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Rural Electrification and Domestic Violence in Sub Saharan Africa

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Maximiliane Sievert*

Rural Electrification and Domestic Violence in Sub Saharan Africa

Abstract

Electrification is frequently said to foster women's development and contribute to a modernization of gender roles. Using Demographic and Health Survey data from rural areas in 22 Sub-Saharan countries collected between 1999 and 2014, this paper examines the role of electricity access in reducing Intimate Partner Violence (IPV). Women in households with electricity report significantly lower acceptance of IPV. This relationship is largely driven by endogeneity, though, and applying matching and region panel approaches cast doubts on the causality of electricity for changes in attitudes towards IPV. The paper also illustrates how inference for a large number of countries is hampered by a lack of local context and observable variation, i.e. the trade-off between internal and external validity in empirical research.

JEL-Codes: J12, J16, O13, O18

Keywords: Rural electrification; domestic violence; intimate partner violence; region fixed effects; propensity score matching

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1. Introduction

One third of all women experience violence within their lifetime, most frequently perpetrated by their intimate partner. Since the 1993 World Conference on Human Rights and the Declaration on the Elimination of Violence against Women it is officially recognized as a violation of human rights. Intimate partner violence (IPV) impacts women's sexual, reproductive, and mental health, and increases the risk of chronic diseases (WHO 2013). It is a leading cause of female homicide death and is associated with increased levels of depression and suicidal behaviour (Devries et al. 2013). Ways to reduce IPV are less obvious, though. It requires tackling socio-economic factors that reinforce a culture of violence against women. This includes changing social norms that support male authority over women as well as strengthening women's economic position and legal rights (Klugman et al. 2014).

In a seminal paper, JENSEN AND OSTER (2009) show that women's attitudes and behaviour are influenced through the introduction of cable TV in rural India. Amongst others, acceptance of IPV is reduced. Since access to electricity facilitates TV consumption and also more generally improves access to information via radio and mobile phones, especially in rural areas, electrification is frequently said to foster women's development and contribute to a modernization of gender roles (KÖHLIN et al. 2011, WILHITE 2017). Moreover, access to electricity is often expected to change women's relative status in the household due to higher female labour participation. Despite the relevance, recent reviews document that there is only weak evidence on the role of electricity access and gender outcomes (DAS ET AL. 2023, PUEYO AND MAESTRE 2019).

Against this background, the present paper analyses attitudes towards IPV in relation to electricity access in rural Africa. In Sub-Saharan Africa, 40 percent of women have experienced physical or sexual violence by an intimate partner. It is the region with the second-highest prevalence worldwide, only exceeded by South Asia with a prevalence rate of 43 percent (KLUGMAN et al. 2014). At the same time, it is the region where most of the remaining non-electrified people live. In 2021, SSA was home to over 80 percent of the global population without access to electricity, which corresponds to 570 million people (IEA et al. 2023).

Using Demographic and Health Survey (DHS) data from rural areas in 22 Sub-Saharan countries collected between 1999 and 2014, the paper provides an extensive cross-country overview on the topic that complements existing evidence. So far, empirical papers mainly focus on single countries and isolated parts of the results chain between access to electricity and IPV. The paper analyses differences in attitudes towards IPV, IPV prevalence, and electrification rates across countries and provides details on the two possible transmission channels, improved access to information and higher female labour market participation. For analysing the role of electricity access, the identification strategy relies on a region-panel and propensity score matching approach.

According to the definition of the WHO "World report on violence and health", IPV is behaviour within an intimate relationship that causes physical, psychological or sexual harm (KRUG et al. 2002). In this paper, we concentrate on acts of physical aggressions – such as slapping, hitting, kicking, and beating. The DHS data is the largest source for nationally representative data about violence at home in developing countries. It provides information both on attitudes toward IPV and its occurrence. While information on electricity access, labour participation, and access to information technologies is not the focus of the DHS data,

it still provides an interesting level of detail concerning these topics and is the most comprehensive cross-country data set available that contains information on all important steps of the results chain from electrification towards IPV.

The focus of the analysis is on attitudes as the main outcome indicator. While the DHS has information on attitudes toward IPV for almost all survey waves collected since 1999, data of effective experience of physical aggressions is available only for a subset of countries and survey waves. Furthermore, the indicator for occurrence of IPV only captures whether a woman has ever experienced IPV in her life. The indicator hence is not very sensitive to a decrease in IPV occurrence since it can only change through cohort replacement. Attitudes towards IPV, however, have been proven to be strongly correlated with occurrence of IPV (ALIO et al. 2011; UTHMAN 2011). Hence, changes in attitudes can be assumed to induce changes in prevalence of IPV.

A first descriptive result shows that the topic is highly relevant with on average 68 percent of all women accepting domestic violence. The level of acceptance varies substantially between countries and over time. In a simple multivariate analysis, we show that additionally to country and time effects, differences in prevalence can be explained by individual factors. Correlates of a low acceptance of IPV are most importantly education and the woman's age. High acceptance of IPV can be found among Muslim women and women exposed to domestic violence during childhood. Furthermore, women in larger households and more traditional relationships with a higher age difference between the partners and who entered cohabitation at younger ages are more likely to accept IPV. In all but one country, levels of consent to IPV decreased over the last 15 years. The size of the reduction varies between one to 50 percentage points.

Looking at potential transmission channels of changes in IPV acceptance, we find that women in households with electricity in fact have better access to information via TV, radio, and mobile phones. Similarly, women in electrified households also have better employment opportunities. They work significantly more often in non-agricultural jobs and earn cash income.

We also find that women in households with electricity expose clearly lower levels of IPV acceptance. However, accounting properly for endogeneity due to non-random electricity access by means of a region panel and propensity score matching approach, the correlation disappears. Looking into differences across countries, substantial differences in the size and even sign of the relationship can be observed. The results accordingly show that access to electricity does not necessarily reduce IPV and often observed correlations between electricity and IPV are largely driven by unobservables. Understanding impact heterogeneities in order to identify sub-populations where positive impacts of electricity on IPV do exist, seems crucial.

The remainder of this paper is organized as follows. Section 2 elaborates the theory of change on how electricity access might influence attitudes toward IPV. Section 3 presents the data. Section 4 specifies the empirical strategy. Section 5 provides descriptive statistics on attitudes toward IPV, cross-country differences, and individual risk and protection factors for IPV. Section 6 analyses information access and female labour participation among electrified households, the two potential transmission channels for changes in IPV. Section 7 presents the results of multivariate regressions to estimate the relationship of electricity and attitudes toward IPV. Section 8 concludes.

2. Theoretical background and literature

Rural electrification enables changes at the household and the enterprise level that ultimately might affect attitudes toward IPV (see Figure 1). Once households in rural areas connect to the electricity grid, they acquire primarily electric lighting, information, and entertainment devices. To a lower extent, households also invest into appliances that facilitate housework like electric irons and refrigerators. Electric stoves are rarely used in rural Sub-Sahara Africa.[1] This leads to better access and thus higher exposure to information.

Moreover, electricity access gives household members higher flexibility to exercise their daily duties, and housework can be done more efficiently. Women, released from housework, can use the additional time for productive purposes and hence increase their labour supply. At the same time, electricity can drive enterprise creation and cause productivity gains in existing enterprises. A resulting increase in labour demand might lead to higher female labour participation, which might improve women's economic situation and change traditional gender roles.

While some of these effects only accrue to households that have electricity at home, attitudes of non-electrified households in electrified areas might also change. First, they can also benefit from the labour demand effect. Second, information spillovers can improve information access of non-electrified households by mouth-to-mouth communication and usage of information technology at electrified neighbours, especially TV watching.

Several studies show empirically that households effectively gain better access to information through electrification (see for example IEG 2008; KHANDKER, BARNES AND SAMAD 2012; LENZ et al. 2017). A change in female labour participation following electrification has

[1] South-Africa is an exception as can be seen in DINKELMAN 2011.

most prominently been shown by DINKELMAN 2011 in South Africa, GROGAN AND SADANAND 2012 in Nicaragua, DASSO AND FERNANDEZ 2015 in Peru, RATHI AND VERMAAK 2018 in South Africa and India, and CHHAYA AND YAMAZAKIB 2021 in Cambodia. Evidence from Africa is more pessimistic (BERNARD 2012; NEELSEN AND PETERS 2011; PETERS, VANCE AND HARSDORFF 2011).

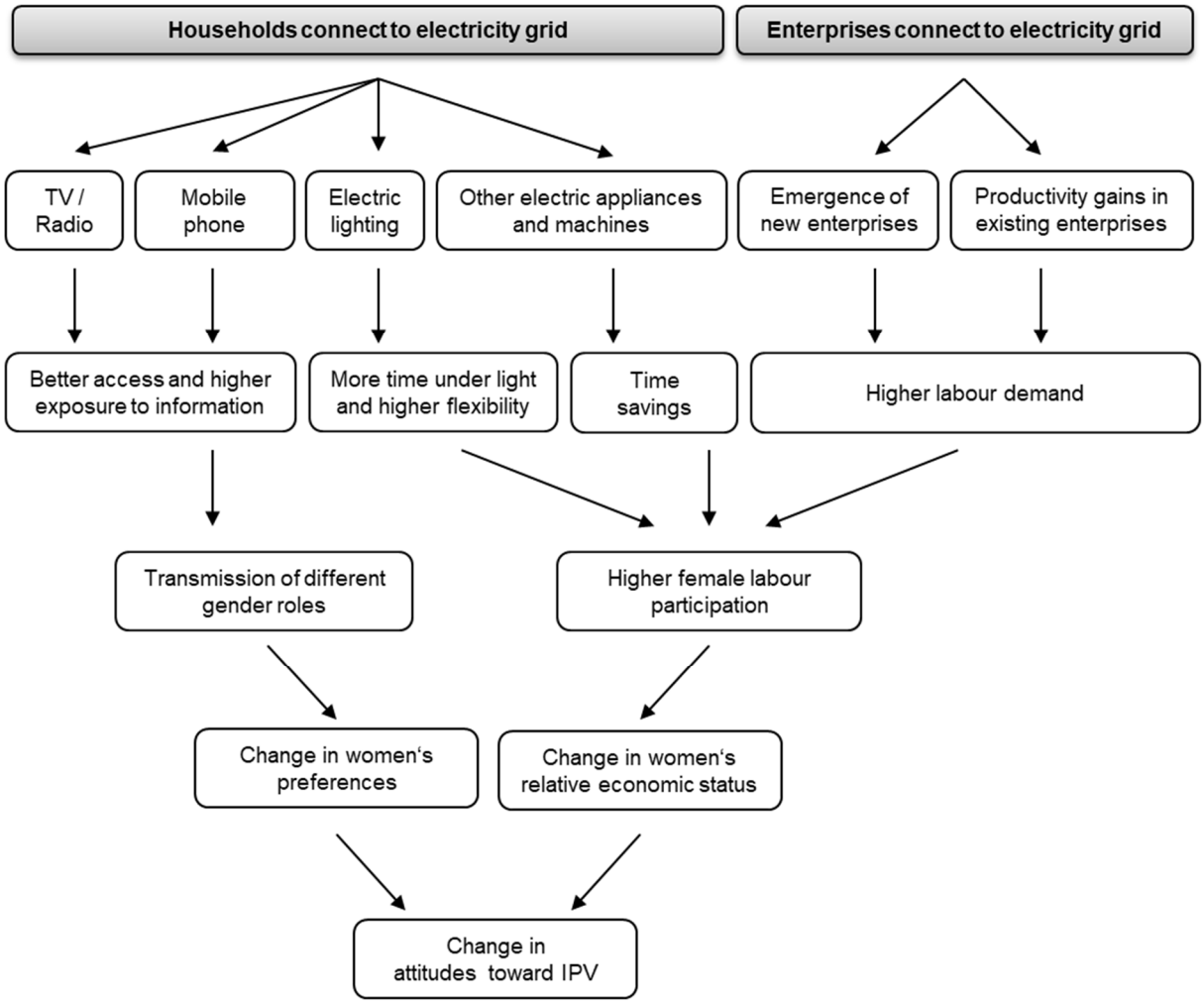
Traditional economic models of domestic violence suggest that educational, economic and social empowerment is protecting women against violence (FARMER AND TIEFENTHALER 1997; TAUCHEN, WALITTE AND LONG 1991). Domestic violence is assumed to be driven either by a direct gratification of the perpetrator (e.g. direct enjoyment of the pain of another or release of frustration) or to execute control. In most Sub-Saharan countries, where IPV is often socially accepted, the latter reason seems to be the dominant.[2] According to the models, a woman accepts IPV as long as the utility she gains from being in a violent relationship is at least as high as her utility when leaving the relationship. Greater economic independence increases the possibility of a woman to leave a relationship without losing utility. Knowledge on different gender roles might shift her preferences whereby the utility she obtains from a violent relationship might decrease. Accordingly, since electricity might affect both the economic opportunities outside the relationship and knowledge on different gender roles, one would expect that women with electricity access are less likely to accept IPV.

The empirical evidence is not that clear, though. Analysing the effect of mass media on several indicators for women's status, JENSEN AND OSTER (2009) show that acceptance of IPV is reduced through the introduction of cable TV in rural India. This study uses very similar outcome indicators for attitudes toward IPV as the ones used in this paper. It furthermore

[2] In industrialized countries, the earlier reason seems to be dominant. See for example CARD AND DAHL (2011) who explain domestic violence in the US by emotional cues.

observes a reduction in son preference, increases in women's autonomy and decreases in fertility.[3]

Figure 1: Theory of Change



Source: own illustration

Also PIEROTI (2013) shows that women who are in regular contact with mass media, i.e. newspaper, radio, or television, are less likely to accept IPV. WAKUNUMA (2012), by contrast, observes an increase in social conflict and violence in relationships induced by mobile phone ownership.

