

Artisanal Mining and Intimate Partner Violence in Sub-Saharan Africa*

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Abstract

We study the effect of artisanal mining on intimate partner violence in Sub-Saharan Africa, where women make up a significant share of the mining workforce. To identify causal effects, we leverage spatial variation in gold suitability and exogenous temporal variation in global gold prices, controlling for industrial mining and environmental factors. Using household surveys from over 30 countries, we find that increased profitability of artisanal gold mining reduces moderately severe physical violence, primarily through higher female labor supply and intra-household bargaining power. However, it also leads to an increase in some forms of sexual violence within households.

Keywords: gold mining, intrahousehold bargaining power, domestic violence, female labor supply

JEL Codes: D12, J16, O13, O55, Q32

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1 Introduction

Artisanal mining, a small-scale and labor-intensive form of natural resource extraction, directly and indirectly, provides at least 134 million jobs globally (World Bank, 2020), and supports the livelihood of 130-270 million people in more than 80 countries, most of which are in Africa (Girard et al., 2023).¹ Despite this widespread activity of artisanal mining, the existing studies focus on large-scale and capital-intensive industrial mining at the macro (Frankel, 2012; Sachs and Warner, 2001) and micro (Aragón and Rud, 2013; Kotsadam and Tolonen, 2016; Berman et al., 2017; Fafchamps et al., 2017; Benshaul-Tolonen, 2019) level mainly due to limitation of granular-level data on artisanal mining. A few recent studies examine the micro-level economic and environmental effects of small-scale artisanal mining in the light of recently collected data on artisanal mining and mining suitability (Bazillier and Girard, 2020; Sánchez De La Sierra, 2020; Girard et al., 2023). However, the impacts of artisanal mining on women's intrahousehold bargaining power, their autonomy in household decision-making, and intimate partner violence against them have not been investigated yet, although female miners constitute a significant portion of the artisanal mining workforce.²

In this paper, we thus fill the gap in the literature by providing a continent-wide analysis quantifying the causal effects of artisanal gold mining—the main form of artisanal mining—on women's intrahousehold bargaining power and intimate partner violence against women in over 30 countries from Sub-Saharan Africa that lead the world in terms of intimate partner violence.³ Therefore, SSA is the ideal context to study the impact of mining shock on intimate partner violence. The economies of most nations in Sub-Saharan Africa depend heavily on natural resources (Thomas and Trevino, 2013; Asiamah et al., 2022), and employment opportunities in artisanal mining are more labor-intensive and gender-inclusive than industrial mining. Thus, artisanal gold mining is a unique employment and income shock, enabling us to study the interaction between household members and provide evidence on the determinants of domestic violence in our context. This paper first

¹Globally, more than one-fourth of the mining workforce is directly engaged in artisanal mining, which employs women more intensively than “traditional” industrial mining. Around 30% of the global artisanal mining workforce are women (Hinton et al., 2003), while 8-17% of the world’s miners are women (Ellix et al., 2021). The share of women artisanal miners in Africa is the highest in the world at 40-50% of artisanal mining workforce (ASM Inventory, 2022; Eshun, 2020). Therefore, developments in the labor-intensive artisanal mining industry that extensively employs women are likely directly related to women globally and in Africa. A study in Burkina Faso shows that artisanal mines attract young girls and women as a source of social and economic independence, thus leading to different lifestyles and greater empowerment (Werthmann, 2009).

²The relationship between extractive industries and women’s welfare, as well as gender equality in general, has been well documented in the literature (see Baum and Benshaul-Tolonen, 2021, for a detailed review). Those studies tend to either focus on industrial mining due to more readily available data to establish a credible identification strategy (e.g., Benshaul-Tolonen, 2024; Kotsadam et al., 2017; Kotsadam and Tolonen, 2016), or only focus on artisanal mining within a specific country (e.g., Rustad et al. (2016) in the Democratic Republic of the Congo, Werthmann (2009) in Burkina Faso, or Guimbeau et al. (2023) in India). None of them has conducted a rigorous study to establish a causal relationship between artisanal mining and women’s welfare across the African continent.

³According to the [World Health Organization \(WHO\)](#), about one-fifth of women in Sub-Saharan Africa (SSA) experienced physical or sexual violence by their husbands or partners in the last twelve months, on average, between 2000 and 2018, and it is highest worldwide.

investigates the effects of artisanal gold mining (ASgM) on different forms of domestic violence, including severe and less severe physical violence and sexual violence and intimate partner violence with different frequencies. We then explore the potential mechanisms through which artisanal gold mining affects intimate partner violence by evaluating various individual- and household-level secondary outcomes, including several measures of women's intrahousehold bargaining power, gender- and industry-specific labor supply and economic activities, household wealth, and migration patterns.

We use nationally representative household surveys to estimate the effects of artisanal gold mining on intimate partner violence and examine the underlying mechanisms. In particular, we use household- and individual-country-year level repeated cross-sectional data from the Demographic and Health Survey (DHS) of over 30 countries in Sub-Saharan Africa. Our individual-level datasets on intimate partner violence with individual and household characteristics allow us to control for determinants of domestic violence at the granular level and provide flexibility to conduct heterogeneity analysis at individual and household levels. We also use spatial information on gold suitability at the most granular possible grid cell level throughout Africa and international gold prices, varying over time, which introduces temporal variation in ASgM. Using representative data and controlling for granular-level fixed effects enables us to provide population-based evidence with strong external validity that is generalizable and not subject to a specific country.

Identifying the causal impact of ASgM on intimate partner violence is challenging since the mining activities are endogenous due to simultaneity bias and omitted variables bias. In terms of simultaneity bias due to reverse causality in the domestic violence regression, ASgM could reduce intimate partner violence due to increased women's labor supply, which might increase women's empowerment, making the ASgM region more attractive to women and thus creating more extracurricular activities at artisanal gold mines. Regarding omitted variables bias, some other unobserved characteristics can lead to heterogeneous trends across individuals living in areas with different suitability for gold mining. Such unobserved characteristics will be captured in the error term confounding with our measure of gold mining activities. We exploit spatial and temporal variations exogenous to the household's actions to overcome these challenges and isolate the effect of industrial gold mining (ISgM) from geographical gold suitability to identify the causal impact of ASgM (Girard et al., 2023). This strategy presents several advantages. First, leveraging granular-level spatial information on gold suitability, we control for fixed effects of widely used PRIO-GRID cells of 0.5×0.5 degrees or about 55×55 kilometers at the equator and time-varying characteristics of individuals and households. Second, we use a temporal variation in ASgM generated from changes in the international gold price that is exogenous to potential revenues from ASgM activities in the local economy. The potential revenue from ASgM directly depends on the world price of gold; however, local artisanal miners cannot affect the world price as they are small-sized price-takers and follow the global market (Sánchez De La Sierra, 2020). So, unlike studies such as Haushofer et al. (2019) that provide experimental evidence with limited external validity, our study provides

population-based evidence on the determinants of intimate partner violence based on highly plausible assumptions. Third, indirectly identifying the effect of ASgM based on gold suitability conditional on ISgM enables us to capture the impact of registered and unregistered ASgM.

This study contributes to several strands of literature. First, we primarily contribute to the literature studying intimate partner violence. The literature suggests that women's empowerment and improvement in their economic conditions have ambiguous effects on the risk of experiencing intimate partner violence. Women's better employment opportunities and earning potential relative to husbands expand their outside options and enhance their intrahousehold bargaining power, which translates into a reduction in intimate partner violence (Farmer and Tiefenthaler, 1996; Stevenson and Wolfers, 2006; Anderberg et al., 2016). However, female empowerment can have a backlash effect if husbands want to regain their intrahousehold power, leading to an increase in domestic violence (Bloch and Rao, 2002; Bobonis et al., 2013; Erten and Keskin, 2021; Field et al., 2021). Hence, the impact of artisanal gold mining, an industry where almost half of the workforce consists of women in Africa (Eshun, 2020), on intimate partner violence is an empirical question. No study has examined the effects of ASgM on women's empowerment and intrahousehold bargaining power. Our paper is, therefore, the first to provide evidence on the impact of artisanal mining on the prevalence of intimate partner violence and women's agency. Not only is this study the pioneer in linking ASgM to domestic violence, but the small-scale artisanal mining that we investigate in this paper also enables us to exploit a more compelling identification strategy to precisely estimate the causal impact and contribute to the literature on the mining-domestic violence relationship in general (Guimbeau et al., 2023). Our results suggest that moderately severe physical violence that women sometimes experience in the household decreases in gold-suitable areas when the international gold price increases, potentially due to women's increased intrahousehold bargaining power through increased employment in mining and sales industries and subsequent rise in women's earnings. It implies that the bargaining power mechanism dominates the potential backlash effect in Sub-Saharan Africa. There is also a separation effect through which the shock could have mediated through to domestic violence. Moreover, we rule out other potential channels, such as changes in demographic composition, household wealth, and alcohol drinking. The ASgM has no significant effect on broad categories of severe physical violence and sexual violence. However, ASgM increases the incidence of women being forced into unwanted sexual acts other than sex, potentially due to conflicts on fertility decisions.

Second, our work is related to the literature that examines the economic impacts of mining by disentangling the micro effects of capital-intensive large-scale industrial mining and labor-intensive small-scale artisanal mining. The effects of industrial gold mines on structural transformation and sectoral shift in employment (Aragón and Rud, 2013; Kotsadam and Tolonen, 2016; Fafchamps et al., 2017), male and female labor supply (Kotsadam and Tolonen, 2016; Santos, 2018), and intimate partner violence (Guimbeau et al., 2023) are well documented in the existing studies. However, a few recent studies examine the heterogeneous micro effects of industrial and artisanal mining on

deforestation and industry-specific employment in Sub-Saharan Africa (Girard et al., 2023), gender- and industry-specific employment in Liberia (Gräser, 2023), and violent conflicts in Africa (Rigterink et al., 2025). However, studies that estimated the relative effects of artisanal and industrial mining are extremely scarce. Leveraging data on industrial gold mines combined with our unique data on gold suitability, we thus contribute to the mining literature by distinguishing the impacts of artisanal and industrial mining on intimate partner violence. Interestingly and intuitively, industrial and artisanal mining has the opposite effects on physical domestic violence towards women, i.e., industrial (artisanal) mining increases (decreases) domestic violence primarily driven by less severe physical violence. Similar to artisanal mining, industrial mining has positive effects on some forms of sexual violence, and the impacts are generally more significant.⁴

Third, we provide new insights into the dynamic effects in the long run or persistence of contemporaneous impacts of mining shocks. We are unaware of any study that documents how mining, particularly artisanal gold mining, affects intimate partner violence in the long term. We examine whether the current shock has a long-lasting impact by utilizing our source of temporal variation, or international gold price, at different periods in the past. Our analysis shows declines in intimate partner violence, especially moderately severe physical violence with less frequency, persist over time as female labor supply in the mining industry sustains over the long run due to the increased profitability of ASgM. We also find that the null effect of ASgM on severe physical violence in the short run becomes negative in the long term. Additionally, we provide some suggestive evidence that the null effect of ASgM on a broad group of sexual domestic violence becomes positive in the long run.

The rest of the paper is structured as follows. Section 2 provides background on ASgM and intimate partner violence in our context and discusses a conceptual framework. Section 3 describes the data and descriptive statistics. Section 4 presents the empirical approach for identifying the causal impacts of the ASgM on labor supply and intimate partner violence. Section 5 presents the results and robustness checks of our main findings, while Section 6 discusses further results to investigate potential mechanisms. Finally, Section 7 concludes.

2 Background and Conceptual Framework

In this section, we first provide background on ASgM and intimate partner violence in relation to the mining activities in Sub-Saharan Africa. We then discuss theoretical frameworks to conceptually

⁴The results from estimating the heterogeneous effects of artisanal and industrial gold mining on our secondary outcomes that shed light on the underlying mechanisms suggest that individuals shift from agricultural to extractive activities when extractive activities become more profitable due to a rise in gold prices. Women's labor supply in the sales or retail industry weakly increases, indicating a potential increase in aggregate demand, which is consistent with a positive impact of ASgM on household wealth. These findings suggest a potential structural transformation in the economy in response to artisanal gold mining shock in the short term. However, industrial gold mining does not affect the economic activities conditional on artisanal gold mining.

link the natural resource shock with intimate partner violence under each of the two sources of variation: (i) for individuals living in cells with different levels of gold suitability and (ii) for those being available to work at artisanal gold mines in periods of high and low gold prices.

2.1 Artisanal Gold Mining in Africa

It is well-known that the continent of Africa is rich in mineral resources. The extraction and exploitation of mineral resources in Africa have also been increasing due to growing exploration activities in the region as there are many untapped reserves (Banerjee et al., 2015). Many African countries are highly dependent on mineral exports because of the abundance of these resources. In particular, 42 out of 54 African countries are characterized as resource-dependent, with 18 classified as dependent on non-fuel minerals. Africa produces more than 60 types of metals and mineral products, while it is assumed to have diamonds. There are several other minerals that the region hosts, including vanadium, manganese, platinum, cobalt, and gold. For example, Africa generates about 20% of the world's gold production, and Ghana and South Africa dominate the gold production within the continent (Signé and Johnson, 2021).

Although artisanal mining plays a central role in many individuals' lives and is largely prevalent in the region, the socio-economic implications of mining in Africa have been overlooked, mainly because data on mining is limited to industrial mining. Fortunately, Girard et al. (2023) propose a new measure of ASgM throughout Africa, enabling us to draw a clear and complete picture of small-scaled ASgM across the whole continent. We provide more details about the gold suitability data in the next section. As shown in Figure 1a, almost one-fifth or specifically 18% of the surface of the continent is suitable for gold and thus ASgM. In Figure 1b, we divide Africa into 10,628 grid cells of 0.5×0.5 degree or about 55×55 kilometers at the Equator (Tollefson et al., 2012) and plot the share of each cell which overlaps with ASgM suitable bedrocks.

2.2 Intimate Partner Violence in Sub-Saharan Africa

Sub-Saharan Africa leads the world in intimate partner violence (Mossie et al., 2023). One in every five women from the region experienced physical and sexual domestic violence over the past twelve months, which is globally the highest estimate, on average between 2000 and 2018.^{5,6} Despite the high average rate, intimate partner violence incidences have declined in the region over time, primarily driven by moderately severe or less severe physical domestic violence. Severe physical and sexual intimate partner violence presented a slight downward trend from 2003 to 2019; however, these forms of violence against women in the household are generally stagnant (Figure 2a). On the other hand, the global price of gold or the gold value increased significantly after 2005, peaked

⁵See the WHO's national estimates of intimate partner violence from <https://vaw-data.srhr.org/data>.

⁶As shown in Figure B.1, intimate partner violence incidences are concentrated in Central Africa, and incidences of mild or less severe physical violence are more prevalent than severe physical and sexual violence within the household.

in 2012, and then slightly dropped until 2019 (Figure 2b). The intimate partner violence and the profitability of gold mining thus generally evolve in opposite directions: domestic violence declines while the gold price increases over time. The bivariate correlation between the incidence of any intimate partner violence in the last twelve months and the international gold price is -0.62 (SE: 0.21, *p*-value: 0.01) in the survey year, -0.7117 (SE: 0.19, *p*-value: 0.00) in a year before the survey year, and -0.7646 (SE: 0.17, *p*-value: 0.00) in two years before the survey year. Section 3 provides more details on international gold prices.

2.3 Conceptual Framework

Before discussing the theoretical concepts on the relationship between mining and intimate partner violence, it is natural to consider the theoretical links between mining and “first-stage” outcomes that are directly associated with the mining shock, such as individuals’ economic activities or employment in the extractive industry, that have further implications on women’s likelihood of experiencing intimate partner violence. Each woman decides the amount of her work depending on her and her husband’s wage (defined as the value of their work, not necessarily the actual market wage), household income, and other factors such as time and risk preferences. As ASgM tends to be labor intensive and less heavy than industrial mining, local growth in mining activities spurred by the discovery of a gold mine and an increase in international gold price entails *a priori* ambiguous effects on female labor supply. First, it can trigger a substitution effect that induces more women to join the mining sector from inactivity or traditional agriculture due to the higher opportunity cost of these activities. Moreover, the local multiplier effect could reinforce female labor response through reallocation to services and trade sector (Moretti, 2010). However, such increased demand for intermediate goods and services coexisting with mining production is likely negligible for ASgM as opposed to ISgM.⁷ But the indirect employment effect of ASgM could be mainly through the increased total demand. Second, increasing returns to mining employment might reduce a woman’s labor supply if the income effect dominates and women’s leisure is a normal good. The income effect of the gold price can also be manifested through changes in her husband’s income or changes in aggregate income pooled from the household members. In addition, although women consist of 40-50% of the artisanal mining workforce (ASM Inventory, 2022), mining communities are still related to the “hyper-masculine” subculture where women are substantially subject to sexual abuse by outsiders or even transactional sex (Rustad et al., 2016), thereby deterring women’s labor supply through the fear channel (Siddique, 2022).⁸

The existing studies and theoretical concepts on intimate partner violence suggest that improve-

⁷Opportunities for indirect employment in services and sales industries can increase as shown by Kotsadam and Tolonen (2016), Santos (2018) and Benshaul-Tolonen (2024) for ISgM. An empirical analysis for ASgM-induced sectoral reallocation is scant, except for Bazillier and Girard (2020), who suggested that households could take advantage of a boom in ASgM by catering to the miners’ demand for goods and services.

⁸Sexual violence can be used strategically by the dominating armed force to gain control over valuable resources or to efficiently tax local populations on their mining production (Rustad et al., 2016; Fourati et al., 2022).

ments in women's economic conditions and women empowerment have *a priori* ambiguous impacts on domestic violence against women. On the one hand, a decrease in a woman's labor supply due to the above would make her economically dependent on her husband, reducing her intrahousehold bargaining power and potentially increasing intimate partner violence. The opposite case applies if the ASgM boom increases a woman's employment opportunities and income relative to her husband, thus increasing her access to resources and expanding her outside options, which leads to a decline in domestic (Farmer and Tiefenthaler, 1996; Stevenson and Wolfers, 2006; Aizer, 2010; Hidrobo and Fernald, 2013; Anderberg et al., 2016).⁹ On the other hand, even an improvement in female job opportunities can backfire if their partners do not want them to work or it challenges the prevailing masculinity norm (Field et al., 2021; Bhalotra et al., 2021; Rustad et al., 2016). Even if husbands want their wives to work, instrumental theories of violence suggest that an increase in the probability of female employment and resulting improvement in women's bargaining power and outside options could lead to more violence from her intimate partner, who might use violence as an instrument of gaining their control over decision-making within the family (Bloch and Rao, 2002; Bobonis et al., 2013; Erten and Keskin, 2018, 2021). In addition, a strong masculinity subculture of a mining community might make women more tolerant towards domestic violence and likely increase intimate partner violence. However, the association between one's attitude toward domestic violence and her experience of intimate partner violence is still unclear (Benshaul-Tolonen, 2024).

3 Data

For our empirical analysis, we combine three data sets: Demographic and Health Surveys (DHS) for all countries in Sub-Saharan Africa, information on the suitability of areas for gold mining covering the entire African continent, and gold prices in the global market over time. First, the DHS data provide individual-level repeated cross-section on the primary outcome variable of women's experience of different forms of intimate partner violence with different frequencies and secondary outcomes that we use to examine the potential underlying mechanisms.¹⁰ Second, geological information on gold suitability provides spatial variation in our key explanatory variable, ASgM. Third, time-varying information on international gold prices provides temporal variation in ASgM, enabling us to capture the evolution of the number of people involved in ASgM and the revenues they collect from such activities over time.¹¹

⁹Besides a direct change among the mining community's residence, Benshaul-Tolonen (2024) also proposes a transmission channel of a new gender perspective from female migrants, who are more open and less tolerant towards domestic violence.

¹⁰In Appendix A.1, we provide details on our secondary outcomes, including gender- and industry-specific labor supply or economic activities, household wealth, attitude toward domestic violence, barriers to health care access, intrahousehold bargaining power, and migration.

¹¹Refer to Table B.1 for a detailed list of the DHS rounds used in the analysis and the availability of our outcome variables in each round.

3.1 Intimate Partner Violence Outcomes

The main outcome we investigate in this paper is the incidence of woman's intimate partner violence from her husband or partner. The existing studies suggest that economically empowering women, e.g., via improving their employment opportunities and earning potentials, could have significant but nuanced impacts on intimate partner violence as discussed in Section 2 (see, for example, Aizer, 2010; Bloch and Rao, 2002; Field et al., 2021; Erten and Keskin, 2021).

The DHS data provide information on different forms of intimate partner violence experienced by the respondent or the woman, including severe physical, less severe physical, and sexual violence. We can further disaggregate these three broad categories of domestic violence. First, less severe physical violence acts include whether a woman has been (i) pushed, shaken, or had something thrown, (ii) slapped, (iii) punched with a fist or hit by something harmful, and (iv) had her arm twisted or hair pulled. Second, severe physical violence acts include whether a woman has been (i)-kicked or dragged, (ii)-strangled or burnt, and (iii)-threatened with a knife/gun or another weapon. Finally, sexual violence acts include whether a woman has been (i)-physically forced into unwanted sex, (ii)-forced into other unwanted sexual acts, and (iii)-physically forced to perform sexual acts the respondent did not want to. We also examine these detailed categories of domestic violence.

The DHS surveys also report intimate partner violence at the extensive margin in different periods (whether a woman ever experienced domestic violence in her life, before the past twelve months, and in the last twelve months) and the intensive margin (the frequency of violence over the past twelve months: (i) sometimes and (ii) often). We focus on intimate partner violence experienced in the last twelve months at the extensive and intensive margins. The information on the frequency of domestic violence experienced by a woman in the past year allows us to investigate how ASgM shock impacts extreme and less extreme violent behaviors.

3.2 Gold Mining

We use geographic information on gold suitability throughout Africa obtained from Girard et al. (2023), who identified bedrocks suitable for gold. Like their study, we match the coordinates of the gold bedrock polygons to the PRIO-GRID 0.5×0.5 degrees cells and define dummy and continuous measures for each cell's gold suitability.¹² The dummy variable takes a value of one if a cell overlaps with a gold bedrock polygon and zero otherwise. To construct the continuous measure of gold suitability, we calculate the share of overlapping area between the cell and gold bedrock. This measure takes continuous values between zero (non-overlapping) and one (entirely overlapping), implying that a cell's gold suitability can range from totally to partially and entirely suitable.

We match these two measures of gold suitability to the DHS surveys by cells. We first determine

¹²A 0.5×0.5 degrees cell is about 55×55 kilometers at the equator (Tollefson et al., 2012).

the cell in which each DHS cluster lies and then use that information to match the gold suitability data with the DHS data at the cell level. The GPS coordinates of DHS clusters or primary sampling units (PSU) are randomly displaced by up to 2 kilometers for urban, and up to 5 kilometers for rural areas with a further displacement of 10 kilometers for 1% of the rural clusters. The displacement of DHS clusters can attenuate our estimates, but it should not bias our results as the displacement is random.

Industrial Gold Mining. Since industrial mining is also suitable in those gold-suitable cells, it is crucial to control ISgM to isolate the impact of ASgM from that of ISgM. Hence, the effect of gold suitability will be the effect of ASgM on our outcomes after conditioning on ISgM in our regressions. For an area to be suitable for large-scale industrial mines, the concentration of gold deposits has to be high enough for the industrial mines that require a substantial investment to be profitable (Benshaul-Tolonen, 2019; Bazillier and Girard, 2020). We use data on industrial mining throughout Africa obtained from Berman et al. (2017), which comes from Raw Material Data (RMD, IntierraRMG). Active mining areas and the type of minerals are defined at the PRIO-GRID cells of 0.5×0.5 degrees between 1997 and 2010. The variable we use in our baseline analysis is a dummy variable indicating whether a cell has industrial mines of gold. Since the data on industrial mines, including gold mines, were only available until 2010, we kept cells with and without industrial mines constant for the periods since 2010 at the state the latest period available, assuming that the spatial distribution of industrial mines remains the same. Figure B.2 presents the distribution of industrial gold mines in Africa across PRIO-GRID cells, showing that (i) industrial gold mines concentrate in the south, and (ii) the spatial distribution of industrial gold mines hardly changes over time until 2010. Therefore, it is reasonable to assume that the distribution of industrial gold mines across space has remained the same since 2010.^{13,14}

3.3 International Gold Price

Similar to Girard et al. (2023), we introduce temporal variation in gold suitability measures defined at the cell level for a given year based on the international gold price. Introducing temporal variation in gold suitability measures is critical as it enables us to capture the changing nature of revenue from ASgM and employment at ASgM sites.

International gold price is exogenous to local gold mining activities since small-scale artisanal gold miners are price takers in the global market. But, as the local gold price strongly correlates with the international price (Sánchez De La Sierra, 2020), the international gold price is highly

¹³As a robustness check, we also use industrial mines of the main minerals in each cell, including minerals other than gold. The spatial distribution of industrial mines of other minerals has also been stable between 1997-2010, especially between 2000-2010.

¹⁴In the next iteration of our analysis, we will use the data on the actual distribution of industrial mines across space in Africa since 2010 obtained from the S&P, which reports data on locations of all industrial mines and main minerals that they have produced each year since 1987.

relevant to ASgM activities at extensive and intensive margins. On the extensive margin, the opportunity cost of non-mining increases as the gold price increases. Then, ASgM becomes more profitable and attractive, leading to the start of gold-digging and exploring new sites. On the intensive margin, miners dig more by increasing their efforts at the existing artisanal gold mines to utilize the high price.

