with a predominant Buddhist or Confucian heritage (54% lower in column 4). Whereas a number of studies have either focused on or include Islamic heritage as a control and reported higher levels, we do not see that here. There are 35 “Islamic” countries in our sample, but, as noted, few from the Gulf and North Africa, which could be affecting the results (this is not clear).³

In our review we briefly discussed a substantial literature on policing and IPV. If women do not expect fair and legal treatment, or any response at all, from the police for reporting abuse, then the cost of abuse for men will be lower on average (Weldon, 2002; Dowling et al., 2018; Sukhtankar, Kruks-Wisner and Mangla, 2022). Column 5 uses a Gallup World Survey question that asks if respondents in a country trust the police; the measure is the share of the respondents who say Yes. We observe a very strong negative relationship with IPV. Substantively, the estimate implies that a 1% higher percentage of the population who say that they trust the police associates with a 1.2% lower reported rate of IPV in the last 12 months. The strong relationship obtains regardless of which of the other covariates are in the model, and is decidedly negative within every region.

1.1 Data and measures

The dependent variable is the log of the percentage of 15-49 year-old partnered women who reported physical or sexual IPV in surveys, as given by World Health Organization (2021). Their measure attempts to capture “The proportion of ever-married/partnered women who reported that they had

²Excepting the “West,” where there is no variation on democracy in 2018, by this measure.

³When we use IPV estimates based on work in progress by Lisa Blaydes to the six missing Gulf states (and which range from 25 to 43%), overall results change little. The coefficient on income drops a small amount but stays “significant,” while democracy increases and the MENA dummy switches to .1 with a standard error of .24.

Table 1: Cross-national correlations of IPV rates

	log(% IPV in last 12 months)				
	(1)	(2)	(3)	(4)	(5)
log(GDP/capita)	−0.489*** (0.030)	−0.358*** (0.044)	−0.301*** (0.048)	−0.261*** (0.049)	−0.247*** (0.050)
Democracy			−0.155* (0.080)	−0.199** (0.077)	−0.175** (0.079)
Buddhism/Confucianism				−0.768*** (0.180)	−0.335 (0.231)
Hinduism				−0.267 (0.294)	0.125 (0.316)
Islam				−0.164* (0.099)	−0.004 (0.100)
Judaism				−0.390 (0.395)	−0.224 (0.369)
Pop. share who trust police					−1.190*** (0.297)
E.Eur/FSU		−0.536*** (0.108)	−0.415*** (0.119)	−0.872*** (0.166)	−0.617*** (0.215)
L.Am./Carib.		−0.277*** (0.106)	−0.157 (0.119)	−0.638*** (0.163)	−0.551** (0.233)
MENA		0.111 (0.137)	0.145 (0.149)	−0.181 (0.197)	−0.021 (0.235)
subSaharan Africa		0.039 (0.104)	0.174 (0.117)	−0.221 (0.152)	0.039 (0.218)
W.Eur,Br. offshoots		−0.449*** (0.134)	−0.366** (0.146)	−0.894*** (0.190)	−0.421* (0.229)
constant	6.758*** (0.283)	5.722*** (0.408)	5.189*** (0.441)	5.329*** (0.447)	5.629*** (0.528)
N	155	155	137	137	123
R ²	0.631	0.703	0.703	0.745	0.781

*p < .1; **p < .05; ***p < .01

Notes: OLS. Dep. var. is log of % 15-49 year-old ever-married/partnered women reporting IPV in last year; most estimates from around 2018. GDP/capita is World Bank PPP estimate for 2018, with some imputations for missing using Penn World Tables. Democracy marks Polity 2 > 5 in 2018. Trust police is from Gallup World Survey, averaged for 2013-2017. Asia is the omitted category for region, and Christianity for religion. See text for coding details.

been subjected to one or more acts of physical or sexual violence, or both, by a current or former husband or male intimate partner within the 12 months preceding the survey” (p. 6). The authors of the report drew on a large number of household surveys, chiefly the Demographic Health Survey (DHS), Reproductive Health Survey (RHS), a WHO multi-country study, and national surveys that use question modules similar to DHS. They used some multilevel modeling to adjust for small differences in age ranges of respondents, survey source, sample size, and year of collection.