[3] These findings have been challenged by a replication study that finds some of the results to be sensitive to index construction and that observes heterogeneous effects by age and social identity, as well as spillover effects (see IVERSEN AND PALMER-JONES 2013).

Also regarding the relationship between women's employment and IPV, empirical studies show both positive and negative effects. KRISHNAN et al. (2010) look at the effect of spousal employment status and physical domestic violence in Bangalore, India. Using panel data, they detect that the risk of violence increases for women who become employed in comparison to women who stay unemployed. Similarly, HEATH (2014) finds a positive correlation between work and domestic violence in Dhaka, Bangladesh. Yet, this correlation is only present among women with less education or who were younger at first marriage. BHALOTRA et al. (2019) show for thirty-one developing countries that an improvement in women's employment opportunities is associated with increased violence. With data from the US, AIZER (2010) shows that an increase in relative female wages decreases domestic violence.

One attempt to explain these conflicting results is that effects differ depending on the bargaining power of a woman. This relationship is often described as an inverted U-shaped relation with women at higher levels of empowerment challenging traditional sex roles, which increases the risk of violence. Only if a woman has realistic opportunities to leave the relationship, protective effects predominate. The bargaining power of a woman is determined both by individual factors such as the relative economic position or cultural expectations regarding gender roles. (ESWARAN AND MALHOTRA 2011; GOODE 1971; HEISE 2012; JEWKES 2002; LEVINSON 1989).

In cross-country comparisons, two factors for differences in IPV stand out: cultural expectations and economic development. Cultural expectations refer to institutions like patrilocality and patrilineality, dowry systems, or "collectivist" cultures compared to "individualist" cultures (see for example ABREVAYA 2009; ALMOND AND EDLUND 2008; ARCHER 2006; FERNÁNDEZ AND FOGLI 2009; FERNÁNDEZ et al. 2004; JAYACHANDRAN 2015). With regard to

economic development, studies highlight the bidirectional relationship between a country's GDP and levels of IPV (see for example JAYACHANDRAN 2015 and DUFLO 2012).

3. Data

This paper uses data from the Demographic and Health Surveys (DHS). DHS data is nationally representative data on population, health, and nutrition from over 90 developing countries. It is the largest source of nationally representative data on domestic violence and provides up to six nationally representative cross-sectional survey waves per country, collected since 1984. Individuals are not tracked over time.

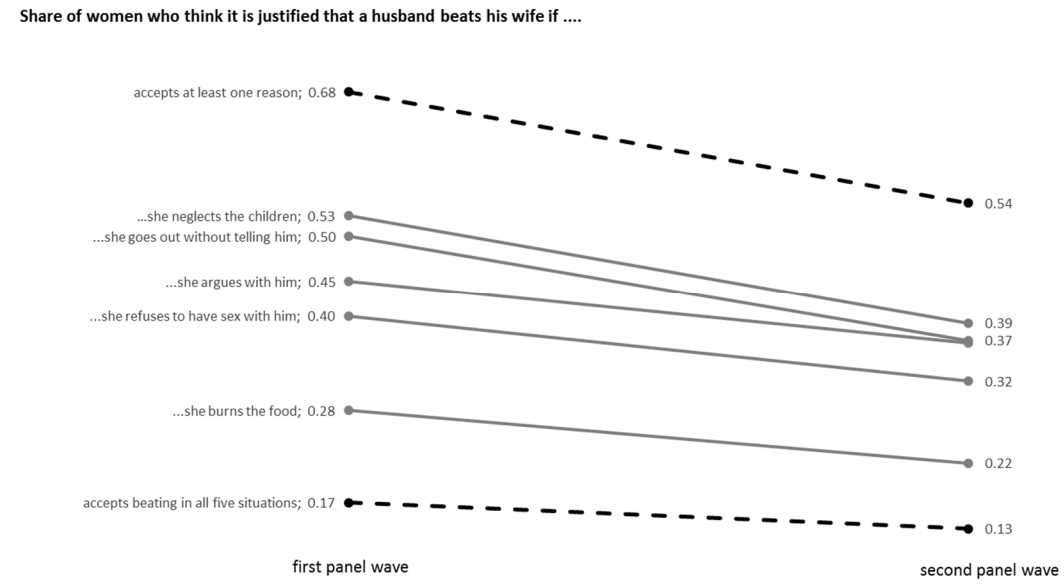
Table 1: DHS data used

	First wave			Second Wave		
		Sample size for			Sample size for	
	year	attitudes toward IPV	experience of IPV	year	attitudes toward IPV	experience of IPV
Benin	2001	3,170	n.a.	2011-12	7,757	n.a.
Burkina Faso	2003	7,994	n.a.	2010	10,179	7,274
Cameroon	2004	4,171	1,346	2011	5,787	2,087
DRC Congo	2007	4,241	1,717	2013-14	9,680	4,038
Ethiopia	2005	7,766	n.a.	2011	8,677	n.a.
Ghana	2003	2,680	n.a.	2008	2,029	1,112
Guinea	2005	4,840	n.a.	2012	4,786	n.a.
Kenya	2003	3,835	2,976	2008-9	4,127	3,457
Lesotho	2004	3,492	n.a.	2009	3,674	n.a.
Liberia	2007	3,122	2,541	2013	4,289	n.a.
Malawi	2004	8,456	7,255	2010	16,007	4,685
Mali	2006	7,034	4,885	2012-13	6,504	2,247
Mozambique	2003	6,135	n.a.	2011	6,732	3,801
Namibia	2006-07	2,270	n.a.	2013	2,246	669
Niger	2006	5,490	n.a.	2012	7,372	n.a.
Nigeria	2008	18,119	13,589	2013	18,665	14,057
Rwanda	2000	5,190	n.a.	2005	5,561	2,118
Senegal	2005	6,559	n.a.	2010-11	7,521	n.a.
Tanzania	2004-05	5,856	n.a.	2010	5,511	4,318
Uganda	2000-01	3,805	n.a.	2011	4,686	1,269
Zambia	2001-02	3,908	n.a.	2007	3,099	2,676
Zimbabwe	2005	4,290	3,413	2010-11	4,374	3,521
Total		123,866	38,942		149,263	57,329

Source: DHS all country data set. Only rural households. Only ever-partnered women.

The surveys collect basic socio-economic household information and elicit information on health aspects among all female household members of reproductive age (15 to 49 years). Since 1999, these women interviews have collected information on attitudes toward IPV. We use all Sub-Saharan country data sets since 1999 in which information on attitude toward IPV is available for at least two waves.[4] In some of these surveys, a sub-sample of women were asked in detail about domestic violence experiences. We restrict the sample to households in rural areas and women who have ever been married or lived in a partnership. Countries, survey waves, and sample sizes used in this paper are displayed in Table 1. In some households, more than one woman is interviewed. We account for this fact in the following by clustering standard errors at the household level.

Figure 2: Justification of IPV, by situation



Source: DHS all country data set, only rural households

For eliciting attitudes toward domestic violence, women are asked about acceptability of IPV in five different situations. They are asked whether they think it is acceptable that a husband beats his wife if i) she goes out without telling him ii) she neglects

[4] For Ethiopia, Mali, Nigeria, and Zimbabwe three waves with information on attitudes exist. We only use the most recent two.

the children iii) she argues with him iv) she refuses to have sex with him or v) she burns the food. The dependent variable for measuring acceptance of domestic violence in the following analysis aggregates this information into a binary variable indicating whether the woman accepts being beaten in any of these five situations.[5]

Female consent to IPV depends on the reason for beating a woman. The DHS data from all Sub-Saharan countries shows that it is most accepted to beat a woman if she neglects her children and it is less accepted if she burns food (see Figure 2). Over time, we can see a general decrease in acceptability of IPV, no matter for what reason. The decrease is strongest for a wife neglecting the children and lowest for a wife arguing with him. Almost 60 percent of all women accept IPV in at least one situation. 15 percent accept it in all five situations. The intermediate steps of accepting four, three, two, or one situation are almost evenly distributed with around 10 percent at each step.

Finally, access to electricity is measured by a binary variable that indicates whether the household has an electricity source. In most cases it is plausible to assume this electricity source to be a connection to the national electricity grid. It cannot be completely ruled out, though, that in some countries also decentralized sources (Solar Home Systems, generators, etc.) are subsumed under this question.

4. Empirical strategy

The aim of this paper is to analyse the relationship between having electricity at home and attitudes toward IPV. The main difficulty in interpreting this relationship causally lies in the

[5] Results are largely robust to alternative ways of constructing the outcome indicator. Annex 3 shows results for each of the five questions separately and three alternative ways of summing up the five questions, including multiple correspondence analysis (mca).

household's connection status not being exogenous but rather a result of a twofold selection process:

First, to connect to the grid, the household must be located in an area that is served by the electricity grid. Electrification rates are normally highest in the countries' capital and urban centres and rapidly decrease with the distance to urban centres. Out of economic considerations, rural areas with an above-average demand for electricity are the priority for rural electrification to make investments into rural electrification as profitable as possible. Rural areas with electricity can hence be expected to be the livelier places with comparably high economic activity. Furthermore, rural electrification is often a highly politicised process. Rural electrification is a means to secure electoral support and regions selected for electrification might be politically privileged regions in other regards too.

Second, a household in a grid connected area decides whether to connect or not. Since electricity has very high priority for rural households, the decision to connect is mainly driven by affordability considerations and connected households can be expected to be the economically better off households. Furthermore, other household characteristics like educational level or modernity drive the households' decision to connect.[6] These regional and household characteristics are likely to be correlated with attitudes toward IPV and thereby make a causal interpretation of an observed correlation difficult.

4.1 Linear Probability Estimation

As a first approach to address the endogeneity problem, we estimate a simple multivariate linear probability model (LPM), regressing the binary attitudes indicator on electrification

[6] See Section 5.2 for characteristics of connected vs. non-connected households.

status and further control variables.[7] The included variables can capture a substantial number of potential confounding factors. Since the DHS data is not a panel, we assume in a first step that no unobserved heterogeneity exists and pool all observations across the two waves of data. Country dummies are included, and standard errors are clustered at the household and cluster level.

At the cluster level, we control for the availability of piped water and health services in the cluster.[8] At the household level, we include a set of household characteristics like the age and sex of the head of household and the household size. In addition, indicators for the economic situation of the household like ownership of bikes, motorcycles, cars, and usage of tapped water are included. At the individual level, we control for the respondent's religion, age, education, marital status, number of children, and the partner's education. Moreover, the age at first cohabitation serves as an approximation for whether the respondent comes from a rather traditional or modern background.

More formally, we estimate the following equation for all women *i* in household *j* in country *k:*

$$y_{ijk} = \beta E_{jk} + \gamma t + \delta X_{ijk} + \alpha_k + \varepsilon_{ijk} \qquad (1)$$

where y_{ijk} is acceptance of IPV. *E* denotes the households' electrification status that equals unity for those connected and *t* denotes a dummy variable for the second period. α_k describes country dummies and *X* denotes sets of respondent, household, and cluster characteristics. Since this approach relies on a comparison of connected versus non-

[7] Despite the binary character of the attitudes indicator, an LPM seems to give good estimates, since the explanatory variable of interest, electrification status, is discrete as well (see WOOLDRIDGE 2002, p.456). Results of a probit estimation of the simple multivariate model confirm the results from the LPM estimation.

[8] Since DHS does not provide information on infrastructure in the cluster, we calculate the share of interviewed households in each cluster that uses water from a tap, that has visited a hospital in the last 12 month, and that has been visited by a family planning worker in the last 12 month.

connected households, results might be downward biased if spillovers from connected households to non-connected households occur as discussed in Section 2.

4.2 Propensity Score Matching

In this approach, we restrict the analysis to households connected to the grid and non-connected household that are as similar as possible to the connected households by means of a Propensity Score Matching (PSM) approach. Matching builds on the Conditional Independence Assumption (CIA) that dictates that the outcome variables must be independent of the treatment, conditional on the observed covariates. The treatment in the present case is whether the household has connected to the grid. The CIA implies that selection into electricity connection is exclusively based on observable characteristics and that the researcher observes all household characteristics that influence the connection decision and attitudes toward IPV simultaneously. The CIA also requires that the covariates are non-responsive to the connection status (ROSENBAUM 1984). The covariates to be included should only be those that affect the decision to connect and the outcome variable (SCHMIDT AND AUGURZKY 2001, CALIENDO AND KOPEINIG 2008).

Finding variables that fulfil this requirement is somewhat challenging, since we do not have pre-electrification information for households connected to the grid. This is why we have to rely on variables that we assume to be non-responsive to the electricity connection. We use sex of the head of the household, availability of tapped water in the cluster, and whether the head of household attended at least secondary school as covariates. One might argue that these variables as well are influenced by electrification. However, the influence seems to be very subtle and only perceivable in the very long run. For example, the educational level of the household could be influenced by electrification, as investments into education might be affected by electrification in the longer run. However, on average the

head of household is 43 years old, and the school attendance decision has been taken around 30 years ago. It is plausible that very few rural areas in the sample had already been electrified 30 years ago, implying that the educational decision is most likely not influenced by electrification. A further violation of the CIA would arise if there were other unobserved covariates, like income or propensity for modernity, affecting adoption of electricity and beliefs over IPV. This, of course, cannot be ruled out completely.

We use a nearest neighbour matching algorithm[9] without replacement and restrict possible matching partners to households living in clusters where no household has electricity. Households in grid access areas that have deliberately decided not to connect are thereby excluded, as they, first, can be expected to be substantially different from connected households. Second, spillover effects from connected to non-connected households cannot bias the control group averages. The PSM approach increases the comparability of the treatment and control group substantially, although balance of covariates cannot be completely achieved. Balancing tests are provided in Annex 2. We test sensitivity of the results to bias as suggested by ROSENBAUM (2002) in Section 7.