The yearly international gold price comes from the World Bank Commodity Price Data (Pink Sheet). We use a one-year lagged gold price index with a base in 2010 in our baseline analysis. For the robustness checks, we use the log of the lagged gold price and the current price as alternative measures of gold value.

3.4 Demographic and Environmental Controls

Following the relevant literature, we include several control variables in our regressions to account for other factors that affect male and female employment and intimate partner violence. Individual- and household-level demographics come from the DHS, whereas we obtain cell-level information from external sources. We discuss the cell-level factor of industrial gold mining above in this section, while Appendix A.2 provides a detailed description of the other environmental covariates we included in our regressions.

3.5 Summary Statistics

We present the descriptive summary for individual and household characteristics in Table 1. The mean age for our women sample is 31.4 years. Nearly 70 percent of them live in rural areas, and more than half have a place of residence different from their place of birth. Since the sample consists of ever-married women and the DHS reports women's experience of violence from their intimate partners, the women who have experienced violence over the past twelve months could have been married or living with a partner during that period. The woman's current marital status also could differ from her marital status when she experienced domestic violence in the last twelve months. More than three-fourths of women in our sample are currently married, slightly above 10% live with a partner, and the remaining about 10% are widowed, divorced, or separated. Most women in our sample have primary education or below (78%) and are Christian or Muslim (95%). Most have also been employed in the last twelve months, particularly in agriculture, while almost all of their husbands/partners are working.

Table 2 presents the descriptive statistics on intimate partner violence with different frequencies over the past twelve months. Panel A shows that about one-fourth of the women experienced domestic violence by their spouse or partner. Across various forms of domestic violence, mild or less severe physical violence is the most common, and incidences of sometimes experiencing violence are more prevalent than often experienced. In addition, Panel B further decomposes mild, severe,

and sexual violence into detailed categories, and we can see that being slapped, pushed, physically forced into unwanted sex, kicked or dragged, and punched with a fist by an intimate partner are the most common. But more severe incidents, such as having their partner strangled or burnt and threatening with a knife/gun, are rare.

Table 3 summarizes the cell-level characteristics for the 0.5×0.5 degrees PRIO-GRID cells that contain the DHS clusters. Across all DHS rounds, there are 3,948 cells. Nearly 60% of them overlap with the gold bedrock, and the mean share of overlapped area per cell is 26%. Most of them are classified as agriculturally suitable, whereas the criterion used to determine a cell's crop suitability is derived from FAO-GAEZ.¹⁵ Our key explanatory variable, gold suitability share \times gold price, which measures a cell's time-varying potential for gold, has a mean value of 0.21 and a standard deviation of 0.30.

4 Identification Strategy

In this section, we describe our empirical strategy for identifying the causal impacts of artisanal gold mining on outcomes of our interest. The approach that we use is consistent with the existing studies that quantify the effect of ASgM on environmental and economic outcomes in Africa (for example, Girard et al., 2023).

4.1 Empirical Specification

To examine the causal impact of ASgM on individual-level employment decisions and intimate partner violence, we estimate the following specification:

$$Y_{ict} = \beta_0 + \beta_1 \text{Gold Suitability}_c \times \text{Gold Price}_{t-1} + \\ + \mathbf{X}'_{ict} \boldsymbol{\gamma} + \mathbf{Z}'_{hct} \boldsymbol{\theta} + \mathbf{M}'_{ct} \boldsymbol{\delta} + \alpha_c + \pi_{country,t} + \varepsilon_{ict}, \quad (1)$$

where Y_{ict} is one of the domestic violence outcomes for woman i living in cell c at survey year t . The key explanatory variable is either a dummy or continuous variable of gold suitability for cell c interacted with the international gold price at time $t - 1$, a time-varying measure of a cell's potential gold value or revenue.¹⁶ We use the lagged value of the international gold price to capture that it takes time (i) for households and individuals to adjust their activities in response to changes in the local gold price and (ii) for the world price to pass through local price. In the previous section, we discussed the individual terms of the interaction term, $\text{Gold Suitability}_c$ and Gold Price_{t-1} , which we do not need to include in equation (1) because we control for cell and time fixed effects as we

¹⁵See Appendix A.2 for a description of the dataset used to construct the crop suitability index and how to classify a cell as agriculturally suitable.

¹⁶In the main results, we report the interaction between the continuous gold suitability measure and the gold price. We use a gold suitability dummy for a robustness check. The results are very robust using both measures.

discuss below.

The vector \mathbf{X}_{ict} contains a set of woman i 's characteristics, including age, education, marital status, and religion, a vector \mathbf{Z}_{hct} includes a set of household characteristics including place of residence and household size and a vector \mathbf{M}_{ct} contains a set of cell-level factors including industrial gold mining, agricultural potential, and weather conditions. In Appendix A.2, we describe each time-varying variable in detail. To control for time-invariant factors at the treatment level, we include cell fixed effects, α_c .

Since states or provinces and districts or communes within a country tend to be not independent of each other in Africa, i.e., each country tends to have a unified system, it is sufficient to control for country \times year fixed effects to capture all unobserved time-varying characteristics at the level higher than cells, such as changes in institutions, changes in labor market and domestic violence policies, the legal status of ASgM, and changes in local economic conditions. As suggested in the literature investigating the macroeconomic effects of mining, the mining boom leads to exchange rate appreciation due to increased capital inflows (Arezki et al., 2014) and an increase in the price of non-traded goods due to the income effect (Corden and Neary, 1982). These changes affect the production of different industries depending on their production input structure and goods consumption in general. Controlling for country-by-year fixed effects also captures such effects of Dutch disease, leaving the resource movement effects, i.e., employment transition across industries. Therefore, we consider that the main part of the variation left in our treatment variable is an employment shock or a shock that reallocates resources across sectors.

Given that we control for country-by-year fixed effects, we do not need to include country and time-fixed effects. The error term, ε_{ict} , captures the remaining unobserved, time-varying, and woman-specific determinants of outcomes, Y_{ict} . We cluster the standard errors at the cell level to allow for heteroskedasticity and serial correlation within cells, assuming that ASgM is varied across cells (Bertrand et al., 2004; Angrist and Pischke, 2009).

4.2 Identification Assumptions and Interpretation

We exploit spatial variation in suitability for gold mines and time variation arising from the international gold price to provide a causal interpretation of our estimates. The spatial variation comes from the difference between the cells suitable and non-suitable for gold on the extensive and intensive margins. Although a cell can be well suited for gold, there might be no gold-digging or mining in that cell unless such activity is profitable. Thus, we use international gold prices as a source of temporal variation that captures the dynamic profitability of mining activities. Exploiting changes in global prices is critical for identifying the causal effects of mining activities because it introduces exogenous time variation in local mining activities, as the international price is not affected by local conditions. Hence, the key identification assumption of global price exogeneity to interpret our estimate as causal is plausible in our setting.

The parameter of interest, β_1 , captures the effect of ASgM, not that of gold mining, given that we partial out the impact of ISgM in our regressions. Hence, controlling for ISgM is crucial for identifying the effect of ASgM, as the gold-suitable areas are suitable for both ASgM and ISgM. Similar to the gold suitability measure, we control for ISgM in our regressions by interacting it with the lagged value of the annual price of gold. Although it is an indirect way of identifying the effect of ASgM, the main advantage of using this indirect measure of ASgM is that we can capture both registered and non-registered artisanal mining. A direct measure of ASgM based on registered artisanal mines like in Gräser (2023), on the other hand, ignores the primary form of artisanal mining—non-registered mining.

As our identification relies on cells' gold suitability and their potential change in gold revenue rather than the actual gold production, it has some limitations that we discuss here. First, the estimated impact of ASgM is likely to be interpreted as a lower-bound estimate of the causal effect due to a potential attenuation bias. Some cells that are treated as gold suitable might not be well suited for gold because the river could have carried the ores of gold, which would also make some cells considered as not suitable for gold as actually suitable for gold. Second, gold-suitable cells might not practically posit any gold, or the gold in the cells might not be reachable. The gold-suitable cells with gold at some period could run out of gold in the subsequent periods. Therefore, our measure of gold mining is likely to be subject to measurement error to some extent, and thus, our estimates are likely biased toward zero. Third, the attenuation bias might also come from the random displacement of the DHS cluster, although this will not bias our estimates (Girard et al., 2023).

Another identification concern relates to the domestic violence reporting bias, which might be correlated with changes in women's employment or earnings. Specifically, women might report domestic violence incidents more as they become more confident due to their better employment or earning potential, potentially resulting in a bias in our estimates.¹⁷ Despite this potential increase in experiences of domestic violence due to better employment and earning outcomes in response to positive mining shock, we identify a decline in intimate partner violence due to the ASgM shock, which we present in the following Section. Therefore, we find a significant reduction in intimate partner violence even if there is a potential upward bias in the reported domestic violence incidents due to the treatment.

5 Results

In this section, we first discuss the results from estimating the effects of ASgM on intimate partner violence. We also briefly discuss the impact of ISgM. Second, we present the dynamic patterns of ASgM impacts in the medium and long term, which speaks about the persistence of the effects

¹⁷Relatedly, the literature investigates the reporting bias of intimate partner violence in surveys, such as Park et al. (2024) suggest that asking domestic violence questions via self-interviewing method increases the reported violence incidents by 13 percentage points in Malawi and 4 percentage points in Liberia.

over time. Then, we present results from estimating heterogeneous effects. We finally examine the robustness checks of our main results.

5.1 Contemporaneous Effects of Artisanal Gold Mining

The impacts of ASgM shock on intimate partner violence experienced by women in the last twelve months are reported in Table 4. Panel A shows that the probability of women experiencing intimate partner violence, especially less severe physical violence, decreases significantly in gold-suitable zones when the gold price increases. However, the impacts of ASgM on severe physical and sexual violence are essentially zero, although the coefficient estimates are negative. Then, we split the domestic violence incidents into two different frequencies: (i) violence sometimes experienced in the last twelve months (Panel B), and (ii) violence often experienced over the past twelve months (Panel C).¹⁸

Most of the negative effects of ASgM on ever-experienced domestic violence over the past twelve months come from the impacts on the less frequent violence (Panel B of Table 4). The results shown in Panel C of Table 4 suggest that any of the different forms of domestic violence often experienced in the last twelve months are not affected by the ASgM shock. This finding is intuitive because such violent behaviors remain unchanged unless the shock significantly changes men's behavior. It is also generally consistent with results from studies on alcohol controls-domestic violence relationship (for example, Basu et al., 2025) that suggest that regulating alcohol consumption is less effective in reducing the likelihood of often experiencing intimate partner violence.

Although the effects of ISgM are not our central focus, we present notable findings on ISgM effects. The impacts of ISgM are the opposite of those of ASgM and are strongly significant (Table 4). In Table B.2, we present the effects of the other two cell-level covariates on broad categories of intimate partner violence. First, crop suitability is weakly associated with an increase in domestic violence, especially sexual violence that occurred sometimes in the last twelve months. However, severe physical violence decreases in crop-suitable regions when crop prices increase. Second, temperature negatively affects intimate partner violence in general. The impacts of temperature on intimate partner violence are not statistically significant; however, it significantly reduces the incidence of severe physical violence (Column (3) of Panel A), particularly those that sometimes occurred in the last twelve months (Column (3) of Panel B). Like other shocks, domestic violence often experienced in the past twelve months does not respond to crop suitability and temperature (Panel C).

To examine the impact of ASgM on intimate partner violence in more detail, we further dis-

¹⁸The domestic violence-reducing impact of artisanal gold mining could be mechanical, i.e., violence reduced because employment in mining and sales requires women to spend more time outside the home away from their husbands and lower the wife's exposure to their husband. Due to the absence of data on an individual's time use, we cannot directly check this possibility. But, in the next section, we investigate other potential mechanisms, given the data availability.

aggregate the three broad categories of domestic violence into ten forms of violence, and Table 5 reports the estimation results. We highlight the main findings. First, we find that, among less severe physical violent activities, the likelihood of women being slapped and punched with a fist or hit by something harmful drives the violence-reducing impact of ASgM identified above (Columns (2) and (3) of Panel A). Second, similar to the results above, these effects mainly come from decreases in violence experienced sometimes (Columns (2) and (3) of Panel B), but the negative impact on the likelihood of being slapped holds for experience occurred often over the past twelve months as well (Column (2) of Panel C). Third, the probability of women being forced into sexual acts other than sex is strongly higher in gold-suitable cells when the gold price increases (Column (9) of Panel A). However, the impact of ASgM shock on broadly defined sexual violence was not significant and negative. This result holds for experiences that occurred sometimes and often (Column (9) of Panels B and C). It is also generally consistent with previous findings that a rise in artisanal gold mining increases sexual violence (Fourati et al., 2022; Rustad et al., 2016; Kotsadam et al., 2017). As suggested by studies on the link between artisanal mining and sexual violence such as Rustad et al. (2016), the main reason for sexual violence against women by an intimate partner to grow in areas near artisanal mining is the subcultures of hyper-masculinity associated with mining. Additionally, we find that the probabilities of women sometimes being threatened with a knife/gun or other weapons (Column (7) of Panel B) and often being physically forced into unwanted sex (Column (8) of Panel C) decrease; however, these effects are weakly significant at the 10% level.

Similar to our results for broad categories of domestic violence, the effects of industrial gold mining on some of the detailed categories are positive, i.e., opposite to that of artisanal gold mining, and the impacts are more significant for domestic violence experienced sometimes by women. For the three forms of sexual violence under consideration, industrial gold mining increases the two types on which ASgM does not significantly affect. Put differently, ISgM increases the likelihood of women being physically forced into unwanted sex and physically forced to perform sexual acts the wife did not want (Panel A of Table 5).¹⁹

5.2 Persistence of the Contemporaneous Effects

In the previous part of this section, we show that some forms of domestic violence in gold-suitable regions respond to a concurrent increase in international gold prices. But, in this part, we examine whether these contemporaneous effects persist over time by estimating the domestic violence out-

¹⁹Table B.3 first shows that the positive relationship between agricultural productivity and sexual violence is driven by an increased incidence of women sometimes being physically forced to perform sexual acts the woman did not want (Column (10) of Panel B). The negative link between crop suitability and physical violence is concentrated among incidences of women having had their arms twisted or hair pulled (Column (4) of Panels A and B) and kicked or dragged (Column (5) of Panels A-B). Second, the high temperature reduces the likelihood of women being kicked or dragged (Column (5) of Panels A and B) and strangled or burnt (Column (6) of Panel B). However, it increases the probability of women being physically forced to perform sexual acts respondents did not want (Column (10) of Panels A and B).

comes on the value of international gold price up to 10 years before the survey year, including one year before (one year lagged) being our baseline regression.²⁰

The dynamic effects of ASgM on broad categories of domestic violence are shown in Figure 3, and the results suggest nuanced effects that significantly evolve over time. These results include (i) the negative effect of ASgM on less severe physical violence tends to be sustained in the long run, (ii) the statistically insignificant effect of ASgM on severe physical violence turns negative and statistically significant at the 5% level in the long run, and (iii) statistically insignificant effect of ASgM on sexual violence becomes positive and statistically significant at the 10% level in the long run. The negative impact on intimate partner violence lasts only two years and becomes statistically insignificant starting from the third year after the price shock (Panel (a)). When we consider domestic violence with different frequencies, similar to our results in the previous part, the main findings for domestic violence in the last twelve months are driven by violence experienced sometimes. The only exception is that the negative impact of ASgM on intimate partner violence experienced sometimes tends to persist in the long run (Panel (b)). As presented in Panel (c), the null effects of ASgM on different forms of domestic violence experienced often remain at zero. However, the point estimates tend to turn positive despite the statistical insignificance.

For detailed categories of domestic violence, we focus on five forms of violence that the ASgM shock has a significant contemporaneous impact on, including women being (i) slapped, (ii) punched with a fist or hit by something harmful, (iii) threatened with knife/gun or other weapons, (iv) physically forced into unwanted sex, and (v) forced into other unwanted sexual acts. Figure 4 presents the results. In terms of domestic violence shown in panel (a), the decrease in the likelihood of women being slapped is persistent over time. However, the impacts in different periods are weakly significant at the 5% level. For the other less severe physical violence, i.e., women being punched with a fist or hit by something harmful, the weakly significant contemporaneous effect deepens in the medium term and becomes strongly significant. But it vanishes in the long run and becomes essentially zero. The significant positive impact of ASgM on women's likelihood of being forced into other unwanted sexual acts persists for about eight years, but it eventually becomes zero afterward. For intimate partner violence that happens sometimes, persistency of contemporaneous effects stays relatively longer (panel (b)). Finally, for domestic violence that happens often, we find that those changes do not last long, except for unwanted sexual acts, which persist for about five years after the shock (panel (c)).

²⁰Considering the time required for the world price to pass through to the local price and the possibility of intimate partner violence occurring at the beginning of the past year, the use of more than one year lag for the gold price, especially 2-3 years lag, also provides a robustness check of our results.

5.3 Heterogeneous Effects

We quantify heterogeneous effects of ASgM on intimate partner violence to analyze which demographic groups drive the average effects and provide initial evidence on the potential mechanisms, which have been further explored in Section 6.

First, we estimate the heterogeneous impacts by household's place of residence. Since artisanal mining sites are more likely to be located in rural areas, we expect impacts to be concentrated among rural households.²¹ Most of the changes in the prevalence of intimate partner violence (both broad and detailed categories) in response to ASgM shock are concentrated in rural households (Figures 5 and 6). For example, decreases in less severe physical violence and thus domestic violence in the last twelve months in response to mining shock that we found in our baseline estimation (Panel A of Table 4) concentrate among rural households (panel (a) of Figure 5). The negative impacts of ASgM on violence sometimes occurred in the last twelve months are also significant in the rural sample, while the effects are not statistically significant in the urban sample (panel (b) of Figure 5). As shown in panel (c) of Figure 5, the prevalence of domestic violence often experienced by women are still not responsive for urban and rural households. These results are intuitive and consistent with our expectations.

Second, we perform heterogeneity by woman's age, which is likely a significant factor for intrahousehold bargaining power. The results, shown in Figure 7, suggest that the violence-reducing effects of ASgM are statistically significant across various age groups (panel (a)). However, the ASgM effects on domestic violence experienced sometimes are relatively stronger in both magnitude and significance for older women (panel (b)). The domestic violence experienced often do not change (Panel (c)), consistent with the results from heterogeneity analysis by place of residence above. Figure 8 presents the results for detailed categories of intimate partner violence.

Third, we analyze heterogeneity by household wealth since the treatment might have affected the individuals and households differently, for example, low-income individuals could be the first to choose to work on artisanal mining sites when the extractive activity becomes more profitable. Figure 9 presents the results, suggesting that the negative impacts of artisanal gold mining on intimate partner violence, particularly less severe physical violence, are concentrated among households with middle wealth. In Section 6, we estimate the employment effects heterogeneous by household wealth to check if female employment is more pronounced than male employment among middle-wealth households.

Finally, we estimate the heterogeneous effects by the age difference between the woman and her partner, and results are shown in Figure 10. This heterogeneity also allows us to incorporate men's characteristics in our analysis. We find that the violence-reducing impacts of ASgM come from women whose age differences from their husbands or partners are in the third tercile, i.e., women

²¹ According to our data, more than 60% of rural regions are suitable for gold, while about half of the urban areas are suitable for gold.

with age close to their partners (panels (a) and (b)).²² The prevalence of violence from an intimate partner is higher as couples' age gets closer: the fraction of women experiencing domestic violence in any form in the last twelve months is 0.21, 0.25, and 0.27 in the first, second, and third terciles of the age difference. So, the regression results suggest that domestic violence incidents have reduced the most for women whose experience of domestic violence is more prevalent.

5.4 Robustness

We conduct a battery of robustness checks of our main results on the concurrent effects of ASgM on intimate partner violence.

Gold Suitability Dummy. In our baseline analysis, we used the share of the cell's area suitable for gold as the spatial treatment. In the first robustness check, we replace this continuous measure of gold suitability with a dummy indicating whether a cell is generally suitable. The results, shown in Tables 6 and 7, are consistent with the baseline findings. For the detailed categories of domestic violence, statistical significance changes for a few outcomes, but the signs for those coefficients are generally similar to the main results.

Alternative Gold Prices. We checked the robustness of the ASgM effects in the previous part by changing the spatial portion (cell's gold suitability) of the variation in the treatment. Now, we test the robustness of our estimates by changing the time-varying part of the variation, i.e., gold price. The baseline analysis uses the 1-year lagged gold price. This section replaces the baseline price variable with either (i) the log price to account for the possibility that mining can have a concave effect on our outcomes or (ii) the current price at the survey year (Berman et al., 2017). The estimates in Tables 8–10 suggest that the results are remarkably robust.

Industrial Mineral Mining. The next robustness check considers replacing ISgM with industrial mining of multiple minerals, including gold,²³ since mineral prices tend to be correlated. We redefine the industrial mining variable by interacting the dummy for a cell's main mineral extracted in an industrial mine with its international price. We report the results in Tables 11 and 12. The coefficient estimates on the effect of artisanal gold mining remain qualitatively the same. The impact of ISgM on intimate partner violence that we found in our baseline analysis is also robust to an alternative measure of industrial mining, i.e., ISgM increases domestic violence towards women by their husbands and partners who are likely to gain more intrahousehold bargaining power in response to improvements in large-scale and capital-intensive industrial mining.

Controlling for Temperature-Induced Push Factor. While an increase in potential gold value acts as a pull factor that drives labor toward mining employment, following Girard et al. (2023), we

²²The women in the first, second, and third tercile are approximately 18, 7, and 2 years younger than their husbands or partners, on average.

²³Other minerals include aluminum, coal, copper, diamond, iron, lead, nickel, phosphate, platinum, silver, tantalum, tin, and zinc.

then use changes in annual temperature as a push factor inducing the movement out of agriculture and potentially into mining due to the sector's low entry barrier (Hilson, 2016). While adverse weather conditions can have detrimental effects on agricultural production, employment, and food security, those living near the artisanal gold mines might be able to adjust their labor supply to other sectors faster, which alleviates the negative weather effect and influences the bargaining position and interaction of household members. We include an interaction between the cell's gold suitability measure and average annual temperature to capture the weather-induced push factor. Incorporating the push factor still preserves our main findings regarding the ASgM effects since the coefficient estimates on ASgM effects are remarkably similar to the baseline results. Moreover, a temperature rise in gold-suitable areas reduces the incidence of experiencing intimate partner violence, except for domestic violence often experienced by women, particularly less severe physical violence, on which the temperature in gold-suitable areas has positive impacts (Tables 13 and 14). The domestic violence-reducing effects of temperature in gold-suitable areas are consistent with the employment shift from agriculture to mining in response to higher temperatures in gold-suitable areas.

Controlling for Husband's Characteristics. In this robustness check, we include the husband's demographic characteristics, including age and education level, in our primary regression of broadly defined domestic violence outcomes. Due to missing values in the husband's characteristics, we did not control these variables in our baseline regressions but used them for robustness. Table 15 presents the results. Although the sample size has been reduced nearly by 20%, the baseline effects of ASgM and ISgM on our primary outcomes are highly robust. The standard errors slightly increase in the regressions of domestic violence sometimes experienced in the last twelve months. However, the effects of ASgM on overall and less severe physical violence are still statistically significant, at least at the 10% level. The magnitudes of the coefficients are relatively stable. The qualitative results from regressions of domestic violence ever experienced (panel A) and sometimes experienced remain the same.

6 Mechanisms

In this section, we examine the potential mechanisms through which ASgM could have affected intimate partner violence. In doing so, we first investigate if ASgM improves various measures of women's intrahousehold bargaining power. Second, we estimate the effects on industry- and gender-specific employment and household wealth to evaluate the underlying reasons for changes in women's intrahousehold bargaining power. Third, we rule out some other potential channels, including household wealth, compositional changes, and the husband's alcohol drinking. We also provide some evidence on the separation as a channel, i.e., intimate partner violence reduced because partners stopped living together.

6.1 Women’s Intrahousehold Bargaining Power

Our finding on a decrease of less severe physical violence in cells more suitable for ASgM could be due to an improvement in women’s intrahousehold bargaining power. To evaluate this mechanism, we estimate the effect of artisanal gold mining on various measures of intrahousehold bargaining power. The results reported in Table 16 suggest this channel is plausible. Specifically, ASgM improves women’s final say in the decisions on their healthcare, household’s large and daily purchases, and family visits. Unlike Benshaul-Tolonen (2024), we do not find any effects of ASgM on women’s attitude toward domestic violence or healthcare access, as shown in Table 17. However, we found that ISgM significantly reduces the overall barriers to women’s medical access, especially in getting permission, and the effect is much stronger than ASgM. An improved women’s bargaining power combined with a decline in intimate partner violence indicates that the bargaining power channel dominates the potential backlash effect, which is consistent with Heath and Riley (2024), who suggest no backlash effect of digital money treatment in Tanzania.