Table 2 shows coverage, which is quite good except for the MENA region. The countries in this region with estimates are Cyprus, Egypt, Iran, Israel, Jordan, Morocco, Palestine, Tunisia, and Turkey.

Table 2: Countries with WHO IPV estimates				
	N	N w/ IPV data	% w/ IPV data	% non-microstates w/ IPV data
Asia	38	34	89	89
E.Eur/FSU	29	26	90	90
L.Am/Carib	33	26	79	100
MENA	21	9	43	43
subSah.Africa	49	40	82	83
W.Eur+	27	22	81	95
	197	157	80	84

Note: Microstates defined as < .5 million population in 2018.

GDP/capita is World Bank PPP in 2018. We use PPP because this is a better measure of standard of living across countries. To maximize sample size, we imputed a few missing observations by regressing the World Bank estimates on the corresponding Penn World Tables estimates, and using the predicted value for missing cases. Because the two measures are nearly perfectly related this is likely to be an excellent approximation.

We use fairly standard regional classifications. For some “edge” cases, we include Afghanistan and Pakistan in MENA; include the “British offshoots” (US, Canada, Australia, New Zealand) with Western Europe; include former Soviet republics with Eastern Europe; Sudan and South Sudan in sub-Saharan Africa.

For religion, we draw on the Correlates of War’s World Religion Database 1.1, constructed by Errol Henderson and Zeev Maoz.⁴ We take the plurality religion for 2010 from their highest level categories, which are Christianity, Buddhism, Hinduism, Islam, Judaism (one country), and nonreligious (four countries, North Korea, South Korea, Estonia, and the Czech Republic). (There are other “level 1” categories in their classification, but in no case are they coded as the plurality religion.) In only 13 countries with IPV data (8%) is the plurality religion not a majority.

We then modify and simplify this coding by expanding the Buddhism category, adding China and Taiwan (which COW codes as plurality “syncretic”, presumably Buddhism and Confucianism), and Japan (Shinto Buddhism). Seeking to capture the idea of religious heritage or tradition, we assign Estonia and Czech Republic to Christianity, and North and South Korea to Buddhism/Confucianism (they are coded by COW as plurality nonreligious). We end up with the following countries in the Buddhism/Confucianism category, and that also have IPV estimates: Bhutan, Cambodia, China, Hong Kong, Japan, Laos, Mongolia, Myanmar, South Korea, Singapore, Sri Lanka, Thailand, and Vietnam.

We fully recognize that there is enormous religious and cultural diversity with these high-level “world religion” codings, just as there is within the regional designations, or in terms of political institutional

⁴Zeev Maoz and Errol A. Henderson. 2013. “The World Religion Dataset, 1945-2010: Logic, Estimates, and Trends.” *International Interactions*, 39: 265-291.

differences among the “democracies” and “autocracies.” It should also be stressed that average differences in IPV rates by religious grouping could reflect actual differences, or differences in propensity to report, or some combination. We interpret the results shown in Table 1 as largely negative, in the sense they do not show dramatic and clear differences, except possibly for the Buddhism/Confucianism category. We have not seen this last pattern noted or investigated in the literature. It is of interest that these countries are on average *not* less prone to have had violent internal conflicts.

Democracy is 1 for countries that had a Polity 2 score greater than five in 2018.

Trust in police is, as noted, from the Gallup World Survey. We use the average of the measure for the 2013-2017 to maximize observations. The results are virtually identical if we use the values for 2017 or 2018.

2 Details on the bargaining model

We begin by considering the case of fixed division of benefits and burdens in the relationship, at $(\phi^*v, (1 - \phi^*)v)$ for the woman and man respectively. Here, the Nash bargaining will be over the man’s threshold for violence, $\hat{a} \geq 0$. In what follows we will use $\hat{a}$ as an arbitrary threshold and $\hat{a}^*$ as the Nash bargaining solution threshold.