As a robustness check and to quantify possible spillover effects from connected to non-connected households within a cluster, we also perform a cluster matching approach. For this purpose, we collapse the data at the cluster level. Treatment observations are all clusters with at least one household with an electricity connection. Through the matching approach, we identify comparable non-electrified clusters (no household within the cluster has electricity) as the control group.

[9] The decision for a matching algorithm involves a trade-off between bias and efficiency (see CALIENDO AND KOPEINIG 2008). The nearest neighbour algorithm reduces bias at the cost of higher variance compared to algorithms that use multiple neighbours. Restricting replacement has the opposite effect. Robustness tests show that applying algorithms with replacement and using multiple neighbours does not alter the results.

As at the individual level, we use a nearest neighbour matching algorithm without replacement and use the same covariates as above. While we define electrification as a binary status for the identification of matching partners, we use the share of households within a cluster that have electricity as the explanatory variable in the subsequent regression analysis.

4.3 Region panel

In a third approach to reduce the endogeneity problem, we estimate a region fixed-effects panel model. A region is defined as the lowest administrative entity that is representatively covered by DHS over two waves. Between three and 15 of these geographical areas exist per country. On average, each country is divided into nine regions and each region consist on average of 64 clusters. In total, 164 regions exist. From the individual household data, we calculate regional electrification rates and use these as the explanatory variable instead of the households' electrification status.

The model has the following structure:

$$y_{imt} = \beta E_{mt} + \gamma t + \delta E_{m0} \times t + \theta X_{it} + \alpha_m + \varepsilon_{imt} \qquad (2)$$

where y_{imt} is the acceptance of IPV of woman *i* residing in region *m* in period *t. E* denotes the share of households that have electricity at home within each region *m*. α_m describes region fixed effects. *t* denotes a dummy variable for the second period and *X* denotes sets of time-varying respondent, household, and cluster characteristics. The main difference in comparison to the earlier models is the inclusion of region fixed effects and the treatment definition as the share of connected households within the region rather than the individual households' connection status. We furthermore control for the region's electrification rate in the first panel wave by interacting it with the time dummy $\delta E_{m0} \times t$.

The region fixed-effects approach allows for controlling for time-invariant, unobservable characteristics of a region that might be correlated with the electrification status and attitudes toward IPV that otherwise would induce distortions. These might be for example cultural traits like attitudes with regards to technological innovations and gender roles. Obviously, the region panel is not able to control for time-variant, unobservable characteristics. In the present case, the risk that regions might be on different secular trends cannot be fully ruled out. The approach might be furthermore threatened, if people with high entrepreneurial spirit or aspirations moved to electrified areas. We argue that this happens only to a very low extent since the vast majority of people in rural areas are subsistence farmers and therefore depend on arable land. Even rural dwellers who work in non-agricultural jobs depend additionally on subsistence farming and hence are fairly immobile. Moreover, this kind of migration would normally occur within the geographical area defined here as one cohort and therefore does not bias the results.

As in the cluster matching approach, the region panel accounts for spillover effects from electrified to non-electrified households because the region averages consider all households. It compares regions with more progress in electrification to regions with less progress in electrification.

The approach is sensitive to criticism of two-way fixed effects estimations with staggered treatment implementation (De Chaisemartin & D'Haultfœuille, 2020; Goodman-Bacon, 2021) as it potentially relies on *forbidden comparisons*. In the present case, such *forbidden comparisons* arise if the treatment effect is identified by comparing regions with different electrification rates in the first panel wave: If some of the regions with low progress in electrification in the observed period start at non-zero baseline electrification rates, longer-term effects of electrification are likely to violate the parallel trends assumption. This

would lead to a downward bias in the measured effects. To circumvent this problem, firstly, we control for electrification rates in the first panel wave by interacting baseline electrification rates with the time dummy. Secondly, we separately estimate the model for different levels of baseline electrification. We split the sample by baseline electrification quartiles and re-estimate Equation (2) for each sample separately.

5. Prevalence and determinants of domestic violence

5.1 Cross-country differences

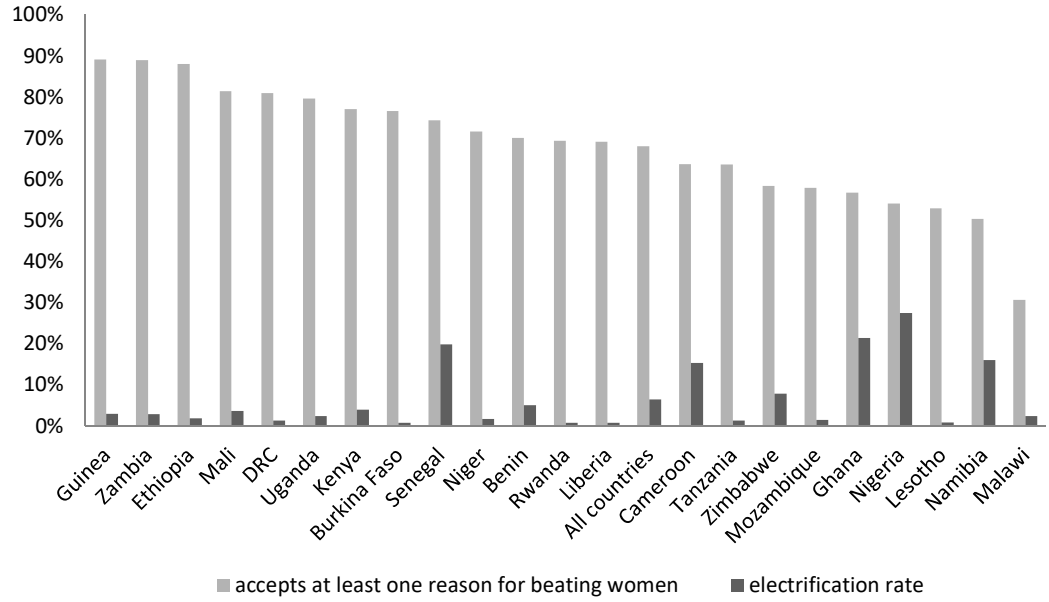
The degree of consent to IPV varies strongly between countries of Sub-Saharan Africa, from less than 30 percent in Malawi to almost 90 percent in Guinea. At country level, no clear correlation with national rural electrification rates exists (see Figure 3).[10] Rural electrification rates vary considerably between countries as well. While in countries like Liberia, Burkina Faso, Rwanda, or Lesotho only around one percent of the respondents lived in households connected to the electricity grid in the first panel wave, more than 15 percent of respondents in Cameroon, Namibia, Senegal, Ghana, and Nigeria did.

Comparing changes in electrification rates and acceptability of IPV between the first and the second survey wave two important observations can be made (see Figure 4): First, large differences between countries exist. Regarding progress on rural electrification, Ghana, Senegal, Benin, and Mali performed best with increases of around 10 percentage points. DRC performed worst with even a decrease in its already extraordinarily low electrification rate. Regarding the acceptability of IPV, some countries like Senegal, Mali, or Tanzania made only minimum progress, while acceptability of IPV went down by 51 percentage points in

[10] The correlation coefficient is -0.3142 but statistically not significant.

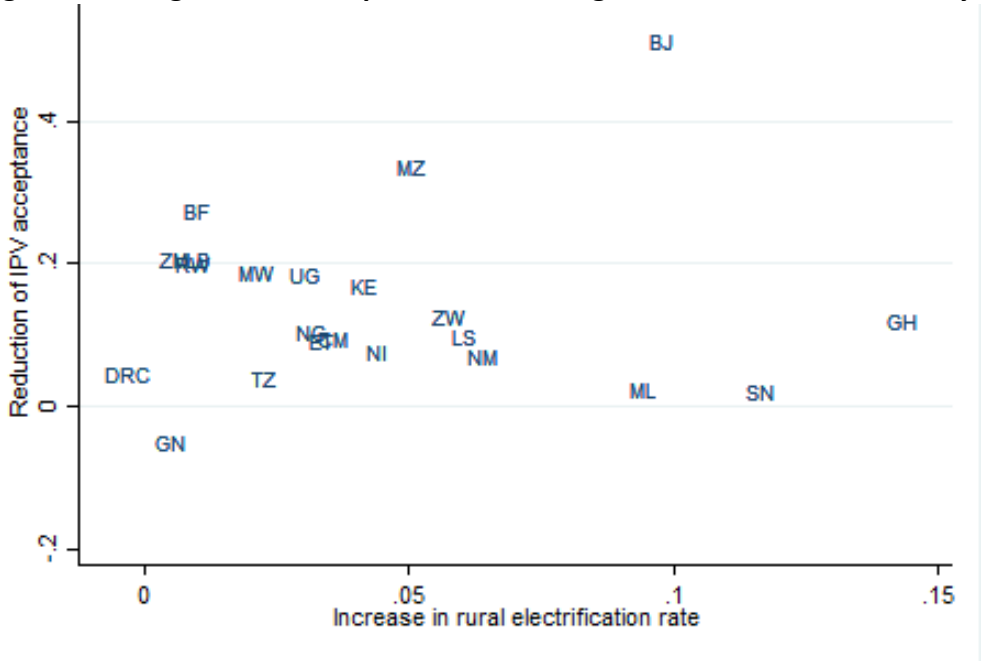
Benin. Second, at the country level, no clear correlation between changes in electrification and IPV acceptance can be observed.

Figure 3: Acceptance of IPV and electrification rates, by country



Source: DHS country data sets, only rural households, first panel wave

Figure 4: Changes in IPV acceptance over changes in electrification rates by country



Source: DHS all country data, only rural households.

5.2 Characteristics of women who accept IPV

Comparing characteristics of women who accept IPV with those who do not (see Table 2, column 2) the following patterns stand out: Women who accept IPV live farer away from urban areas and have less modern infrastructure in their clusters. They generally live in poorer households. These households possess less high-value assets (i.e. a car) and have poorer infrastructure (no piped water). Higher education decreases the likelihood of accepting IPV. Respondents who accept IPV attended secondary school less often than women who do not accept IPV. The difference for primary school attendance is less pronounced. Moreover, women who accept IPV have less educated partners.

Accepting IPV is more common among younger women, and among women in more traditional partnerships who married earlier and have a higher age difference with her partner. Women living in larger households are more likely to accept IPV. Also the respondents' number of children increases the likelihood of accepting violence. Muslim women are more likely to accept IPV as well as women living in a polygamous relationship, which is most frequent in Muslim relationships. Among a smaller sample of women for whom we have more details concerning domestic violence, we see that women who witnessed her father beating her mother in childhood are more likely to accept violence.

Women who live in households with electricity are generally better off than women in non-connected households (Table 2, Column 3). For example, they own more assets and have better education. They seem to be more modern, as indicated by the older age at first cohabitation or the lower age difference between partners.

Table 2: Descriptives on sample (only first wave)

	(1) all respondents, all countries			(2) Respondents who accept IPV difference* (p-value)	(3) Respondents with electricity difference** (p-value)
	N	mean	sd		
Cluster characteristics					
Cluster has electricity	122,112	0.25	0.43	-0.029 (0.000)	0.711 (0.000)
Share of HH in cluster with water tap	122,112	0.13	0.26	-0.021 (0.000)	0.174 (0.000)
Share of HH in cluster went to hospital last 12 month	118,281	0.37	0.22	-0.002 (0.000)	0.056 (0.000)
Share of HH visited by family planning worker last 12 month	115,090	0.063	0.09	0 (0.598)	0.011 (0.000)
HH characteristics					
Respondents per HH	122,112	1.4	0.83	0.047 (0.000)	0.030 (0.003)
HH has electricity	122,112	0.075	0.26	-0.027 (0.000)	1
HH uses tap water	122,067	0.13	0.33	- 0.027 (0.000)	0.208(0.000)
Age head of HH	121,949	42.4	13.66	-0.092 (0.286)	0.198 (0.302)
Head of HH is female	122,112	0.19	0.39	-0.014 (0.000)	0.037 (0.000)
Number of HH members	122,112	6.76	4.31	0.248 (0.000)	0.433 (0.000)
HH owns bike	121,875	0.35	0.48	0.011 (0.001)	-0.040 (0.000)
HH owns motorcycle	121,809	0.099	0.3	-0.002 (0.255)	0.098 (0.000)
HH owns car	121,734	0.02	0.14	-0.012 (0.000)	0.099 (0.000)
Respondent characteristics					
Respondent is muslim	120,743	0.39	0.49	0.0301 (0.000)	-0.084 (0.000)
Age of respondent	122,112	31	8.95	-0.675 (0.000)	0.572 (0.000)
Respondent attended secondary school	122,109	0.1	0.3	-0.047 (0.000)	0.220 (0.000)
Respondent attended primary school	122,109	0.43	0.5	-0.030 (0.000)	0.251 (0.000)
Respondent is married	122,112	0.79	0.41	0.013 (0.000)	-0.030 (0.000)
Number of children	122,112	4.12	2.88	0.010 (0.585)	-0.422 (0.000)
Age at first cohabitation	122,112	17.2	3.74	-0.355 (0.000)	1.309 (0.000)
Exposed to violence in childhood	30,106	0.21	0.41	0.041 (0.000)	0.016 (0.020)
Characteristics current partnership					
Age difference between partners	107,998	9.52	7.75	0.323 (0.000)	-0.561 (0.000)
Partner attended secondary school	119,125	0.18	0.39	-0.043 (0.000)	0.246 (0.000)
Relationship is polygamous	105,508	0.32	0.47	0.032 (0.000)	-0.051 (0.000)
Partner drinks alcohol	35,407	0.27	0.44	0.003 (0.523)	0.048 (0.000)

*Source: DHS all country data set, only rural households, first wave. * difference in means between women who accept IPV and those who do not. Country dummies included. **difference in means between women in HHs with and without electricity connection. Country dummies included.*

6. Electricity, information access, and female labour participation

According to the theory of change, a change in attitudes toward IPV after electrification can either be induced through better information access or via higher female labour participation. In the following, we analyse in the DHS data set whether women in connected households indeed show differing patterns regarding these characteristics.