6.2 Female Labor Supply, Structural Transformation, and Earning Potential

We now move to the results on the employment effects of ASgM to investigate the impact of ASgM on women’s intrahousehold bargaining power. As we discussed in Section 2, women’s intrahousehold bargaining power and intimate partner violence against them depend on the wife’s employment and earnings relative to the husband. Table 18 shows the estimated effects of ASgM on overall (panel A), male (panel B), and female (panel C) employment in the aggregate economy and across different industries, including mining, agriculture, services, and sales or retail.²⁴ The overall employment effects mirror the results in Girard et al. (2023). Our innovation in employment effects of ASgM is thus the heterogeneous effect by gender, which is essential for our analysis. Aggregate and gender-specific labor supply decrease in response to a positive shock of ASgM; however, the negative impact is not statistically significant (Column (1)). It indicates that employment is not the main channel. But overall employment in mining or extractive activities significantly increases due to ASgM shock, as expected. The magnitude of the positive impact of ASgM on female labor supply is twice as much as that on male labor supply. The statistical significance of the ASgM effect is more significant for women than men. These indicate that women supply their labor to artisanal gold mining more than men when the industry becomes more profitable (Column (2)).

As shown in Column (3) of Table 18, in contrast, agricultural activities by men and women or male and female employment in agriculture decreases, and the effects are statistically significant

²⁴ Additionally, employment in mining and agriculture is negatively correlated with a correlation coefficient of -0.10 (*p*-value: 0.00), which confirms that agricultural employment can be used as a proxy for non-mining employment. The correlation coefficient between employment in mining and agriculture industries is -0.15 (*p*-value: 0.00) and -0.07 (*p*-value: 0.00) for male and female workers, respectively.

at the 5% and 10% level, respectively. The magnitude of the coefficient estimates on agricultural employment effects are the same for men and women. The impact of ASgM on the probability of either a man or woman being employed is negative but not statistically significant. The contrasting changes in mining and agricultural employment suggest that (i) employment increase in mining comes from agricultural employment and (ii) there is likely a structural transformation from non-mineral to mineral industry when mining becomes more profitable according to the Dutch disease hypothesis (van der Ploeg, 2011; Aragón and Rud, 2013).

In Column (4) of Table 18, we show the results on employment response in services due to mining shock. The result suggests that the effects of ASgM on overall and gender-specific labor supply in the services industry are negative. However, the impact on female employment in services is not statistically significant. It indicates a potential transition from services to extractive industry, which is plausible because it could be relatively less costly to leave the services industry, particularly for men. The reason that female employment in services does not significantly decrease could be because of a positive impact of increased aggregate demand from positive mining shock in services than in the agricultural industry. Considering that women can have a comparative advantage in services, they will be the last to leave the industry, consistent with the essentially null employment effects in services for women. Finally, as shown in Column (5), female employment in sales or retail industry increases, while an increase in male employment in sales is not significant. One of the reasons that women get into non-mining industries like sales/retail after the positive mining shock is that women are not allowed to go to mining sites in some countries, such as Liberia, due to traditional gender-based beliefs. This result is consistent with Gräser (2023), who show an overall pattern of women entering the sales/retail industry in response to the opening of artisanal mining.

Given that the underlying mechanism for strengthening women’s intrahousehold bargaining power is not higher employment, at least on the extensive margin, we further explore other potential mechanisms. Several mechanisms could have increased women’s bargaining power within the household, mainly by increasing their earnings relative to their husbands or partners. As theoretically modeled in Basu (2006), a woman’s bargaining power or “balance of power” can be influenced by the household’s decision, for example, through what she earns rather than the female wage rate or employment status. First, female employment in mining and sales industries increased, which could have led to a rise in women’s earnings.²⁵ Second, although we cannot empirically check due to the data limitation, women’s hours and days spent on mining activities and retail work could have intensively increased, leading to a rise in their total earnings. Third, male employment increased only in mining and decreased in two industries (agriculture and services), while female employment increased in mining and sales and decreased only in agriculture. So, earning potential might have improved more for women than men, strengthening women’s intrahousehold bargaining power relative to men.

²⁵The DHS does not report an individual’s wage and earnings, so we cannot examine how ASgM affects women’s earnings relative to men. But, we have shown that household wealth increased due to the ASgM.

The lack of data on individual-level income restricts this paper from directly checking if the wife's earnings increased more than her husband's. However, we estimate the effect of ASgM on household wealth combined with the employment effects above to indirectly examine a channel of increase in a woman's income relative to her husband or partner. The effect of ASgM on household wealth in Sub-Saharan Africa has been estimated in Girard et al. (2023); however, we re-estimate the wealth effects under five different scenarios to offer some validity and robustness. We document a significantly positive impact of ASgM on household wealth (see Table 19). We do not know the contribution of the wife and husband to the household wealth growth. However, we conjecture that the wife's income increases more because (i) household wealth increases, (ii) the employment effect is more significant in magnitude and statistical significance, and (iii) women's employment increases in more industries, such as sales or retail. Thus, the household wealth-increasing impact of ASgM and our results on employment responses indicate that the increase in payrolls or income from extractive activities was substantial, especially for women. An increase in overall and female employment in the sales or retail industry, shown in Column (5) of Table 18, could also indicate an improvement in aggregate demand through higher income.

As discussed in the previous section, we estimate the employment effects heterogeneous by household wealth. Figure 11 shows the results. An increase in mining employment is higher for low-wealth households, and the positive impact on mining employment by either men or women is at least weakly significant for low- and middle-wealth. These results are mainly driven by females, whose labor supply strongly increased even among middle-wealth households (panel (c)), while men's mining employment weakly increases only in low-wealth households (panel (b)). This result supports our findings above on the primary mechanism, indirectly suggesting that higher female earnings from more female employment in the mining industry relative to men leads to a decline in intimate partner violence.

6.3 Household Wealth

We further check whether a reduction in intimate partner violence is mediated through a change in household wealth because Haushofer et al. (2019) show that changes in household income affect the intimate partner violence in the context of a cash transfer program in Kenya. Thus, we run the baseline regression on domestic violence outcomes with household wealth index as an additional covariate, and we report the results in Tables 20 and 21. Higher household wealth significantly reduces all forms of domestic violence incidents. However, since the magnitude of ASgM coefficients hardly changes, except for a slight decrease, household wealth is not the primary channel through which ASgM affects intimate partner violence.

6.4 Composition Changes and Separation

We check if the baseline results reflect the changes in the composition of the mining communities over time in response to the gold price shock. For example, a boom in ASgM could trigger more inflows of migrants, particularly young women, to the communities, and those women carry different gender attitudes that help to transmit to the host communities (Werthmann, 2009; Benshaul-Tolonen, 2024; Kotsadam and Tolonen, 2016). They are also less likely to engage in traditional agriculture and more likely in mining or services/trade activities. We, therefore, regress women's characteristics on the explanatory variable controlling for the same cell-level covariates and fixed effects, and Table 22 reports the results. We found no significant impact of ASgM on all characteristics except that, after the gold price increase, women living in gold-suitable areas are less likely to live together with their unmarried partner and more likely to be separated from a consensual union (Columns (3) and (6)). It could happen in two cases. First, the number of couples who are separated or not living together could have increased if more women in such situations migrated into the area. Second, couples who used to live together start to live separately when the economic and employment opportunities rise due to a gold price hike.

To evaluate the first possibility, we examine the women's migration pattern in more detail. In Table 22, we classify a woman as a migrant if her place of residence is different from her birthplace, which could be too broad to capture migration flow in response to a contemporary local demand shock. Thus, we show alternative regression results when we code a person's migration status based on how many years she has lived in her location (Table 23). We observe a weakly significant increase in new migrants, those who arrived in the community less than a year ago, especially among ever-married women. The effects on more established migrants are insignificant and attenuate over time. These results suggest that the composition of the communities is generally stable in response to the shock. Given no major changes in the population composition, the first channel described above is less plausible. So, the intimate partner violence could have been reduced via a "separation" effect due to less interaction between partners as they are not living together.

6.5 Alcohol Drinking

Studies on the link between alcohol consumption and domestic violence suggest that husband's or partner's alcohol drinking is a significant determinant of violent behavior and intimate partner violence in developed (Card and Dahl, 2011; Ivandić et al., 2024) and developing (Luca et al., 2015, 2019; Basu et al., 2025) countries. Since the employment and income from artisanal mining by husbands or male partners can increase their alcohol consumption through income effect²⁶ and high rates of binge drinking (Cawley and Ruhm, 2011) or reduce alcohol consumption via problem drinking effect (Mullahy and Sindelar, 1996). The DHS data collect information on whether a woman

²⁶See Fogarty (2010) for a comprehensive literature review on studies estimating the income elasticity of demand for alcoholic drinks.

and her husband or partner drink alcohol. Leveraging this information, we first estimate the effect of artisanal gold mining on husband's alcohol drinking to examine if its impact on intimate partner violence is mediated through changes in men's alcohol consumption. Panel A of Table 24 reports the results under four separate specifications wherein more controls are added successively. Our baseline and preferred specification in Column (4) suggests that the effect of artisanal gold mining on a husband or partner's alcohol consumption is essentially zero. This result provides evidence that ASgM does not reduce intimate partner violence via altering the husband's alcohol drinking and the associated behavioral changes.

Although the data on women's alcohol drinking status is available for limited countries and DHS rounds, we estimate the effect of artisanal gold mining on women's drinking behavior and find that ASgM reduces women's alcohol consumption. The impact is statistically significant at the 10% level (panel B of Table 24). This finding supports our results on the positive effect of ASgM on female employment, which is more significant than the male employment effect. Women reduce alcohol drinking as they supply their labor to broader industries in response to the positive economic shock. However, industrial gold mining strongly increases women's alcohol consumption, and the effect is larger both in magnitude and statistical significance. It potentially indicates the non-gender-inclusive feature of industrial mining.

6.6 Fertility Decision

So far, we have focused on explaining how ASgM might have reduced physical violence and thus overall domestic violence. However, the baseline effects on detailed categories of intimate partner violence suggest that ASgM increases a specific form of sexual violence, i.e., women being forced into unwanted sexual acts other than sex. Women's better labor market opportunities and earning potentials might make a wife postpone fertility (Baizán, 2007; Bloom et al., 2009; Aaronson et al., 2021; Doepeke et al., 2023), while the husband wants a child. So we estimate the impact on fertility decisions proxied by the number of children, and results are shown in Table 25. The effects of ASgM on different fertility measures are statistically insignificant; however, the signs of the coefficients are negative. Although the impact is not statistically significant or imprecisely estimated, the result provides suggestive evidence on the negative effect of female labor force participation and fertility, which could explain an increase in the wife's experience of unwanted sexual acts by her husband or partner. The insignificant impact of ASgM on fertility, however, is consistent with the insignificant effect on overall female employment. It is also possible that the husband wanted sexual acts other than sex when the wife refused to have sex preventing them from having children.

7 Conclusion

This paper examines the impact of artisanal gold mining on intimate partner violence in Sub-Saharan Africa. Since data on gold mining have been limited to industrial mines only, the literature on the socio-economic impact of mining so far has been restricted from investigating the impact of artisanal mining at the micro and macro levels. Leveraging continent-wide information on gold suitability along with industrial gold mines at the granular or cell level and exogenous variation from international gold price, we provide the first estimates on the causal effects of artisanal gold mining on intrahousehold bargaining power with a focus on intimate partner violence. Using nationally representative individual and household-level repeated cross-sectional survey data from more than 30 countries in Sub-Saharan Africa, we provide population-based evidence with strong external validity.

Our analysis shows that the domestic violence declines in gold-suitable areas when the profitability of gold mining increases. In the short term, less severe physical violence with less frequency decrease, which drives the negative impact of ASgM on domestic violence. Women's intrahousehold bargaining power improved due to the ASgM, indicating that the bargaining power channel dominates the potential backlash effect. The overall employment does not change for men and women in response to increased profitability of extractive activities; however, women's employment increased with higher magnitude in more industries, including mining and sales or retail, than men.²⁷ Combining these with a result suggesting that artisanal mining increases household wealth, we argue that the primary underlying mechanism that strengthens women within the household is a potential rise in women's earnings relative to husbands or partners. This result is in line with a theoretical framework where women's better economic conditions improve their intrahousehold bargaining power and reduce violence by their intimate partners. The incidence of women being forced into unwanted sexual acts other than sex by their husbands or partners, however, increases when the value of artisanal gold mining rises, suggesting a highly heterogeneous impact of artisanal gold mining. The declines in domestic violence, particularly less severe physical violence, tend to be sustained over time. However, our results show that severe physical domestic violence eventually decreases in the long run while the incidence of sexual violence increases. Given the unique nature of our data, we also disentangle the effects of industrial gold mining from artisanal gold mining and show that industrial mining and artisanal mining have opposite impacts on intimate partner violence. Industrial gold mining, which is less inclusive and highly dependent on heavy machines operated by men, increases violence against women.

This evidence provides three critical implications for understanding the socio-economic impacts of mining. First, it is crucial to distinguish the effect of artisanal mining from that of industrial

²⁷The increases in male and female employment in the mining industry mainly come from the agriculture industry, which presents a shrinking employment due to mining boom, indicating a potential structural transformation in the short term.

mining because they have different implications due to the operational differences between the two sectors. Second, we show that women's empowerment via better earning potentials from employment opportunities in artisanal gold mining contributes to their well-being by reducing domestic violence. This impact seems to dominate the potential backlash effects in our context. Third, policymakers should also consider the heterogeneous impacts of artisanal gold mining on various forms of domestic violence, especially sexual violence.

We conclude with some caveats and directions for future research. This paper shows an improvement in women's intrahousehold bargaining power. However, we fail to find a significant and positive impact of artisanal mining on overall and gender-specific employment. Since our results suggest that household income increases in regions suitable for gold when the price increases, we argue that the potential underlying mechanism through which ASgM affects women's intrahousehold bargaining power and intimate partner violence is an increase in women's total earnings relative to men. Women's total earnings could increase due to (i) a relative increase in their employment on the intensive margin—they work longer hours or for more days, and (ii) wages or payouts per unit of labor increases. Therefore, first, because the DHS offers information on an individual's economic activities only on the extensive margin (whether an individual is involved in an economic activity), future research can use better employment data, e.g., with information on an individual's employment on the extensive and intensive margins, to confirm our null overall employment effect and provide evidence on the employment effects on the intensive margin. Second, one can explore data on individual-level earnings and wages to directly investigate the underlying mechanism via a relative increase in women's earnings that we propose based on indirect evidence. Third, more generally, future research can use the rich data on gold suitability combined with industrial gold mining or direct measures of artisanal mining to study other socio-economic issues around artisanal mining.

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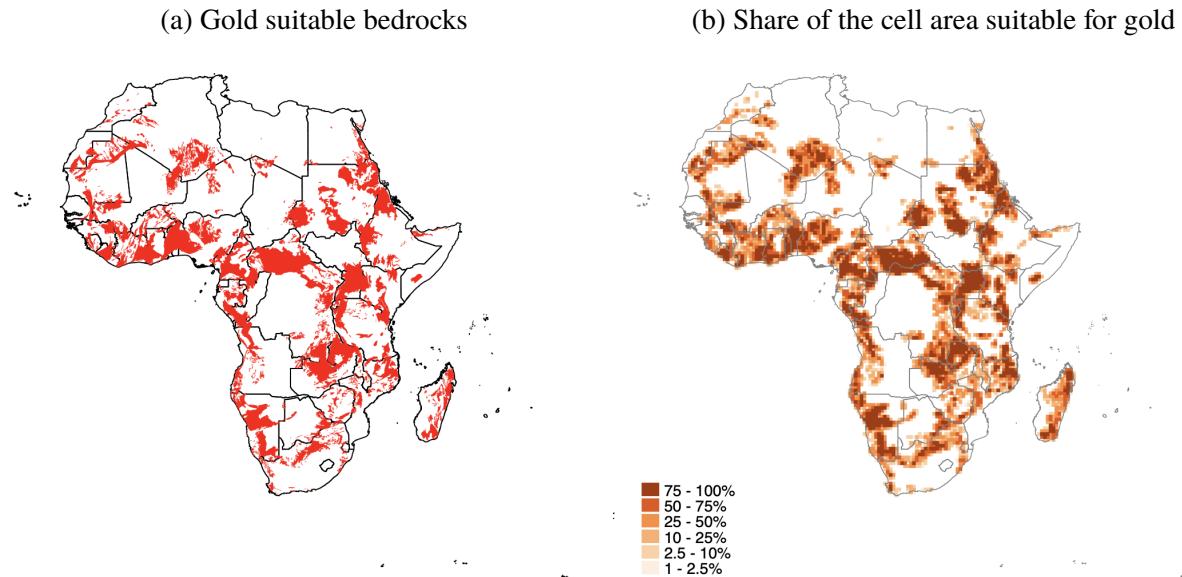
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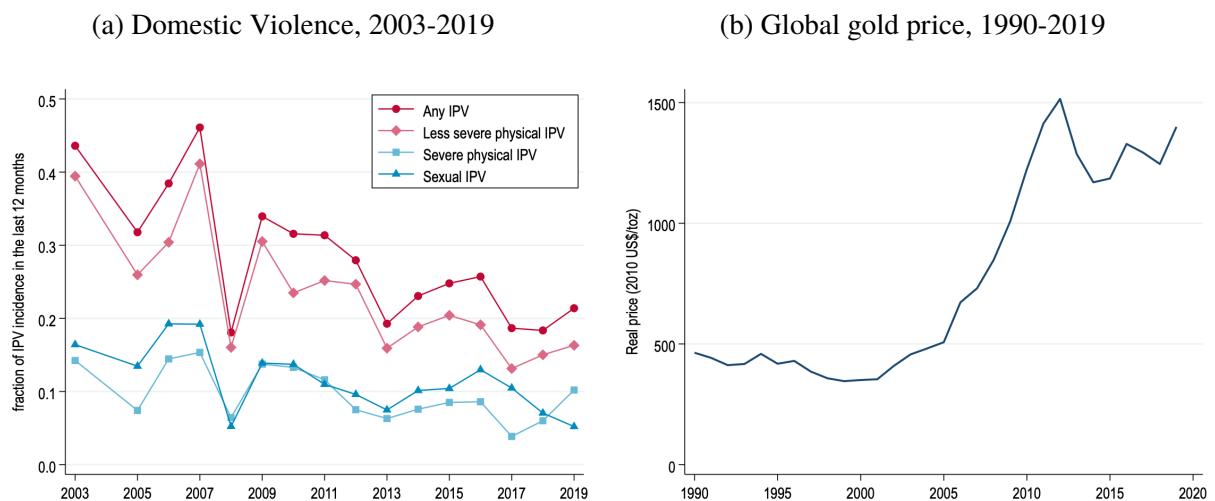
Figures

Figure 1: Artisanal Gold Mining in Africa



Notes: Panel (a) depicts the geological bedrocks suitable for artisanal gold mining based on data from Girard et al. (2023). Panel (b) shows the percentage of areas suitable for artisanal gold mining in the PRIO-GRID cells of 0.5×0.5 degrees or 55×55 kilometers at the Equator.

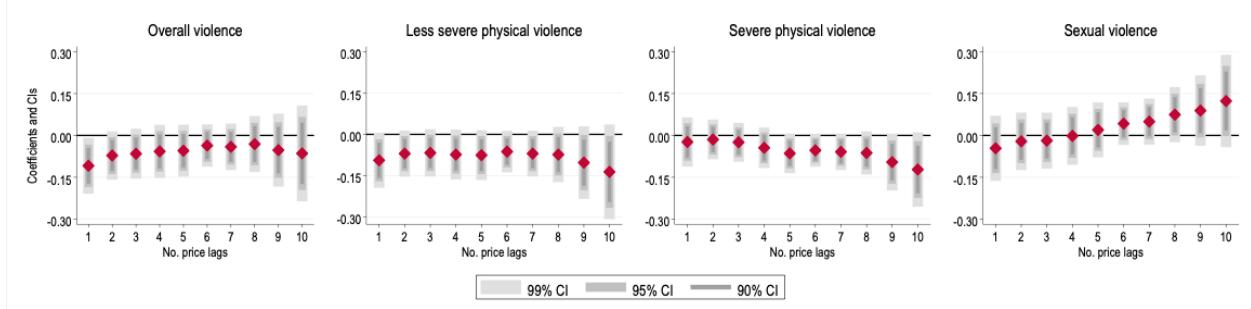
Figure 2: Trends of Domestic Violence and Global Gold Price



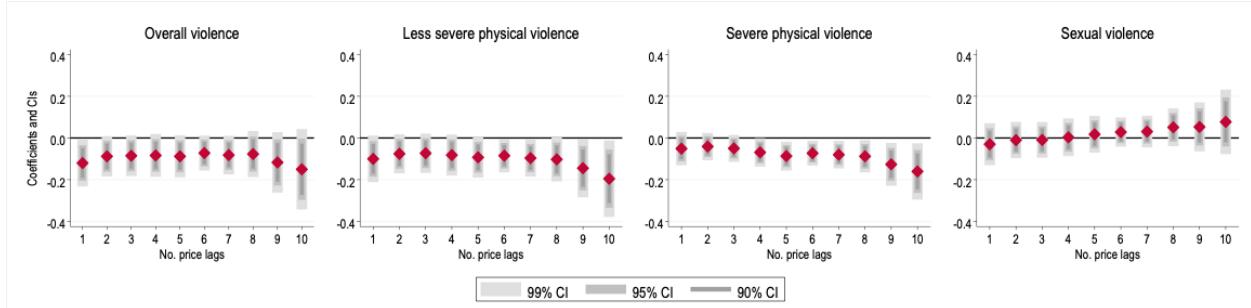
Notes: Panel (a) plots the trend of intimate partner violence in Sub-Saharan Africa using the DHS data from 2003-2019. The domestic violence data was unavailable in 2004 for all countries in our sample. The sample weight is applied to calculate the average incidence of intimate partner violence. Panel (b) shows the annual average price of gold (in 2010 US\$/troy ounce) in the international market between 1990 and 2019 using data from the World Bank's Pink Sheet.

