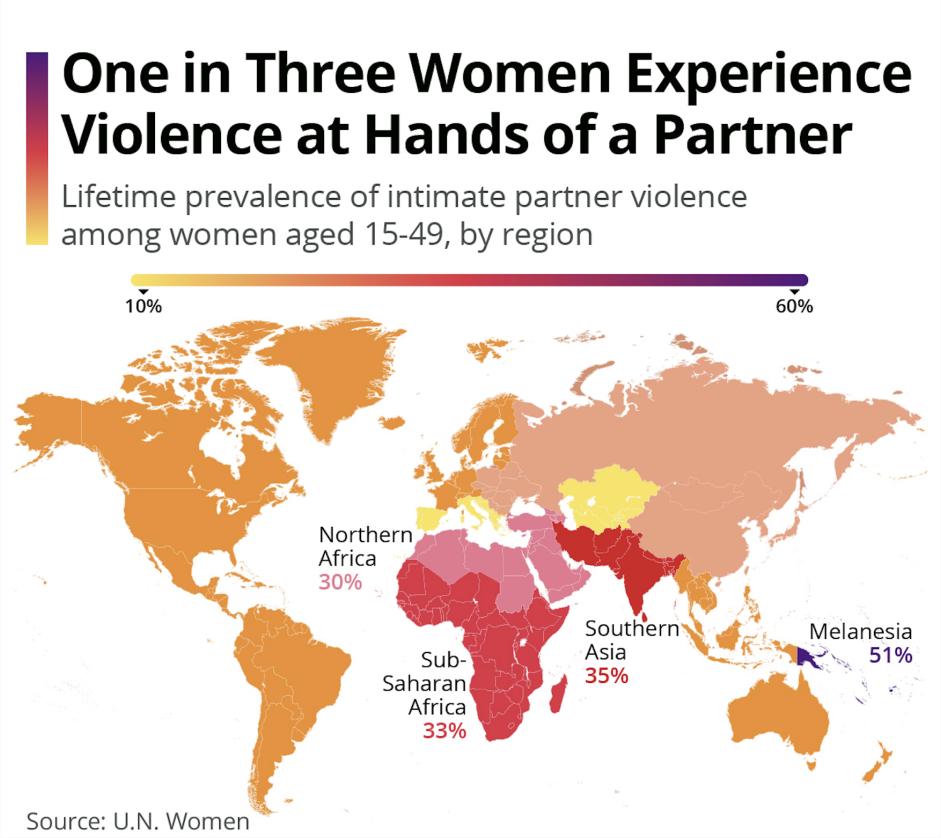
Women's Employment, Husbands' Economic Self-Interest and Domestic Violence

Deniz Sanin
University of South Carolina

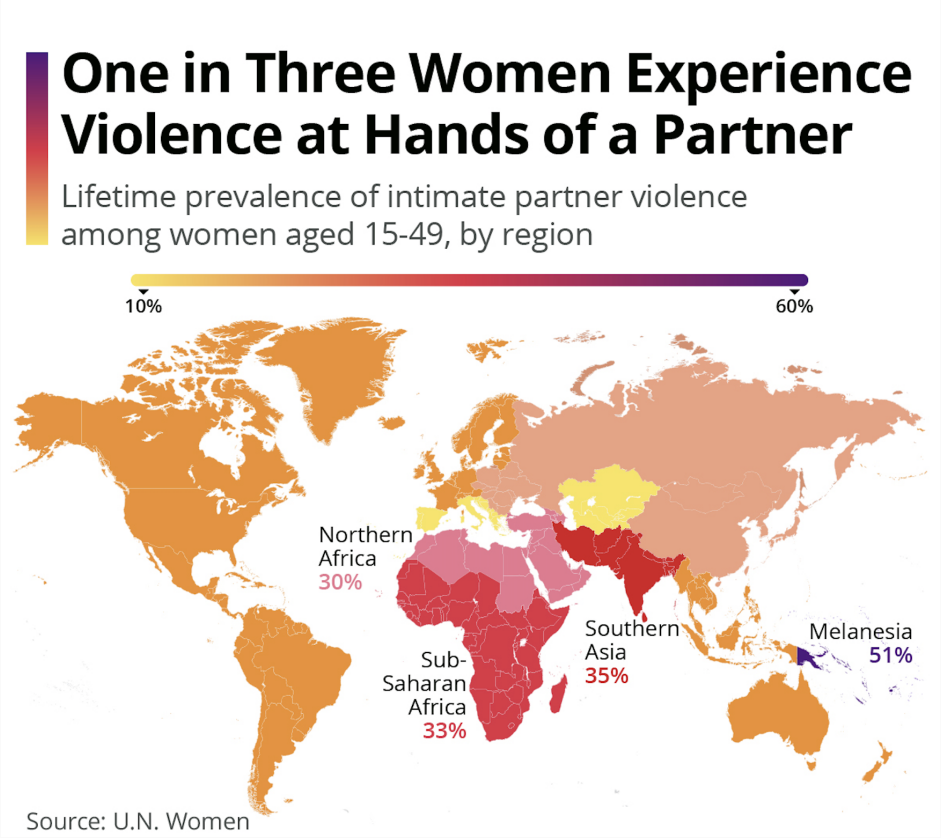
Cornell University
Joint Law, Economics, and, Policy Seminar (LEAP) & Development Economics Workshop
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Domestic Violence [between partners] (DV)



- Extreme form of gender inequality and a global health problem of epidemic proportions (WHO 2013).

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- **Rwanda: 41.5% partnered women** reported ever experiencing DV as of 2019 (Rwanda National Institute of Statistics, 2019).

Addressing DV: Providing jobs to women

- **Theories on women's income & DV:**
  - $\downarrow$ DV: $\uparrow$ in **women's outside options**, $\downarrow$ **financial stress in the household.**
  - $\uparrow$ DV: Husbands' incentives to **extract women's resources**, **male backlash.**

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- **Job $\neq$ income:**
  - Psychosocial benefits, confidence. Hussam, Kelley, Lane and Zahra 2022, McKelway 2025.
  - Exposure reduction. Dugan et al., 1999.
  - Earning income using **capacity to work**, health capital. Becker 1962, 2007; Goldin 2016.
    - **If a husband's violence physically incapacitates his wife and creates an economic cost to him (because he benefits from her work) $\rightarrow$ DV↓.**

This Paper

Research Question: Does providing job opportunities to women decrease the violence they face from their partners, and if so, via which channels?

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Part I: Provide causal evidence on the effect of a mill:

- the wife's transition to paid employment, $\uparrow$ in the husband's earnings, $\downarrow$ DV.
    - Self-reports & **universe of monthly hospital records for (physical or sexual) DV.**

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- the wife's transition to paid employment, ↑ in the husband's earnings, ↓ DV.
  - Self-reports & **universe of monthly hospital records for (physical or sexual) DV.**

Part II: Uncover the mechanisms:

- ↓ in DV is plausibly driven by women's employment.
  - ↑ **in the husband's economic cost of physically incapacitating the wife.**
  - ↑ in the wife's outside options and contribution to household income.
  - ~~Exposure Reduction.~~

This Paper: Key Features for Context

Coffee Mill: Coffee cherries (Harvest) $\xrightarrow{\text{Processing}}$ High-quality Beans $\rightarrow$ Export



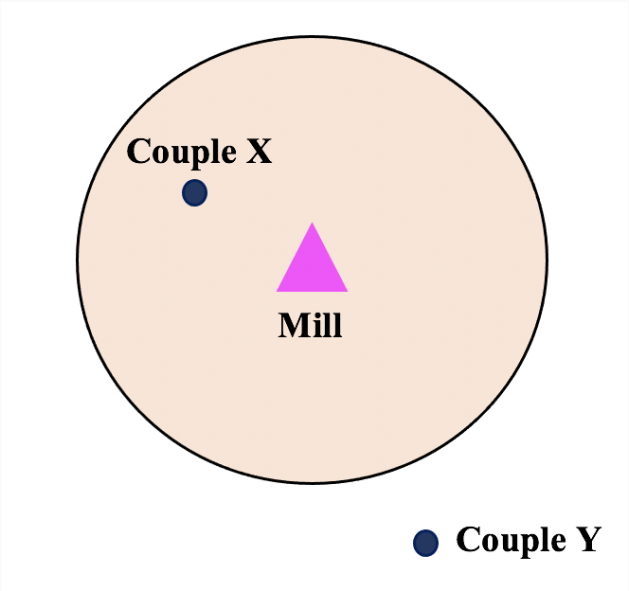
Harvested Coffee Cherries

This Paper: Key Features for Context

Coffee Mill: Coffee cherries (Harvest) $\xrightarrow{\text{Processing}}$ High-quality Beans $\rightarrow$ Export

1. **Spatial Variation.**
   - **Catchment Area (CA):** A mill serves coffee farmers (mostly couples) that reside within its CA, a buffer zone around the mill.

$\rightarrow$ Cherries will rot if not transported to a mill within a few hours of harvest.

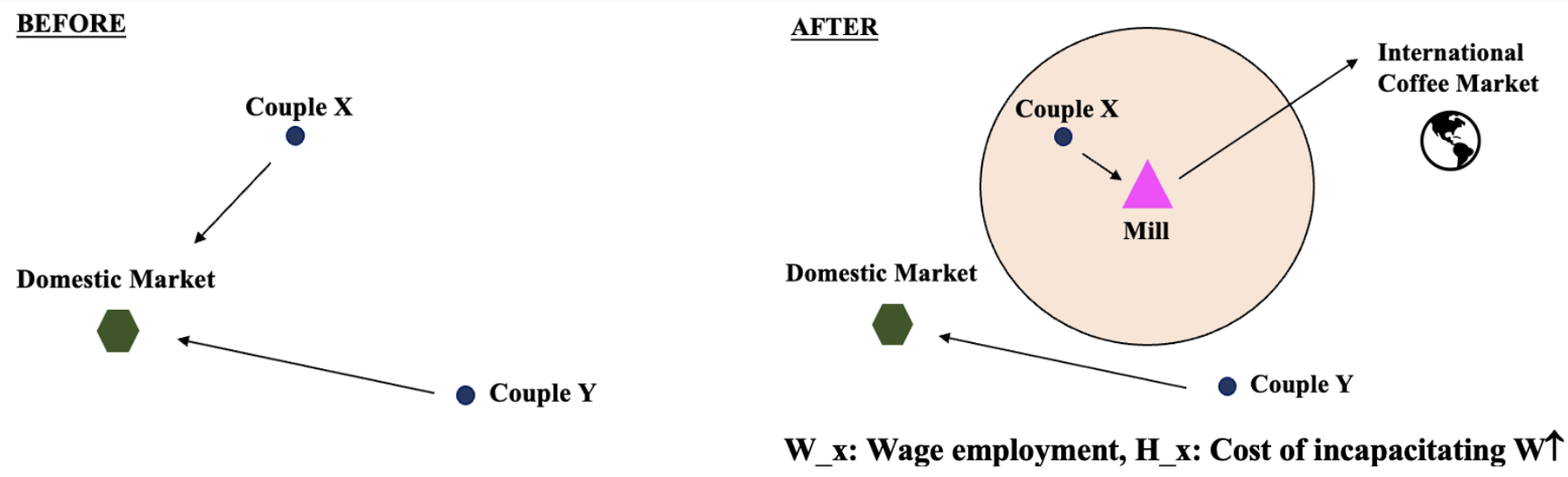


This Paper: Key Features for Identification

1. **Spatial Variation.**
   - **Catchment Area (CA):** Buffer zone around the mill.