Table 3: Media access of connected and non-connected households (p-values in parentheses)

Indicator	N full sample	(1) Mean non-connec. HH	(2) Difference connect. vs. non-connect. HH*
Has TV at home	232,891	0.06	0.149 (0.000)
watches TV	232,692	0.18	0.202 (0.000)
watches TV at least weekly	232,692	0.07	0.137 (0.000)
watches TV at least daily	232,692	0.01	0.049 (0.000)
Has radio at home	233,022	0.56	0.128 (0.000)
Listens to radio	232,822	0.56	0.120 (0.000)
Listens to radio at least weekly	232,822	0.37	0.124 (0.000)
Listens to radio at least daily	232,822	0.13	0.044 (0.000)
Has mobile phone at home	161,902	0.37	0.200 (0.000)

Source: DHS all country data set. *Notes:* *difference between households with and without electricity estimated by means of a probit estimation, controlling for cluster, household, and respondent characteristics discussed in Section 4.1.

As displayed in Table 3, column 1, also non-electrified household watch TV, listen to the radio, and have mobile phones. They either operate these appliances on dry-cell batteries (radios) or have a generator or solar panel to power a TV set. Households without electricity source at home visit neighbours, bars, or shops to watch TV or listen to the radio. They charge their mobile phone at neighbours', schools, health stations or in shops where phones can be charged for a fee. Yet, connected households have significantly better access to these information and entertainment sources (see Table 3, column 2). They are more likely to have a TV set, a radio, and a mobile phone at home. They also watch TV more frequently. The substantial share of non-connected households watching TV and using

mobile phones points to the importance of possible spillover effects from connected to non-connected households. These spillovers will downward bias the LPM estimates. For the matching and region panel approaches, they are less important.

Regarding female labour participation, it can be observed that virtually all women pursue some kind of work apart from housework (see Table 4). These activities comprise working on the family's fields, selling things, helping in the family business, and salaried work. Of course, not all of these activities can be expected to influence attitudes toward IPV. According to the theory of change, the strongest effect can be expected from non-agricultural jobs outside the household. Earning money with the job can furthermore be expected to influence attitudes toward IPV.

A quarter of all women in non-connected households work in non-agricultural jobs, which are above all sales jobs (63 percent – not displayed in the table). Around 18 percent are skilled manual workers, six percent work as unskilled manual workers. The service sector employs further eight percent, and three percent work in professional, technical or managerial occupations. Around one third of all women exercise the work at home, almost half of the jobs are self-employment and 70 percent earn money with their work.

Table 4: Female labour participation in connected and non-connected households (p-values in parentheses)

Indicator	**N** full sample	**(1)** Mean non-connec. HH	**(2)** Difference connect. vs. non-connect. HH*
Woman works	228,725	0.99	0.011 (0.003)
Woman works in non-agricultural job	228,725	0.24	0.089 (0.000)
Works at home	149,233	0.31	0.028 (0.000)
Works self-employed	161,951	0.69	0.010 (0.000)
Earns money	232,455	0.46	0.053 (0.000)

Source: DHS all country data set. *Notes: *difference between households with and without electricity estimated by means of a probit model, controlling for cluster, household, and respondent characteristics discussed in Section 4.1.*

Women in grid connected households work significantly more often in non-agricultural jobs (see Table 4, column 2). Compared to women in non-connected households, these non-agricultural jobs are more frequently in the service sector and professional activities. They are less often sales activities. Moreover, they are more likely to have a paid job.

7. Electricity and intimate partner violence

Table 5 displays the results from four different regression models. Column 1 and 2 show results from a simple Linear Probability Model with and without controlling for the cluster, household, respondent, and partnership characteristics discussed in Section 4.1.[11] In these models, a clearly negative and significant correlation between the households' electrification status and the acceptance of IPV can be observed.

Table 5: Effect of electricity access on attitudes toward IPV (LMP and matching approach)

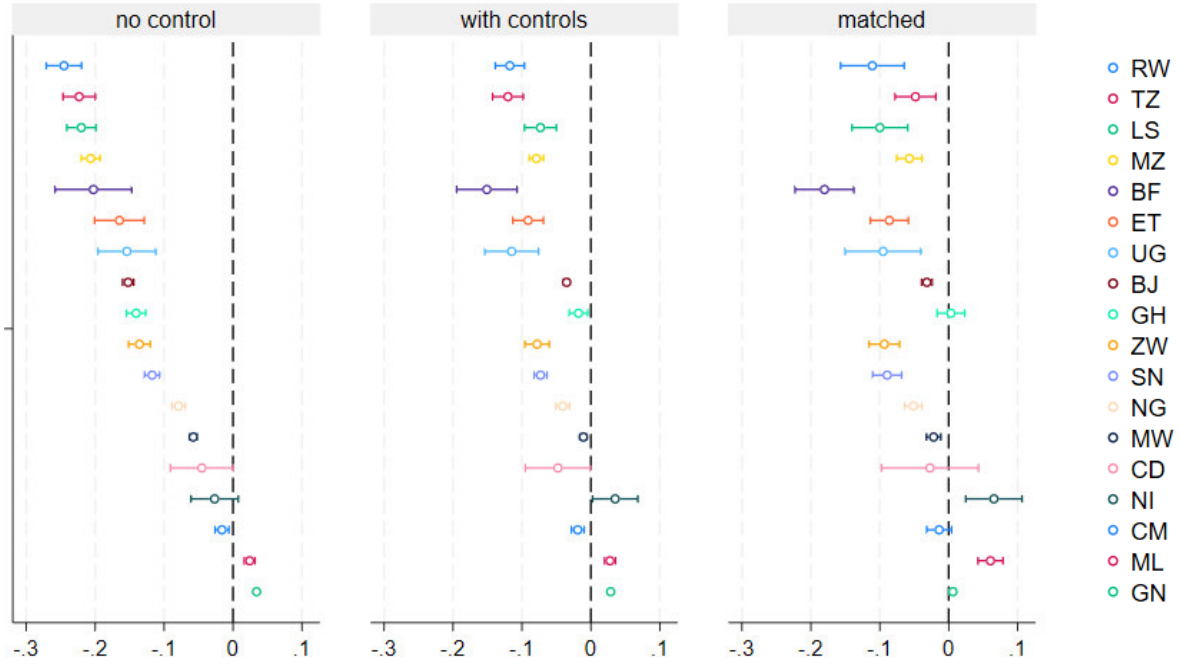
	(1) all observations	(2) all observations	(3) Individual matching	(4) Cluster matching
HH has electricity	-0.092 (0.000)***	-0.045 (0.000)***	-0.044 (0.000)***	
Share of households with electricity in cluster				-0.026 (0.000)***
Cluster characteristics	No	Yes	Yes	Yes
HH characteristics	No	Yes	Yes	Yes
Respondent characteristics	No	Yes	Yes	Yes
Partnership characteristics	No	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes
Region dummies	No	Yes	Yes	Yes
Year of data collection	No	Yes	Yes	Yes
Mean value acceptance IPV of non-electrified	0.59	0.59	0.55	0.52
Adj. R-Squared	0.16	0.19	0.13	0.54
Number of observations	240,989	233,091	45,184	6,138

Source: DHS all country data set. Notes: P-values in parentheses. Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household and cluster level. Detailed results can be found in Annex 1.

[11] It is not possible to control for ethnicity, since only a small subset of country data sets provides this information. However, the general tendency of the results can be confirmed among the subset of countries and controlling for ethnicity.

Including control variables reduces the size of the coefficient to five percentage points. This corresponds to a reduction in accepting IPV of eight percent and is around half of the overall reduction in IPV acceptance between the first and the second panel wave. Column 3 displays results of the matching approach where we match households with electricity individually to households without electricity, column 4 displays results from the cluster matching, where we collapse the data at the cluster level and match clusters instead of individuals. The cluster matching reduces the coefficient to 3 percentage points, the individual matching only marginally. All coefficients stay significant at the 1 percent level.

Figure 5: Effect of electricity access on attitudes toward IPV by country



Source: DHS all country data set. Notes: Figure displays the estimated treatment coefficients for an increase in electrification on IPV acceptance. 90% confidence interval. Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household and cluster level. The three panels display results of a regression without control variables ("no control"), with control variables ("with control") and with the matched sample only ("matched"). RW=Rwanda, TZ=Tanzania, LS=Lesotho, MZ=Mozambique, BF=Burkina Faso, ET=Ethiopia, UG=Uganda, BJ=Benin, GH=Ghana, ZW=Zimbamwe, SN=Senegal, NG=Nigeria, MW=Malawi, CD=DRC, NI=Niger, CM=Cameroon, ML=Mali, GN=Guinea. Detailed results can be found be found in Annex 4.

These results have to be interpreted with some care, though, since it cannot be fully ruled out that results still suffer from endogeneity. Applying a sensitivity analysis following ROSENBAUM (2002) shows that the results of the matching approach are rather sensitive to bias: A hidden bias of the magnitude of 1.3 would explain away the observed effect. This means that results are robust as long as two households with the same observed covariates differ in their odds of being connected to electricity by at most 1.3.

In order to shed light on potential heterogenous effects across countries, I run the analysis for each country individually. Figure 5 illustrates large differences across countries. While clear negative correlations prevail for most countries, in Mali and Guinea an increase in electrification is even associated with an increase in IPV acceptance. The size of the coefficients also varies substantially.

Table 6: Effect of electricity access on attitudes toward IPV (Region panel)

	(1) Region panel	(2) lowest electr. quartile	(3) Second lowest electr. quartile	(4) Second highest electr. quartile	(5) Highest electr. quartile
Share of households with electricity in region	0.039 (0.833)	0.525 (0.323)	0.136 (0.911)	-0.133 (0.636)	-0.018 (0.949)
Cluster characteristics	Yes	Yes	Yes	Yes	Yes
HH characteristics	Yes	Yes	Yes	Yes	Yes
Respondent characteristics	Yes	Yes	Yes	Yes	Yes
Partnership characteristics	Yes	Yes	Yes	Yes	Yes
Year of data collection	Yes	Yes	Yes	Yes	Yes
Regional electrification rate in first wave	Yes	No	No	No	No
Mean value acceptance IPV in first panel wave	0.66	0.72	0.62	0.73	0.58
Mean electrification rate in first panel wave	0.09	0.00	0.02	0.05	0.25
Adj. R-Squared	0.04	0.04	0.04	0.06	0.02
Number of observations	233,091	60,092	63,774	52,151	57,074

Source: DHS all country data set. Notes: P-values in parentheses. Standard errors are clustered at the region level. Detailed results can be found in the Suplemental Materials.

Table 6 displays the results of the region panel approach. Here, the coefficient turns positive and insignificant when looking at the whole sample (column (1)). To make sure that only regions with similar baseline electrification rates are used for identifying the impact of interest, we split the sample by first-wave electrification quartiles (Columns (2)-(5)). The coefficient stays insignificant for each of the four groups, but it turns negative for the two higher baseline electrification quartiles.

8. Conclusion

This paper analysed the relationship between rural electrification and domestic violence in 22 Sub-Saharan countries. It focussed on attitudes toward IPV among women between 15 and 49 years elicited by the Demographic and Health Surveys between 1999 and 2014.

Women in households with electricity report significantly lower acceptance of IPV. This seems to confirm the often-articulated hope that access to electricity might transform gender roles as also prominently shown by JENSEN AND OSTER (2009). However, the results also show that this relationship is substantially driven by unobservables. Matching and region panel approaches are able to control for parts of this endogeneity and cast doubts on whether the relationship can be interpreted causally. The matching results show a small negative correlation but are rather sensitive to bias. Following ROSENBAUM (2002), a sensitivity analysis shows that a hidden bias of the magnitude of 1.3 would explain away the observed effect. This means that results are only robust as long as two households with the same observed covariates differ in their odds of being connected to electricity by at most 1.3. Since this is not unlikely, results have to be seen as sensitive to bias. In the region panel approach, the overall effect turns insignificant and partly even positive.

We furthermore document substantial heterogeneities between countries. The coefficient size and even the direction of the effect differ across countries. For most

countries, a negative correlation exists, but in some countries such as Mali or Guinea, increases in electrification are associated with increased acceptance of IPV. Also controlling for observable covariates and matching has different effects in different countries. These finding resonates with the JENSEN AND OSTER (2009) replication study by IVERSEN AND PALMER-JONES (2013) that shows that introduction of cable TV in fact only impacts certain subgroups (better educated women) and has no universal effect. Understanding such impact heterogeneities is crucial.

While this study is able to document the relationship for a large number of countries, it lacks the level of detail for individual countries to provide more depths on understanding heterogeneities. We do not have detailed information on what exactly happened in the different regions, for example with regard to media roll-out and number and type of TV channels available. This would help to better explain why electricity is associated with lower IPV acceptance and in others not.

The paper illustrates the trade-off between external and internal validity of study designs to empirically assess impacts of infrastructure investments. The large number of countries covered in this paper maximizes the external validity of the findings, but comes at the cost of very aggregate data, a lack of local context and, hence, variation that hampers the generation of conclusive results. More detailed and well-identified case-studies from one specific setting in one country could solve internal validity issues but make it harder to infer relevant knowledge for a larger population. Possibly, big data and machine learning might be a way out of this dilemma and might enable us merge different data sources and add local context to large, cross-country data sets.

Still, considering discussions on the importance of reporting null-effects in empirical economics (see ABADIE 2020), also the absence of impacts for a large share of the population

is highly informative given the widespread prior that electricity contributes to empowerment of women.