Figure 3: Persistence of ASgM Effects on Broad Categories of Domestic Violence

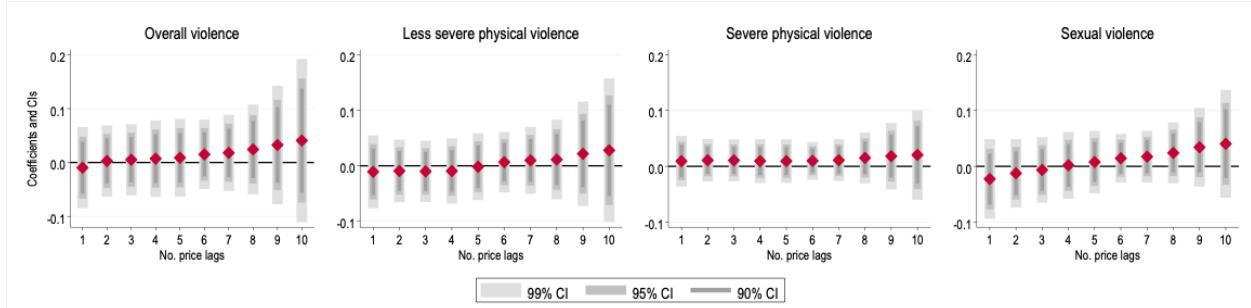
(a) Ever experienced



(b) Sometimes experienced

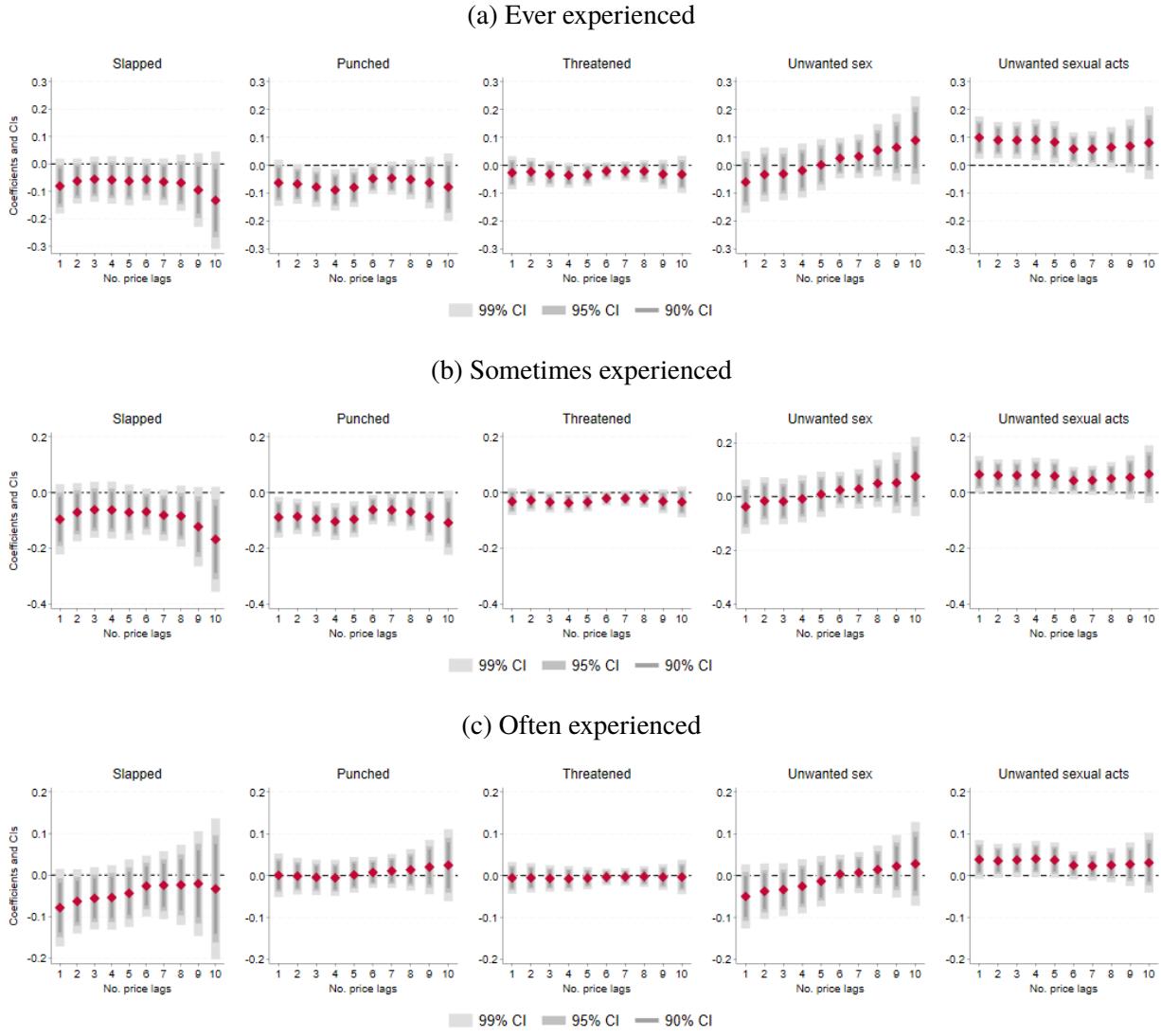


(c) Often experienced



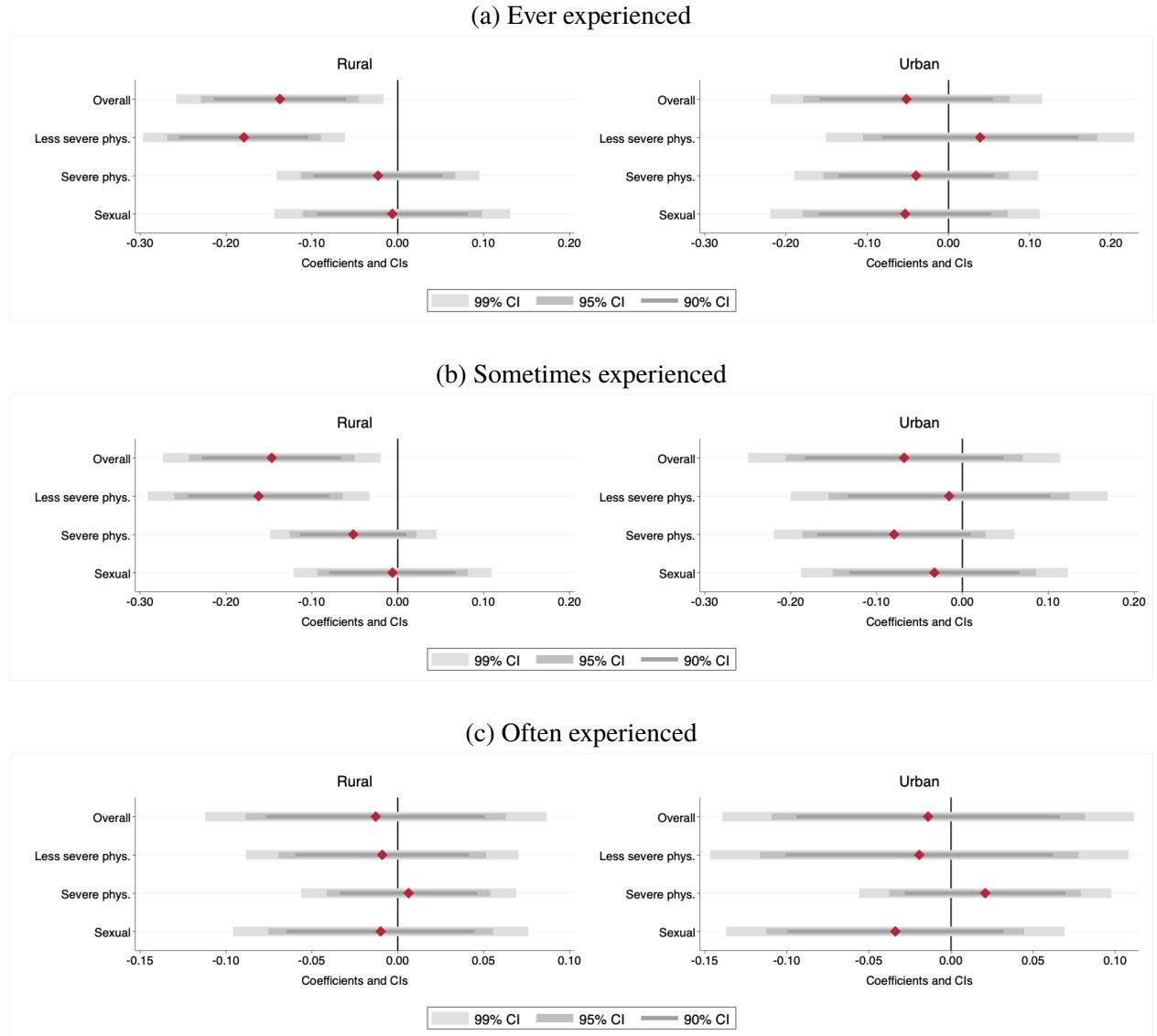
Notes: The figure presents the OLS estimates on the persistence of effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables for broad categories of domestic violence ever experienced in the last twelve months (panel (a)) and those with different frequencies (panels (b) and (c)). The broad categories of domestic violence include dummy variables indicating whether a woman has been experiencing less severe physical, severe physical, and sexual violence. In each sub-panel, each of the point estimates comes from separate regressions where the key explanatory variable is a measure of artisanal gold mining shock at different periods (an interaction between the proportion of the surface of the cell that is gold-suitable and the value of the international gold price with different lags). For example, the first estimate in each sub-panel comes from a regression where we use a one-year time lag from the survey year, which covers the same period as domestic violence experiences in the last twelve months, i.e., the number of lags is one. All regressions include the baseline covariates and fixed effects. The unit of observation is the woman. Standard errors are clustered by cells, and 90%, 95%, and 99% confidence intervals are presented.

Figure 4: Persistence of ASgM Effects on Detailed Categories of Domestic Violence



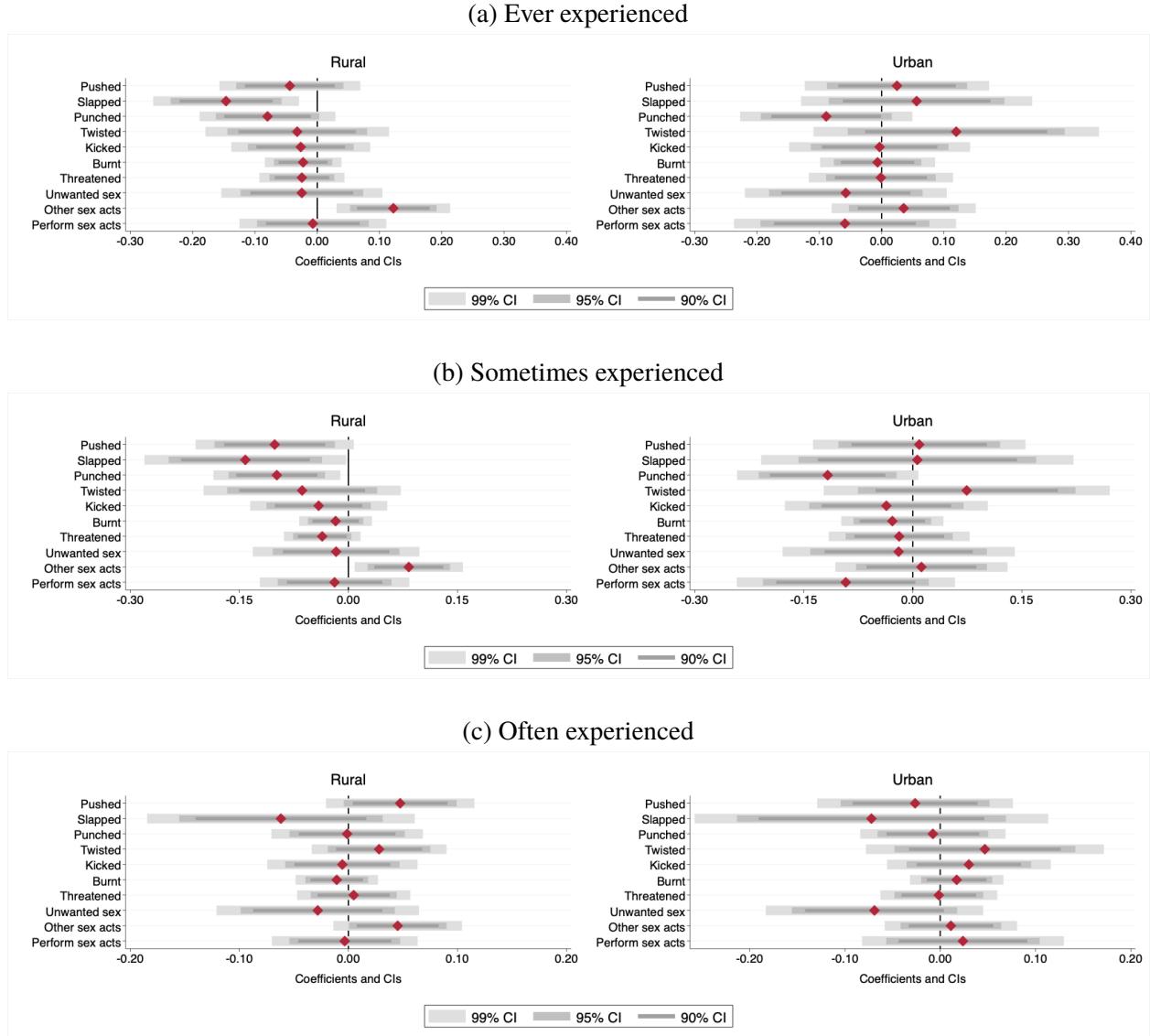
Notes: The figure presents the OLS estimates on the persistence of effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables for detailed categories of domestic violence ever experienced by the woman in the last twelve months (panel (a)) and those with different frequencies (panels (b) and (c)). The detailed categories of domestic violence include dummy variables indicating whether a woman has been (i) pushed, shook, or had something thrown, (ii) slapped, (iii) punched with fist or hit by something harmful, (iv) had arm twisted or hair pulled, (v) kicked or dragged, (vi) strangled or burnt, (vii) threatened with knife/gun or other weapons, (viii) physically forced into unwanted sex, (ix) forced into other unwanted sexual acts, and (x) physically forced to perform sexual acts she did not want by her husband or partner, respectively. In each sub-panel, each of the point estimates comes from separate regressions where the key explanatory variable is a measure of artisanal gold mining shock at different periods (an interaction between the proportion of the surface of the cell that is gold-suitable and the value of the international gold price with different lags). For example, the first estimate in each sub-panel comes from a regression where we use a 1-year time lag from the survey year, which covers the same period as domestic violence experiences in the last twelve months, i.e., the number of lags is one. All regressions include the baseline covariates and fixed effects. The unit of observation is the woman. Standard errors are clustered by cells, and 90%, 95%, and 99% confidence intervals are presented.

Figure 5: Heterogeneous Effects of ASgM on Broad Categories of Domestic Violence by Place of Residence



Notes: The figure presents the OLS estimates on the effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa, heterogeneous by place of residence (urban and rural). The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (panel (a)), and panels (b) and (c) disaggregate those experiences into different frequencies. The broad categories of domestic violence include dummy variables indicating whether a woman has been experiencing less severe physical, severe physical, and sexual violence. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include individual and household characteristics, cell-level covariates, cell fixed effects (FEs), and country-by-year FEs. The individual or woman characteristics include age, education level, current marital status, and religion. The only household characteristic is household size. The cell-level covariates include industrial gold mining, agricultural potential, and weather conditions. The unit of observation is the woman. Standard errors are clustered by cells, and 90%, 95%, and 99% confidence intervals are presented.

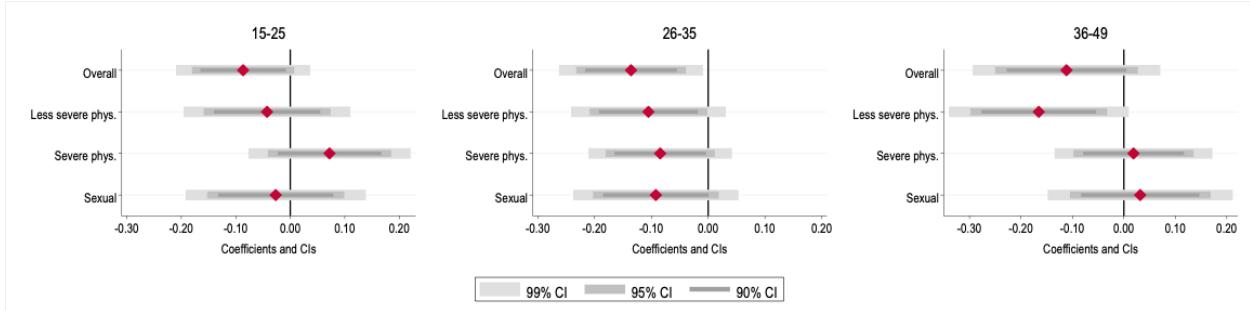
Figure 6: Heterogeneous Effects of ASgM on Detailed Categories of Domestic Violence by Place of Residence



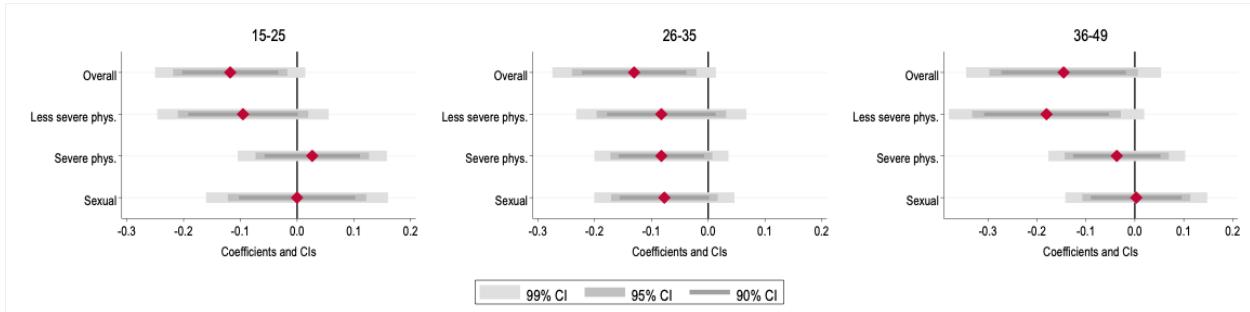
Notes: The figure presents the OLS estimates on the effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa, heterogeneous by place of residence (urban and rural). The dependent variables are dummy variables if a woman ever experienced detailed categories of domestic violence in the last twelve months (panel (a)), and panels (b) and (c) disaggregate those experiences into different frequencies. The detailed categories of domestic violence include dummy variables indicating whether a woman has been (i) pushed, shook, or had something thrown, (ii) slapped, (iii) punched with fist or hit by something harmful, (iv) had arm twisted or hair pulled, (v) kicked or dragged, (vi) strangled or burnt, (vii) threatened with knife/gun or other weapons, (viii) physically forced into unwanted sex, (ix) forced into other unwanted sexual acts, and (x) physically forced to perform sexual acts she did not want by her husband or partner, respectively. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include individual and household characteristics, cell-level covariates, cell fixed effects (FEs), and country-by-year FEs. The individual or woman characteristics include age, education level, current marital status, and religion. The only household characteristic is household size. The cell-level covariates include industrial gold mining, agricultural potential, and weather conditions. The unit of observation is the woman. Standard errors are clustered by cells, and 90%, 95%, and 99% confidence intervals are presented.

Figure 7: Heterogeneous Effects of ASgM on Broad Categories of Domestic Violence by Woman's Age

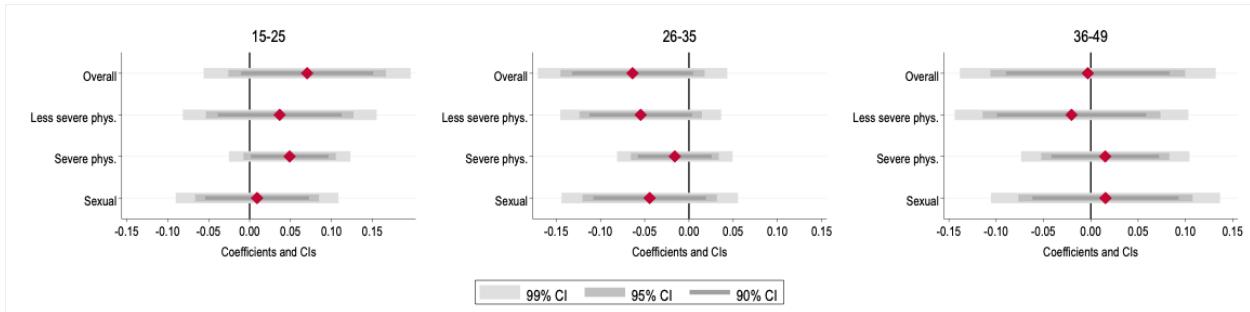
(a) Ever experienced



(b) Sometimes experienced

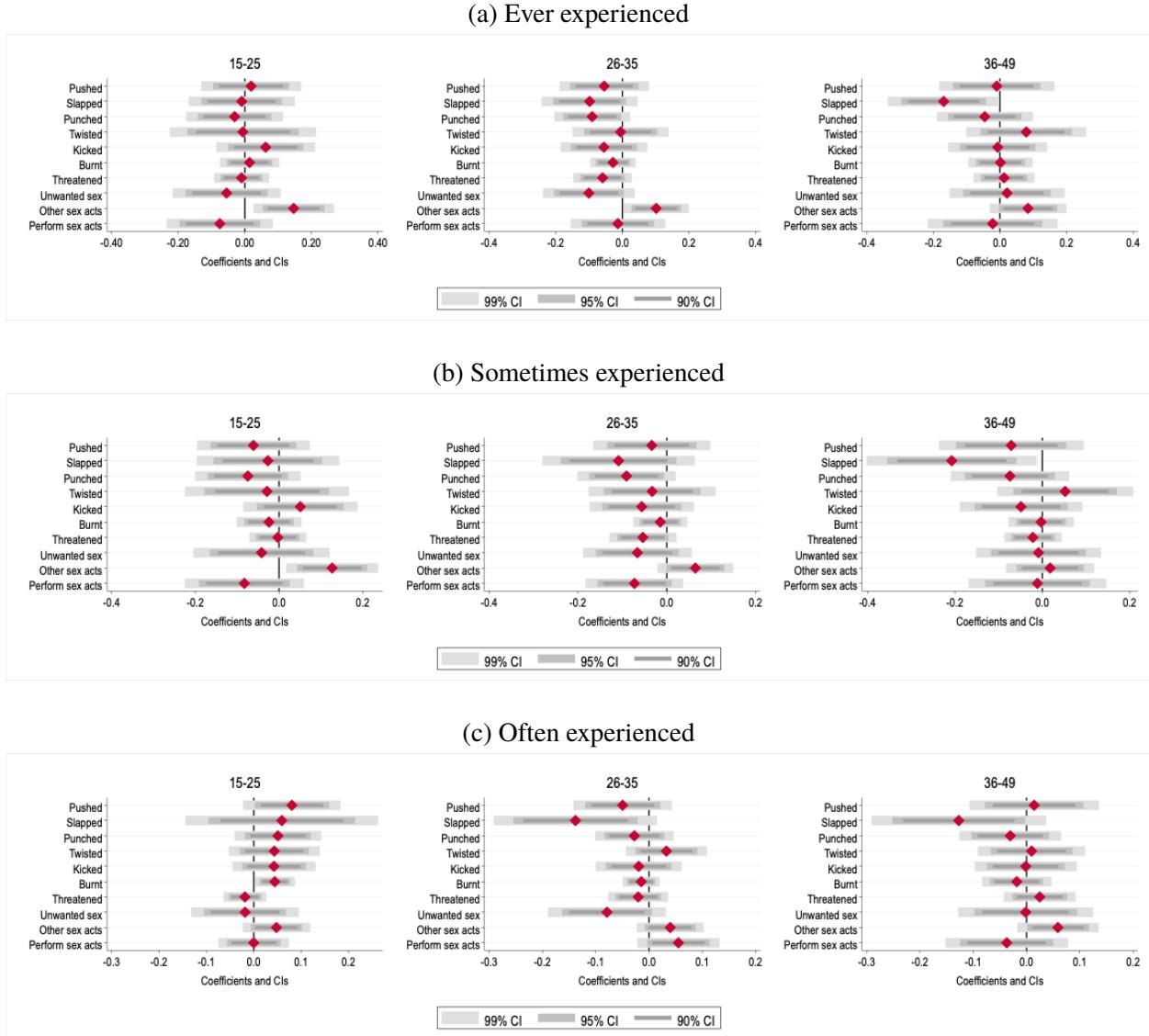


(c) Often experienced



Notes: The figure presents the OLS estimates on the effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa heterogeneous by woman's age groups. We estimate the regressions using sub-samples consisting of (i) 15-25 years old women, (ii) 26-35 years old women, and (iii) 36-49 years old women. The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (panel (a)), and panels (b) and (c) disaggregate those experiences into different frequencies. The broad categories of domestic violence include dummy variables indicating whether a woman has been experiencing less severe physical, severe physical, and sexual violence. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include individual and household characteristics, cell-level covariates, cell fixed effects (FEs), and country-by-year FEs. The individual or woman characteristics include age, education level, current marital status, and religion. The household characteristics include urban/rural status and household size. The cell-level covariates include industrial gold mining, agricultural potential, and weather conditions. The unit of observation is the woman. Standard errors are clustered by cells, and 90%, 95%, and 99% confidence intervals are presented.

Figure 8: Heterogeneous Effects of ASgM on Detailed Categories of Domestic Violence by Woman's Age



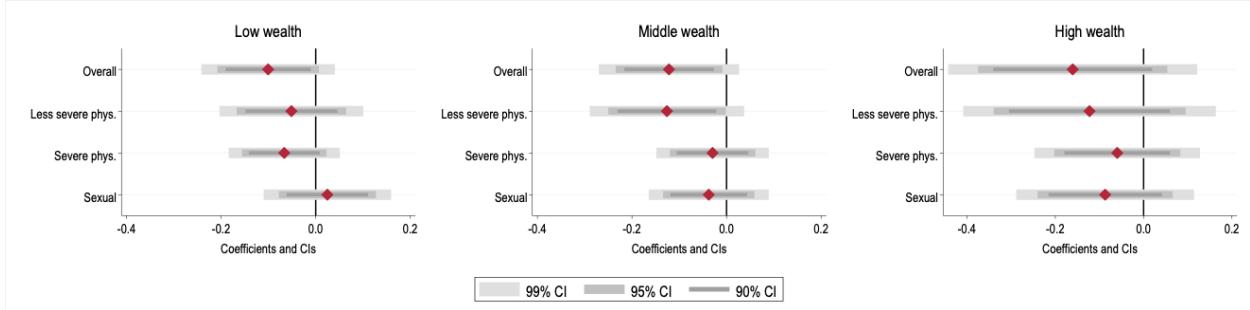
Notes: The figure presents the OLS estimates on the effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa heterogeneous by woman's age groups. We estimate the regressions using sub-samples consisting of (i) 15-25 years old women, (ii) 26-35 years old women, and (iii) 36-49 years old women. The dependent variables are dummy variables if a woman ever experienced detailed categories of domestic violence in the last twelve months (panel (a)), and panels (b) and (c) disaggregate those experiences into different frequencies. The detailed categories of domestic violence include dummy variables indicating whether a woman has been (i) pushed, shook, or had something thrown, (ii) slapped, (iii) punched with fist or hit by something harmful, (iv) had arm twisted or hair pulled, (v) kicked or dragged, (vi) strangled or burnt, (vii) threatened with knife/gun or other weapons, (viii) physically forced into unwanted sex, (ix) forced into other unwanted sexual acts, and (x) physically forced to perform sexual acts she did not want by her husband or partner, respectively. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include individual and household characteristics, cell-level covariates, cell fixed effects (FEs), and country-by-year FEs. The individual or woman characteristics include age, education level, current marital status, and religion. The household characteristics include urban/rural status and household size. The cell-level covariates include industrial gold mining, agricultural potential, and weather conditions. The unit of observation is the woman. Standard errors are clustered by cells, and 90%, 95%, and 99% confidence intervals are presented.