   → Cherries will rot if not transported to a mill within a few hours of harvest.

2. **Time Variation.**
   - **Both Before & After:** Gendered division of labor + Labor-intensive tasks.
   - **Before:** W harvests the cherries with H and processes them as an **unpaid family worker** at home. H sells low-quality coffee in the local market for a low price.
   - **After:** H sells the cherries to the mill for a **high premium**. W does some processing tasks at the mill as a **wage worker.**



This Paper: Identification

1. **Diff-in-Diff Event-Study Design I**
    - **Spatial Variation:** Within-Outside of the CA. [Couples]
    - **Yearly Time Variation:** Before-After a mill's year of opening.
    - **Event of Interest:** Opening of a mill.
    - **Data:** Annual self-reported labor market outcomes and DV.

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2. **Diff-in-Diff Event Study Design II** $\rightarrow$ Studying the incapacitation cost channel
   - **Spatial Variation:** Within-Outside of the CA. [Hospitals]
   - **Monthly Time Variation:** Mills operate during the harvest season, March-July.
     - $\exists$ **months st:** Incapacitation cost changes, other channels are fixed/ ruled out w/ data.
   - **Event of Interest:** Start of mill operations within the year (once the mill is built).
   - **Data: Monthly hospital records for DV** from later in the expansion, number of hospitals within a mill's CA is fixed.

This Paper: Preview of Results

Part I: Effect of Mill Exposure

- Following the mill opening, women in the CAs are **16% more likely** to work for cash and ∼**30% less likely** to self-report physical or sexual DV in the past 12 months, relative to the year before.

- Mill opening ↑ earnings for each spouse.

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Part II: Mechanisms

- ↑ in the economic cost of women's physical incapacitation.
- ↑ in women's bargaining power and contribution to household income.
- ~~Exposure reduction.~~

Contributions and Related Literature I

- Women's Income and DV
  - **$\downarrow$ in DV:** $\uparrow$ in outside option, $\downarrow$ in financial stress, exposure reduction

    Tauchen et al. 1991, Farmer and Tiefenthaler 1997, Aizer 2010, Anderberg et al. 2016, Hidrobo et al. 2016, Haushofer et al. 2019, Lowes 2023, Adams et al. 2024, Frankenthal 2024, Angelucci 2008, Bhalotra et al. 2019, Heath et al. 2020, Arenas-Arroyo et al. 2021, Bhalotra et al. 2025, Chin 2011.

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I. First paper to introduce **the cost of women's physical incapacitation as a channel** linking women's employment to DV and to provide causal evidence isolating it.

Contributions and Related Literature II

- Female labor force participation (FLFP) in developing countries
  - Drivers of FLFP and the effects of interventions that can ↑ FLFP.

    Alesina et al. 2013, AlAzzawi 2014, Juhn et al. 2014, Gaddis and Pieters 2017, Khanna and Pandey 2020, Angelucci et al. 2015, Banerjee et al. 2015, Keats 2018, Baird et al. 2019, Bursztyn et al. 2020, Hyland et al. 2020, Field et al. 2021, McKelway 2021, Daher et al. 2025, Kala and McKelway 2025, Hsu et al. 2026.

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II. **Focusing on consequences of women's employment:** The interventions and phenomena that increase female employment in developing countries may improve their health and physical security in the household.

    See Jensen 2012, Sivasankaran 2014, Heath and Mobarak 2015, Qian 2008, Atkin 2009, Anderson and Eswaran 2009, Majlesi 2016 for the effects of women's increased job availability on marriage, fertility, education decisions, children's health and bargaining power.

Outline

- Context: Rapid Expansion of Coffee Mills in Rwanda
- Data
- Empirical Strategy I and Results: Effect of a Mill Opening
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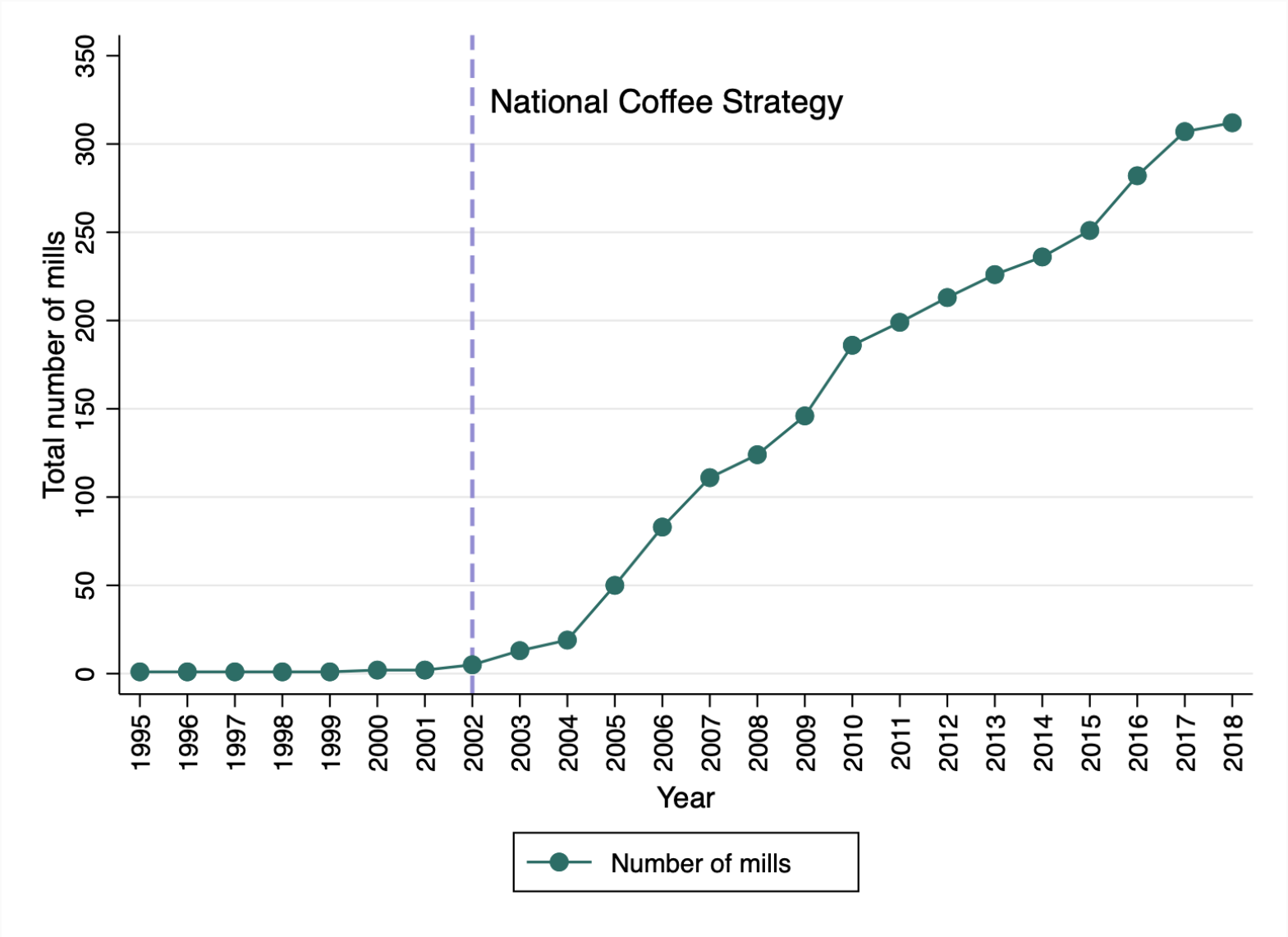
Context: Rapid Expansion of Coffee Mills

- **2002:** The government adopted the National Coffee Strategy which aimed to shift to mill-processed (high-quality) coffee production to participate in the international specialty coffee market (Boudreaux, 2011).

- **Early 2000s:** A public-private partnership project helped farmers to establish cooperatives and build mills in their communities.

- **After early 2000s:** Farmers continue to build mills across the country and a rapid expansion took place.

Context: Rapid Expansion of Coffee Mills



- What predicts mill placement?→ Historical number of coffee trees (1999) and the FAO coffee suitability index.

Identifying Assumption

Context: Women's employment in the coffee value chain

Before a mill opening:

- Farmers harvest the cherries, clean, dry them and sort out the defectives by hand at home $\rightarrow$ sell the low-quality product in the local market for a low price.

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A mill (in the CAs):

- Enables farmers to sell the cherries for a **high premium** on the international coffee market (via selling to the mill).
  - **H:** Earnings $\uparrow$, value of W's work capacity in harvesting $\uparrow$
- Demands **paid labor** for the sorting tasks that its machinery cannot do.
  - **W:** Unpaid family worker $\rightarrow$ wage worker in the mill.
  - **H**: W shares her personal earnings with H.

Coffee Sorting in a Mill

Transportation Harvesting



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Data

- Data on mills: Rwanda GeoData, Macchiavello and Morjaria (2020)
  - **Geocoded, universe of mills with information on year of operation.**
  - Complement with:
    - Historical number of coffee trees using 1999 Coffee Census.
    - Crop suitability data.

- Demographic Health Survey (DHS) 2004/5, '10/11, '13/'14, '19
  - **Geocoded**, nationally representative, repeated cross-section.
  - **Working, working for cash, experiencing DV in the past 12 months.**
  - Occupation, household decisions of couples.

- Integrated HH Living Conditions Survey (EICV) 2005/6, '11, '13/'14, '16/17
  - Individual **earnings** of couples.
  - Household **monthly food consumption expenditure.**
  - Not geocoded, mill opening at the district level ($\approx$ 800 km^2).