As described in the text, the woman’s and man’s expected payoffs at a threshold $\hat{a}$ are

$$u_f = \phi^*v - (1 - F(\hat{a}))k \text{ and } u_m = (1 - \phi^*)v - \beta \int_0^{\hat{a}} af(a)da - \gamma(1 - F(\hat{a})).$$

Recall that $F(a)$ is the cumulative distribution of the man’s urge-to-attack intensity. Assume this is strictly increasing on either $[0, A]$ or $[0, \infty)$. We will assume that $A > 0$ is sufficiently large in some of the arguments that follow, to avoid having to spell out boundary cases that add little insight.

We note first that u_f is increasing in $\hat{a}$, and that u_m increases with $\hat{a}$ for $\hat{a} < \gamma/\beta$ and is decreasing after this (seen by taking the derivative of u_m with respect to $\hat{a}$).

Define $\underline{a}_f$ and $\bar{a}_m$ as the minimum and maximum $\hat{a}$ ’s such that the woman and man would be indifferent between the relationship and leaving, namely, $u_f \geq w_f$ and $u_m \geq w_m$. There can be a strict surplus to the relationship if and only if $\underline{a}_f < \bar{a}_m$. The claims in the text about how varying exogenous parameters affect the likelihood of break up follow directly. Break up is more likely the larger is $\underline{a}_f$ and the smaller is $\bar{a}_m$.

Define $U_f = u_f - w_f$ and $U_m = u_m - w_m$. The Nash product is then $U_f U_m$, and the NBS is the choice of $\hat{a}$ that maximizes this. If there is a (strict) surplus for some $\hat{a}$, both terms are positive at the maximum. Taking the derivative in $\hat{a}$, $U_f U_m$ is shown to be increasing when

$$\frac{k}{\phi^*v - (1 - F(\hat{a}))k - w_f} > \frac{\beta\hat{a} - \gamma}{(1 - \phi^*)v - \beta \int_0^{\hat{a}} af(a)da - \gamma(1 - F(\hat{a})) - w_m}.$$

At $\hat{a} = \underline{a}_f$ the LHS is infinity, certainly greater than the RHS which is finite (we are assuming there is a surplus, so $\underline{a}_f < \bar{a}_m$.) LHS decreases with $\hat{a}$, while RHS decreases up to $\hat{a} = \gamma/\beta$ (if this is in the interval) and then is increasing towards infinity at $\hat{a} = \bar{a}_m$. The maximum of $U_f U_m$ cannot occur when $\hat{a} \leq \gamma/\beta$ (since both terms are there increasing), so there is a unique intersection that defines $\hat{a}^*$. At this intersection LHS = RHS and LHS slopes down while RHS slopes up.

Thus we can extract comparative statics on $\hat{a}^*$ by asking how a change in an exogenous parameter shifts LHS and/or RHS (up or down). We have:

- Increasing w_f shifts LHS up, so $\hat{a}^*$ increases, reducing the frequency of IPV.
- Increasing w_m or β , or decreasing γ , shifts RHS up, so that $\hat{a}^*$ decreases, increasing IPV.
- Increasing k : Divide top and bottom of LHS by k , leaving $(\phi^*v - w_f)/k$ as the term involving k in the denominator. $\phi^*v - w_f > 0$ since otherwise there would be no surplus, so increasing k shifts the LHS up, reducing the frequency of IPV.
- Increasing v shifts both LHS and RHS down, so there is no determinant impact on $\hat{a}^*$.
- Increasing ϕ^* (making the cultural norms of household division of responsibilities and benefits more gender equal) shifts LHS down and RHS up, thus reducing $\hat{a}^*$, which means *more* IPV. This is because the man becomes more unhappy with the terms of the relationship, which increases the credibility of implicit or explicit breakdown threats, and, in turn, leads to greater tolerance of violence by the woman to preserve the relationship (as long as a surplus remains, which becomes less likely).