Figure 9: Heterogeneous Effects of ASgM on Broad Categories of Domestic Violence by Household Wealth

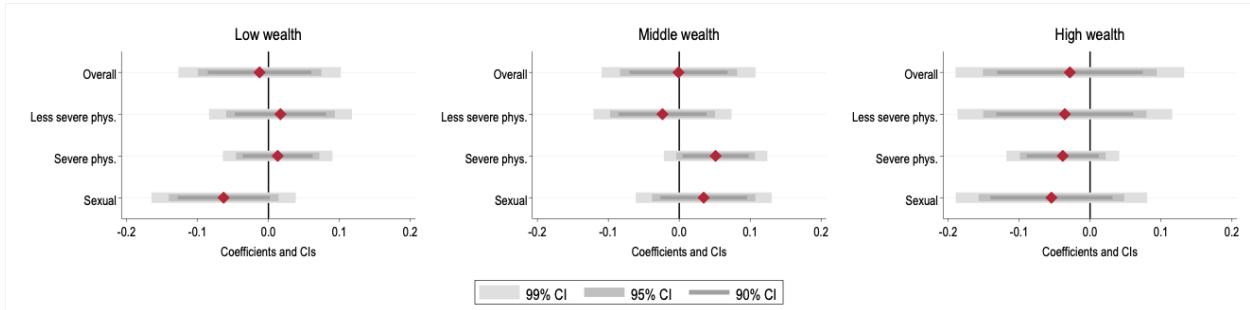
(a) Ever experienced



(b) Sometimes experienced

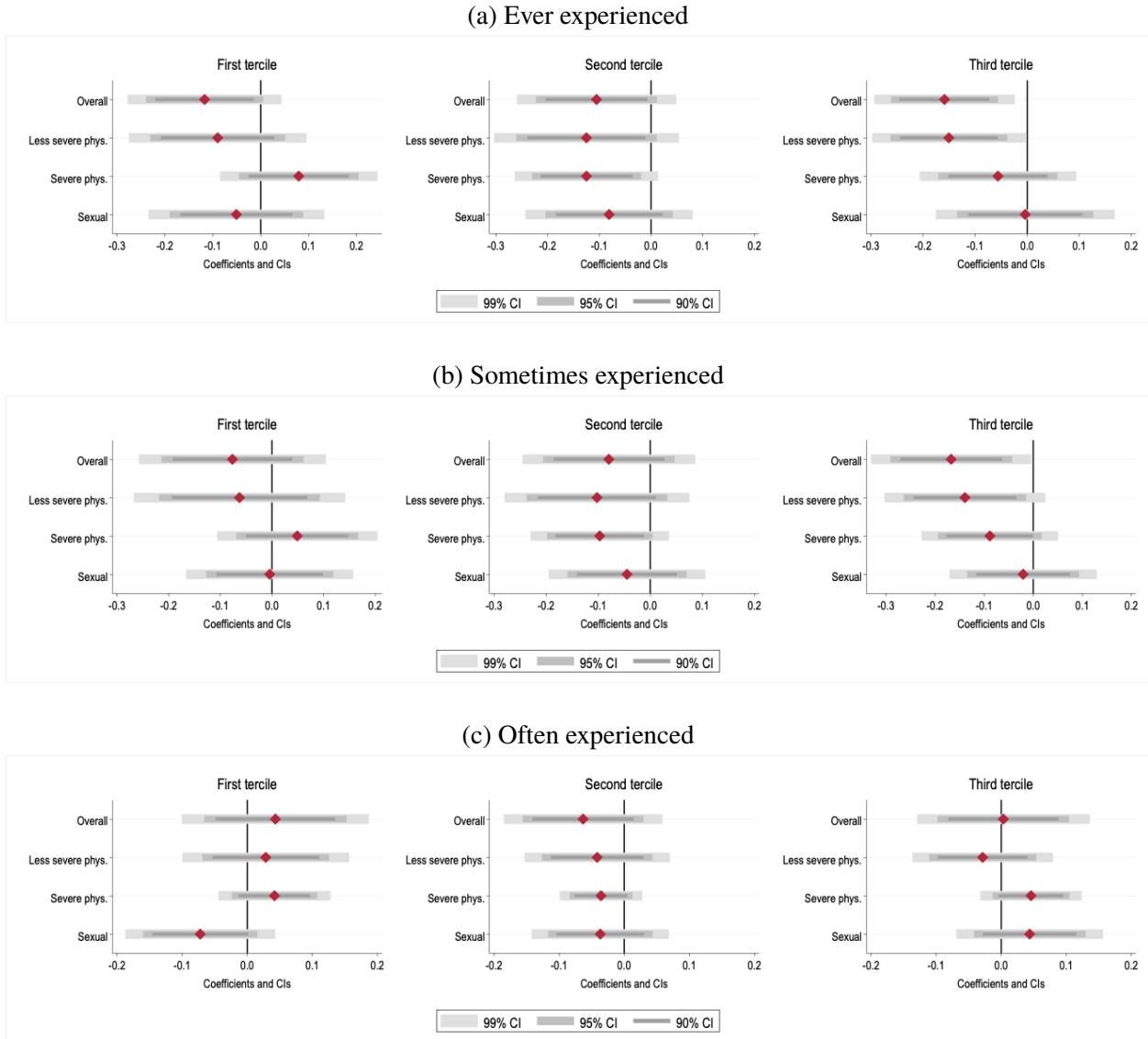


(c) Often experienced



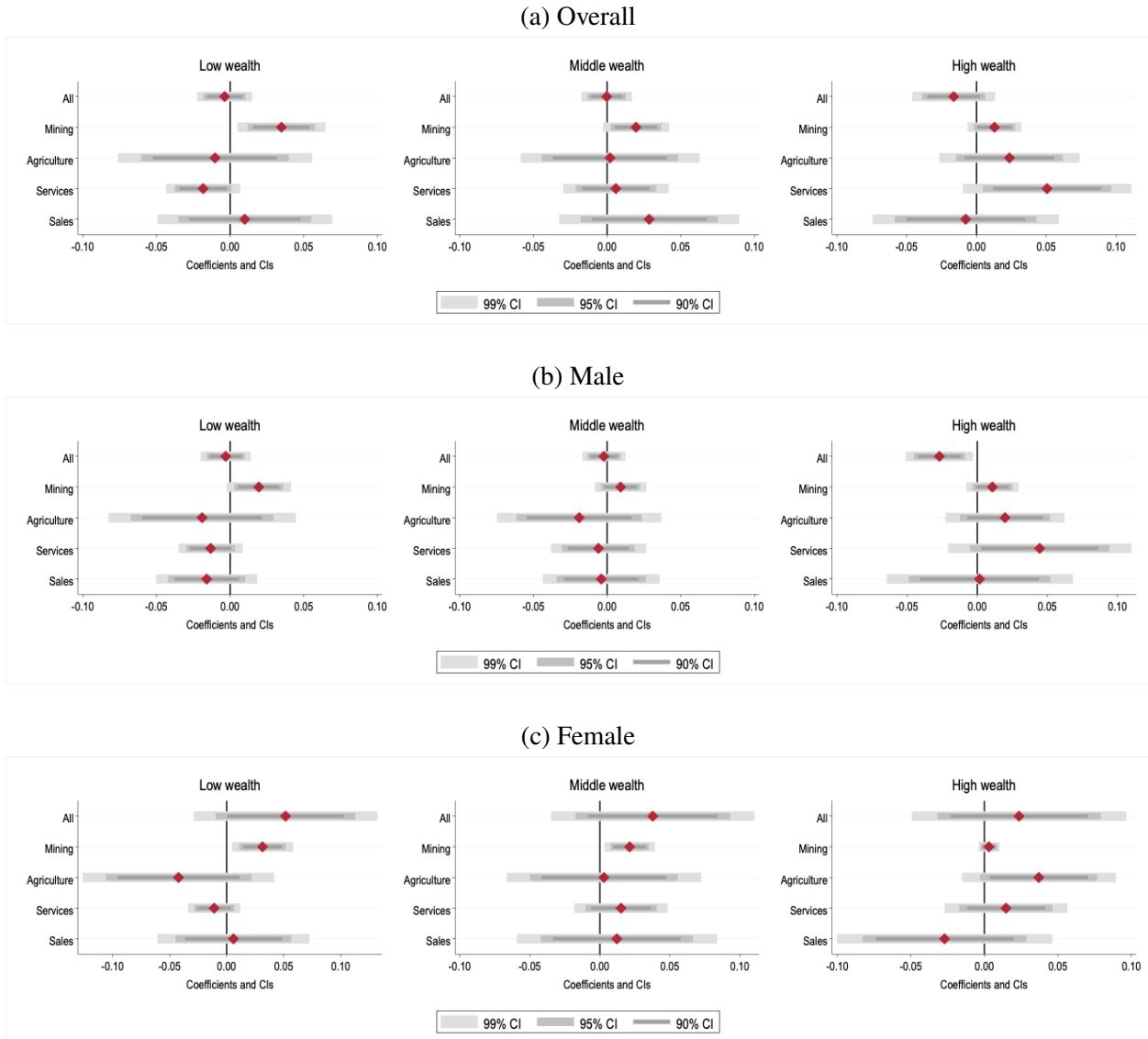
Notes: The figure presents the OLS estimates on the effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa heterogeneous by household wealth. We estimate the regressions using sub-samples consisting of households with (i) low wealth—lowest 40% of households, (ii) middle wealth—middle 40% of households, and (iii) high wealth—top 20% of households. The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (panel (a)), and panels (b) and (c) disaggregate those experiences into different frequencies. The broad categories of domestic violence include dummy variables indicating whether a woman has been experiencing less severe physical, severe physical, and sexual violence. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include the baseline covariates and fixed effects. The unit of observation is the woman. Standard errors are clustered by cells, and 90%, 95%, and 99% confidence intervals are presented.

Figure 10: Heterogeneous Effects of ASgM on Broad Categories of Domestic Violence by Age Difference between Partners



Notes: The figure presents the OLS estimates on the effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa heterogeneous by woman's age difference from her partner. We estimate the regressions using sub-samples consisting women whose age difference from her partner is in the (i) first tercile, (ii) second tercile, and (iii) third tercile. The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (panel (a)), and panels (b) and (c) disaggregate those experiences into different frequencies. The broad categories of domestic violence include dummy variables indicating whether a woman has been experiencing less severe physical, severe physical, and sexual violence. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include the baseline covariates and fixed effects. The unit of observation is the woman. Standard errors are clustered by cells, and 90%, 95%, and 99% confidence intervals are presented.

Figure 11: Heterogeneous Employment Effects of ASgM by Household Wealth



Notes: The figure presents the OLS estimates on the effects of artisanal gold mining on employment or labor supply in Sub-Saharan Africa heterogeneous by household wealth. We estimate the regressions using sub-samples consisting of households with (i) low wealth—lowest 40% of households, (ii) middle wealth—middle 40% of households, and (iii) high wealth—top 20% of households. The dependent variables are dummy variables indicating whether an individual is employed in all industries, mining, agriculture, services, and sales in the last twelve months. The aggregate, male, and female employment are considered in panels (a)-(c), respectively. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include the baseline covariates and fixed effects. The unit of observation is the woman. Standard errors are clustered by cells, and 90%, 95%, and 99% confidence intervals are presented.

Tables

Table 1: Descriptive Statistics of Demographic Characteristics

	Mean	SD	Min	Max	Observations
Panel A. Individual characteristics					
Age	31.42	8.706	15	49	855,216
Urban	0.312	0.464	0	1	855,216
Never mover	0.418	0.493	0	1	538,819
Marital status					
Married	0.774	0.418	0	1	842,673
Living with partner	0.112	0.315	0	1	842,673
Widowed	0.038	0.191	0	1	842,673
Divorced	0.032	0.177	0	1	842,673
Separated	0.044	0.204	0	1	842,673
Education					
No school	0.443	0.497	0	1	855,196
Primary	0.342	0.474	0	1	855,196
Secondary	0.186	0.389	0	1	855,196
Higher	0.029	0.167	0	1	855,196
Religion					
None	0.031	0.173	0	1	734,557
Muslim	0.390	0.488	0	1	777,227
Christian	0.558	0.497	0	1	793,175
Others	0.031	0.172	0	1	791,199
Panel B. Household wealth ^a					
Wealth index	0	1	-3.79	11.42	602,378
Low income	0.416	0.493	0	1	602,378
Middle income	0.388	0.487	0	1	602,378
High income	0.195	0.396	0	1	602,378
Panel C. Women's employment status					
Employed in the last twelve months	0.725	0.446	0	1	829,962
Currently working	0.662	0.473	0	1	842,158
Agriculture ^b	0.493	0.500	0	1	595,650
Extractive	0.004	0.065	0	1	489,963
Service	0.053	0.225	0	1	596,581
Sales	0.275	0.447	0	1	596,581
Panel D. Spouse's employment status					
Employed in the last twelve months	0.973	0.162	0	1	771,390
Agriculture ^b	0.483	0.500	0	1	750,400
Extractive	0.022	0.146	0	1	600,448
Service	0.066	0.248	0	1	735,110
Sales	0.113	0.317	0	1	735,110

Notes: The descriptive statistics are calculated from the DHS sample of ever-married women aged between 15-49 years old inclusive. ^aHousehold wealth summary statistics are calculated at the household level. ^bConditional on being employed in the last twelve months.

Table 2: Descriptive Statistics of Domestic Violence Outcomes

	Ever		Sometimes		Often	
	Mean	SD	Mean	SD	Mean	SD
Panel A. Broad categories of domestic violence						
Less severe physical violence	0.201	0.401	0.165	0.371	0.053	0.223
Severe physical violence	0.082	0.275	0.062	0.241	0.022	0.146
Sexual violence	0.098	0.298	0.072	0.258	0.030	0.171
Overall (any of these) violence	0.245	0.430	0.206	0.404	0.071	0.256
Panel B. Detailed categories of domestic violence						
Pushed	0.093	0.290	0.066	0.249	0.027	0.163
Slapped	0.174	0.379	0.135	0.341	0.046	0.210
Punched with fist	0.071	0.257	0.049	0.216	0.021	0.145
Twisted arm/pulled hair	0.052	0.222	0.036	0.186	0.014	0.119
Kicked/dragged	0.073	0.260	0.053	0.224	0.020	0.139
Strangled or burnt	0.024	0.154	0.017	0.128	0.006	0.080
Threatened or attacked with knife/gun	0.016	0.125	0.010	0.099	0.005	0.072
Physically forced into unwanted sex	0.088	0.283	0.061	0.240	0.027	0.163
Forced into other unwanted sexual acts	0.034	0.182	0.022	0.146	0.011	0.102
Physically forced to perform unwanted sexual acts	0.037	0.190	0.025	0.157	0.011	0.105

Notes: The table presents the descriptive statistics of domestic violence experienced over the past twelve months using the DHS sample of ever-married women aged between 15-49 years (inclusive).

Table 3: Descriptive Statistics of Mining, Agricultural, and Environmental Factors

	Mean	SD	Min	Max	Observations
Gold suitable dummy	0.588	0.492	0	1	3,948
Gold suitable share	0.259	0.334	0	1	3,948
Crop suitable dummy (Medium) ^a	0.825	0.380	0	1	3,948
Crop suitable dummy (Good)	0.702	0.457	0	1	3,948
Industrial gold mines dummy ^b	0.026	0.158	0	1	9,976
Gold suitable share × Gold price	0.207	0.300	0	1.237	10,170
Crop suitable × Crop price	0.340	0.452	0	1.510	10,841
Industrial gold × Gold price	0.018	0.122	0	1.237	9,602
Temperature	24.50	3.603	9.517	31.13	10,163

Notes: The variables are calculated at 0.5×0.5 degrees PRIO-GRID cells, which overlap with the DHS enumeration area. ^aA cell is suitable for agriculture if it is classified as “Medium” (or “Good”) or better for cultivation of at least one crop. ^b= 1 if a cell’s main mineral of industrial production is gold in year t .

Table 4: Effects of Artisanal and Industrial Gold Mining on Broad Categories of Domestic Violence

	Dependent variable: A dummy variable for domestic violence			
	(1) Overall violence	(2) Less severe physical violence	(3) Severe physical violence	(4) Sexual violence
Panel A. Ever experienced				
Gold suitable \times Gold price	-0.109*** (0.039)	-0.094** (0.039)	-0.023 (0.034)	-0.046 (0.045)
Industrial gold mines \times Gold price	0.135*** (0.045)	0.171*** (0.054)	0.034 (0.049)	0.097 (0.064)
Observations	69990	69987	69979	69972
R ²	0.18	0.17	0.12	0.13
Panel B. Sometimes experienced				
Gold suitable \times Gold price	-0.120*** (0.043)	-0.100** (0.043)	-0.051 (0.031)	-0.030 (0.039)
Industrial gold mines \times Gold price	0.178*** (0.056)	0.191*** (0.060)	0.077 (0.056)	0.086* (0.050)
Observations	69813	68275	69478	68665
R ²	0.21	0.17	0.14	0.12
Panel C. Often experienced				
Gold suitable \times Gold price	-0.010 (0.029)	-0.011 (0.025)	0.009 (0.018)	-0.023 (0.028)
Industrial gold mines \times Gold price	-0.066 (0.052)	-0.079 (0.049)	-0.052 (0.035)	0.016 (0.041)
Observations	69840	67703	69250	67516
R ²	0.20	0.21	0.09	0.11

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. Experiences of overall, less severe physical, severe physical, and sexual violence are considered in Columns (1)-(4), respectively. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). The effects of industrial gold mining are also presented, and the measure of industrial gold mining is our baseline measure (an interaction of a dummy indicating whether a cell has industrial gold mines with the lagged value of the international gold price). All regressions include individual and household characteristics, other cell-level covariates, cell fixed effects (FEs), and country-by-year FEs. The individual or woman characteristics include age, education level, current marital status, and religion. The household characteristics include urban/rural status and household size. The cell-level covariates include agricultural potential and weather conditions. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 5: Effects of Artisanal and Industrial Gold Mining on Detailed Categories of Domestic Violence

	Dependent variable: A dummy variable for domestic violence									
	Less severe physical violence				Severe physical violence			Sexual violence		
	(1) Pushed, shook, or had something thrown	(2) Slapped	(3) Punch with fist or hit by something harmful	(4) Had arm twisted or hair pulled	(5) Kicked or dragged	(6) Strangled or burnt	(7) Threatened with knife/gun or other weapons	(8) Physically forced into unwanted sex	(9) Forced into other unwanted sexual acts	(10) Physically forced to perform sexual acts respondent did not want
Panel A. Ever experienced										
Gold suitable × Gold price	-0.006 (0.034)	-0.081** (0.039)	-0.063* (0.032)	0.022 (0.052)	-0.012 (0.033)	-0.010 (0.020)	-0.026 (0.023)	-0.060 (0.043)	0.100*** (0.029)	-0.036 (0.041)
Industrial gold mines × Gold price	0.018 (0.051)	0.148*** (0.050)	0.043 (0.039)	0.201** (0.097)	0.088 (0.058)	-0.004 (0.045)	-0.010 (0.038)	0.134** (0.063)	0.034 (0.048)	0.188*** (0.062)
Observations	69952	69959	69921	63488	68212	69943	64505	69947	66091	53538
R ²	0.10	0.15	0.09	0.08	0.13	0.12	0.07	0.12	0.10	0.09
Panel B. Sometimes experienced										
Gold suitable × Gold price	-0.046 (0.033)	-0.096** (0.049)	-0.088*** (0.028)	-0.007 (0.047)	-0.031 (0.030)	-0.016 (0.016)	-0.032* (0.019)	-0.038 (0.039)	0.065** (0.026)	-0.053 (0.035)
Industrial gold mines × Gold price	0.030 (0.044)	0.154*** (0.059)	0.005 (0.034)	0.191* (0.098)	0.171*** (0.066)	-0.000 (0.042)	0.020 (0.031)	0.132** (0.055)	0.014 (0.034)	0.093 (0.067)
Observations	64635	61680	65880	60819	64500	68626	63516	64561	64004	51865
R ²	0.10	0.16	0.09	0.07	0.15	0.13	0.05	0.12	0.09	0.08
Panel C. Often experienced										
Gold suitable × Gold price	0.018 (0.021)	-0.078** (0.036)	0.001 (0.020)	0.029 (0.022)	0.004 (0.020)	0.001 (0.010)	-0.005 (0.015)	-0.050* (0.030)	0.038** (0.018)	0.005 (0.022)
Industrial gold mines × Gold price	-0.030 (0.034)	-0.076 (0.076)	0.004 (0.029)	0.073 (0.053)	-0.082 (0.055)	-0.020 (0.023)	-0.038 (0.026)	0.039 (0.041)	0.034 (0.037)	0.107*** (0.038)
Observations	56547	43102	60325	56533	57675	66445	62618	57266	61709	49578
R ²	0.15	0.23	0.13	0.09	0.10	0.06	0.08	0.12	0.08	0.10

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced detailed categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. In Columns (1)-(10), the domestic violence outcome indicates whether a woman has been (i) pushed, shaken, or had something thrown, (ii) slapped, (iii) punched with a fist or hit by something harmful, (iv) had arm twisted or hair pulled, (v) kicked or dragged, (vi) strangled or burnt, (vii) threatened with knife/gun or other weapons, (viii) physically forced into unwanted sex, (ix) forced into other unwanted sexual acts, and (x) physically forced to perform sexual acts she did not want by husband or partner, respectively. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). The effects of industrial gold mining are also presented, and the measure of industrial gold mining is our baseline measure (an interaction of a dummy indicating whether a cell has industrial gold mines with the lagged value of the international gold price). All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 6: Robustness: Effects of ASgM on Broad Categories of Domestic Violence using Gold Suitability Dummy

	Dependent variable: A dummy variable for domestic violence			
	(1) Overall violence	(2) Less severe physical violence	(3) Severe physical violence	(4) Sexual violence
	Panel A. Ever experienced			
Gold suitable dummy \times Gold price	-0.114*** (0.028)	-0.097*** (0.031)	0.017 (0.025)	-0.040 (0.030)
Observations	69990	69987	69979	69972
R ²	0.18	0.17	0.12	0.13
	Panel B. Sometimes experienced			
Gold suitable dummy \times Gold price	-0.094*** (0.032)	-0.097*** (0.034)	0.009 (0.023)	-0.022 (0.024)
Observations	69813	68275	69478	68665
R ²	0.21	0.17	0.14	0.12
	Panel C. Often experienced			
Gold suitable dummy \times Gold price	-0.028 (0.022)	-0.021 (0.019)	0.006 (0.013)	-0.033 (0.022)
Observations	69840	67703	69250	67516
R ²	0.20	0.21	0.09	0.11

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. Experiences of overall, less severe physical, severe physical, and sexual violence are considered in Columns (1)-(4), respectively. The key explanatory variable is an interaction of the gold suitability dummy with the 1-year lagged gold price index. All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 7: Robustness: Effects of ASgM on Detailed Categories of Domestic Violence using Gold Suitability Dummy

	Dependent variable: A dummy variable for domestic violence									
	Less severe physical violence				Severe physical violence			Sexual violence		
	(1) Pushed, shook, or had something thrown	(2) Slapped	(3) Punch with fist or hit by something harmful	(4) Had arm twisted or hair pulled	(5) Kicked or dragged	(6) Strangled or burnt	(7) Threatened with knife/gun or other weapons	(8) Physically forced into unwanted sex	(9) Forced into other unwanted sexual acts	(10) Physically forced to perform sexual acts respondent did not want
Panel A. Ever experienced										
Gold suitable dummy × Gold price	0.004 (0.025)	-0.106*** (0.031)	-0.006 (0.023)	0.076* (0.044)	0.003 (0.025)	0.021* (0.013)	0.001 (0.014)	-0.036 (0.029)	0.039* (0.020)	-0.011 (0.029)
Observations	69952	69959	69921	63488	68212	69943	64505	69947	66091	53538
R ²	0.10	0.15	0.09	0.08	0.13	0.12	0.07	0.12	0.10	0.09
Panel B. Sometimes experienced										
Gold suitable dummy × Gold price	-0.022 (0.024)	-0.124*** (0.038)	-0.025 (0.019)	0.033 (0.039)	-0.007 (0.024)	0.011 (0.011)	-0.007 (0.011)	-0.018 (0.024)	0.029* (0.017)	-0.024 (0.025)
Observations	64635	61680	65880	60819	64500	68626	63516	64561	64004	51865
R ²	0.10	0.16	0.09	0.07	0.15	0.13	0.05	0.12	0.09	0.08
Panel C. Often experienced										
Gold suitable dummy × Gold price	0.010 (0.016)	-0.087*** (0.028)	0.006 (0.016)	0.041** (0.019)	-0.002 (0.016)	0.009 (0.008)	0.004 (0.010)	-0.040* (0.023)	0.004 (0.013)	-0.002 (0.014)
Observations	56547	43102	60325	56533	57675	66445	62618	57266	61709	49578
R ²	0.15	0.23	0.13	0.09	0.10	0.06	0.08	0.12	0.08	0.10

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced detailed categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. In Columns (1)-(10), the domestic violence outcome indicates whether a woman has been (i) pushed, shaken, or had something thrown, (ii) slapped, (iii) punched with a fist or hit by something harmful, (iv) had arm twisted or hair pulled, (v) kicked or dragged, (vi) strangled or burnt, (vii) threatened with knife/gun or other weapons, (viii) physically forced into unwanted sex, (ix) forced into other unwanted sexual acts, and (x) physically forced to perform sexual acts she did not want by husband or partner, respectively. The key explanatory variable is an interaction of the gold suitability dummy with the 1-year lagged gold price index. All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 8: Robustness: Effects of ASgM on Broad Categories of Domestic Violence using Alternative Gold Prices