- Hospital Management Information System Data (HMIS), 2012-2019
  - **Geocoded, monthly** panel data of hospitals.
  - **Universe of hospital cases due to gender based violence**, age$>$18 $\rightarrow$ DV.
  - Placebo: Universe of monthly non-DV hospital records (all and for a subset of diseases).

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DID Event-Study I: Effect of a Mill Opening

$$Y_{istk} = \beta_0 + \sum_{k=-7}^{6} Mill_{is} \times \beta_k \mathbb{1}[\tau = k] + \mathbf{X_{it}}\phi + \alpha_s + \gamma_{dt} + \epsilon_{istk}.$$

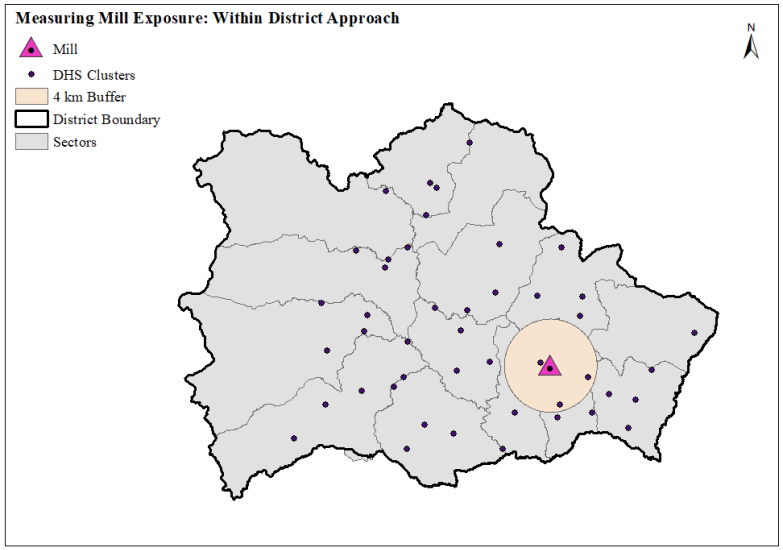
- Y_{ist}: Binary var coded as 1 if woman i, in sub-district s, in year t and at event time k
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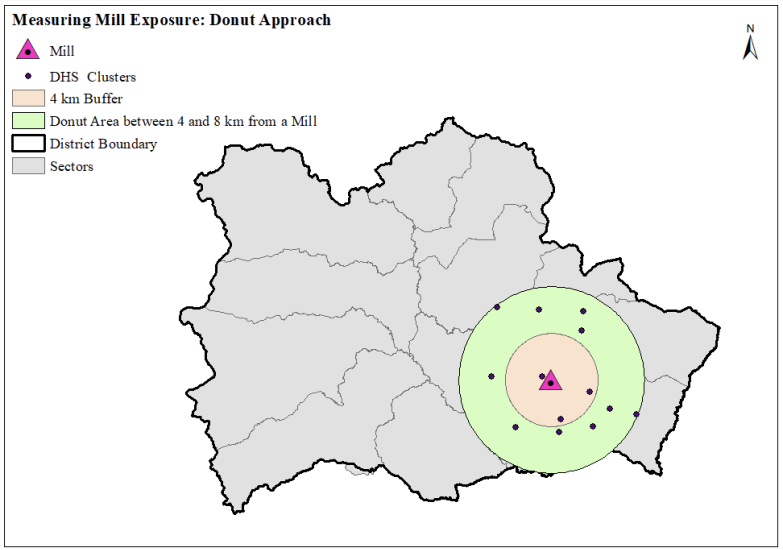
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- $\mathbf{X_{it}}$: Individual controls of the woman including religion, education, agricultural occupation, age-group FE, year of marriage FE, interview month and year FE.
- α_s, γ_{dt}: Sub-district FE, District-by-yr FE.

Measuring Mill Exposure: DHS Clusters

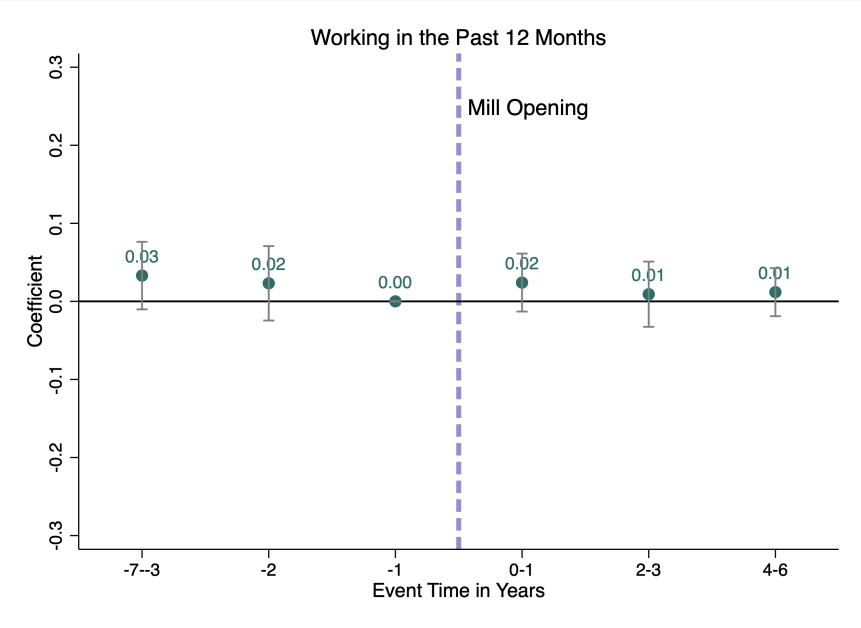


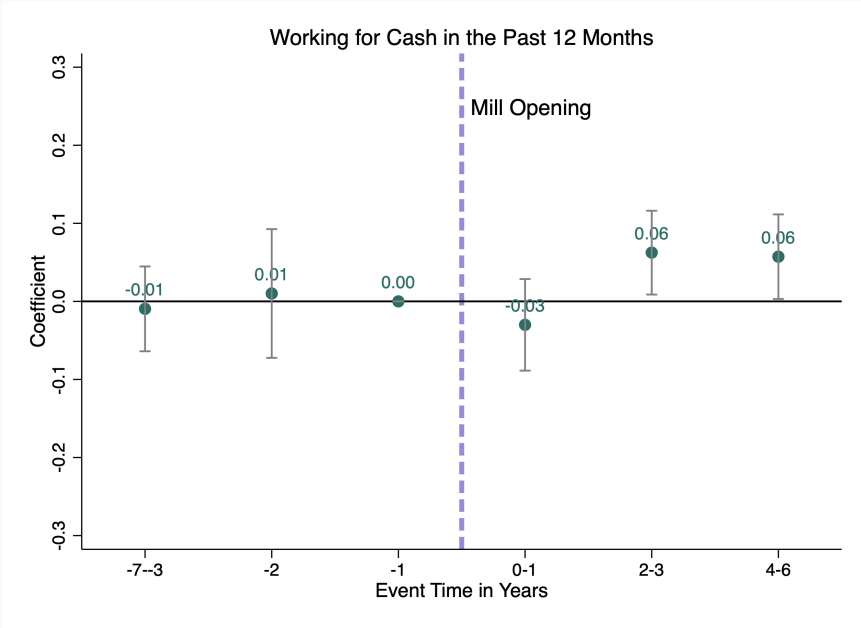


1. Within District Approach [Left] - Main Approach
   - Treatment: CA - 4 km buffer zone around a mill.
   - Control: Outside of the CA within the district. ($\approx$ 800 km^2)
2. Donut Approach [Right] - Robustness
   - Control: Donut area between 4 and 8 km from a mill.

Results: Effect on Wife's Employment

Tables



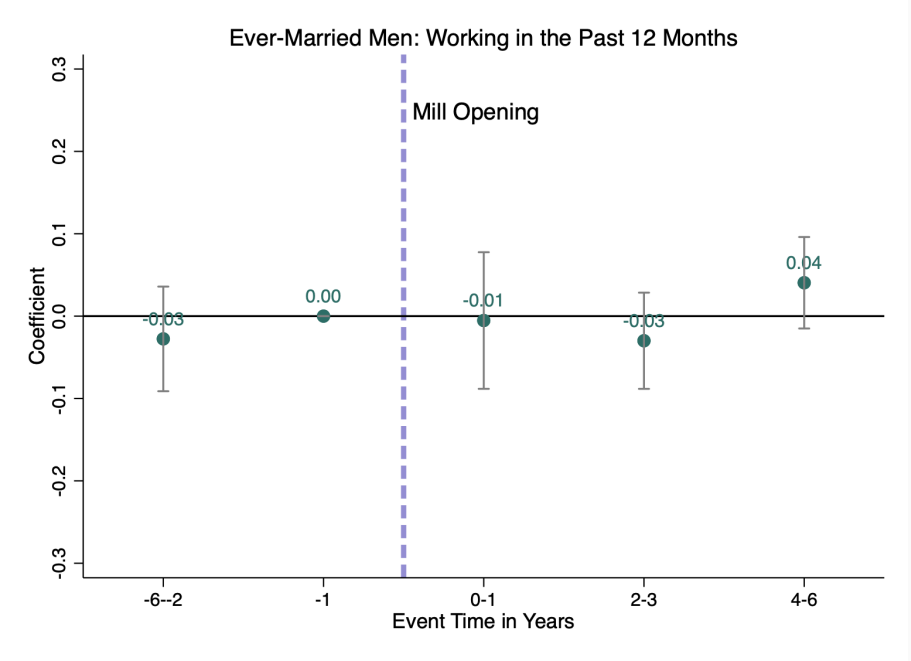


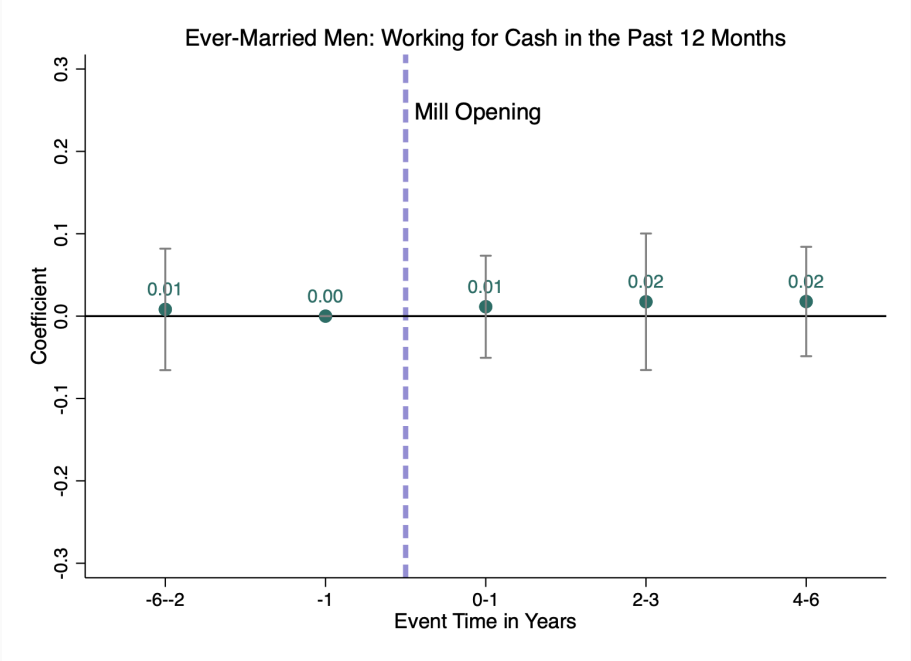
- Working $\leftrightarrow$
- Working for cash $\uparrow$ in the past 12 months.