We next examine the bargaining problem when both ϕ and $\hat{a}$ are negotiable. Now there is a (strict) surplus to the relationship if there is a set of pairs $(\phi, \hat{a})$ such that $u_f > w_f$ and $u_m > w_m$. We will consider the case where this set exists and the NBS is interior to it.

Taking the derivative of $U_f U_m$ with respect to ϕ shows that the Nash product is increasing in ϕ when $vU_m - vU_f > 0$. Since U_m decreases and U_f increases in ϕ , the maximum occurs at ϕ^* such that $U_f = U_m$. At $U_f = U_m$, the first-order condition for $\hat{a}$ becomes $k = \beta\hat{a} - \gamma$, thus $\hat{a}^* = (k + \gamma)/\beta$. ϕ^* is then defined by

$$\begin{aligned} \phi^*v - (1 - F(\hat{a}^*))k - w_f &= (1 - \phi^*)v - \beta \int_0^{\hat{a}^*} af(a)ds - \gamma(1 - F(\hat{a}^*)) - w_m \\ \phi^* &= \frac{1}{2} + \frac{w_f - w_m}{2v} - \frac{1}{2v} \left[\beta \int_0^{\hat{a}^*} af(a)da + (\gamma - k)(1 - F(\hat{a}^*)) \right] \end{aligned}$$

To interpret, this is a Coase theorem-type of result. The man's use of violence can have an immoral emotional or instrumental benefit for him, but imposes a "negative externality" on the woman. When ϕ is completely flexible, the division of burdens and benefits in the relationship can in principle be adjusted so as to try to compensate the woman, in a sense, for the man's abusive behavior. In effect the man makes concessions on ϕ because otherwise the woman's threat to break up the relationship exceeds his. In the "optimal" arrangement, the threshold $\hat{a}$ equates the man's marginal benefits with the woman's marginal costs, which in turn maximizes the size of the available relationship surplus. This is then distributed through ϕ to equalize the parties' implicit threats of breakdown, according to the Nash bargaining logic.

Looking at the last expression above, the final term shows how motivations for violence modify the standard NBS (the first two terms). Levels of violence depend on β , γ , and k , through the threshold $\hat{a}$ – increasing in β , decreasing in k and γ . But the effects of these factors on gender equity within the relationship (ϕ^*) are more subtle and can be indeterminate. They depend on whether a change in β , γ , or k has a larger impact on the man's or woman's surplus from the relationship (U_m or U_f). For example, increasing β , which is effectively a measure of the man's value for violence, has an indeterminate effect on the man's value for the relationship, because while he abuses more often he is also more unhappy when suppressing the urge to attack. The effect on the woman's value for the relationship in this case is unambiguous (greater β lowers it). Similarly, increasing k , the woman's

disutility for abuse relative to her value for the relationship, reduces the amount of violence but makes its costs worse when it occurs. On the man's side, larger k increases the costs of suppressed urge to attack but lowers expected social or legal sanctions. Interestingly, with the assumption of linear payoffs in ϕ (as we have here), increasing γ has the net effect of shifting gender equity *away* from the woman, because this lowers the man's value for the relationship while increasing the woman's (by reducing abuse). This makes the man more likely to risk break up which the woman has reasons to avoid if there is a surplus.

We see the “culturally fixed ϕ^* ” version of the model as much more plausible, because it can represent the obvious fact that there are strong social norms about the gender division of benefits and burdens in households essentially everywhere. Phenomena such as backlash are also difficult to understand if Coasian bargaining worked smoothly in households.

Still, the model with flexible ϕ does suggest a mechanism that could in some relationships or settings tend to make the impact of effective policy changes on IPV work more through the extensive margin (more break ups of abusive relationships) than through changes in the frequency of violent abuse within observed households (the intensive margin). Keep in mind that “compensation” only works up to a point before exit becomes preferable.⁵

2.1 A dynamic, game-theoretic variant with unobservable urge-to-attack levels

A key assumption above was that the woman can observe the man's realized urge-to-attack motivation a , and so judge whether he is implementing self-control at the “negotiated” level $\hat{a}$. We feel this is reasonable – for example in the case of anger, this emotion is by its nature hard to disguise and couples also usually develop a good ability to read the other's state.