Another limitation is the papers' focus on on-grid electrification. Today, a large share of the progress in electricity access is reached through off-grid sources like solar home systems and mini-grids. The latter are often considered superior when pushing low-carbon energy transitions. The on-grid electricity mix in most countries has substantial fossil fuel generation, in contrast to green solar panels and often at least hybrid mini-grids driven by solar or water with diesel-backups.

While impacts that accrue due to higher exposure to information sources can be expected to be similar for on-grid and off-grid electrification, the impact pathway through female labor participation is probably much weaker for off-grid sources. Increased labour demand through enterprise creation and productivity gains in existing enterprises in off-grid electrification projects is unlikely. Accordingly, the impacts observed in this analysis are likely rather the upper bound when considering today's electrification efforts.

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Annex

Annex 1: Details on results in Section 7

Table A1_ 1_ Details on Table 5

		All observations	All observations	Individual Matching	Cluster Matching
	HH has electricity connection	-0.092	-0.045	-0.044	-0.026
		(0.000)***	(0.000)***	(0.000)***	(0.000)***
	Follow-up		0.142	0.151	0.126
			(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		-0.016	-0.033	-0.027
			(0.000)***	(0.000)***	(0.000)***
	Share of HH in cluster went to hospital last 12 month		-0.032	0.055	0.049
			(0.000)***	(0.000)***	(0.000)***
	Share of HH visited by family planning worker last 12 mth		0.007	0.006	0.006
			(0.409)	(0.718)	(0.000)***
Household Characteristics	Household uses water from tap		-0.008	-0.009	-0.004
			(0.000)***	(0.273)	(0.000)***
	Age head of HH		-0.000	-0.000	0.002
			(0.493)	(0.002)***	(0.000)***
	Head of HH is female		-0.008	-0.034	-0.019
			(0.000)***	(0.000)***	(0.000)***
	Number of HH members		0.003	0.002	0.010
			(0.000)***	(0.000)***	(0.000)***
	HH has bike		0.005	0.004	-0.005
			(0.000)***	(0.087)*	(0.000)***
	HH has motorcycle		0.007	0.012	0.016
			(0.000)***	(0.000)***	(0.000)***
	HH has car		-0.035	-0.029	-0.171
			(0.000)***	(0.000)***	(0.000)***
Respondent Characteristics	Respodent is muslim		0.009	0.002	-0.022
			(0.000)***	(0.624)	(0.000)***
	Age of respondent		-0.002	-0.004	-0.011
			(0.000)***	(0.000)***	(0.000)***
	Respondent attended secondary school		-0.062	-0.065	-0.086
			(0.000)***	(0.000)***	(0.000)***
	Respondent attended primary school		-0.003	-0.004	-0.016
			(0.000)***	(0.000)***	(0.000)***
	Respondent is married		-0.005	-0.041	-0.027
			(0.000)***	(0.000)***	(0.000)***
	Respondent's number of children		0.004	0.003	0.006
			(0.000)***	(0.000)***	(0.000)***
	Age at first cohabitation		-0.002	-0.002	-0.002
			(0.000)***	(0.000)***	(0.000)***
	Partner attended secondary school		-0.020	-0.021	-0.038
			(0.000)***	(0.000)***	(0.000)***
	Year of data collection		-0.043	-0.041	-0.039
			(0.000)***	(0.000)***	(0.000)***
	Country dummies	Yes	Yes	Yes	Yes
	_cons	0.304	84.600	67.254	73.622
		(0.000)***	(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.59	0.59	0.55	0.52
	Adj. R-Squared	0.16	0.19	0.13	0.54
	Number of observations	240,898	233,091	45,184	6,138

Source: DHS all country data set. Notes: Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Table A1_ 2: Details on Table 6

		Region Panel	Q1 – elec. quartile	Q2 – elec. quartile	Q3 – elec. quartile	Q4 – elec. quartile
	Regional electrification rate	0.040	0.410	-1.530	-0.066	0.183
		(0.829)	(0.522)	(0.010)**	(0.805)	(0.371)
Cluster Characteristics	Follow-up	0.175	0.265	-0.093	0.254	-0.073
		(0.022)**	(0.007)***	(0.467)	(0.153)	(0.618)
	Electrification rate at baseline	0.014	2.642	-8.658	-1.193	-0.030
		(0.903)	(0.731)	(0.058)*	(0.166)	(0.806)
	Share of HH in cluster with water tap	-0.026	-0.005	-0.027	-0.019	-0.045
		(0.014)**	(0.828)	(0.111)	(0.383)	(0.044)**
	Share of HH in cluster went to hospital last 12 month	-0.010	0.004	-0.125	0.020	0.104
		(0.681)	(0.914)	(0.004)***	(0.713)	(0.067)*
	Share of HH visited by family planning worker last 12 mth	-0.020	0.069	-0.105	-0.019	-0.054
		(0.615)	(0.260)	(0.308)	(0.619)	(0.609)
Household Characteristics	Age head of HH	0.000	0.000	0.000	-0.000	-0.000
		(0.737)	(0.170)	(0.291)	(0.190)	(0.535)
	Head of HH is female	-0.010	0.006	-0.012	-0.013	-0.023
		(0.013)**	(0.450)	(0.039)**	(0.203)	(0.011)**
	Number of HH members	0.002	0.003	0.002	0.004	0.001
		(0.000)***	(0.001)***	(0.063)*	(0.000)***	(0.170)
	HH has bike	0.004	-0.000	-0.004	0.012	0.010
		(0.345)	(0.978)	(0.549)	(0.140)	(0.412)
	HH has motorcycle	-0.003	0.000	0.012	-0.011	-0.008
		(0.629)	(0.971)	(0.453)	(0.310)	(0.315)
	HH has car	-0.048	-0.038	-0.056	-0.022	-0.056
		(0.000)***	(0.226)	(0.016)**	(0.221)	(0.003)***
	Household uses water from tap	-0.007	-0.020	0.007	-0.008	-0.009
		(0.237)	(0.054)*	(0.569)	(0.482)	(0.499)
Respondent Characteristics	Respondent is muslim	0.009	0.018	-0.003	0.023	-0.008
		(0.323)	(0.220)	(0.835)	(0.156)	(0.731)
	Age of respondent	-0.003	-0.002	-0.002	-0.002	-0.004
		(0.000)***	(0.001)***	(0.000)***	(0.001)***	(0.000)***
	Respondent attended secondary school	-0.003	-0.059	-0.066	-0.077	-0.061
		(0.000)***	(0.003)***	(0.000)***	(0.000)***	(0.000)***
	Respondent attended primary school	-0.067	-0.007	-0.004	0.004	-0.026
		(0.240)	(0.371)	(0.407)	(0.842)	(0.029)**
	Respondent is married	-0.006	0.002	-0.003	-0.001	-0.021
		(0.288)	(0.857)	(0.746)	(0.930)	(0.093)*
	Respondent's number of children	-0.008	0.003	0.002	0.002	0.008
		(0.000)***	(0.092)*	(0.332)	(0.290)	(0.000)***
	Age at first cohabitation	-0.001	-0.001	-0.001	-0.001	-0.002
		(0.002)***	(0.319)	(0.182)	(0.054)*	(0.011)**
	Partner attended secondary school	-0.001	-0.016	-0.027	-0.024	-0.032
		(0.000)***	(0.066)*	(0.000)***	(0.001)***	(0.001)***
	Year of data collection	-0.047	-0.063	-0.027	-0.066	-0.008
		(0.000)***	(0.000)***	(0.057)*	(0.008)***	(0.716)
	_cons	95.880	126.904	54.257	133.233	16.257
		(0.000)***	(0.000)***	(0.053)*	(0.007)***	(0.704)
	Adj. R-Squared	0.03	0.04	0.05	0.04	0.02
	Number of observations	211,707	52,751	54,287	53,508	51,161

Source: DHS all country data set. Notes: Table displays effect of electricity access on attitudes toward IPV (Region panel). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the region level.

Annex 2: Details on Propensity Score Matching Approach

Household matching

Since the decision to connect to the electricity grid is a household decision, we use households rather than women as the matching unit. In the first step we estimate a probit model and regress the connection status of a household on a number of covariates for all countries separately. Results are displayed in the first column of Figure A1_1 below. In a second step, we use the coefficients from this regression to predict the probability to connect among all households that live in clusters without electricity access. A cluster is considered to have no electricity access if none of the households surveyed within the cluster has a grid connection. we thereby exclude as matching partners households in electricity access areas that have deliberately decided not to connect since they might be affected by the treatment through spillovers and can be assumed to be substantially different from connected households. The estimated probabilities, also known as the propensity scores, are then used to identify matching partners using a nearest neighbor algorithm without replacement.

Figure A2_1: Probit estimations before and after matching (p-values in parentheses)

	Before matching	After matching
water_piped_vill	0.101	0.129
	(0.000)***	(0.000)***
hoh_higher_edu	0.092	0.081
	(0.000)***	(0.000)***
head_hh_female	0.019	0.046
	(0.000)***	(0.000)***
Pseudo R-Squared	0.25	0.01
Wald test	24,198.81	582.54
p value	0.00	0.00
Number of observations	268,979	50,487

Note: Country dummies included. *, ** and *** indicate significance levels of 10%, 5% and 1%, respectively.

The distribution of the propensity scores among connected households and non-connected household in non-electrified areas is displayed in Figure A1_2. Since for some connected households no suitable matching partners can be found, 724 households out of the total of 25,928 connected households are not used in the matching approach (no common support).

In order to assess whether the comparability of the groups has improved through the matching approach we look at differences in means of the covariates between the connected households and the control households. As can be seen in Figure A1_3, the difference between the groups to be compared becomes substantially smaller if we only use the matched sample. However, differences stay statistically significant. As a second way to test the quality of the matching process, we look at the pseudo-R^2 of the probit model, regressing the connection status on covariates used for the matching. First, we use all non-connected HH as counterfactual (see Figure A1_1, column 1) and then we use only the matched non-connected ones (Figure A1_1, column 2). The pseudo-R^2 is expected to fall if a balance improvement is achieved. This is what we see in our data: the pseudo-R^2 falls from 0.25 to 0.01. However, the respective Wald test shows a joint significant influence of the covariates in the non-matched and matched case. Accordingly, the matching approach is able to increase the comparability substantially. Differences between the two groups still exist, though.

Figure A2_2: Distribution of propensity scores among connected households (1. Yes) and non-connected households in non-electrified areas (0. No)

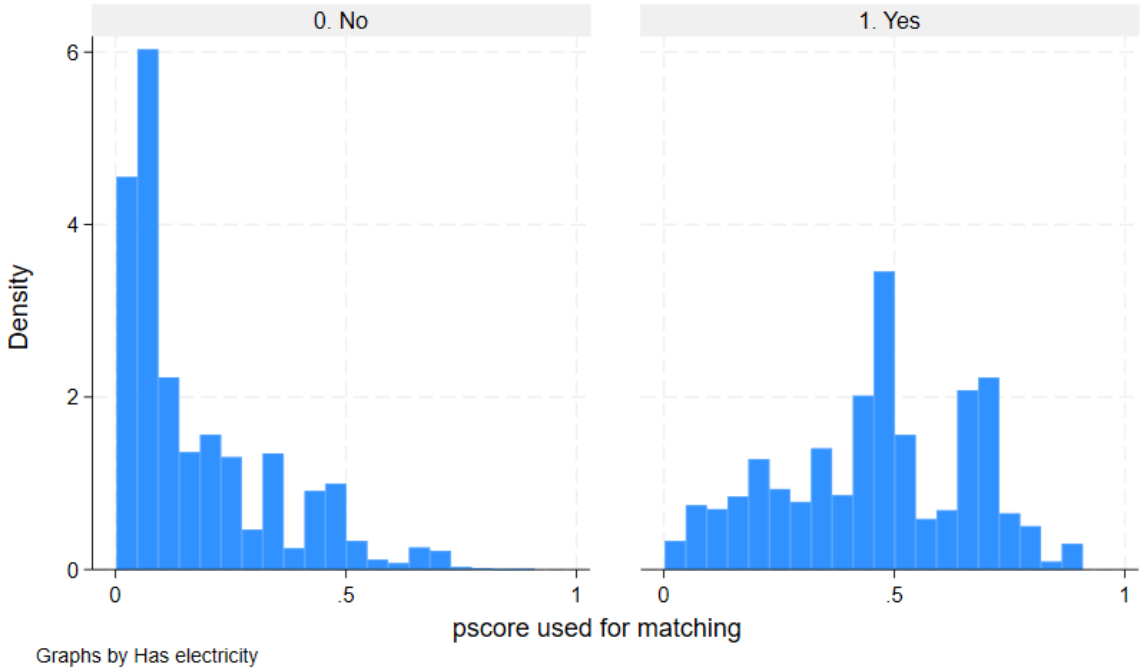


Figure A2_3: Balancing of covariates between treatment and control group

Difference in means of covariates	Before matching	After matching
water_piped_vill	0.22***	0.08***
hoh_higher_edu	0.23***	0.08***
head_hh_female	0.04***	0.03**

Note: difference in means between connected and non-connected households. Country dummies included. *, ** and *** indicate significance levels of 10%, 5% and 1%, respectively.

Cluster matching

For the cluster matching approach, we collapse the data on the cluster level. Treatment observations are all clusters with at least one household with an electricity connection. Through the matching approach, we identify comparable non-electrified clusters (no household within the cluster has electricity) as the control group. As on the individual level, we use a nearest neighbour matching algorithm without replacement and use the same covariates as above. The balancing test look as follows:

Figure A2_4: Cluster matching: balancing of between treatment and control group

Difference in means of covariates	Before matching	After matching
water_piped_vill	0.15***	0.08***
hoh_higher_edu	0.12***	0.07***
head_hh_female	0.03***	0.03***

Note: difference in means between connected and non-connected households. Country dummies included. *, ** and *** indicate significance levels of 10%, 5% and 1%, respectively.