No sorting in agri occupations

Ever-married sample is used. All results are robust to using the married sample.

Results: Effect on Husband's Employment

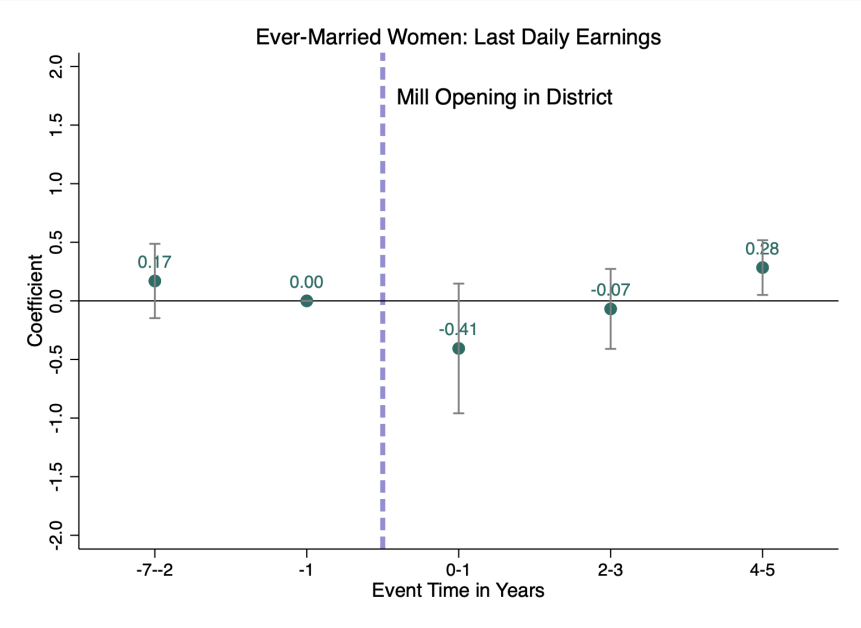


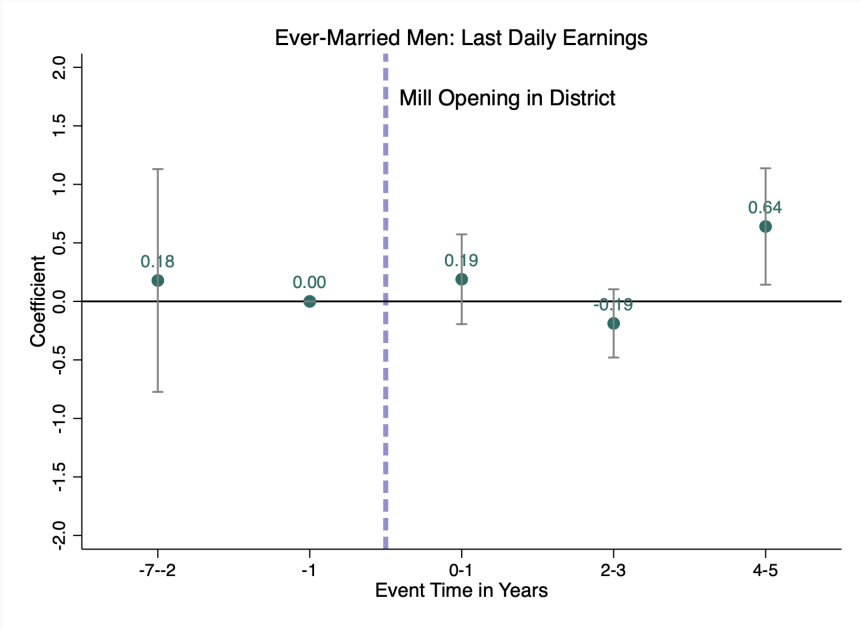


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Results: Effect on Individual and Household Earnings



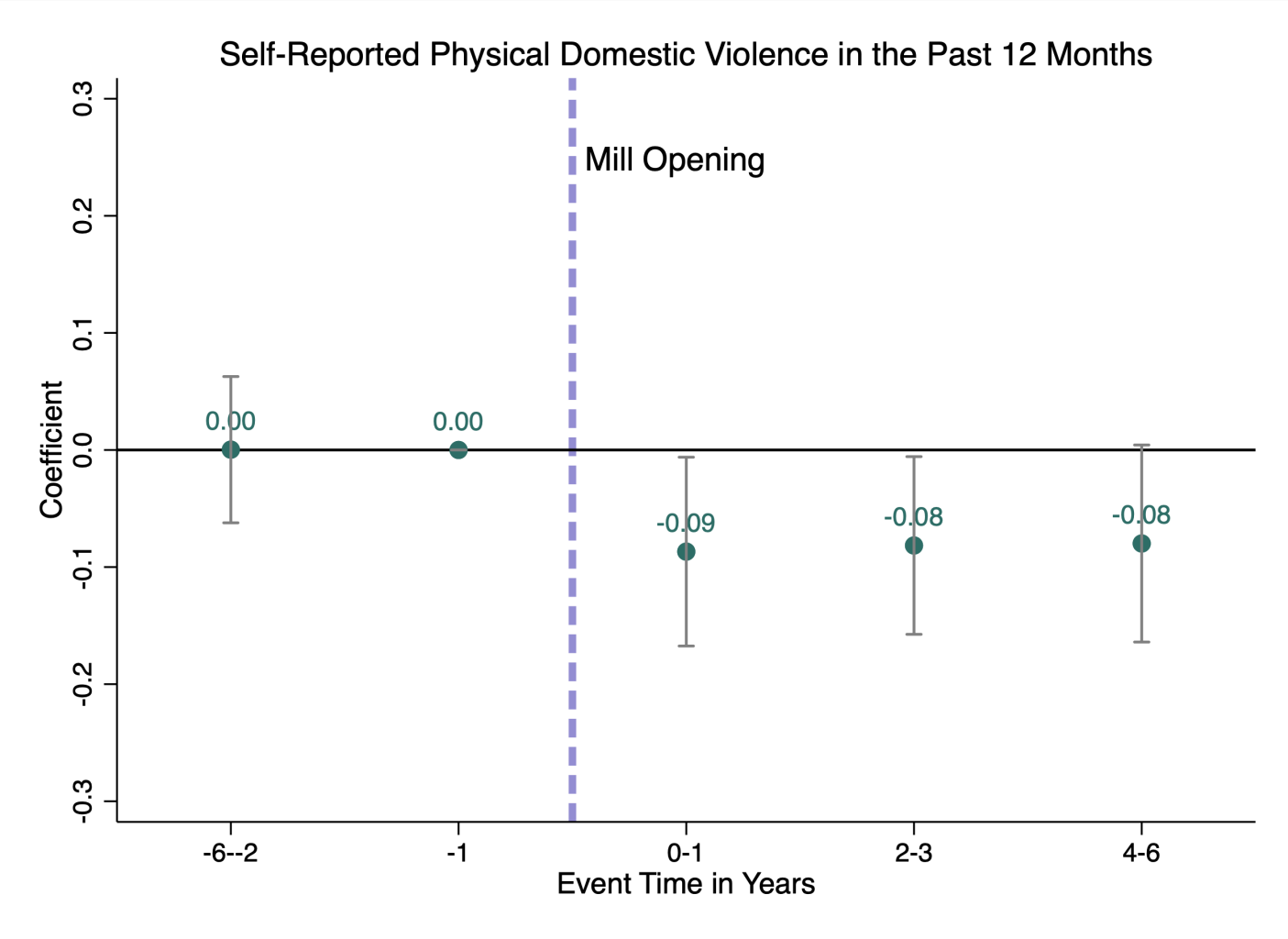


- Individual last daily earnings both for women and men (mostly husbands) ↑.
- Household Earnings (sum of the wife's and husband's last daily earnings) ↑.

Household Earnings

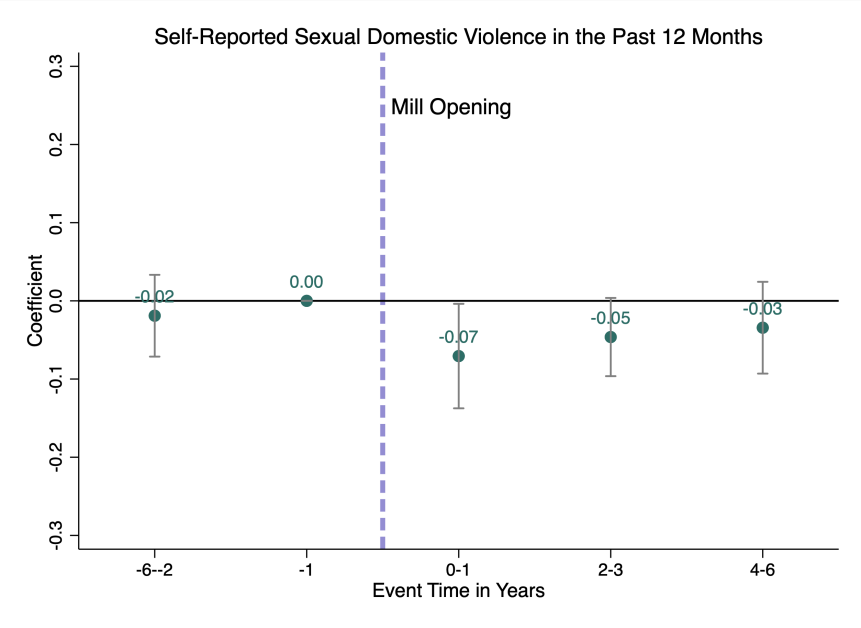
- **Not geo-coded data:** Specification identifies effects at a broader geog unit.
  → **Slow response is expected.**
- Pseudo-likelihood poisson regression is used following Chen and Roth, 2024.