But it is certainly of interest to consider what the implications are if we assume at the other extreme that the woman observes only the man's action – say, violent or not – and not his internal state a . We comment briefly on a dynamic model in which the couple interacts in successive periods $t = 0, 1, 2, \dots$. The most interesting implication is that the moral hazard problem that comes with difficulty observing the man's efforts at self-control favors an equilibrium in which there are some relationships with frequent abuse and women who are trapped, and other relationships with no physical abuse.

For concreteness, take a to be a level of anger. In each period, the man observes his anger level a_t , drawn as before from $F()$, and then chooses whether to violently attack his partner. After observing this choice, the woman chooses whether to end the relationship, which implements payoffs (w_f, w_m) for all future periods. To begin with and for simplicity, this is assuming that it is not an option for the woman to leave temporarily and then return to the relationship.

If the man does not attack in a period, payoffs are ϕ^*v for the woman and $(1 - \phi^*)v - \beta a_t$ for the man. If the man attacks, the payoffs in that period are $\phi^*v - k$ for the woman and $(1 - \phi^*)v - \gamma$ for the man. Future payoffs are discounted by a common discount factor $\delta \in [0, 1)$.

Analysis: If the woman would not leave no matter what the man does, then the man will attack whenever $\beta a_t > \gamma$, or $a_t > a_m \equiv \gamma/\beta$. Note that if there is an upper bound on the man's anger levels, A , and β is small enough or γ large enough, then the man is never physically abusive.

The woman does not have a credible threat to leave if, at a_m , w_f is less than $\phi^*v - (1 - F(a_m))k$, the

⁵If ϕ is flexible but the partners differ significantly in their marginal values for additional resources within the household (e.g., concave utility over ϕv and $(1 - \phi)v$), then the changing exogenous parameters may make for changes on both margins, but in the same directions as in the polar cases.

per period payoff of just staying in the relationship. An immediate implication is that women with bad outside options (very low w_f) can be trapped in a repeatedly abusive relationship.

If $w_f > \phi^*v - (1 - F(a_m))k$, then the woman has a credible exit threat if the man does not control himself. Indeed, in this case we can construct a “break up” equilibrium in which the woman leaves in the first period, expecting that the man will never control himself. This is an equilibrium because if the man thinks the woman will definitely leave “tomorrow” (in the model), then he has no reason for self-control to preserve the relationship.

The break-up equilibrium may be inefficient if there would be a surplus to the relationship for sufficient degrees of self-control by the man ($\hat{a} > a_m$). Can they do better?

Suppose the man believes that the woman would leave if he is ever physically abusive. This threat can be rendered credible by a mutual expectation that once the man is abusive once, they will both expect the break-up equilibrium strategies to be played thereafter. Now the man can have a reason to exercise self-control at a threshold $\hat{a} > a_m$, although if the upper bound on his anger levels A is greater than this $\hat{a}$, then violence and break up will eventually occur.⁶

In the Nash bargaining model we developed in the text, relationships can have different equilibrium frequencies of abuse, and comparative statics applied to these frequencies. Here, there are essentially two kinds of relationships: One where any abuse would lead to break up and as a result it doesn’t happen or is very infrequent, and one where the woman’s exit option is sufficiently bad relative to the husband’s “abuse disposition” that she stays in the relationship. In the latter type, the amount of abuse depends on β and γ is not sensitive to the woman’s outside option or costs k until these cross distinct thresholds.

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⁶The condition that defines this $\hat{a}$ equates the man’s continuation payoff for restraint in a period with $a_t = \hat{a}$ and his payoff for abuse, which is $(1 - \phi^*)v - \gamma + \delta w_m / (1 - \delta)$. The man’s continuation payoff in this equilibrium is defined by $V_m = (1 - \phi^*)v - \beta \int_0^{\hat{a}} af(a)da + F(\hat{a})\delta V_m + (1 - F(\hat{a}))(-\gamma + \delta w_m / (1 - \delta))$.

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