	Dependent variable: A dummy variable for domestic violence							
	(1) Overall violence	(2)	(3) Less severe physical violence	(4)	(5)	(6) Severe physical violence	(7)	(8) Sexual violence
Panel A. Ever experienced								
Gold suitable × Log price	-0.072** (0.028)		-0.067** (0.028)		-0.015 (0.026)		-0.026 (0.035)	
Gold suitable × Current price		-0.111** (0.048)		-0.117** (0.049)		-0.006 (0.045)		-0.024 (0.059)
Observations	69990	69990	69987	69987	69979	69979	69972	69972
R ²	0.18	0.18	0.17	0.17	0.12	0.12	0.13	0.13
Panel B. Sometimes experienced								
Gold suitable × Log price	-0.079** (0.032)		-0.070** (0.032)		-0.038 (0.023)		-0.010 (0.029)	
Gold suitable × Current price		-0.099* (0.054)		-0.101* (0.055)		-0.042 (0.041)		0.001 (0.049)
Observations	69813	69813	68275	68275	69478	69478	68665	68665
R ²	0.21	0.21	0.17	0.17	0.14	0.14	0.12	0.12
Panel C. Often experienced								
Gold suitable × Log price	-0.008 (0.022)		-0.013 (0.019)		0.009 (0.014)		-0.018 (0.024)	
Gold suitable × Current price		-0.026 (0.039)		-0.033 (0.033)		0.017 (0.025)		-0.024 (0.041)
Observations	69840	69840	67703	67703	69250	69250	67516	67516
R ²	0.20	0.20	0.21	0.21	0.09	0.09	0.11	0.11

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. Experiences of overall, less severe physical, severe physical, and sexual violence are considered in Columns (1)-(2), (3)-(4), (5)-(6), (7)-(8), respectively. The key explanatory variable is an interaction of the proportion of the cell's surface suitable for gold with the log of 1-year lagged gold price (odd-numbered columns) or current price index at the survey year (even-numbered columns). All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 9: Robustness: Effects of ASgM on Detailed Categories of Domestic Violence using Log Gold Price

	Dependent variable: A dummy variable for domestic violence									
	Less severe physical violence				Severe physical violence			Sexual violence		
	(1) Pushed, shook, or had something thrown	(2) Slapped	(3) Punch with fist or hit by something harmful	(4) Had arm twisted or hair pulled	(5) Kicked or dragged	(6) Strangled or burnt	(7) Threatened with knife/gun or other weapons	(8) Physically forced into unwanted sex	(9) Forced into other unwanted sexual acts	(10) Physically forced to perform sexual acts respondent did not want
Panel A. Ever experienced										
Gold suitable × Log price	-0.005 (0.026)	-0.057** (0.028)	-0.049* (0.026)	0.016 (0.043)	-0.011 (0.026)	-0.006 (0.014)	-0.020 (0.017)	-0.040 (0.033)	0.079*** (0.022)	-0.029 (0.034)
Observations	69952	69959	69921	63488	68212	69943	64505	69947	66091	53538
R ²	0.10	0.15	0.09	0.08	0.13	0.12	0.07	0.12	0.10	0.09
Panel B. Sometimes experienced										
Gold suitable × Log price	-0.034 (0.025)	-0.065* (0.037)	-0.069*** (0.022)	-0.006 (0.039)	-0.025 (0.024)	-0.011 (0.012)	-0.024* (0.013)	-0.019 (0.029)	0.051*** (0.019)	-0.043 (0.029)
Observations	64635	61680	65880	60819	64500	68626	63516	64561	64004	51865
R ²	0.10	0.16	0.09	0.07	0.15	0.13	0.05	0.12	0.09	0.08
Panel C. Often experienced										
Gold suitable × Log price	0.010 (0.017)	-0.064** (0.026)	-0.003 (0.017)	0.023 (0.018)	0.004 (0.017)	0.001 (0.008)	-0.004 (0.012)	-0.038 (0.026)	0.032** (0.014)	0.004 (0.018)
Observations	56547	43102	60325	56533	57675	66445	62618	57266	61709	49578
R ²	0.15	0.23	0.13	0.09	0.10	0.06	0.08	0.12	0.08	0.10

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced detailed categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. In Columns (1)-(10), the domestic violence outcome indicates whether a woman has been (i) pushed, shaken, or had something thrown, (ii) slapped, (iii) punched with a fist or hit by something harmful, (iv) had arm twisted or hair pulled, (v) kicked or dragged, (vi) strangled or burnt, (vii) threatened with knife/gun or other weapons, (viii) physically forced into unwanted sex, (ix) forced into other unwanted sexual acts, and (x) physically forced to perform sexual acts she did not want by husband or partner, respectively. The key explanatory variable is an interaction of the proportion of the cell's surface suitable for gold with the log of 1-year lagged gold price. All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 10: Robustness: Effects of ASgM on Detailed Categories of Domestic Violence using Contemporaneous Gold Price

Dependent variable: A dummy variable for domestic violence										
	Less severe physical violence				Severe physical violence			Sexual violence		
	(1) Pushed, shook, or had something thrown	(2) Slapped	(3) Punch with fist or hit by something harmful	(4) Had arm twisted or hair pulled	(5) Kicked or dragged	(6) Strangled or burnt	(7) Threatened with knife/gun or other weapons	(8) Physically forced into unwanted sex	(9) Forced into other unwanted sexual acts	(10) Physically forced to perform sexual acts respondent did not want
Panel A. Ever experienced										
Gold suitable × Current price	-0.001 (0.045)	-0.088* (0.049)	-0.065 (0.044)	0.060 (0.075)	-0.002 (0.046)	0.002 (0.026)	-0.030 (0.029)	-0.053 (0.056)	0.147*** (0.039)	-0.023 (0.057)
Observations	69952	69959	69921	63488	68212	69943	64505	69947	66091	53538
R ²	0.10	0.15	0.09	0.08	0.13	0.12	0.07	0.12	0.10	0.09
Panel B. Sometimes experienced										
Gold suitable × Current price	-0.044 (0.044)	-0.091 (0.063)	-0.095** (0.038)	0.038 (0.069)	-0.026 (0.043)	-0.012 (0.021)	-0.038* (0.022)	-0.016 (0.049)	0.098*** (0.034)	-0.044 (0.051)
Observations	64635	61680	65880	60819	64500	68626	63516	64561	64004	51865
R ²	0.10	0.16	0.09	0.07	0.15	0.13	0.05	0.12	0.09	0.08
Panel C. Often experienced										
Gold suitable × Current price	0.012 (0.030)	-0.118** (0.046)	-0.007 (0.030)	0.031 (0.031)	0.005 (0.029)	0.007 (0.014)	-0.004 (0.022)	-0.058 (0.044)	0.057** (0.026)	0.009 (0.031)
Observations	56547	43102	60325	56533	57675	66445	62618	57266	61709	49578
R ²	0.15	0.23	0.13	0.09	0.10	0.06	0.08	0.12	0.08	0.10

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced detailed categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. In Columns (1)-(10), the domestic violence outcome indicates whether a woman has been (i) pushed, shaken, or had something thrown, (ii) slapped, (iii) punched with a fist or hit by something harmful, (iv) had arm twisted or hair pulled, (v) kicked or dragged, (vi) strangled or burnt, (vii) threatened with knife/gun or other weapons, (viii) physically forced into unwanted sex, (ix) forced into other unwanted sexual acts, and (x) physically forced to perform sexual acts she did not want by husband or partner, respectively. The key explanatory variable is an interaction of the proportion of the cell's surface suitable for gold with the current price index at the survey year. All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 11: Robustness: Effects of ASgM on Broad Categories of Domestic Violence Controlling for Industrial Mineral Mining

	Dependent variable: A dummy variable for domestic violence			
	(1) Overall violence	(2) Less severe physical violence	(3) Severe physical violence	(4) Sexual violence
	Panel A. Ever experienced			
Gold suitable \times Gold price	-0.109*** (0.039)	-0.095** (0.039)	-0.027 (0.034)	-0.045 (0.045)
Industrial mining \times Mineral price	0.133*** (0.051)	0.167*** (0.057)	0.090 (0.056)	0.079 (0.061)
Observations	70276	70273	70265	70258
R ²	0.18	0.17	0.13	0.13
	Panel B. Sometimes experienced			
Gold suitable \times Gold price	-0.119*** (0.043)	-0.100** (0.043)	-0.054* (0.031)	-0.028 (0.039)
Industrial mining \times Mineral price	0.161*** (0.060)	0.177*** (0.063)	0.121** (0.055)	0.066 (0.049)
Observations	70099	68552	69762	68950
R ²	0.21	0.17	0.14	0.12
	Panel C. Often experienced			
Gold suitable \times Gold price	-0.010 (0.029)	-0.012 (0.025)	0.010 (0.018)	-0.023 (0.028)
Industrial mining \times Mineral price	-0.056 (0.049)	-0.049 (0.048)	-0.034 (0.033)	0.015 (0.037)
Observations	70121	67973	69528	67791
R ²	0.20	0.21	0.09	0.11

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. Experiences of overall, less severe physical, severe physical, and sexual violence are considered in Columns (1)-(4), respectively. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 12: Robustness: Effects of ASgM on Detailed Categories of Domestic Violence Controlling for Industrial Mineral Mining

	Dependent variable: A dummy variable for domestic violence									
	Less severe physical violence				Severe physical violence			Sexual violence		
	(1) Pushed, shook, or had something thrown	(2) Slapped	(3) Punch with fist or hit by something harmful	(4) Had arm twisted or hair pulled	(5) Kicked or dragged	(6) Strangled or burnt	(7) Threatened with knife/gun or other weapons	(8) Physically forced into unwanted sex	(9) Forced into other unwanted sexual acts	(10) Physically forced to perform sexual acts respondent did not want
Panel A. Ever experienced										
Gold suitable × Gold price	-0.004 (0.034)	-0.081** (0.039)	-0.064** (0.032)	0.024 (0.051)	-0.014 (0.032)	-0.010 (0.020)	-0.025 (0.023)	-0.057 (0.043)	0.097*** (0.029)	-0.037 (0.041)
Industrial mining × Mineral price	0.053 (0.056)	0.148*** (0.055)	0.068 (0.041)	0.145 (0.091)	0.131* (0.073)	0.024 (0.043)	0.012 (0.037)	0.099 (0.062)	0.081* (0.044)	0.169*** (0.065)
Observations	70237	70245	70206	63768	68498	70228	64756	70233	66371	53775
R ²	0.10	0.15	0.09	0.08	0.13	0.12	0.07	0.12	0.10	0.09
Panel B. Sometimes experienced										
Gold suitable × Gold price	-0.043 (0.033)	-0.096** (0.049)	-0.088*** (0.028)	-0.004 (0.046)	-0.032 (0.030)	-0.016 (0.016)	-0.031 (0.019)	-0.034 (0.039)	0.064** (0.025)	-0.052 (0.035)
Industrial mining × Mineral price	0.033 (0.049)	0.151** (0.063)	0.030 (0.036)	0.157** (0.080)	0.181*** (0.064)	0.012 (0.038)	0.029 (0.029)	0.100* (0.054)	0.046 (0.034)	0.095 (0.059)
Observations	64899	61941	66148	61082	64765	68906	63766	64838	64281	52098
Panel C. Often experienced										
Gold suitable × Gold price	0.018 (0.021)	-0.077** (0.036)	0.001 (0.020)	0.031 (0.022)	0.005 (0.020)	0.001 (0.010)	-0.006 (0.015)	-0.050* (0.030)	0.037** (0.018)	0.005 (0.022)
Industrial mining × Mineral price	0.016 (0.038)	-0.043 (0.074)	0.008 (0.029)	0.009 (0.044)	-0.046 (0.054)	-0.003 (0.023)	-0.022 (0.025)	0.024 (0.039)	0.059* (0.032)	0.077** (0.039)
Observations	56766	43270	60573	56773	57908	66708	62858	57523	61972	49804

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced detailed categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. In Columns (1)-(10), the domestic violence outcome indicates whether a woman has been (i) pushed, shaken, or had something thrown, (ii) slapped, (iii) punched with a fist or hit by something harmful, (iv) had arm twisted or hair pulled, (v) kicked or dragged, (vi) strangled or burnt, (vii) threatened with knife/gun or other weapons, (viii) physically forced into unwanted sex, (ix) forced into other unwanted sexual acts, and (x) physically forced to perform sexual acts she did not want by husband or partner, respectively. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 13: Robustness: Effects of ASgM on Broad Categories of Domestic Violence Controlling for Temperature-Induced Push Factor

	Dependent variable: A dummy variable for domestic violence			
	(1) Overall violence	(2) Less severe physical violence	(3) Severe physical violence	(4) Sexual violence
Panel A. Ever experienced				
Gold suitable × Gold price	-0.112*** (0.040)	-0.086** (0.041)	-0.030 (0.035)	-0.050 (0.045)
Gold suitable × Temperature	-0.023 (0.043)	0.050 (0.048)	-0.041 (0.040)	-0.028 (0.045)
Temperature	-0.021 (0.037)	-0.069 (0.042)	-0.048 (0.033)	0.031 (0.041)
Observations	69990	69987	69979	69972
R ²	0.18	0.17	0.12	0.13
Panel B. Sometimes experienced				
Gold suitable × Gold price	-0.131*** (0.044)	-0.103** (0.045)	-0.056* (0.032)	-0.039 (0.039)
Gold suitable × Temperature	-0.070 (0.048)	-0.019 (0.050)	-0.035 (0.036)	-0.060 (0.039)
Temperature	-0.016 (0.042)	-0.048 (0.044)	-0.040 (0.028)	0.020 (0.036)
Observations	69813	68275	69478	68665
R ²	0.21	0.17	0.14	0.12
Panel C. Often experienced				
Gold suitable × Gold price	0.003 (0.029)	0.003 (0.026)	0.011 (0.017)	-0.017 (0.027)
Gold suitable × Temperature	0.082** (0.036)	0.089*** (0.030)	0.008 (0.022)	0.035 (0.030)
Temperature	-0.036 (0.028)	-0.038 (0.024)	-0.025 (0.016)	0.008 (0.023)
Observations	69840	67703	69250	67516
R ²	0.20	0.21	0.09	0.11

Notes: The table presents the OLS estimates on the heterogeneous temperature effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. Experiences of overall, less severe physical, severe physical, and sexual violence are considered in Columns (1)-(4), respectively. The key explanatory variable is an interaction of the gold suitability share with the log of the 1-year lagged gold price index and the interaction between gold suitability share and average annual temperature. All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 14: Robustness: Effects of ASgM on Detailed Categories of Domestic Violence Controlling for Temperature-Induced Push Factor

	Dependent variable: A dummy variable for domestic violence									
	Less severe physical violence				Severe physical violence			Sexual violence		
	(1) Pushed, shook, or had something thrown	(2) Slapped	(3) Punch with fist or hit by something harmful	(4) Had arm twisted or hair pulled	(5) Kicked or dragged	(6) Strangled or burnt	(7) Threatened with knife/gun or other weapons	(8) Physically forced into unwanted sex	(9) Forced into other unwanted sexual acts	(10) Physically forced to perform sexual acts respondent did not want
Panel A. Ever experienced										
Gold suitable × Gold price	0.005 (0.035)	-0.081** (0.041)	-0.043 (0.032)	0.022 (0.051)	-0.013 (0.033)	-0.010 (0.019)	-0.026 (0.023)	-0.060 (0.042)	0.099*** (0.030)	-0.045 (0.047)
Gold suitable × Temperature	0.068 (0.049)	-0.002 (0.045)	0.128*** (0.035)	-0.009 (0.044)	-0.008 (0.043)	-0.000 (0.022)	0.007 (0.023)	-0.002 (0.044)	-0.008 (0.032)	-0.025 (0.045)
Temperature	-0.026 (0.033)	-0.037 (0.042)	-0.084*** (0.030)	0.037 (0.030)	-0.051 (0.031)	-0.019 (0.016)	-0.007 (0.016)	0.003 (0.038)	0.012 (0.028)	0.070** (0.034)
Observations	69952	69959	69921	63488	68212	69943	64505	69947	66091	53538
Panel B. Sometimes experienced										
Gold suitable × Gold price	-0.039 (0.034)	-0.101** (0.050)	-0.075*** (0.029)	-0.007 (0.047)	-0.033 (0.031)	-0.017 (0.016)	-0.032* (0.019)	-0.044 (0.039)	0.067*** (0.026)	-0.067* (0.040)
Gold suitable × Temperature	0.056 (0.043)	-0.045 (0.050)	0.098*** (0.031)	-0.029 (0.041)	-0.030 (0.038)	-0.003 (0.019)	0.000 (0.019)	-0.047 (0.039)	0.013 (0.027)	-0.041 (0.039)
Temperature	-0.027 (0.033)	-0.017 (0.044)	-0.056** (0.027)	0.034 (0.027)	-0.035 (0.027)	-0.020 (0.013)	-0.004 (0.014)	-0.010 (0.035)	-0.014 (0.025)	0.062** (0.031)
Observations	64635	61680	65880	60819	64500	68626	63516	64561	64004	51865
Panel C. Often experienced										
Gold suitable × Gold price	0.024 (0.021)	-0.058 (0.038)	0.010 (0.019)	0.029 (0.022)	0.006 (0.020)	0.002 (0.010)	-0.005 (0.014)	-0.042 (0.028)	0.037** (0.018)	0.012 (0.025)
Gold suitable × Temperature	0.035 (0.029)	0.089** (0.042)	0.059*** (0.023)	0.012 (0.022)	0.015 (0.027)	0.007 (0.012)	0.006 (0.016)	0.051 (0.033)	-0.010 (0.020)	0.019 (0.027)
Temperature	-0.008 (0.020)	-0.085** (0.034)	-0.043** (0.018)	-0.002 (0.015)	-0.030* (0.018)	-0.006 (0.009)	-0.003 (0.008)	-0.002 (0.026)	0.008 (0.014)	0.005 (0.015)
Observations	56547	43102	60325	56533	57675	66445	62618	57266	61709	49578

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced detailed categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. In Columns (1)-(10), the domestic violence outcome indicates whether a woman has been (i) pushed, shaken, or had something thrown, (ii) slapped, (iii) punched with a fist or hit by something harmful, (iv) had arm twisted or hair pulled, (v) kicked or dragged, (vi) strangled or burnt, (vii) threatened with knife/gun or other weapons, (viii) physically forced into unwanted sex, (ix) forced into other unwanted sexual acts, and (x) physically forced to perform sexual acts she did not want by husband or partner, respectively. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 15: Robustness: Effects of ASgM on Broad Categories of Domestic Violence Controlling for Husband's Characteristics

	Dependent variable: A dummy variable for domestic violence			
	(1) Overall violence	(2) Less severe physical violence	(3) Severe physical violence	(4) Sexual violence
	Panel A. Ever experienced			
Gold suitable × Gold price	-0.123*** (0.041)	-0.099** (0.043)	-0.034 (0.038)	-0.055 (0.046)
Industrial gold mines × Gold price	0.128*** (0.048)	0.180*** (0.055)	0.032 (0.058)	0.068 (0.062)
Observations	57686	57684	57677	57672
R ²	0.16	0.16	0.14	0.14
	Panel B. Sometimes experienced			
Gold suitable × Gold price	-0.112** (0.045)	-0.084* (0.045)	-0.046 (0.035)	-0.031 (0.041)
Industrial gold mines × Gold price	0.232*** (0.062)	0.257*** (0.068)	0.085 (0.059)	0.071 (0.050)
Observations	57574	56456	57371	56656
R ²	0.20	0.17	0.15	0.13
	Panel C. Often experienced			
Gold suitable × Gold price	-0.014 (0.032)	-0.010 (0.028)	0.013 (0.017)	-0.021 (0.029)
Industrial gold mines × Gold price	-0.064 (0.055)	-0.072 (0.049)	-0.045 (0.040)	0.007 (0.042)
Observations	57577	55801	57112	55607
R ²	0.21	0.23	0.09	0.12

Notes: The table presents results from OLS regressions checking the robustness of the baseline results on the effects of ASgM on overall and different forms of intimate partner violence in Sub-Saharan Africa by controlling for husband's characteristics. The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. Experiences of overall, less severe physical, severe physical, and sexual violence are considered in Columns (1)-(4), respectively. The key explanatory variable is our baseline measure of ASgM (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include the baseline demographic and environmental controls and fixed effects in addition to husband's age and education level. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 16: Effects of Artisanal Gold Mining on Women's Intrahousehold Bargaining Power Outcomes

	(1) Aggregate index 1	(2) Aggregate index 2	(3) Own money	(4) Own health	(5) Large purchase	(6) Daily purchase	(7) Visit	(8) Cook	(9) Husband money
Gold suitable × Gold price	0.059*** (0.016)	0.071*** (0.020)	0.018 (0.018)	0.063*** (0.023)	0.054** (0.022)	0.093** (0.036)	0.097*** (0.027)	0.039 (0.043)	-0.011 (0.038)
Observations	601189	598713	280025	594362	598571	233360	598556	134210	467840
R ²	0.35	0.34	0.12	0.28	0.27	0.30	0.24	0.19	0.28

Notes: The table presents the effects of artisanal gold mining on women's intrahousehold bargaining power using OLS regressions. The outcomes are dummy variables, indicating if the woman has the final say, individually or jointly with her husband/partner/someone else, on (i) spending her own money, (ii) her health care, (iii) making large purchases, (iv) making daily purchases, (v) making family visits, (vi) deciding what to cook daily, and (vii) spending her husband's money. The aggregate index 1 is calculated by taking a simple average of all the dummies, and aggregate index 2 is a simple average of the three most commonly asked questions in the DHS: (ii), (iii), and (v). The key explanatory variable is the interaction between gold suitability share and 1-year lagged gold price index. All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the individual. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 17: Effects of ASgM on Women's Attitude toward Domestic Violence and Barriers to Health Care Access

	Panel A. Attitude toward domestic violence						Panel B. Barriers to health care access			
	(1) Aggregate index	(2) Go out	(3) Neglect	(4) Argue	(5) Refuse sex	(6) Burn food	(7) Aggregate index	(8) Permission	(9) Money	(10) Distance
Gold suitable × Gold price	0.001 (0.019)	0.011 (0.024)	0.009 (0.024)	0.002 (0.025)	-0.008 (0.021)	-0.010 (0.018)	-0.010 (0.019)	-0.019 (0.018)	-0.016 (0.024)	0.005 (0.027)
Industrial gold × Gold price	-0.001 (0.022)	0.003 (0.027)	-0.015 (0.032)	0.016 (0.029)	0.002 (0.026)	-0.008 (0.028)	-0.064* (0.037)	-0.098*** (0.035)	-0.038 (0.053)	-0.056 (0.044)
Observations	597179	593799	594434	593123	591133	593662	598011	597803	597852	597834
R ²	0.28	0.22	0.20	0.22	0.24	0.16	0.22	0.16	0.17	0.19

Notes: The table presents the effects of artisanal gold mining on women's attitudes toward domestic violence (panel A) and their barriers to healthcare access (panel B). The outcomes for women's attitudes are dummy variables indicating whether the woman agrees that it is justified for the husband to beat his wife if she (i) goes out without telling her husband, (ii) neglects the children, (iii) argues with her husband, (iv) refuses to have sex, and (v) burns the food. The aggregate index is calculated by taking a simple average of the dummies. Outcomes for barriers to health care access are dummy variables equal to one if a woman thinks (i) getting permission, (ii) getting money, or (iii) distance to the health facility is a barrier to health care access. The key explanatory variable is the interaction between gold suitability share and 1-year lagged gold price index. All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the individual. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 18: Employment Effects of Artisanal Gold Mining

	Dependent variable: A dummy variable for employment				
	(1) All	(2) Mining	(3) Agriculture	(4) Services	(5) Sales
Panel A. Overall					
Gold suitable × Gold price	-0.005 (0.005)	0.024*** (0.008)	-0.027 (0.017)	-0.024** (0.011)	0.033* (0.018)
Industrial gold mines × Gold price	0.007 (0.010)	0.011 (0.014)	-0.034 (0.028)	-0.011 (0.015)	0.022 (0.024)
Observations	690232	540713	669866	663098	663098
R ²	0.09	0.09	0.42	0.12	0.19
Panel B. Male					
Gold suitable × Gold price	-0.007 (0.004)	0.012** (0.005)	-0.034** (0.015)	-0.017* (0.010)	0.004 (0.010)
Industrial gold mines × Gold price	0.016 (0.012)	0.004 (0.009)	-0.040 (0.028)	0.005 (0.013)	0.016 (0.014)
Observations	658986	516913	640177	624925	624925
R ²	0.08	0.08	0.36	0.08	0.09
Panel C. Female					
Gold suitable × Gold price	-0.015 (0.020)	0.023*** (0.006)	-0.034* (0.021)	-0.016 (0.011)	0.037* (0.022)
Industrial gold mines × Gold price	0.008 (0.040)	0.011 (0.013)	-0.032 (0.042)	-0.021 (0.018)	0.013 (0.035)
Observations	690121	398605	482918	483692	483692
R ²	0.20	0.09	0.44	0.14	0.28