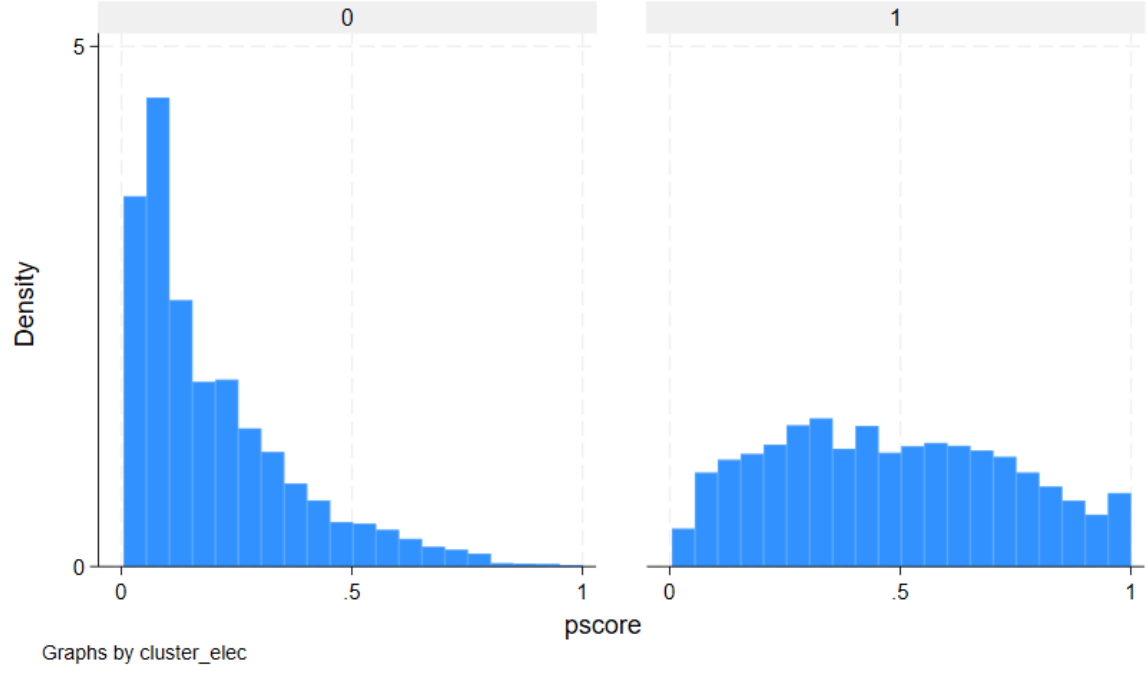
Differences in means of the covariates between the connected clusters and the control clusters become substantially smaller if we only use the matched sample. Again, differences stay statistically significant. The pseudo-R^2 of the probit model, regressing the connection status on covariates used for the matching, falls from 0.21 to 0.07. and indicates a balance improvement. The respective Wald test shows a joint significant influence of the covariates in the non-matched and matched case. Accordingly, also in the cluster matching approach comparability is substantially improved, but differences between the two groups still exist.

Figure A2_5: Probit estimations before and after cluster matching (p-values in parentheses)

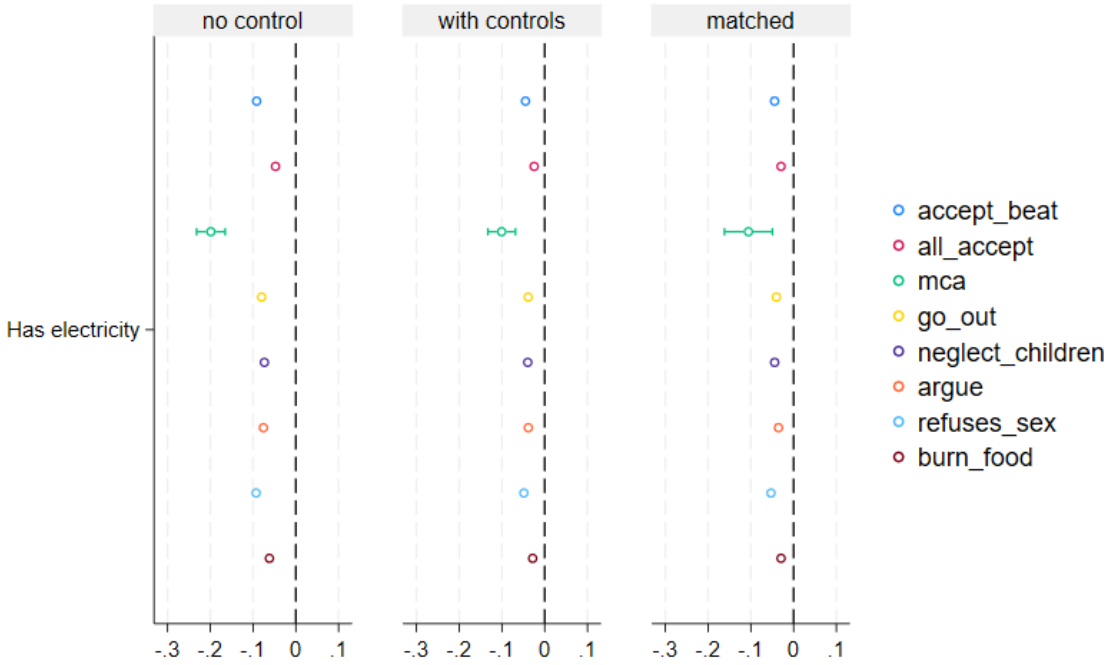
	Before matching	After matching
water_piped_vill	0.257	0.218
	(0.000)***	(0.000)***
hoh_higher_edu	0.560	0.547
	(0.000)***	(0.000)***
head_hh_female	0.142	0.271
	(0.000)***	(0.000)***
Pseudo R-Squared	0.21	0.07
Wald test	1,950.81	499.52
p value	0.00	0.00
Number of observations	12,801	7,041

Note: Country dummies included. *, ** and *** indicate significance levels of 10%, 5% and 1%, respectively.

Figure A2_6: Distribution of propensity scores among connected clusters (1. Yes) and non-connected clusters (0. No)



Annex 3: Robustness of index construction



Source: DHS all country data set. *Notes*: Figure displays the estimated treatment coefficients for an increase in electrification on IPV acceptance. 90% confidence interval. Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household and cluster level. The three panels display results of a regression without control variables ("no control"), with control variables ("with control") and with the matched sample only ("matched").ACCEPT_BEAT = accepts beating in at least one situation; ALL_ACCEPT = accepts beating in all situations; MCA=Indicator constructed through Multiple Correspondences Analysis

Annex 4: Individual country regressions

Guinea

		All observations	All observations	Individual Matching
	HH has electricity connection	0.034	0.029	0.006
		(0.000)***	(0.000)***	(0.004)***
Cluster Characteristics	Share of HH in cluster with water tap		-0.016	0.025
			(0.000)***	(0.000)***
	Share of HH in cluster went to hospital last 12 month		-0.032	-0.123
			(0.000)***	(0.284)
	Share of HH visited by family planning worker last 12 mth		0.007	-0.321
			(0.000)***	(0.000)***
Household Characteristics	Household uses water from tap		-0.008	0.016
			(0.000)***	(0.000)***
	Age head of HH		-0.000	-0.000
			(0.000)***	(0.834)
	Head of HH is female		-0.003	0.016
			(0.079)*	(0.000)***
	Number of HH members		0.000	-0.003
			(0.763)	(0.000)***
	HH has bike		0.020	0.016
			(0.000)***	(0.000)***
	HH has motorcycle		0.001	0.051
			(0.506)	(0.000)***
	HH has car		-0.007	-0.069
			(0.000)***	(0.000)***
Respondent Characteristics	Respodent is muslim		0.071	0.033
			(0.000)***	(0.002)***
	Age of respondent		-0.001	-0.004
			(0.000)***	(0.000)***
	Respondent attended secondary school		-0.062	0.010
			(0.001)***	(0.005)***
	Respondent attended primary school		-0.003	-0.012
			(0.000)***	(0.002)***
	Respondent is married		0.040	-0.096
			(0.000)***	(0.000)***
	Respondent's number of children		0.004	0.005
			(0.000)***	(0.000)***
	Age at first cohabitation		0.001	0.002
			(0.000)***	(0.000)***
	Partner attended secondary school		-0.020	-0.003
			(0.065)*	(0.000)***
	Year of data collection		0.008	0.005
			(0.000)***	(0.000)***
	_cons	0.304	-16.173	-9.160
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.92	0.92	0.92
	Adj. R-Squared	0.00	0.06	0.07
	Number of observations	9,441	9,441	559

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Mali

		All observations	All observations	Individual Matching
	HH has electricity connection	0.024	0.028	0.076
		(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		0.047	0.038
			(0.000)***	(0.226)
	Share of HH in cluster went to hospital last 12 month		-0.046	-0.096
			(0.000)***	(0.020)**
	Share of HH visited by family planning worker last 12 mth		-0.054	0.122
			(0.008)***	(0.003)***
Household Characteristics	Household uses water from tap		-0.011	-0.005
			(0.035)**	(0.784)
	Age head of HH		-0.001	-0.001
			(0.000)***	(0.012)**
	Head of HH is female		-0.034	-0.017
			(0.000)***	(0.516)
	Number of HH members		0.003	0.005
			(0.000)***	(0.004)***
	HH has bike		0.010	0.042
			(0.001)***	(0.007)***
	HH has motorcycle		0.006	0.061
			(0.007)***	(0.000)***
	HH has car		0.025	0.051
			(0.000)***	(0.000)***
Respondent Characteristics	Respodent is muslim		0.056	0.048
			(0.000)***	(0.027)**
	Age of respondent		-0.000	-0.002
			(0.047)**	(0.015)**
	Respondent attended secondary school		-0.021	-0.082
			(0.002)***	(0.001)***
	Respondent attended primary school		0.015	-0.021
			(0.000)***	(0.243)
	Respondent is married		0.054	-0.058
			(0.000)***	(0.002)***
	Respondent's number of children		0.001	0.002
			(0.004)***	(0.461)
	Age at first cohabitation		-0.003	-0.003
			(0.000)***	(0.016)**
	Partner attended secondary school		-0.011	-0.026
			(0.028)**	(0.020)**
	Year of data collection		-0.004	-0.005
			(0.000)***	(0.012)**
	_cons	0.804	8.028	11.459
		(0.000)***	(0.000)***	(0.007)***
	Mean outcome among non-electrified HH	0.80	0.80	0.80
	Adj. R-Squared	0.00	0.01	0.04
	Number of observations	12,967	12,967	1,981

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Cameroon

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.016	-0.019	-0.017
		(0.002)***	(0.000)***	(0.066)*
Cluster Characteristics	Share of HH in cluster with water tap		0.089	0.048
			(0.000)***	(0.007)***
	Share of HH in cluster went to hospital last 12 month		0.208	0.201
			(0.000)***	(0.000)***
	Share of HH visited by family planning worker last 12 mth		-0.087	0.244
			(0.028)**	(0.000)***
Household Characteristics	Household uses water from tap		-0.097	-0.086
			(0.000)***	(0.000)***
	Age head of HH		0.000	0.001
			(0.003)***	(0.000)***
	Head of HH is female		-0.011	-0.026
			(0.027)**	(0.000)***
	Number of HH members		-0.001	0.002
			(0.215)	(0.001)***
	HH has bike		0.017	0.012
			(0.002)***	(0.141)
	HH has motorcycle		0.036	0.029
			(0.000)***	(0.001)***
	HH has car		-0.053	-0.065
			(0.000)***	(0.000)***
Respondent Characteristics	Respodent is muslim		0.015	-0.042
			(0.063)*	(0.003)***
	Age of respondent		-0.001	-0.003
			(0.011)**	(0.000)***
	Respondent attended secondary school		-0.039	-0.060
			(0.000)***	(0.000)***
	Respondent attended primary school		0.024	0.007
			(0.000)***	(0.520)
	Respondent is married		-0.027	-0.034
			(0.000)***	(0.000)***
	Respondent's number of children		0.001	0.005
			(0.149)	(0.001)***
	Age at first cohabitation		-0.001	-0.005
			(0.004)***	(0.000)***
	Partner attended secondary school		-0.013	-0.031
			(0.001)***	(0.000)***
	Year of data collection		-0.014	-0.014
			(0.000)***	(0.000)***
	_cons	0.585	29.498	28.728
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.57	0.57	0.57
	Adj. R-Squared	0.00	0.02	0.03
	Number of observations	9,185	9,185	3,665

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Niger

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.027	0.035	0.051
		(0.128)	(0.035)**	(0.016)**
Cluster Characteristics	Share of HH in cluster with water tap		-0.137	-0.062
			(0.000)***	(0.114)
	Share of HH in cluster went to hospital last 12 month		0.225	0.155
			(0.000)***	(0.053)*
	Share of HH visited by family planning worker last 12 mth		0.690	0.767
			(0.000)***	(0.000)***
Household Characteristics	Household uses water from tap		-0.023	0.007
			(0.004)***	(0.811)
	Age head of HH		-0.000	-0.001
			(0.683)	(0.315)
	Head of HH is female		0.064	-0.027
			(0.000)***	(0.426)
	Number of HH members		0.003	0.014
			(0.000)***	(0.000)***
	HH has bike		0.035	0.049
			(0.000)***	(0.027)**
	HH has motorcycle		-0.023	0.016
			(0.011)**	(0.449)
	HH has car		-0.092	-0.049
			(0.000)***	(0.198)
Respondent Characteristics	Respodent is muslim		-0.124	
			(0.000)***	
	Age of respondent		-0.000	-0.001
			(0.260)	(0.581)
	Respondent attended secondary school		-0.075	-0.174
			(0.000)***	(0.000)***
	Respondent attended primary school		0.024	0.034
			(0.000)***	(0.202)
	Respondent is married		0.067	-0.018
			(0.000)***	(0.622)
	Respondent's number of children		0.001	-0.002
			(0.356)	(0.529)
	Age at first cohabitation		0.005	0.023
			(0.000)***	(0.000)***
	Partner attended secondary school		0.038	0.036
			(0.000)***	(0.073)*
	Year of data collection		-0.032	-0.001
			(0.000)***	(0.800)
	_cons	0.671	63.785	2.660
		(0.000)***	(0.000)***	(0.793)
	Mean outcome among non-electrified HH	0.66	0.66	0.66
	Adj. R-Squared	0.00	0.06	0.06
	Number of observations	12,302	12,302	1,148