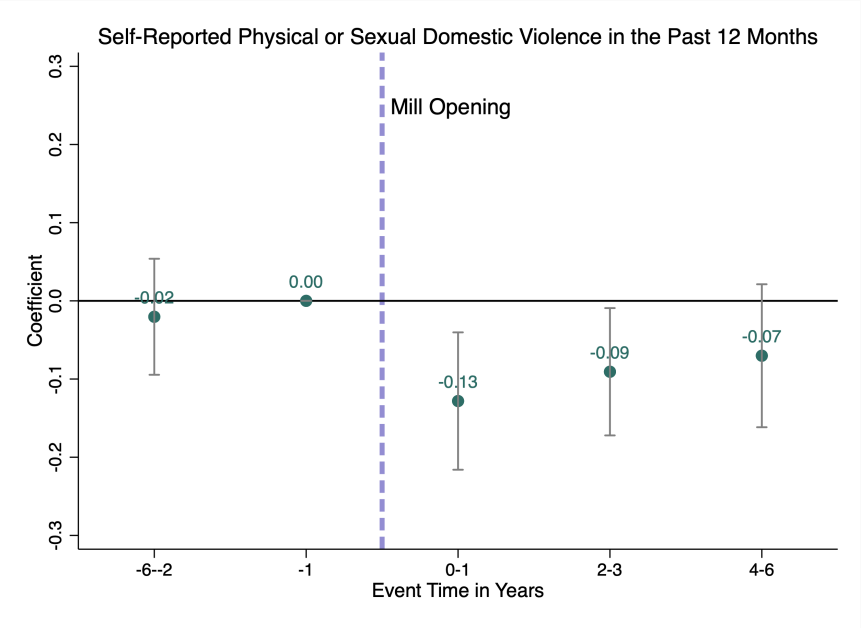
Results: Effect on Self-Reported DV



- Physical DV↓ in the past 12 months: Persistent effects
  - Includes behaviors that could physically incapacitate women: Kicking, punching, twisting an arm and attacking with a gun, knife and other weapon.

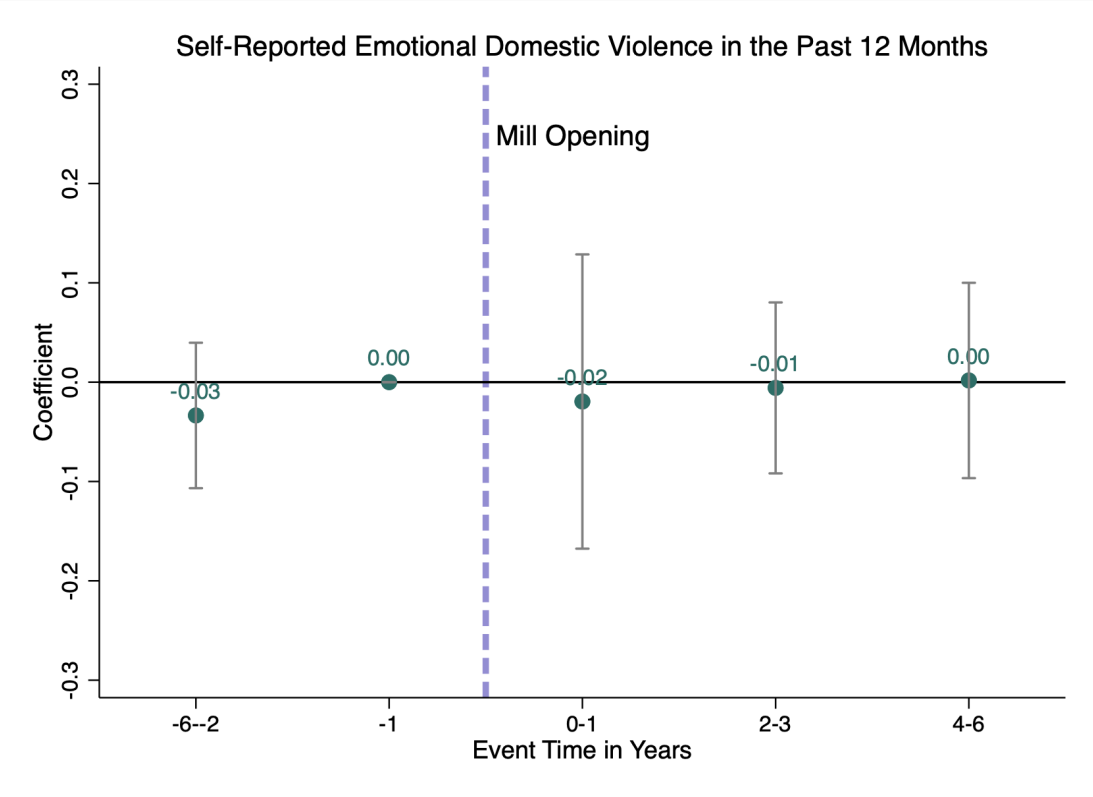
Results: Effect on Self-Reported DV





- Sexual DV↓ in the past 12 months: Effects weaken over time, contributing to the decline in the effect size of overall (physical or sexual) DV.
    - Includes behaviors relatively less likely to cause physical incapacitation: Forced intercourse or other sexual acts the wife did not consent to.

Results: Women's Self-Reported DV



- Emotional DV $\leftrightarrow$ in the past 12 months in any year following a mill opening.
  - Behaviors that does not physically incapacitate women: Humiliation, threats, or insults directed at the wife.
- Using seemingly unrelated regressions and Wald tests: The effects are significantly more persistent for physical DV than for sexual or emotional DV.

Outline

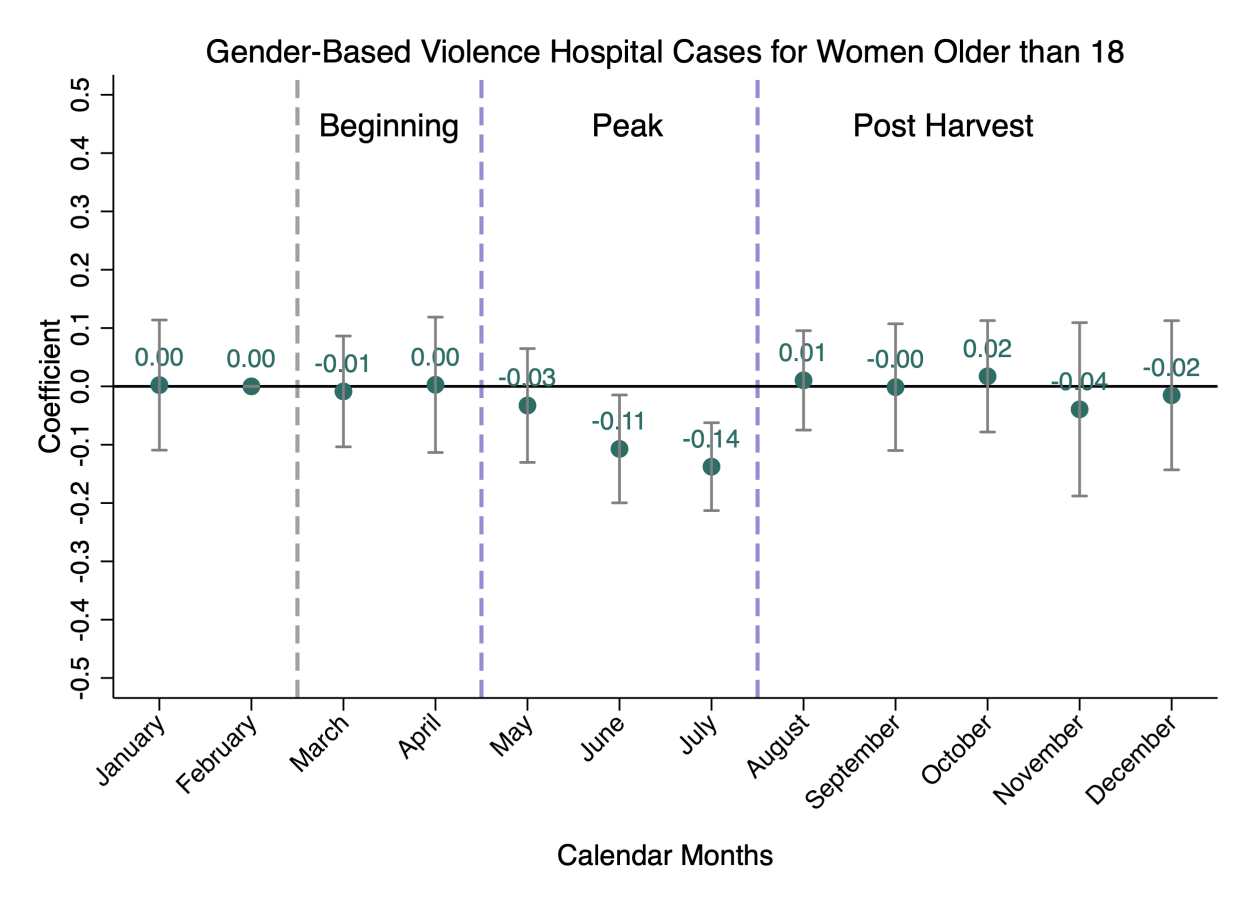
- Context: Rapid Expansion of Coffee Mills in Rwanda
- Data
- Empirical Strategy I and Results: Effect of a Mill Opening
  - Self-reported data on labor market outcomes and DV
- **Empirical Strategy II and Results: Within-Year Variation Once Mills Are Built**
  - **Monthly hospital data on DV**
- Mechanisms
  - The cost of women's physical incapacitation
  - Women's bargaining power
  - Exposure reduction
  - Increase in household income
- External Validity
- Robustness Checks

Empirical Strategy II: Within-Year Variation Once Mills Are Built

$$Y_{hdtm} = \beta_0 + \sum_{m=1}^{12} \textit{Hospital in Mill Catchment}_{hd} \times \beta_m \mathbb{1}[\mu = m] + \lambda_h + \sigma_m + \gamma_{pt} + \epsilon_{hdtm}.$$