Notes: The table presents the effects of artisanal gold mining on employment or labor supply in Sub-Saharan Africa using OLS regressions. The dependent variables are dummy variables indicating whether an individual is employed in different industries. The aggregate, male, and female employment are considered in Panels A-C, respectively. Employment outcomes in Columns (1)-(5) are activities in all industries, mining, agriculture, services, and sales, respectively, in the last twelve months. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the individual. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 19: Effects of Artisanal Gold Mining on Household Wealth

	Dependent variable: Household wealth index, standardized				
	(1)	(2)	(3)	(4)	(5)
Gold suitable \times Gold price (lag 1)	0.090** (0.043)				0.088** (0.043)
Gold suitable \times Log price		0.069** (0.030)			
Gold suitable \times Current price			0.094* (0.048)		
Gold suitable dummy \times Gold price				0.066** (0.031)	
Crop suitable \times Crop price	-0.019 (0.039)	-0.018 (0.039)	-0.013 (0.040)	-0.021 (0.038)	-0.019 (0.039)
Industrial gold mining \times Gold price	0.166*** (0.056)	0.163*** (0.056)	0.141*** (0.055)	0.161*** (0.057)	
Industrial mineral mining \times Mineral price					0.158*** (0.048)
Temperature	-0.171*** (0.037)	-0.172*** (0.037)	-0.181*** (0.039)	-0.171*** (0.037)	-0.169*** (0.037)
Observations	552088	552088	651510	552088	554109
R ²	0.65	0.65	0.62	0.65	0.65

Notes: The table presents the effects of artisanal gold mining on household wealth in Sub-Saharan Africa using OLS regressions. The dependent variable is the standardized household wealth index. The key explanatory variable is an alternative specification of an interaction of a cell's gold suitability with the international gold price. Column (1) is a baseline specification, an interaction of gold suitability share with a 1-year lagged gold price index. Column (2) uses log gold price. Column (3) uses contemporaneous price. Column (4) uses a gold suitability dummy. Column (5) controls industrial mineral mining. All regressions include the baseline demographic and environmental controls and fixed effects. The unit of observation is the household. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 20: Effects of ASgM and ISgM on Broad Categories of Domestic Violence (Household Wealth Controlled)

	Dependent variable: A dummy variable for domestic violence			
	(1) Overall violence	(2) Less severe physical violence	(3) Severe physical violence	(4) Sexual violence
Panel A. Ever experienced				
Gold suitable \times Gold price	-0.106*** (0.039)	-0.091** (0.039)	-0.022 (0.034)	-0.044 (0.045)
Industrial gold mines \times Gold price	0.134*** (0.045)	0.170*** (0.053)	0.034 (0.049)	0.096 (0.064)
Household wealth	-0.027*** (0.003)	-0.031*** (0.003)	-0.016*** (0.003)	-0.018*** (0.003)
Observations	69990	69987	69979	69972
R ²	0.18	0.17	0.13	0.13
Panel B. Sometimes experienced				
Gold suitable \times Gold price	-0.118*** (0.044)	-0.098** (0.043)	-0.050 (0.031)	-0.029 (0.039)
Industrial gold mines \times Gold price	0.178*** (0.056)	0.190*** (0.060)	0.077 (0.056)	0.086* (0.050)
Household wealth	-0.020*** (0.003)	-0.025*** (0.003)	-0.010*** (0.003)	-0.008*** (0.003)
Observations	69813	68275	69478	68665
R ²	0.21	0.17	0.14	0.12
Panel C. Often experienced				
Gold suitable \times Gold price	-0.008 (0.029)	-0.009 (0.025)	0.010 (0.018)	-0.021 (0.027)
Industrial gold mines \times Gold price	-0.067 (0.052)	-0.079 (0.049)	-0.052 (0.035)	0.015 (0.040)
Household wealth	-0.022*** (0.003)	-0.016*** (0.002)	-0.010*** (0.002)	-0.015*** (0.002)
Observations	69840	67703	69250	67516
R ²	0.20	0.21	0.09	0.11

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on overall and different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. Experiences of overall, less severe physical, severe physical, and sexual violence are considered in Columns (1)-(4), respectively. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). The effects of industrial gold mining are also presented, and the measure of industrial gold mining is our baseline measure (an interaction of a dummy indicating whether a cell has industrial gold mines with the lagged value of the international gold price). All regressions include the baseline demographic and environmental controls and fixed effects in addition to the household wealth index. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 21: Effects of ASgM and ISgM on Detailed Categories of Domestic Violence (Household Wealth Controlled)

	Dependent variable: A dummy variable for domestic violence									
	Less severe physical violence				Severe physical violence			Sexual violence		
	(1) Pushed, shook, or had something thrown	(2) Slapped	(3) Punch with fist or hit by something harmful	(4) Had arm twisted or hair pulled	(5) Kicked or dragged	(6) Strangled or burnt	(7) Threatened with knife/gun or other weapons	(8) Physically forced into unwanted sex	(9) Forced into other unwanted sexual acts	(10) Physically forced to perform sexual acts respondent did not want
Panel A. Ever experienced										
Gold suitable × Gold price	-0.004 (0.034)	-0.078** (0.039)	-0.061* (0.032)	0.022 (0.051)	-0.011 (0.033)	-0.010 (0.020)	-0.025 (0.023)	-0.058 (0.043)	0.101*** (0.029)	-0.037 (0.041)
Industrial gold mines × Gold price	0.018 (0.051)	0.147*** (0.050)	0.042 (0.039)	0.205** (0.097)	0.089 (0.058)	-0.004 (0.045)	-0.010 (0.038)	0.133** (0.063)	0.034 (0.048)	0.193*** (0.064)
Household wealth	-0.019*** (0.003)	-0.027*** (0.003)	-0.020*** (0.003)	-0.007*** (0.003)	-0.016*** (0.003)	-0.004** (0.002)	-0.008*** (0.002)	-0.015*** (0.003)	-0.009*** (0.002)	-0.012*** (0.003)
Observations	69952	69959	69921	63488	68212	69943	64505	69947	66091	53538
R ²	0.10	0.15	0.09	0.08	0.13	0.12	0.07	0.12	0.10	0.09
Panel B. Sometimes experienced										
Gold suitable × Gold price	-0.046 (0.033)	-0.094* (0.049)	-0.087*** (0.029)	-0.006 (0.047)	-0.030 (0.031)	-0.016 (0.016)	-0.031* (0.019)	-0.037 (0.039)	0.066** (0.025)	-0.053 (0.035)
Industrial gold mines × Gold price	0.030 (0.044)	0.154*** (0.059)	0.004 (0.034)	0.192** (0.098)	0.171*** (0.065)	-0.000 (0.042)	0.020 (0.031)	0.132** (0.055)	0.014 (0.034)	0.096 (0.068)
Household wealth	-0.012*** (0.003)	-0.024*** (0.004)	-0.015*** (0.003)	-0.003 (0.002)	-0.010*** (0.003)	-0.001 (0.001)	-0.005*** (0.001)	-0.006** (0.001)	-0.004** (0.003)	-0.007*** (0.002)
Observations	64635	61680	65880	60819	64500	68626	63516	64561	64004	51865
R ²	0.10	0.17	0.09	0.07	0.15	0.13	0.06	0.12	0.09	0.08
Panel C. Often experienced										
Gold suitable × Gold price	0.019 (0.021)	-0.075** (0.036)	0.002 (0.020)	0.030 (0.022)	0.006 (0.020)	0.001 (0.010)	-0.005 (0.015)	-0.048 (0.030)	0.039** (0.018)	0.004 (0.022)
Industrial gold mines × Gold price	-0.031 (0.034)	-0.078 (0.075)	0.004 (0.030)	0.076 (0.053)	-0.082 (0.055)	-0.020 (0.023)	-0.038 (0.026)	0.038 (0.041)	0.034 (0.036)	0.109*** (0.038)
Household wealth	-0.014*** (0.002)	-0.020*** (0.003)	-0.010*** (0.002)	-0.006*** (0.002)	-0.011*** (0.002)	-0.004*** (0.001)	-0.003*** (0.001)	-0.015*** (0.002)	-0.007*** (0.001)	-0.006*** (0.001)
Observations	56547	43102	60325	56533	57675	66445	62618	57266	61709	49578
R ²	0.15	0.23	0.13	0.09	0.10	0.06	0.08	0.12	0.09	0.10

Notes: The table presents the OLS estimates on the effects of artisanal gold mining on different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced detailed categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. In Columns (1)-(10), the domestic violence outcome indicates whether a woman has been (i) pushed, shaken, or had something thrown, (ii) slapped, (iii) punched with a fist or hit by something harmful, (iv) had arm twisted or hair pulled, (v) kicked or dragged, (vi) strangled or burnt, (vii) threatened with knife/gun or other weapons, (viii) physically forced into unwanted sex, (ix) forced into other unwanted sexual acts, and (x) physically forced to perform sexual acts she did not want by husband or partner, respectively. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). The effects of industrial gold mining are also presented, and the measure of industrial gold mining is our baseline measure (an interaction of a dummy indicating whether a cell has industrial gold mines with the lagged value of the international gold price). All regressions include the baseline demographic and environmental controls and fixed effects in addition to the household wealth index. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 22: Effects of ASgM on Individual and Household Characteristics

	Dependent variable: Observable characteristics								
	(1) Never married	(2) Married	(3) Living together	(4) Widowed	(5) Divorced	(6) Separated	(7) Age	(8) Non-mover	(9) Household size
Gold suitable × Gold price	0.003 (0.008)	0.012 (0.013)	-0.024** (0.012)	0.004 (0.003)	-0.002 (0.002)	0.008** (0.004)	-0.180 (0.181)	-0.028 (0.031)	-0.005 (0.019)
Observations	944670	944670	944670	944670	944670	944670	957053	564907	957053
R ²	0.38	0.29	0.16	0.06	0.03	0.03	0.10	0.16	0.23

Notes: The table presents the effects of artisanal gold mining on observable characteristics of the full DHS sample using OLS regressions. Non-movers (Column (8)) are those who never move out of their residence. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include individual and household characteristics, cell-level covariates, cell fixed effects (FEs), and country-by-year FEs. The individual or woman characteristics include education level and religion. The only household characteristic is urban/rural status. The cell-level covariates include industrial gold mining, agricultural potential, and weather conditions. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 23: Effects of ASgM on Migration

	(1) 0 year	(2) 1 year	(3) 2 years	(4) 3 years	(5) 4 years
Panel A. All women					
Gold suitable × Gold price	0.013** (0.006)	0.011 (0.009)	0.011 (0.012)	0.010 (0.015)	0.008 (0.017)
Observations	944687	944687	944687	944687	944687
R^2	0.06	0.10	0.13	0.17	0.19
Panel B. Ever-married women					
Gold suitable × Gold price	0.011* (0.006)	0.008 (0.009)	0.007 (0.011)	0.004 (0.014)	0.001 (0.016)
Observations	702016	702016	702016	702016	702016
R^2	0.07	0.10	0.14	0.18	0.20

Notes: The table presents the effects of artisanal gold mining on individual migration status using OLS regressions. Each Column represents the maximum period the woman is residing in her location. For example, Column (2) contains individuals living in their locality for at most one year. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include individual and household characteristics, cell-level covariates, cell fixed effects (FEs), and country-by-year FEs. The individual or woman characteristics include education level and religion. The only household characteristic is urban/rural status. The cell-level covariates include industrial gold mining, agricultural potential, and weather conditions. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 24: Effects of ASgM on Alcohol Drinking

	(1)	(2)	(3)	(4)
Panel A. Husband or partner's drinking status				
Gold suitable × Gold price	-0.016 (0.022)	-0.020 (0.023)	0.015 (0.024)	0.016 (0.023)
Industrial gold mines × Gold price	-0.042 (0.052)	-0.057 (0.050)	-0.024 (0.030)	-0.048 (0.034)
Observations	235324	235324	235324	235324
R ²	0.23	0.23	0.23	0.26
Panel B. Woman's drinking status				
Gold suitable × Gold price	-0.064* (0.034)	-0.064* (0.034)	-0.063* (0.034)	-0.063* (0.033)
Industrial gold mines × Gold price	0.240*** (0.021)	0.240*** (0.021)	0.237*** (0.021)	0.253*** (0.036)
Observations	60941	60941	60941	60941
R ²	0.29	0.29	0.29	0.30
Cell FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	No
Country FE	No	Yes	No	No
Country × Year FE	No	No	Yes	Yes
Controls	No	No	No	Yes

Notes: The table presents the effects of artisanal and industrial gold mining on husband or partner's (top panel) and woman's alcohol-drinking status using OLS regressions. The key explanatory variable is our baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). The controls include the woman's age, education level, current marital status, religion, urban/rural status, household size, industrial gold mining, agricultural potential, and weather conditions. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 25: Effects of ASgM on Fertility Decisions

	Dependent variable: Number of children		
	(1) Total ever born	(2) Living children	(3) Under-5 children
Gold suitable \times Gold price	-0.025 (0.055)	-0.013 (0.044)	-0.026 (0.032)
Industrial gold mines \times Gold price	-0.143* (0.084)	-0.057 (0.076)	0.059* (0.036)
Observations	702016	702016	702016
R^2	0.56	0.51	0.57

Notes: The table presents the effects of artisanal and industrial gold mining on fertility decisions or the number of children using OLS regressions. The fertility outcomes include the total number of children ever born (Column (1)), the number of living children (Column (2)), and the number of under-five children (Column (3)). The key explanatory variable is the baseline measure of artisanal gold mining (an interaction of the proportion of the cell's surface suitable for gold with the lagged value of the international gold price). All regressions include the baseline controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Supplementary Materials

(For Online Publication Only)

Artisanal Mining and Intimate Partner Violence in Sub-Saharan Africa

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This supplementary material presents further details on the data by describing additional outcomes and demographic and environmental controls (Appendix A) and provides additional figures and tables with more results (Appendix B).

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A Data Appendix

In Section 3, we defined our primary outcome variables for different forms of intimate partner violence with different frequencies. This appendix describes our secondary outcomes and demographic and environmental or cell-level characteristics included in our regressions.

A.1 Secondary Outcomes

In this section, we provide details about our secondary outcomes, including various measures of women's intrahousehold bargaining power, individual's gender- and industry-specific employment, household wealth, women's attitudes to intimate partner violence, women's access to health care, and migration.

Woman's Intrahousehold Bargaining Power. The DHS asks women to evaluate their involvement in the household decision-making process throughout several domains, specifically whether she has the final say on (a) spending her own money, (b) her health care, (c) making large purchases, (d) making daily purchases, (e) making family visits, (f) deciding what to cook daily, and (g) spending her husband's money (variable 739 and 743a-743f). We construct a dummy equal to one if she makes a decision by herself or jointly with her husband/partner/someone else. We then calculate an aggregate index for this dimension as a simple average of these dummies. As the questions are not consistently asked throughout the country-year rounds, following Benshaul-Tolonen (2024), we compute another aggregate index using the three most commonly asked domains in the DHS: deciding her own health care, making large purchases, and making family visits.

Labor Supply. The focus is employment outcomes among ever-married and 15 and 49-year-old women. We also look at labor supply by husbands or partners to examine the employment impact of artisanal mining heterogeneous by gender. Quantifying relative changes in employment and earning potential between wives and husbands in response to the ASgM shock is crucial in understanding the impact of ASgM on intimate partner violence because it depends on changes in the wife's employment opportunity relative to her husband or partner. The DHS data set is suitable for this purpose as the data provide information on the status of current employment or employment in the last twelve months for the woman and her husband or partner. The data report the woman's and her husband's activity status in different sectors, such as agriculture, extractive or mining, services, and sales or retail. Although we denote an individual's extractive activities as employment in mining, an individual might not be involved in an employment relation with an employer but just self-employed and directly earn from the sales of gold extracted.

First, we extract the woman's current employment status²⁸ from variable 714 and her employ-

²⁸While we acknowledge that a boom in local mining activities could induce one to work harder and work for longer hours (i.e., intensive margin), due to the data availability in the DHS, our employment measure can only capture a snapshot of labor allocation across the sector (i.e., extensive margin).

ment status in the past twelve months from variable 731 and define a dummy variable that takes a value of one if the woman is currently employed or employed in the past year, 0 otherwise. For men, we use variable 705, which reports the industry of the husband's current or most recent employment over the past twelve months, to define a dummy variable similar to a variable constructed for women above. We then combine these two variables for men and women to define a dummy variable of overall employment, indicating whether the wife or husband is currently employed or has been employed over the past twelve months. Second, we use a grouped or aggregate classification of industries in which the woman and her husband or partner work (currently or worked in the last twelve months) captured in variables 717 and 705 to create three dummy variables indicating whether the individual works in the agriculture, services or trade sector. Information on the industry in which the respondent and her husband or partner work enable us to examine the structural change, i.e., whether there is any shift of employment across sectors in response to ASgM shock. In this classification, we consider that the non-agriculture industry captures mining and its associated industries. According to the Dutch disease hypothesis, the rapid development in the mining industry leads to the transition of resources such as labor from non-mining to mining, i.e., from agriculture to non-agriculture. Third, we use a detailed classification of industries in which the woman and her husband or partner work (currently and worked in the last year) captured in variables 716 and 704. Using detailed industry classifications, we manually define two dummy variables indicating whether the respondent and her husband or partner work in the extractive sector. It is worth noting that the detailed industries that we used to define the extractive industry are not entirely consistent across DHS rounds and countries.²⁹ However, indicators of male and female employment in the extractive sector enable us to look deeper than the non-agriculture sector. However, a change in aggregate demand due to the ASgM shock can positively affect the labor supply in non-mining industries, especially in the services and trade sectors.

Household Wealth. To examine how artisanal gold mining (ASgM) induced by changes in international gold prices affects the living standards of households, we estimate the impact of the ASgM on household wealth. The DHS provides information on the household wealth index (variable 191), which is generated based on asset information from the Household Questionnaire, where each household asset is given a factor score calculated from the principal component analysis. To make it comparable across countries, we standardize the wealth index by country and year. In addition, the DHS provides information on the household wealth index (variable 190) grouped into three categories rather than household income: low wealth or low income (the lowest 40% of households), middle wealth or middle income (the middle 40% of households), and high wealth or high income (the top 20% of households).

In addition to the domestic violence outcomes in the baseline analysis, we explore another as-

²⁹For example, we consider the following different occupations in different DHS rounds and countries as extractive activity or industry: “miner” in Benin’s 1996 round, several occupations like “mining engineer” and “other senior geology and mining staff not elsewhere classified” in Benin’s 2011-2012 round, and “grouped in labors in mining, construction, manufacturing, and transport” in Ghana’s 1998-1999 round.

pect of female empowerment through two dimensions closely related to actual domestic violence incidents: women's attitude toward domestic violence and their intrahousehold bargaining power. There is a well-established literature that posits an improvement in female bargaining power following an increase in women's outside labor market opportunities, which might contribute to a reduction in domestic violence toward women.³⁰ The descriptive statistics for these variables are in Table B.4.

Attitude toward Domestic Violence. We use five questions regarding a woman's attitude toward domestic violence (variable 744a-744e). Specifically, she is asked to evaluate whether it is justified for a husband to beat his wife if she (a) goes out without telling her husband, (b) neglects the children, (c) argues with her husband, (d) refuses to have sex, and (e) burns the food. The variables are dummy which equals one if she thinks it is justified, and zero otherwise. We then calculate the simple average of these dummies to get the aggregate index for women's attitudes to domestic violence.

Access to Health Care. We use three variables to measure a woman's barrier to healthcare access. These are dummies equal to one if a woman thinks (i) getting permission, (ii) getting money, or (iii) distance to the health facility is a barrier to her access to health care. We also calculate an aggregate index for this dimension as a simple average of the three dummies.

Migration. We determine the respondent's migration status based on a question asking how long the woman has been living in her current residence (variable 104). We classify a woman to be *non-mover* if she never moves out of her residence and *mover* otherwise. For movers, we also determine whether she just recently migrated.

A.2 Details on Demographic and Environmental Controls

This section first describes the individual- and household-level demographic characteristics from the DHS surveys included in our regressions. Then, we discuss some cell-level factors likely to affect our outcomes in Sub-Saharan Africa.

Individual Characteristics. We control for four individual-level demographics in our regressions, including women's age, education, marital status, and religion. First, we include the woman's age (variable 012), which is expected to determine her employment and intimate partner violence. For labor supply, an individual's age is likely to serve as a proxy for health conditions, physical strength, and availability to work in artisanal gold mines and in different industries. For domestic violence outcomes, age can indicate a woman's vulnerability and her dependence on her husband or partner. For example, older wives might have more bargaining power within the household, and younger couples can also be responsive to different shocks or tend to argue more. Second, we con-

³⁰For some studies on the link between female labor market opportunities and their intrahousehold bargaining power, see Benshaul-Tolonen (2024), Anderson and Eswaran (2009), Majlesi (2016), Heath (2014), and Guimbeau et al. (2023).

trol for women's education, captured by variable 106, in our employment and domestic violence regressions. The literature suggests that a woman's employment, for example, in the extractive sector, and her likelihood of experiencing intimate partner violence (Erten and Keskin, 2018) depend on her education level. We classify women's education into three groups: no education, secondary education, and higher education. Third, we include marital status (variable 501) in our regressions because (i) the DHS data collects information on domestic violence by either the husband or partner and (ii) the sample consists of ever-married women whose current marital status could be different from marital status sometime over the past twelve months when the woman experienced intimate partner violence. Married women are expected to supply less labor than single women as they tend to be more responsible for household tasks like chores, cooking, and childcare in developing countries, such as Sub-Saharan Africa. We control for a variable indicating whether a woman is currently married, living with a partner, widowed, divorced, or separated. Fourth, religion (variable 130) could also affect for employment, especially for women, and domestic violence by husband or partner. Given that DHS surveys have different sets of religions across countries and even across survey rounds for the same country, we classify them into four general categories: (i) no religion, (ii) Muslim, (iii) Christian, and (iv) other religions.

Household Characteristics. We control for two household-level demographics in our regressions, including place of residence and household size. First, we include a dummy for the place of residence or an urban/rural status captured in variable v025. Since gold mining is more prevalent in rural areas, most actions or impacts are expected to concentrate in rural regions. We also include household size (variable 136)³¹ as the second household-level demographic controls. For employment, household size can have two opposing impacts on labor supply by either wife or husband. If there are more family members, they are likely to supply more labor to provide food for them, for example. But, if multiple people in the household work, then, for example, the wife does not need to work and spends more time on domestic household tasks like childcare and cooking instead of labor supply to the market, e.g., at ASgM sites. For intimate partner violence, household size might have a counterfeiting impact: more household members provide additional security for wives but create another source of pressure on husbands or conflicts between partners.

There are two additional cell-level environmental factors that we controlled in our regressions, including (i) agricultural suitability and (ii) weather conditions in addition to industrial gold mining, which we described in the main text of the paper.

Agriculture or Crop Suitability. To rule out other major activities happening in a given cell that might have a significant impact on employment, income, and thus intimate partner violence, we control for agricultural activities measured by the cell's agricultural suitability (Nunn, 2011; McGuirk, 2020; Girard et al., 2023). Following Nunn (2011), we use crop suitability instead of the actual yield of crops to be consistent with the gold suitability measure and because suitability is

³¹Household size refers to the total number of household members living together, and it might be different from family members as they might include members from the extended family.

more exogenous to local activities. We first find a cell's most suitable crop and interact with that crop's international price to be consistent with how we specify the gold suitability in our baseline. The crop suitability data comes from FAO's Global Agro-Ecological Zones (GAEZ), and crop price information is derived from the World Bank Pink Sheet.³²

We obtain the GAEZ suitability index under rain-fed and high-intensity input conditions for 51 crops with a 1981-2000 reference period. Since the data is recorded at 5 arc-minute levels, we aggregate up by taking the weighted average of the index of those 5 arc-minute cells within a 0.5×0.5 degrees cell with the weights being the area of the 5 arc-minute cells to come up with the suitability index for each crop at 0.5×0.5 degrees grid cell. We define a cell as suitable for agriculture if it is classified as "Good" (or "Medium") for at least one crop (i.e., crop suitability dummy equals to 1).³³ For those cells, we find its main suitable crop by taking a crop with the highest suitability index, and we then interact its crop suitability dummy by that corresponding crop's international price. If there are more than two crops, we will take a simple average of their price index base 1 in 2010. Figure B.3 shows the regions suitable for agricultural cultivation in Africa and the main suitable crop for each 0.5×0.5 degrees grid cell. Of the 10,662 cells, 4,441 cells (41.65%) are classified as at least "Good", and 4,143 cells (93.29%) have a unique main suitable crop.

Weather Conditions. We include time-varying weather conditions at the cell level to account for major environmental factors likely to be associated with local activities and employment opportunities like mining and agriculture. The weather condition is proxied by the average temperature of the year as the temperature data is more reliable than precipitation data (Dell et al., 2014; Girard et al., 2023). Information on temperature is obtained from the Climatic Research Unit of the University of East Anglia (CRU).