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

DRC

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.045	-0.048	-0.027
		(0.052)*	(0.047)**	(0.451)
Cluster Characteristics	Share of HH in cluster with water tap		-0.142	-0.058
			(0.004)***	(0.446)
	Share of HH in cluster went to hospital last 12 month		0.088	0.307
			(0.000)***	(0.001)***
	Share of HH visited by family planning worker last 12 mth		-0.422	-1.430
			(0.000)***	(0.000)***
Household Characteristics	Household uses water from tap		0.015	0.118
			(0.473)	(0.011)**
	Age head of HH		0.001	-0.005
			(0.000)***	(0.009)***
	Head of HH is female		0.017	0.153
			(0.003)***	(0.041)**
	Number of HH members		0.003	0.027
			(0.000)***	(0.000)***
	HH has bike		0.003	0.119
			(0.612)	(0.004)***
	HH has motorcycle		-0.033	0.273
			(0.010)***	(0.000)***
	HH has car		-0.357	
			(0.060)*	
Respondent Characteristics	Respodent is muslim		0.027	0.187
			(0.005)***	(0.022)**
	Age of respondent		-0.003	0.002
			(0.000)***	(0.583)
	Respondent attended secondary school		0.005	0.013
			(0.444)	(0.736)
	Respondent attended primary school		-0.007	-0.097
			(0.157)	(0.171)
	Respondent is married		0.035	0.111
			(0.000)***	(0.160)
	Respondent's number of children		-0.004	-0.050
			(0.004)***	(0.000)***
	Age at first cohabitation		-0.003	-0.003
			(0.000)***	(0.262)
	Partner attended secondary school		0.027	-0.020
			(0.000)***	(0.529)
	Year of data collection		-0.005	-0.030
			(0.001)***	(0.000)***
	_cons	0.782	11.695	62.012
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.78	0.78	0.78
	Adj. R-Squared	0.00	0.02	0.28
	Number of observations	13,289	13,289	135

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Malawi

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.058	-0.011	-0.022
		(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		-0.055	0.011
			(0.000)***	(0.212)
	Share of HH in cluster went to hospital last 12 month		-0.052	-0.317
			(0.000)***	(0.000)***
	Share of HH visited by family planning worker last 12 mth		-0.015	0.125
			(0.094)*	(0.000)***
Household Characteristics	Household uses water from tap		-0.002	-0.047
			(0.347)	(0.000)***
	Age head of HH		-0.000	-0.001
			(0.000)***	(0.002)***
	Head of HH is female		-0.012	0.013
			(0.000)***	(0.149)
	Number of HH members		0.006	0.008
			(0.000)***	(0.000)***
	HH has bike		-0.027	-0.000
			(0.000)***	(0.945)
	HH has motorcycle		-0.008	-0.059
			(0.284)	(0.000)***
	HH has car		0.006	0.021
			(0.343)	(0.066)*
Respondent Characteristics	Respodent is muslim		-0.086	-0.104
			(0.000)***	(0.000)***
	Age of respondent		-0.002	-0.003
			(0.000)***	(0.000)***
	Respondent attended secondary school		-0.030	-0.018
			(0.000)***	(0.026)**
	Respondent attended primary school		0.012	0.005
			(0.000)***	(0.662)
	Respondent is married		0.008	-0.002
			(0.000)***	(0.841)
	Respondent's number of children		-0.003	0.001
			(0.000)***	(0.514)
	Age at first cohabitation		-0.000	-0.002
			(0.842)	(0.007)***
	Partner attended secondary school		-0.024	-0.032
			(0.000)***	(0.000)***
	Year of data collection		-0.029	-0.024
			(0.000)***	(0.000)***
	_cons	0.190	57.866	49.541
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.19	0.19	0.19
	Adj. R-Squared	0.00	0.06	0.08
	Number of observations	24,047	24,047	1,512

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Nigeria

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.079	-0.041	-0.045
		(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		0.012	-0.029
			(0.358)	(0.055)*
	Share of HH in cluster went to hospital last 12 month		0.024	-0.042
			(0.246)	(0.077)*
	Share of HH visited by family planning worker last 12 mth		0.026	-0.095
			(0.460)	(0.016)**
Household Characteristics	Household uses water from tap		0.017	0.036
			(0.002)***	(0.000)***
	Age head of HH		-0.001	-0.001
			(0.000)***	(0.000)***
	Head of HH is female		-0.045	-0.049
			(0.000)***	(0.000)***
	Number of HH members		0.006	0.005
			(0.000)***	(0.000)***
	HH has bike		0.028	0.007
			(0.000)***	(0.088)*
	HH has motorcycle		-0.002	-0.002
			(0.501)	(0.651)
	HH has car		-0.038	-0.039
			(0.000)***	(0.000)***
Respondent Characteristics	Respodent is muslim		0.005	-0.010
			(0.321)	(0.081)*
	Age of respondent		-0.004	-0.004
			(0.000)***	(0.000)***
	Respondent attended secondary school		-0.080	-0.084
			(0.000)***	(0.000)***
	Respondent attended primary school		0.005	-0.008
			(0.112)	(0.111)
	Respondent is married		-0.045	-0.066
			(0.000)***	(0.000)***
	Respondent's number of children		0.008	0.006
			(0.000)***	(0.000)***
	Age at first cohabitation		-0.002	-0.001
			(0.000)***	(0.002)***
	Partner attended secondary school		-0.014	-0.045
			(0.000)***	(0.000)***
	Year of data collection		-0.020	-0.014
			(0.000)***	(0.000)***
	_cons	0.508	41.418	28.907
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.52	0.52	0.52
	Adj. R-Squared	0.01	0.03	0.03
	Number of observations	34,905	34,905	20,005

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Senegal

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.117	-0.073	-0.098
		(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		-0.070	-0.049
			(0.000)***	(0.046)**
	Share of HH in cluster went to hospital last 12 month		0.094	0.141
			(0.000)***	(0.000)***
	Share of HH visited by family planning worker last 12 mth		-0.156	-0.028
			(0.000)***	(0.646)
Household Characteristics	Household uses water from tap		-0.022	-0.033
			(0.000)***	(0.071)*
	Age head of HH		-0.000	0.001
			(0.008)***	(0.008)***
	Head of HH is female		-0.029	-0.029
			(0.000)***	(0.001)***
	Number of HH members		0.001	-0.000
			(0.000)***	(0.545)
	HH has bike		0.031	0.039
			(0.000)***	(0.002)***
	HH has motorcycle		0.016	0.037
			(0.000)***	(0.000)***
	HH has car		-0.042	-0.023
			(0.000)***	(0.077)*
Respondent Characteristics	Respodent is muslim		0.142	0.138
			(0.000)***	(0.000)***
	Age of respondent		0.001	0.002
			(0.000)***	(0.002)***
	Respondent attended secondary school		-0.092	-0.085
			(0.000)***	(0.000)***
	Respondent attended primary school		-0.008	-0.041
			(0.017)**	(0.000)***
	Respondent is married		0.047	0.076
			(0.000)***	(0.000)***
	Respondent's number of children		0.001	0.001
			(0.018)**	(0.679)
	Age at first cohabitation		-0.007	-0.005
			(0.000)***	(0.000)***
	Partner attended secondary school		-0.013	-0.030
			(0.011)**	(0.022)**
	Year of data collection		0.002	0.000
			(0.004)***	(0.970)
	_cons	0.763	-3.258	0.397
		(0.000)***	(0.017)**	(0.913)
	Mean outcome among non-electrified HH	0.77	0.77	0.77
	Adj. R-Squared	0.01	0.04	0.04
	Number of observations	13,067	13,067	5,325

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Zimbabwe

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.136	-0.078	-0.093
		(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		-0.030	0.008
			(0.047)**	(0.654)
	Share of HH in cluster went to hospital last 12 month		0.030	0.039
			(0.017)**	(0.079)*
	Share of HH visited by family planning worker last 12 mth		0.351	0.520
			(0.000)***	(0.000)***
Household Characteristics	Household uses water from tap		-0.005	-0.018
			(0.562)	(0.080)*
	Age head of HH		-0.001	-0.001
			(0.000)***	(0.002)***
	Head of HH is female		-0.043	-0.065
			(0.000)***	(0.000)***
	Number of HH members		0.005	0.010
			(0.000)***	(0.000)***
	HH has bike		-0.003	-0.013
			(0.585)	(0.104)
	HH has motorcycle		0.027	-0.089
			(0.036)**	(0.000)***
	HH has car		0.006	0.082
			(0.551)	(0.000)***
Respondent Characteristics	Respodent is muslim		-0.011	0.181
			(0.703)	(0.000)***
	Age of respondent		-0.007	-0.005
			(0.000)***	(0.000)***
	Respondent attended secondary school		-0.104	-0.131
			(0.000)***	(0.000)***
	Respondent attended primary school		-0.100	-0.013
			(0.000)***	(0.621)
	Respondent is married		-0.012	-0.037
			(0.021)**	(0.000)***
	Respondent's number of children		0.002	-0.012
			(0.328)	(0.000)***
	Age at first cohabitation		-0.005	-0.008
			(0.000)***	(0.000)***
	Partner attended secondary school		-0.045	-0.090
			(0.000)***	(0.000)***
	Year of data collection		-0.022	-0.027
			(0.000)***	(0.000)***
	_cons	0.536	45.272	55.374
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.53	0.53	0.53
	Adj. R-Squared	0.01	0.06	0.10
	Number of observations	8,391	8,391	1,635

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Benin

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.152	-0.035	-0.032
		(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		0.047	0.042
			(0.000)***	(0.000)***
	Share of HH in cluster went to hospital last 12 month		-0.023	0.000
			(0.006)***	(0.988)
	Share of HH visited by family planning worker last 12 mth		0.002	-0.064
			(0.894)	(0.003)***
Household Characteristics	Household uses water from tap		0.009	0.018
			(0.000)***	(0.000)***
	Age head of HH		0.000	0.000
			(0.002)***	(0.967)
	Head of HH is female		-0.014	-0.028
			(0.000)***	(0.000)***
	Number of HH members		-0.000	-0.002
			(0.480)	(0.000)***
	HH has bike		0.001	-0.037
			(0.486)	(0.000)***
	HH has motorcycle		-0.007	-0.029
			(0.001)***	(0.000)***
	HH has car		0.014	-0.031
			(0.007)***	(0.000)***
Respondent Characteristics	Respodent is muslim		0.043	0.003
			(0.000)***	(0.416)
	Age of respondent		-0.001	-0.000
			(0.000)***	(0.333)
	Respondent attended secondary school		-0.055	-0.062
			(0.000)***	(0.000)***
	Respondent attended primary school		-0.024	-0.050
			(0.000)***	(0.000)***
	Respondent is married		-0.007	-0.007
			(0.017)**	(0.104)
	Respondent's number of children		0.003	-0.004
			(0.000)***	(0.001)***
	Age at first cohabitation		0.000	-0.003
			(0.848)	(0.000)***
	Partner attended secondary school		-0.038	-0.018
			(0.000)***	(0.000)***
	Year of data collection		-0.046	-0.042
			(0.000)***	(0.000)***
	_cons	0.359	93.113	84.929
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.36	0.36	0.36
	Adj. R-Squared	0.01	0.24	0.15
	Number of observations	10,196	10,196	2,390

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Ghana

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.141	-0.018	0.003
		(0.000)***	(0.009)***	(0.748)
Cluster Characteristics	Share of HH in cluster with water tap		-0.201	-0.284
			(0.000)***	(0.000)***
	Share of HH in cluster went to hospital last 12 month		0.215	0.236
			(0.000)***	(0.000)***
	Share of HH visited by family planning worker last 12 mth		0.033	0.041
			(0.145)	(0.228)
Household Characteristics	Household uses water from tap		0.056	0.094
			(0.000)***	(0.000)***
	Age head of HH		-0.001	-0.002
			(0.000)***	(0.000)***
	Head of HH is female		0.034	0.029
			(0.000)***	(0.001)***
	Number of HH members		0.004	0.004
			(0.000)***	(0.010)***
	HH has bike		0.015	0.008
			(0.004)***	(0.367)
	HH has motorcycle		0.060	0.068
			(0.000)***	(0.000)***
	HH has car		-0.137	-0.079
			(0.000)***	(0.000)***
Respondent Characteristics	Respodent is muslim		0.046	0.033
			(0.000)***	(0.005)***
	Age of respondent		-0.006	-0.005
			(0.000)***	(0.000)***
	Respondent attended secondary school		-0.033	-0.012
			(0.000)***	(0.217)
	Respondent attended primary school		-0.039	-0.072
			(0.000)***	(0.000)***
	Respondent is married		-0.017	-0.018
			(0.006)***	(0.066)*
	Respondent's number of children		0.012	0.013
			(0.000)***	(0.000)***
	Age at first cohabitation		-0.001	-0.003
			(0.137)	(0.003)***
	Partner attended secondary school		-0.122	-0.099
			(0.000)***	(0.000)***
	Year of data collection		-0.019	-0.015
			(0.000)***	(0.000)***
	_cons	0.547	39.410	31.149
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.59	0.59	0.59
	Adj. R-Squared	0.02	0.08	0.07
	Number of observations	4,364	4,364	1,989