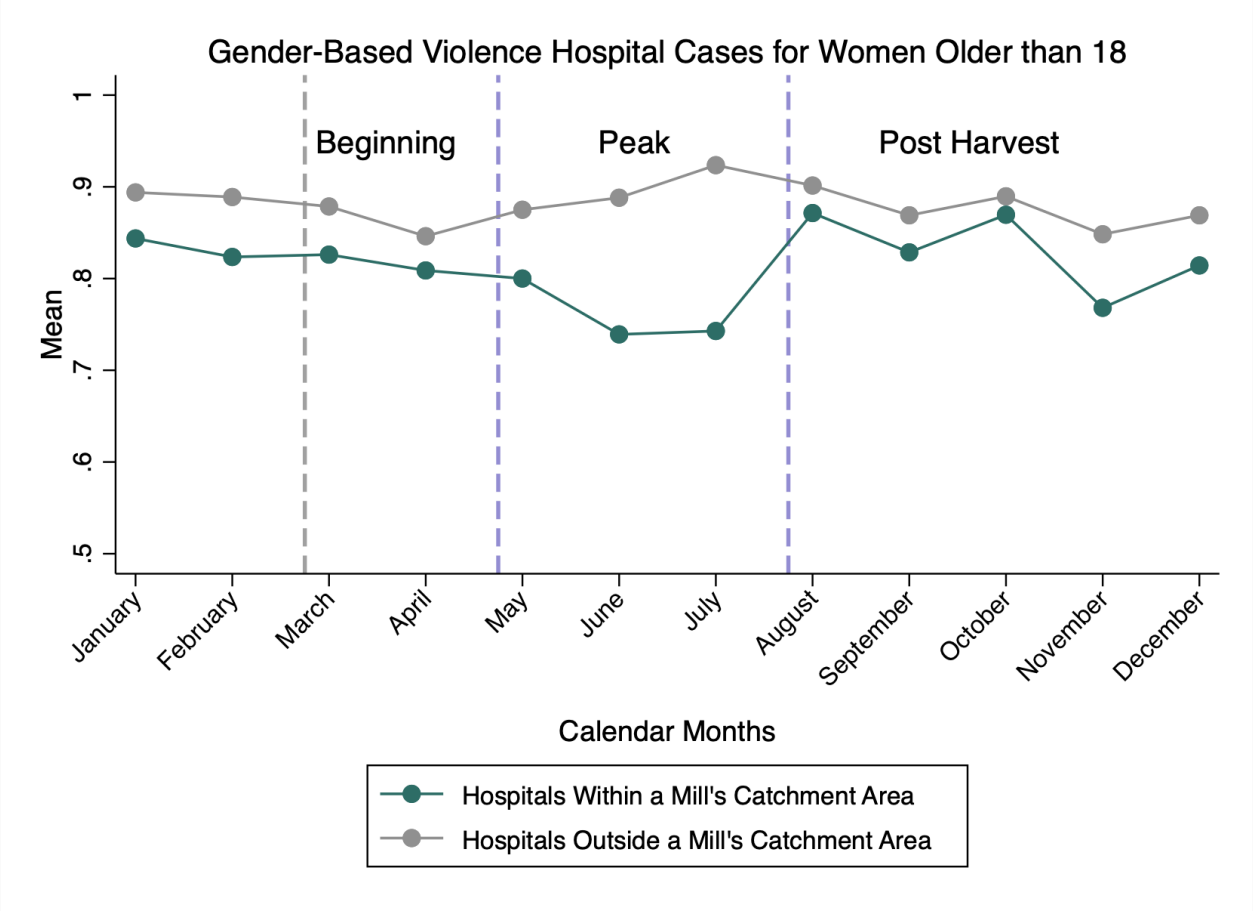
- Y_{hdtm}: Binary variable coded as 1 if **hospital** h, in district d, **month** m and year t has a DV patient, and 0 otherwise.
- $\textit{Hospital in Mill Catchment}_{hd}$: Binary variable coded as 1 if hospital h in district d is located within the CA and 0 otherwise.
- λ_h, σ_m, γ_{pt}: **Hospital FE**, Month FE, Prov-by-year FE.

Results: Women's Monthly Hospital Cases



- Relative to the change in hospitals outside the CAs
  1. **Hospitals in the CAs are less likely to have a DV patient during the peak** compared to one month before the beginning of the harvest season.
  2. **No change** in the treatment-control difference in the probability that a hospital has a DV patient **in the post-harvest months.**
- Placebo: No change in non-DV cases within the year. Non-DV Reporting

Results: Women's Monthly Hospital Cases (Means)



- The absence of statistically significant coef. during the post-harvest months **does not imply** that hospital cases in the CAs and non-CAs are the same.
- During post-harvest months, the share of hospitals with at least one DV patient remains lower among hospitals in CAs than among hospitals outside CAs.

Outline

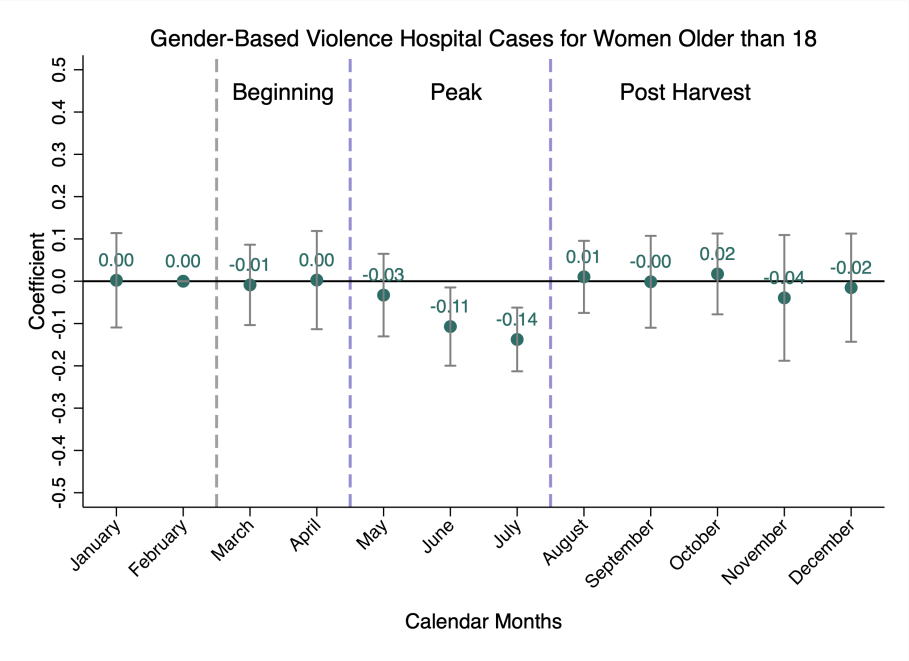
- Context: Rapid Expansion of Coffee Mills in Rwanda
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  - Monthly hospital data on DV
- **Mechanisms**
  - The cost of women's physical incapacitation
  - Women's bargaining power
  - Exposure reduction
  - Increase in household income
- External Validity
- Robustness Checks

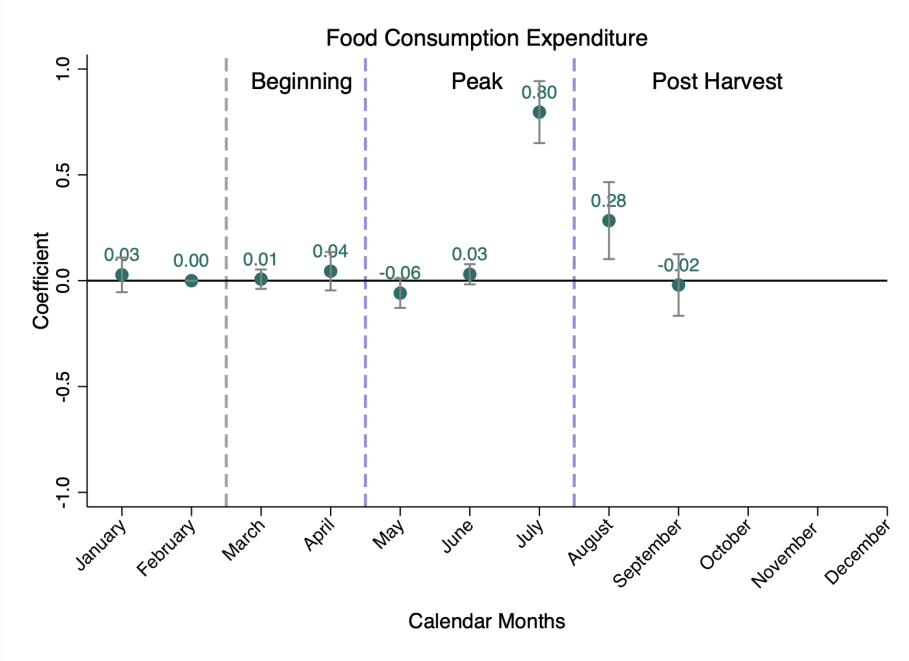
Mechanisms

Potential mechanisms behind the effect of a mill on DV:

- Increase in the cost of women's physical incapacitation (-)
- Increase in women's outside options, thus, bargaining power (-)
- Exposure reduction (-)
- Increase in the household income (-)
  - Due to husbands' earnings
  - Due to women's earnings
- Extractive violence (+)
- Male Backlash (+)
  - Not suitable to test in this context; H earns more.