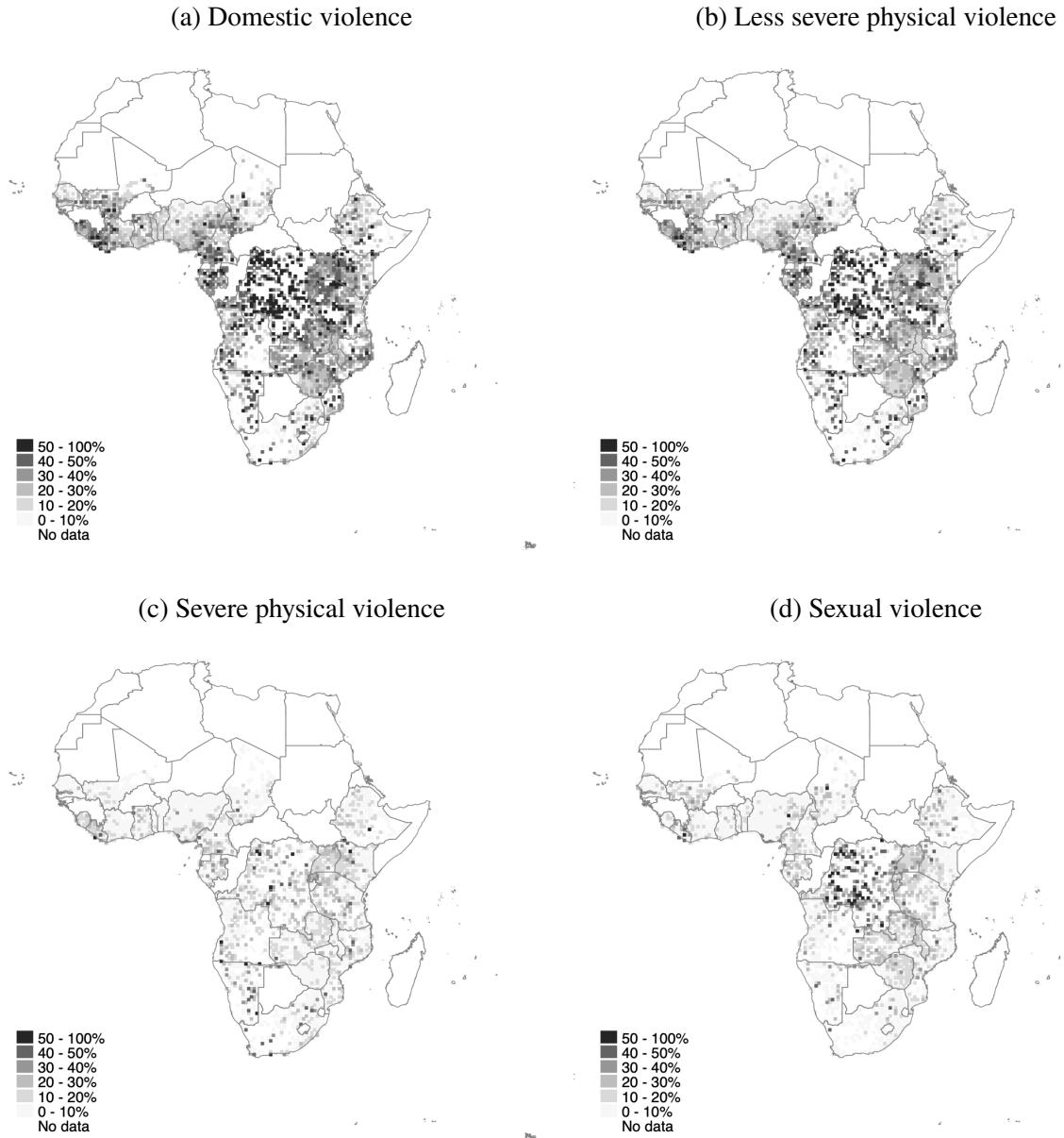
³²See how FAO-GAEZ computes the suitability index from <https://gaez.fao.org/pages/theme-details-theme-4>.

³³Following GAEZ's classification method, a cell is classified as "Good" ("Medium") for the cultivation of a crop if its suitability index is at least 5500 (4000).

B Additional Figures and Tables

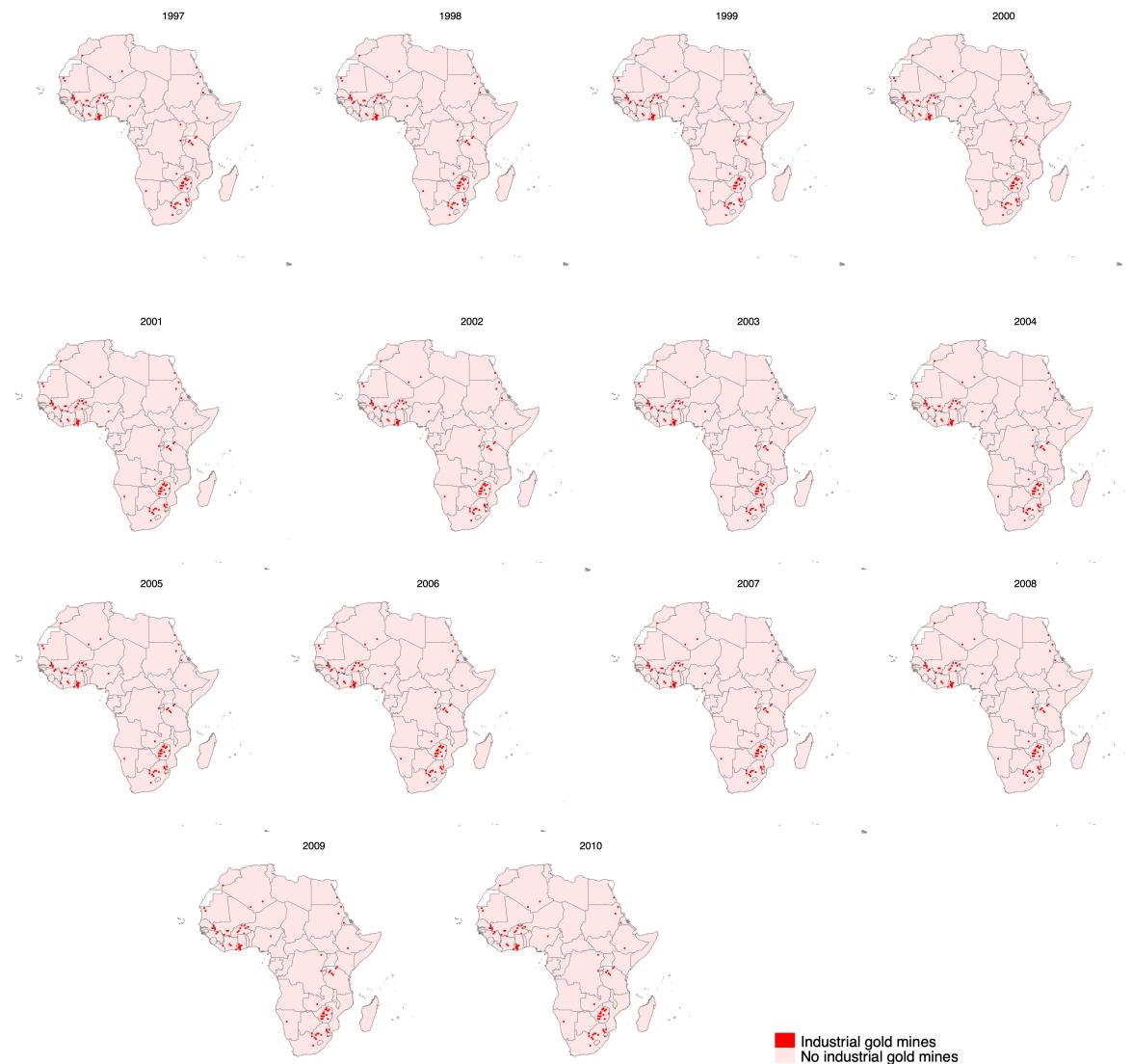
B.1 Additional Figures

Figure B.1: Intimate Partner Violence over the Past Twelve Months



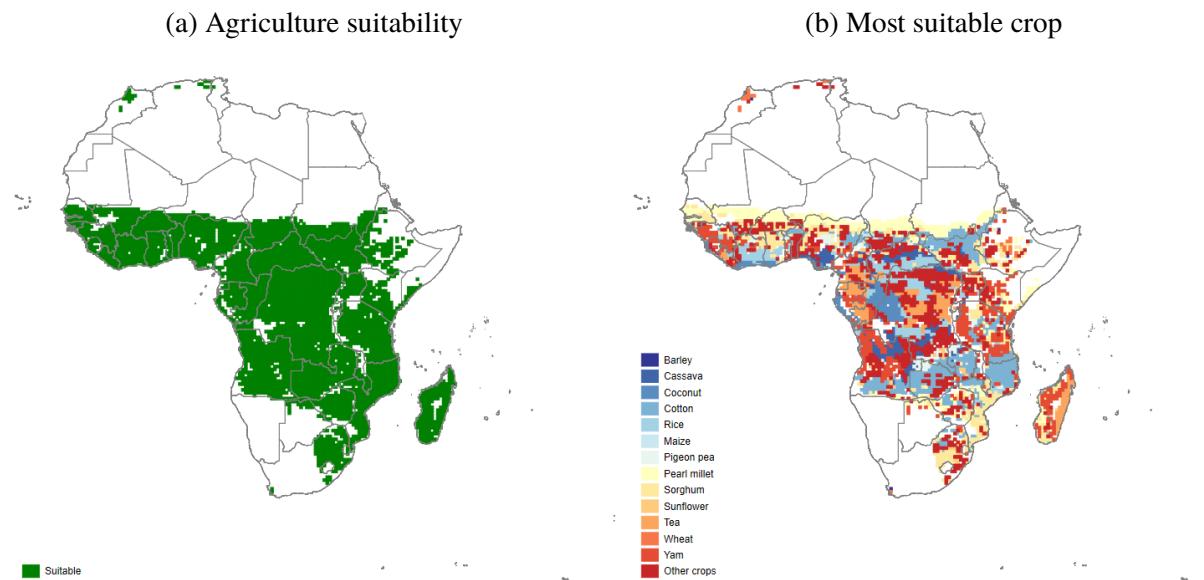
Notes: The figure plots the average share of women who have experienced intimate partner violence in the last twelve months by husband or partner in each cell between 1990 and 2019 using DHS data for Sub-Saharan African countries. Panel (a) shows the fraction of women who have experienced a domestic violence. Panels (b)-(d) show the share of women who experienced different forms of domestic violence, including less severe or mild physical violence (panel (b)), severe physical violence (panel (c)), and sexual violence (panel (d)).

Figure B.2: Spatial Distribution of Industrial Gold Mines across PRIO-GRID Cells, 1997-2010



Notes: The figure plots the distribution of industrial gold mines in Africa across PRIO-GRID cells of 0.5×0.5 degrees latitude and longitude (around 55×55 kilometers at the equator) from 1997 to 2010.

Figure B.3: Spatial Distribution of Crop Suitability in Africa



Notes: The figure shows the distribution of the region that is suitable for agricultural cultivation in Africa under rain-fed and high input intensity conditions (panel (a)) and the main suitable crop for each 0.5×0.5 degrees cell (panel (b)). A cell is suitable for agriculture if classified as “Good” or above, i.e., if its suitability index is at least 5500.

B.2 Additional Tables

Table B.1: Data Availability on Outcomes by Country and DHS Rounds

Country	DHS Rounds	Domestic violence	Intrahousehold bargaining power	Sector of activity	Extractive activities	Household wealth
Angola	2015-16	Y	Y	Y	Y	Y
Benin	1996	N	N	Y	Y	N
	2001	N	Y	Y	N	N
	2011-12	N	Y	Y	Y	Y
	2017-18	Y	Y	Y	Y	Y
Burkina Faso	1992-93	N	N	Y	N	N
	1998-99	N	N	Y	N	N
	2003	N	Y	Y	N	Y
	2010	Y	Y	N	N	Y
Burundi	2010-11	N	Y	Y	Y	Y
	2016-17	Y	Y	Y	Y	Y
Cameroon	1991	N	N	Y	N	N
	2004	Y	Y	Y	N	Y
	2011	Y	Y	Y	N	Y
	2018	Y	Y	Y	N	Y
Chad	2014-15	Y	Y	Y	Y	Y
Congo DR	2007	Y	Y	Y	N	Y
	2013-14	Y	Y	Y	N	Y
Cote d'Ivoire	1994	N	N	Y	N	N
	1998-99	N	N	Y	N	N
	2011-12	Y	Y	Y	Y	Y
Eswatini	2006-07	N	Y	Y	Y	Y
Ethiopia	1992	N	N	Y	Y	N
	1997	N	Y	Y	Y	N
	2003	N	Y	Y	Y	Y
	2008	Y	Y	Y	Y	Y
Gabon	2012	Y	Y	Y	N	Y
Ghana	1993-94	N	N	Y	N	N
	1998-99	N	N	Y	Y	N
	2003	N	Y	Y	Y	Y
	2008	Y	Y	Y	Y	Y
	2014	N	Y	Y	Y	Y
Guinea	1999	N	N	Y	N	N
	2005	N	Y	Y	Y	Y
	2012	N	Y	Y	Y	Y
	2018	N	Y	Y	Y	Y
Kenya	2003	Y	Y	Y	Y	Y
	2008-09	Y	Y	Y	Y	Y
	2014	Y	Y	Y	Y	Y
Lesotho	2004-05	N	Y	Y	Y	Y
	2009-10	N	Y	Y	Y	Y
	2014	N	Y	Y	Y	Y
Liberia	2006-07	Y	Y	Y	Y	Y
	2013	N	Y	Y	Y	Y
Madagascar	1997	N	N	Y	N	N
	2008-09	N	Y	Y	Y	Y
Malawi	2000	N	Y	Y	Y	N
	2004-05	Y	Y	Y	Y	Y
	2010	Y	Y	Y	Y	Y
	2015-16	Y	Y	Y	Y	Y

Table B.1: (Continued)

Country	DHS Rounds	Domestic violence	Intrahousehold bargaining power	Sector of activity	Extractive activities	Household wealth
Mali	1995-96	N	N	Y	N	N
	2001	N	Y	Y	N	N
	2006	Y	Y	Y	Y	Y
	2012-13	Y	Y	Y	N	Y
	2018	Y	Y	Y	N	Y
Mozambique	2011	Y	Y	Y	Y	Y
Namibia	2000	N	N	Y	Y	N
	2006-07	N	Y	Y	Y	Y
	2013	Y	Y	Y	Y	Y
Nigeria	1990	N	N	Y	N	N
	2003	N	Y	Y	Y	Y
	2008	Y	Y	Y	Y	Y
	2013	Y	Y	Y	Y	Y
	2018	Y	Y	Y	N	Y
Rwanda	2005	Y	Y	Y	Y	Y
	2010-11	Y	Y	Y	Y	Y
	2014-15	Y	Y	Y	Y	Y
Senegal	1992-93	N	N	Y	N	N
	1997	N	N	Y	N	N
	2005	N	Y	Y	N	Y
	2010-11	N	Y	Y	N	Y
	2012-13	N	Y	Y	N	Y
	2014	N	Y	Y	N	Y
	2015	N	Y	Y	N	Y
	2016	N	Y	Y	N	Y
	2017	Y	Y	Y	N	Y
	2018	Y	Y	Y	N	Y
Sierra Leone	2008	N	Y	Y	N	Y
	2013	Y	Y	Y	Y	Y
South Africa	2016	Y	Y	Y	N	Y
Tanzania	1999	N	N	N	N	N
	2003-04	N	N	Y	Y	Y
	2007-08	N	N	N	Y	Y
	2009-10	Y	Y	Y	Y	Y
	2011-12	N	N	N	Y	Y
	2015-16	Y	Y	Y	Y	Y
Togo	1998	N	N	Y	N	N
	2013-14	Y	Y	Y	N	Y
Uganda	2000-01	N	Y	Y	N	Y
	2006	Y	Y	Y	Y	Y
	2011	Y	Y	Y	N	Y
	2016	Y	Y	Y	N	Y
Zambia	2007	Y	Y	Y	Y	Y
	2013-14	Y	Y	Y	Y	Y
	2018	Y	Y	Y	Y	Y
Zimbabwe	1999	N	Y	Y	N	N
	2005-06	Y	Y	Y	N	Y
	2010-11	Y	Y	Y	N	Y
	2015	Y	Y	Y	N	Y

Notes: The table presents the DHS data availability on intimate partner violence, woman's intrahousehold bargaining power, sector of activity by individuals, extractive or mining activities by individuals, and household wealth across countries in Sub-Saharan Africa. Yes (Y) and No (N) indicate whether the variable is available in the DHS round of the country.

Table B.2: Effects of Cell-Level Covariates on Broad Categories of Domestic Violence

	Dependent variable: A dummy variable for domestic violence			
	(1) Overall violence	(2) Less severe physical violence	(3) Severe physical violence	(4) Sexual violence
Panel A. Ever experienced				
Gold suitable \times Gold price	-0.109*** (0.039)	-0.094** (0.039)	-0.023 (0.034)	-0.046 (0.045)
Industrial gold mines \times Gold price	0.135*** (0.045)	0.171*** (0.054)	0.034 (0.049)	0.097 (0.064)
Crop suitable \times Crop price	0.075** (0.037)	0.024 (0.040)	-0.036 (0.029)	0.033 (0.037)
Temperature	-0.028 (0.034)	-0.052 (0.039)	-0.061** (0.030)	0.021 (0.038)
Observations	69990	69987	69979	69972
Panel B. Sometimes experienced				
Gold suitable \times Gold price	-0.120*** (0.043)	-0.100** (0.043)	-0.051 (0.031)	-0.030 (0.039)
Industrial gold mines \times Gold price	0.178*** (0.056)	0.191*** (0.060)	0.077 (0.056)	0.086* (0.050)
Crop suitable \times Crop price	0.047 (0.036)	-0.004 (0.039)	-0.042* (0.024)	0.054* (0.029)
Temperature	-0.039 (0.038)	-0.054 (0.041)	-0.051* (0.027)	-0.000 (0.034)
Observations	69813	68275	69478	68665
Panel C. Often experienced				
Gold suitable \times Gold price	-0.010 (0.029)	-0.011 (0.025)	0.009 (0.018)	-0.023 (0.028)
Industrial gold mines \times Gold price	-0.066 (0.052)	-0.079 (0.049)	-0.052 (0.035)	0.016 (0.041)
Crop suitable \times Crop price	0.037 (0.026)	0.024 (0.023)	0.011 (0.017)	-0.005 (0.027)
Temperature	-0.008 (0.027)	-0.009 (0.023)	-0.023 (0.015)	0.020 (0.022)
Observations	69840	67703	69250	67516

Notes: The table presents the OLS estimates on the effects of cell-level covariates on overall and different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced broad categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. Experiences of overall, less severe physical, severe physical, and sexual violence are considered in Columns (1)-(4), respectively. All regressions include the baseline demographic controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table B.3: Effects of Cell-Level Covariates on Detailed Categories of Domestic Violence

	Dependent variable: A dummy variable for domestic violence									
	Less severe physical violence				Severe physical violence			Sexual violence		
	(1) Pushed, shook, or had something thrown	(2) Slapped	(3) Punch with fist or hit by something harmful	(4) Had arm twisted or hair pulled	(5) Kicked or dragged	(6) Strangled or burnt	(7) Threatened with knife/gun or other weapons	(8) Physically forced into unwanted sex	(9) Forced into other unwanted sexual acts	(10) Physically forced to perform sexual acts respondent did not want
Panel A. Ever experienced										
Gold suitable × Gold price	-0.006 (0.034)	-0.081** (0.039)	-0.063* (0.032)	0.022 (0.052)	-0.012 (0.033)	-0.010 (0.020)	-0.026 (0.023)	-0.060 (0.043)	0.100*** (0.029)	-0.036 (0.041)
Industrial gold mines × Gold price	0.018 (0.051)	0.148*** (0.050)	0.043 (0.039)	0.201** (0.097)	0.088 (0.058)	-0.004 (0.045)	-0.010 (0.038)	0.134** (0.063)	0.034 (0.048)	0.188*** (0.062)
Crop suitable × Crop price	0.028 (0.029)	-0.004 (0.040)	0.029 (0.031)	-0.049* (0.026)	-0.054* (0.030)	0.022 (0.016)	0.012 (0.015)	0.007 (0.037)	-0.031 (0.026)	0.054** (0.027)
Temperature	-0.004 (0.031)	-0.038 (0.038)	-0.041 (0.029)	0.034 (0.028)	-0.053* (0.028)	-0.019 (0.015)	-0.005 (0.014)	0.002 (0.036)	0.010 (0.027)	0.062** (0.030)
Observations	69952	69959	69921	63488	68212	69943	64505	69947	66091	53538
Panel B. Sometimes experienced										
Gold suitable × Gold price	-0.046 (0.033)	-0.096** (0.049)	-0.088*** (0.028)	-0.007 (0.047)	-0.031 (0.030)	-0.016 (0.016)	-0.032* (0.019)	-0.038 (0.039)	0.065** (0.026)	-0.053 (0.035)
Industrial gold mines × Gold price	0.030 (0.044)	0.154*** (0.059)	0.005 (0.034)	0.191* (0.098)	0.171*** (0.066)	-0.000 (0.042)	0.020 (0.031)	0.132** (0.055)	0.014 (0.034)	0.093 (0.067)
Crop suitable × Crop price	0.006 (0.027)	-0.027 (0.042)	0.017 (0.024)	-0.042* (0.023)	-0.052** (0.024)	0.008 (0.014)	0.001 (0.013)	0.030 (0.030)	-0.015 (0.021)	0.040* (0.023)
Temperature	-0.009 (0.030)	-0.032 (0.041)	-0.023 (0.025)	0.025 (0.025)	-0.045* (0.025)	-0.020* (0.012)	-0.004 (0.013)	-0.025 (0.033)	-0.010 (0.023)	0.050* (0.027)
Observations	64635	61680	65880	60819	64500	68626	63516	64561	64004	51865
Panel C. Often experienced										
Gold suitable × Gold price	0.018 (0.021)	-0.078** (0.036)	0.001 (0.020)	0.029 (0.022)	0.004 (0.020)	0.001 (0.010)	-0.005 (0.015)	-0.050* (0.030)	0.038** (0.018)	0.005 (0.022)
Industrial gold mines × Gold price	-0.030 (0.034)	-0.076 (0.076)	0.004 (0.029)	0.073 (0.053)	-0.082 (0.055)	-0.020 (0.023)	-0.038 (0.026)	0.039 (0.041)	0.034 (0.037)	0.107*** (0.038)
Crop suitable × Crop price	0.029 (0.018)	0.004 (0.034)	0.011 (0.020)	-0.014 (0.016)	-0.003 (0.017)	0.019** (0.010)	0.015 (0.009)	-0.005 (0.029)	-0.012 (0.016)	0.022 (0.014)
Temperature	0.004 (0.019)	-0.054* (0.031)	-0.024 (0.017)	0.002 (0.014)	-0.025 (0.017)	-0.004 (0.008)	-0.001 (0.007)	0.016 (0.024)	0.005 (0.014)	0.010 (0.014)
Observations	56547	43102	60325	56533	57675	66445	62618	57266	61709	49578

Notes: The table presents the OLS estimates on the effects of cell-level covariates on different forms of intimate partner violence in Sub-Saharan Africa. The dependent variables are dummy variables if a woman ever experienced detailed categories of domestic violence in the last twelve months (Panel A). In Panels B and C, experiences of domestic violence are disaggregated into different frequencies. In Columns (1)-(10), the domestic violence outcome indicates whether a woman has been (i) pushed, shaken, or had something thrown, (ii) slapped, (iii) punched with a fist or hit by something harmful, (iv) had arm twisted or hair pulled, (v) kicked or dragged, (vi) strangled or burnt, (vii) threatened with knife/gun or other weapons, (viii) physically forced into unwanted sex, (ix) forced into other unwanted sexual acts, and (x) physically forced to perform sexual acts she did not want by husband or partner, respectively. All regressions include the baseline demographic controls and fixed effects. The unit of observation is the woman. Standard errors clustered by cells are in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table B.4: Descriptive Statistics of Women's Attitude toward Domestic Violence, Barriers to Health Care Access, and Intrahousehold Bargaining Power Outcomes

	Mean	SD	Min	Max	Observations
Panel A. Attitude toward domestic violence					
<i>Beating is justified if a woman . . .</i>					
Goes out without telling a husband	0.37	0.48	0	1	717,027
Neglects the children	0.39	0.49	0	1	717,886
Argues with a husband	0.35	0.48	1	0	716,247
Refuses to have sex	0.31	0.46	0	1	713,694
Burns the food	0.20	0.40	0	1	717,044
Aggregate index	0.32	0.38	0	1	721,260
Panel B. Barriers to health care access					
<i>If . . . is a big barrier to health care access</i>					
Getting permission	0.15	0.36	0	1	636,045
Getting money	0.55	0.50	0	1	636,094
Distance to health facility	0.41	0.49	1	0	636,090
Aggregate index	0.37	0.34	0	1	636,282
Panel C. Intrahousehold bargaining power					
<i>If she has final say on . . .</i>					
Spending her money	0.88	0.33	0	1	317,515
Her health care	0.51	0.50	1	0	638,705
Large purchase	0.48	0.50	0	1	643,027
Daily purchase	0.58	0.49	0	1	255,239
Family visits	0.59	0.49	0	1	643,004
What to cook	0.71	0.45	0	1	151,528
Spending husband's money	0.43	0.50	0	1	487,972
Aggregate index	0.56	0.38	0	1	662,737

Notes: The descriptive statistics are estimated from the DHS sample of ever-married women aged between 15-49 years (inclusive).

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