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Ethiopia

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.165	-0.091	-0.086
		(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		-0.050	-0.022
			(0.000)***	(0.366)
	Share of HH in cluster went to hospital last 12 month		-0.055	-0.033
			(0.000)***	(0.491)
	Share of HH visited by family planning worker last 12 mth		0.023	-0.027
			(0.197)	(0.735)
Household Characteristics	Household uses water from tap		0.008	-0.053
			(0.055)*	(0.003)***
	Age head of HH		0.000	0.001
			(0.897)	(0.005)***
	Head of HH is female		-0.005	0.020
			(0.142)	(0.103)
	Number of HH members		-0.001	0.003
			(0.394)	(0.440)
	HH has bike		-0.010	-0.167
			(0.615)	(0.000)***
	HH has motorcycle		-0.245	-0.519
			(0.005)***	(0.000)***
	HH has car		0.094	0.095
			(0.023)**	(0.449)
Respondent Characteristics	Respodent is muslim		-0.007	0.027
			(0.025)**	(0.045)**
	Age of respondent		-0.002	-0.003
			(0.000)***	(0.016)**
	Respondent attended secondary school		-0.209	-0.382
			(0.000)***	(0.000)***
	Respondent attended primary school		-0.038	-0.038
			(0.000)***	(0.010)***
	Respondent is married		0.012	0.032
			(0.002)***	(0.057)*
	Respondent's number of children		0.004	-0.004
			(0.000)***	(0.329)
	Age at first cohabitation		-0.003	-0.005
			(0.000)***	(0.022)**
	Partner attended secondary school		-0.063	-0.043
			(0.000)***	(0.010)**
	Year of data collection		-0.013	-0.014
			(0.000)***	(0.000)***
	_cons	0.842	26.196	28.265
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.83	0.83	0.83
	Adj. R-Squared	0.01	0.04	0.14
	Number of observations	16,095	16,095	1,594

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Uganda

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.154	-0.115	-0.095
		(0.000)***	(0.000)***	(0.001)***
Cluster Characteristics	Share of HH in cluster with water tap		0.082	0.016
			(0.001)***	(0.836)
	Share of HH in cluster went to hospital last 12 month		-0.062	0.103
			(0.000)***	(0.414)
	Share of HH visited by family planning worker last 12 mth		-0.144	-0.067
			(0.000)***	(0.668)
Household Characteristics	Household uses water from tap		-0.081	-0.153
			(0.000)***	(0.003)***
	Age head of HH		-0.000	0.001
			(0.020)**	(0.315)
	Head of HH is female		-0.000	-0.142
			(0.995)	(0.024)**
	Number of HH members		-0.000	-0.001
			(0.589)	(0.858)
	HH has bike		0.006	-0.040
			(0.082)*	(0.170)
	HH has motorcycle		-0.017	-0.108
			(0.111)	(0.045)**
	HH has car		0.081	0.164
			(0.001)***	(0.000)***
Respondent Characteristics	Respodent is muslim		0.064	0.139
			(0.000)***	(0.012)**
	Age of respondent		-0.002	-0.004
			(0.000)***	(0.128)
	Respondent attended secondary school		-0.056	-0.166
			(0.000)***	(0.000)***
	Respondent attended primary school		0.019	0.045
			(0.000)***	(0.556)
	Respondent is married		-0.007	-0.069
			(0.157)	(0.072)*
	Respondent's number of children		-0.000	-0.002
			(0.918)	(0.834)
	Age at first cohabitation		-0.002	0.003
			(0.000)***	(0.387)
	Partner attended secondary school		-0.018	-0.027
			(0.001)***	(0.423)
	Year of data collection		-0.016	-0.012
			(0.000)***	(0.000)***
	_cons	0.708	33.235	23.941
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.70	0.70	0.70
	Adj. R-Squared	0.00	0.05	0.11
	Number of observations	8,151	8,151	470

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Burkina Faso

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.203	-0.151	-0.193
		(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		-0.049	0.435
			(0.005)***	(0.000)***
	Share of HH in cluster went to hospital last 12 month		0.154	-0.264
			(0.000)***	(0.000)***
	Share of HH visited by family planning worker last 12 mth		0.038	-0.014
			(0.133)	(0.847)
Household Characteristics	Household uses water from tap		0.001	-0.174
			(0.922)	(0.000)***
	Age head of HH		0.000	-0.002
			(0.000)***	(0.001)***
	Head of HH is female		-0.056	-0.049
			(0.000)***	(0.081)*
	Number of HH members		0.005	0.008
			(0.000)***	(0.000)***
	HH has bike		-0.039	0.066
			(0.000)***	(0.007)***
	HH has motorcycle		-0.009	-0.033
			(0.002)***	(0.096)*
	HH has car		-0.085	0.026
			(0.000)***	(0.529)
Respondent Characteristics	Respodent is muslim		0.062	0.142
			(0.000)***	(0.000)***
	Age of respondent		0.003	-0.005
			(0.000)***	(0.014)**
	Respondent attended secondary school		-0.055	0.006
			(0.000)***	(0.898)
	Respondent attended primary school		0.005	-0.078
			(0.359)	(0.006)***
	Respondent is married		-0.059	0.015
			(0.000)***	(0.708)
	Respondent's number of children		-0.006	0.013
			(0.000)***	(0.013)**
	Age at first cohabitation		-0.006	0.004
			(0.000)***	(0.287)
	Partner attended secondary school		-0.110	-0.036
			(0.000)***	(0.415)
	Year of data collection		-0.044	-0.048
			(0.000)***	(0.000)***
	_cons	0.607	87.888	96.628
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.62	0.62	0.62
	Adj. R-Squared	0.00	0.09	0.24
	Number of observations	17,602	17,602	347

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Lesotho

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.220	-0.073	-0.100
		(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		0.017	0.158
			(0.032)**	(0.000)***
	Share of HH in cluster went to hospital last 12 month		0.007	-0.016
			(0.659)	(0.831)
	Share of HH visited by family planning worker last 12 mth		-0.000	-0.216
			(0.998)	(0.221)
Household Characteristics	Household uses water from tap		-0.017	-0.107
			(0.002)***	(0.000)***
	Age head of HH		0.002	-0.001
			(0.000)***	(0.142)
	Head of HH is female		-0.030	0.088
			(0.000)***	(0.001)***
	Number of HH members		-0.004	-0.012
			(0.000)***	(0.002)***
	HH has bike		0.044	-0.050
			(0.002)***	(0.068)*
	HH has motorcycle		-0.025	0.136
			(0.580)	(0.008)***
	HH has car		-0.072	-0.066
			(0.000)***	(0.002)***
Respondent Characteristics	Respodent is muslim		0.000	0.000
			(1.000)	(1.000)
	Age of respondent		-0.010	-0.010
			(0.000)***	(0.000)***
	Respondent attended secondary school		-0.131	-0.105
			(0.000)***	(0.000)***
	Respondent attended primary school		-0.103	0.042
			(0.000)***	(0.506)
	Respondent is married		-0.033	0.031
			(0.000)***	(0.264)
	Respondent's number of children		0.024	0.036
			(0.000)***	(0.001)***
	Age at first cohabitation		0.000	0.007
			(0.907)	(0.016)**
	Partner attended secondary school		-0.070	-0.095
			(0.000)***	(0.000)***
	Year of data collection		-0.014	-0.016
			(0.000)***	(0.005)***
	_cons	0.493	29.780	33.749
		(0.000)***	(0.000)***	(0.004)***
	Mean outcome among non-electrified HH	0.51	0.51	0.51
	Adj. R-Squared	0.01	0.06	0.10
	Number of observations	6,966	6,966	402

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Mozambique

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.206	-0.079	-0.055
		(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		-0.058	-0.070
			(0.000)***	(0.000)***
	Share of HH in cluster went to hospital last 12 month		0.198	-0.009
			(0.000)***	(0.839)
	Share of HH visited by family planning worker last 12 mth		-0.282	-0.134
			(0.000)***	(0.000)***
Household Characteristics	Household uses water from tap		-0.023	-0.028
			(0.008)***	(0.078)*
	Age head of HH		0.000	0.001
			(0.119)	(0.056)*
	Head of HH is female		0.035	0.023
			(0.000)***	(0.001)***
	Number of HH members		0.003	0.006
			(0.000)***	(0.006)***
	HH has bike		0.010	-0.020
			(0.058)*	(0.045)**
	HH has motorcycle		0.013	-0.004
			(0.188)	(0.839)
	HH has car		0.009	0.076
			(0.156)	(0.000)***
Respondent Characteristics	Respodent is muslim		0.005	0.079
			(0.549)	(0.006)***
	Age of respondent		-0.000	-0.002
			(0.589)	(0.063)*
	Respondent attended secondary school		-0.019	-0.132
			(0.011)**	(0.000)***
	Respondent attended primary school		-0.015	0.031
			(0.001)***	(0.002)***
	Respondent is married		0.088	-0.032
			(0.000)***	(0.002)***
	Respondent's number of children		-0.008	-0.014
			(0.000)***	(0.000)***
	Age at first cohabitation		-0.001	-0.001
			(0.158)	(0.109)
	Partner attended secondary school		0.005	0.070
			(0.432)	(0.000)***
	Year of data collection		-0.045	-0.048
			(0.000)***	(0.000)***
	_cons	0.398	90.581	97.706
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.41	0.41	0.41
	Adj. R-Squared	0.01	0.13	0.18
	Number of observations	10,738	10,738	949

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Rwanda

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.245	-0.118	-0.111
		(0.000)***	(0.000)***	(0.000)***
Cluster Characteristics	Share of HH in cluster with water tap		-0.012	0.085
			(0.225)	(0.029)**
	Share of HH in cluster went to hospital last 12 month		-0.087	-0.394
			(0.000)***	(0.000)***
	Share of HH visited by family planning worker last 12 mth		0.013	-1.141
			(0.755)	(0.000)***
Household Characteristics	Household uses water from tap		0.003	-0.072
			(0.525)	(0.001)***
	Age head of HH		-0.000	0.003
			(0.115)	(0.111)
	Head of HH is female		-0.020	-0.038
			(0.000)***	(0.145)
	Number of HH members		-0.005	0.005
			(0.000)***	(0.404)
	HH has bike		-0.019	0.028
			(0.000)***	(0.128)
	HH has motorcycle		-0.001	0.072
			(0.960)	(0.279)
	HH has car		-0.199	-0.180
			(0.000)***	(0.000)***
Respondent Characteristics	Respodent is muslim		0.167	0.558
			(0.000)***	(0.000)***
	Age of respondent		-0.002	-0.010
			(0.000)***	(0.001)***
	Respondent attended secondary school		-0.130	-0.122
			(0.000)***	(0.000)***
	Respondent attended primary school		-0.035	0.038
			(0.000)***	(0.187)
	Respondent is married		-0.019	-0.135
			(0.000)***	(0.000)***
	Respondent's number of children		0.009	0.015
			(0.000)***	(0.046)**
	Age at first cohabitation		-0.003	-0.009
			(0.000)***	(0.046)**
	Partner attended secondary school		-0.044	-0.002
			(0.000)***	(0.934)
	Year of data collection		-0.038	-0.043
			(0.000)***	(0.000)***
	_cons	0.595	77.691	87.006
		(0.000)***	(0.000)***	(0.000)***
	Mean outcome among non-electrified HH	0.59	0.59	0.59
	Adj. R-Squared	0.00	0.05	0.22
	Number of observations	10,231	10,231	215

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.

Tanzania

		All observations	All observations	Individual Matching
	HH has electricity connection	-0.223	-0.120	-0.038
		(0.000)***	(0.000)***	(0.014)**
Cluster Characteristics	Share of HH in cluster with water tap		-0.011	-0.236
			(0.318)	(0.000)***
	Share of HH in cluster went to hospital last 12 month		0.103	0.281
			(0.000)***	(0.000)***
	Share of HH visited by family planning worker last 12 mth		0.048	-0.238
			(0.443)	(0.006)***
Household Characteristics	Household uses water from tap		-0.015	0.079
			(0.126)	(0.000)***
	Age head of HH		0.000	0.004
			(0.088)*	(0.000)***
	Head of HH is female		0.008	0.145
			(0.112)	(0.000)***
	Number of HH members		-0.002	-0.015
			(0.066)*	(0.000)***
	HH has bike		-0.004	-0.044
			(0.407)	(0.004)***
	HH has motorcycle		0.051	0.143
			(0.005)***	(0.000)***
	HH has car		-0.048	-0.054
			(0.092)*	(0.263)
Respondent Characteristics	Respodent is muslim		-0.031	-0.018
			(0.000)***	(0.489)
	Age of respondent		-0.005	-0.018
			(0.000)***	(0.000)***
	Respondent attended secondary school		-0.208	-0.303
			(0.000)***	(0.000)***
	Respondent attended primary school		-0.000	-0.160
			(0.932)	(0.000)***
	Respondent is married		-0.009	-0.001
			(0.074)*	(0.968)
	Respondent's number of children		0.009	0.024
			(0.000)***	(0.000)***
	Age at first cohabitation		-0.001	0.002
			(0.149)	(0.574)
	Partner attended secondary school		-0.050	-0.032
			(0.000)***	(0.021)**
	Year of data collection		-0.008	-0.009
			(0.000)***	(0.013)**
	_cons	0.623	15.861	19.087
		(0.000)***	(0.000)***	(0.009)***
	Mean outcome among non-electrified HH	0.58	0.58	0.58
	Adj. R-Squared	0.00	0.02	0.19
	Number of observations	11,154	11,154	863

Source: DHS country data set. *Notes:* Table displays the effect of electricity access on attitudes toward IPV (LMP and matching approach). Coefficients are estimated by a Linear Probability Model with robust standard errors clustered at the household level.