Evidence on the Increase in the Cost of Women's Physical Incapacitation I

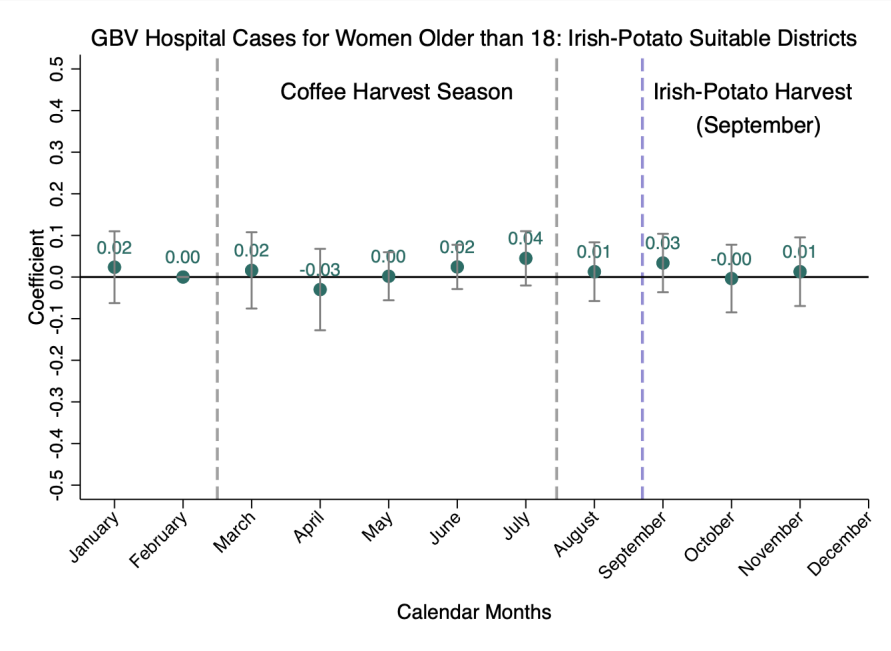


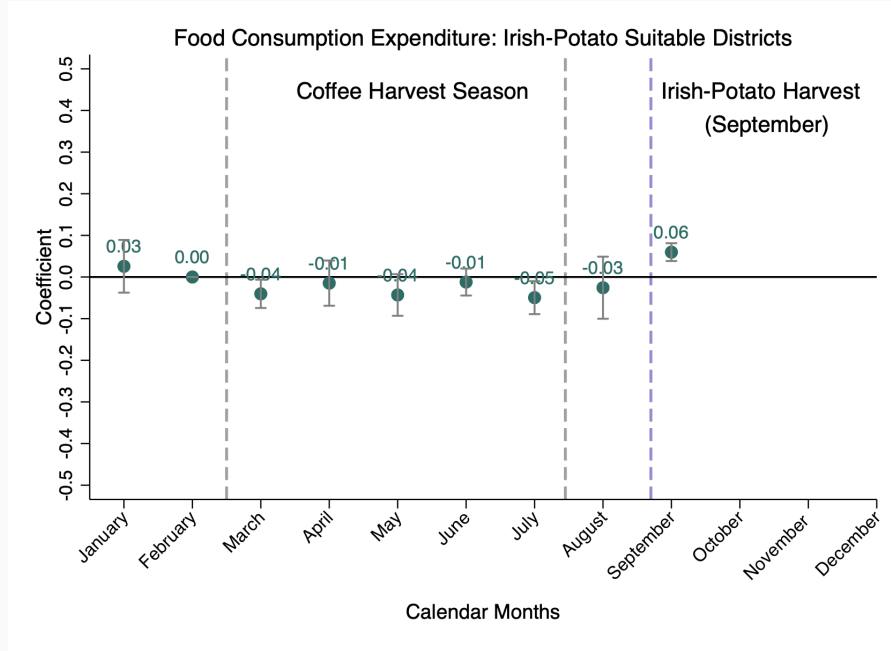


→ **Seasonal decline in the treatment-control diff in the probability that a hospital has a DV patient when the cost of physical incapacitation peaks.**

1. When incapacitation cost ↓ in August, the diff reverts to its pre-harvest level.
2. ~~Income effect alone for hospital cases~~: During August, **no change in the diff & higher consumption relative to pre-harvest.** Men's MH
3. Keeping women's outside options fixed: Plausibly, the wife's outside option in the CA is similar in Jul-Aug.

Evidence on the Increase in the Cost of Women's Physical Incapacitation II



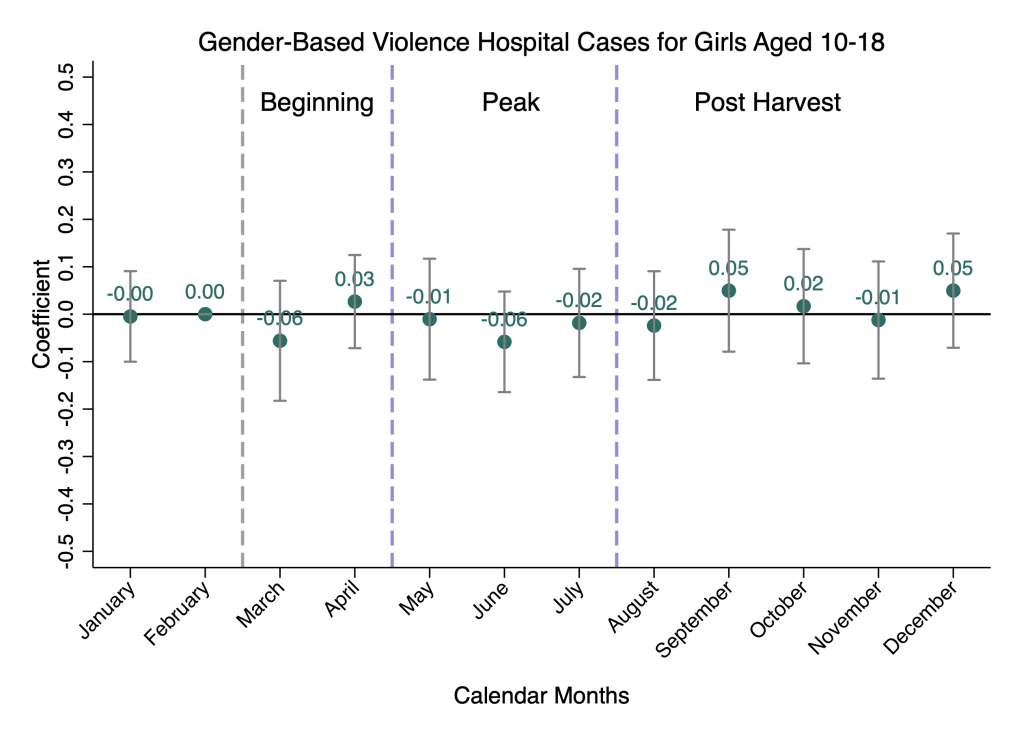


→ **Irish Potato Regions: When the value of the wife's work capacity is mostly fixed within the year, there is no seasonal pattern in DV estimates within the year**, despite higher consumption during the potato harvest.

1. The value of women's physical capacity to work in unpaid tasks does not experience a structural increase as it does within the CA.

2. Women mostly do not engage in paid employment.

Evidence on the Increase in the Cost of Women's Physical Incapacitation III



→ **No seasonal pattern in GBV estimates when the perpetrator lacks economic self-interest in the victim's work.**

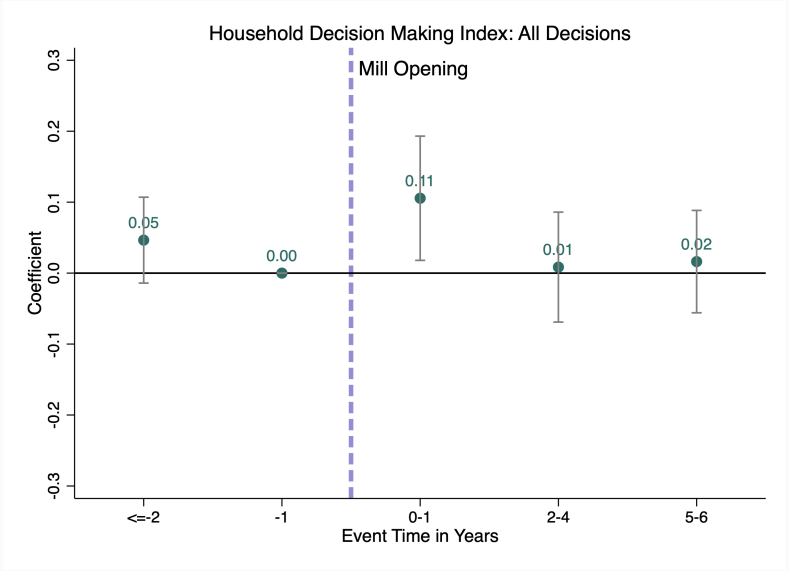
1. Girls aged 10–18 are not the primary age group participating in the coffee harvest or working in mills.
2. Primarily sexual cases, arguably less likely to reflect violence perpetrated by the victims' fathers.

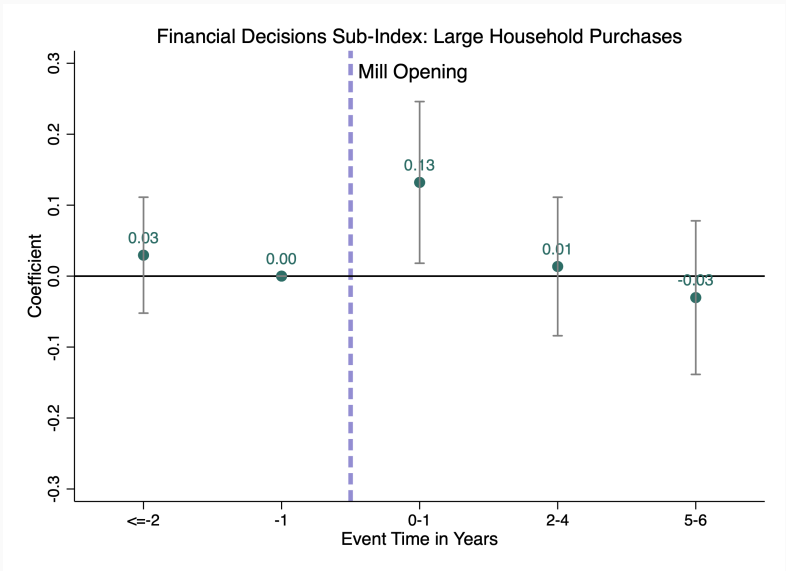
Mechanisms

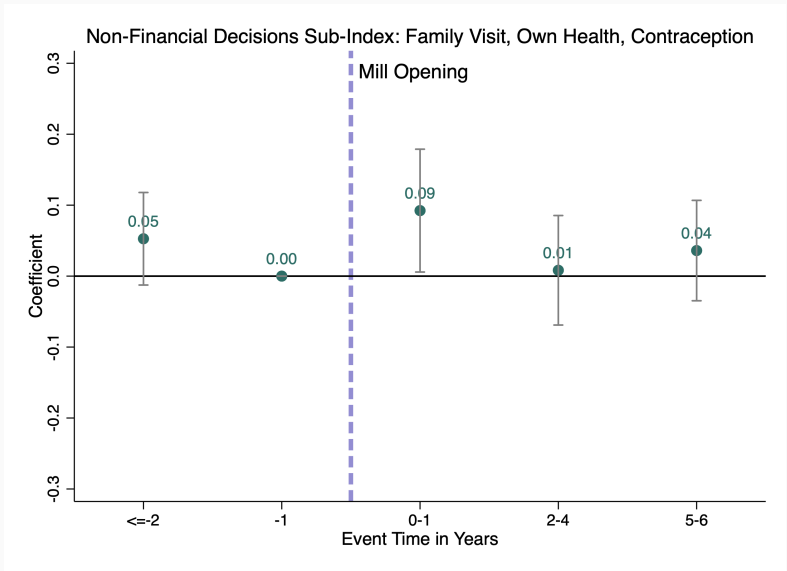
Potential mechanisms behind the effect of a mill on DV:

- Increase in the cost of women's physical incapacitation ✓
- Increase in women's outside options, thus, bargaining power
- Exposure reduction
- Increase in the household income
  - Due to husbands' earnings
  - Due to women's earnings
- Extractive violence

Other Mechanisms: Increase in (Married) Women's Bargaining Power







- Making decisions alone or jointly with the husband ↑. Not persistent.

No change in divorce

Mechanisms

Potential mechanisms behind the effect of a mill on DV:

- Increase in the cost of women's physical incapacitation ✓
- Increase in women's outside options ✓
- Exposure Reduction
- Increase in household income
  - Due to husbands' earnings
  - Due to women's earnings
- Extractive violence

Other Mechanisms: Exposure Reduction

	(1) Working for Cash	(2) Physical or Sexual Domestic Violence
Mill x Event Time -13- -2	0.04	-0.01
	(0.04)	(0.08)
Mill x Event Time -1	0.00	0.00
	(.)	(.)
Mill x Event Time 0-2	-0.06	0.01
	(0.04)	(0.09)
Mill x Event Time 3-5	0.07*	-0.13*
	(0.04)	(0.08)
Observations	6728	1953
Dependent variable mean	0.28	0.30

- Use couples with **plausibly no change in exposure** before-after a mill.
  - **Wife in agriculture - Husband in a non-agricultural manual job.**
    - Already not seeing each other during work hours before a mill.
    - Mill: Shock to W's earnings, W do not report a higher number of hours spent at work.
- $\downarrow$ in DV even among couples with no change in exposure.

Mechanisms

Potential mechanisms behind the effect of a mill on DV:

- Increase in the cost of women's physical incapacitation ✓
- Increase in women's outside options ✓
- ~~Exposure Reduction~~
- Increase in household income
  - Due to husbands' earnings
  - Due to women's earnings
- Extractive violence

Other Mechanisms: Increase in the Household Income

	(1) Husband: Last Daily Earnings
Mill in District x Event Time -7- -2	0.11 (0.14)
Mill in District x Event Time -1	0.00 (.)
Mill in District x Event Time 0-3	0.16 (0.11)
Mill in District x Event Time 4-6	0.12 (0.22)
Mill in District x Event Time 7-10	0.16 (0.30)
Observations	6572
Dependent variable mean	1657.61

- Wife in agriculture - Husband in a non-agricultural manual job.
  - ↑ in the wife's earnings, **no change in the husband's earnings.**

- DV↓ even among couples where an ↑ in HH income is only via women's paid employment.
  - ↑ in the wife's contribution to HH income is a plausible mechanism.
  - Extractive violence is not the dominant mechanism.

Potential mechanisms behind the effect of a mill on DV:

- **Increase in the cost of women's physical incapacitation ✓**
- **Increase in women's outside options ✓**
- ~~Exposure Reduction~~
- **Increase in household income ✓**
  - ~~Due to husbands' earnings~~
  - Due to women's earnings ✓
- ~~Extractive violence~~

Outline

- Context: Rapid Expansion of Coffee Mills in Rwanda
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  - Exposure reduction
  - Increase in household income
- **External Validity**
- Robustness Checks

External Validity

- Do the results indicate that providing jobs to women $\downarrow$ DV in every context?
  - **Unfortunately, NO.**

  $\rightarrow$ Kotsadam and Villanger (2022): No effects of providing factory jobs to women on physical DV in Ethiopia in an RCT.

External Validity

- Do the results indicate that providing jobs to women ↓ DV in every context?
  - **Unfortunately, NO.**

  → Kotsadam and Villanger (2022): No effects of providing factory jobs to women on physical DV in Ethiopia in an RCT.

- **Theoretical Framework:** Providing jobs to women ↓ DV when:
  1. The woman's threat of divorce is **credible** based on laws, social norms.
  2. The husband **benefits** from women's work capacity.

- **Conditions hold for Rwanda:**

  1a. **DV laws: Women use their right to divorce** their husbands unilaterally if their husbands engage in DV (Sanin, 2024).

  1b. Divorce rates are higher compared to Ethiopia.

  2a. **Couples work together:** Employer-Employee relationship.

  2b. **The wife shares her earnings with the husband:** Higher share of women decide jointly with their husbands on how to use their earnings compared to Ethiopia.

Outline

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  - Women's bargaining power
  - Exposure reduction
  - Increase in household income
- External Validity
- **Robustness Checks**

Robustness Checks

- Parallel Trends
  - For all dependent variables, the coefficients for the years or months proceeding the event of interest are close to 0 and statistically insignificant.
- Measuring the Catchment Area and Selection into the Treatment Group
  - Different CA sizes: 5 and 10 km Different CA
    $\rightarrow$ Also alleviates the random displacement of DHS clusters and measurement error.
  - Donut Approach Results Donut
    - Treatment: 4 km CA.
    - Control: Donut area between 4 and 8 km from a mill.
- Selection through Marriage Survival Selection
  - Women within and outside the CA are not differentially likely to divorce following a mill opening.
  - Results are robust to excluding year of marriage fixed effects.
- Recent developments in the Event Study Literature
  - All results (including mechanisms) are robust to using the estimator proposed in Sun and Abraham (2020). SA

Conclusion

- Using the expansion of coffee mills in Rwanda as a natural experiment + novel monthly DV hospitalizations, present evidence which suggests that:
  - Providing employment opportunities to women ↓ DV when the husband has economic self-interest in the wife's work capacity.
  - ↑ in women's outside options and contribution to HH income also operate as mechanisms.

- **Shed light on how phenomena that affect female employment in developing countries may affect DV.**
  - **Policy implication**: Jobs vs. cash transfer to women.
    Complements Hussam, Kelley, Lane and Zahra (2022).
  - **Implication for the other side of the coin:** Shocks that may lead to women's unemployment may worsen DV.
    → Climate change-induced weather shocks, automating agriculture.

- **Shed light on husbands' incentives behind inflicting violence.**
  - Based on economic incentives and a cost-benefit analysis.
    → **Align with Becker (1968)'s economic model of crime.**

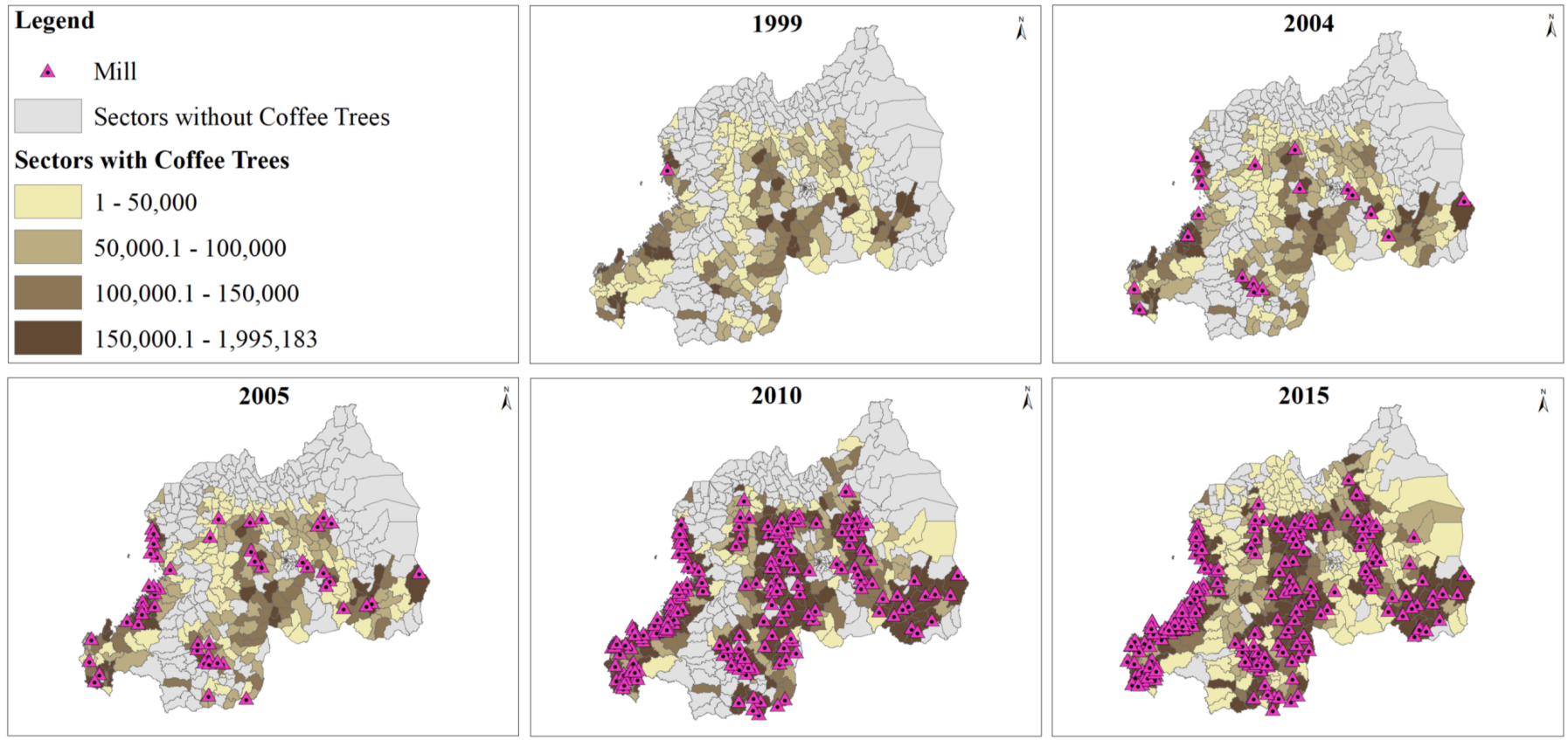
Thank you!



Appendix

Rapid Expansion of Coffee Mills

Expansion



Identifying Assumption

Assumption:

- A mill opening at a specific location in a given year is uncorrelated with other determinants of changes in
  - women's paid employment
  - DV.

- What predicts a mill opening?

Sub-district Level Baseline Characteristics that Predict Mill Opening I

Table A47: Sub-district Level Baseline Characteristics that Predict Mill Opening

	(1) First Mill in 2005-10	(2) Mill by 2018
Log Coffee Trees in 1999	0.03***	0.04***
	(0.01)	(0.01)
FAO-GAEZ Coffee Suitability Index	0.07*	0.03
	(0.04)	(0.04)
Log Population in 2002	-0.10	-0.14
	(0.49)	(0.49)
Log Female Population in 2002	0.07	0.20
	(0.49)	(0.49)
Share of Self-Employed Women in 2002	0.27	0.17
	(0.55)	(0.54)
Share of Unpaid Worker Women in 2002	0.00	0.44
	(0.58)	(0.58)
Share of Primary-Educated Women in 2002	1.45	1.38
	(1.09)	(1.08)
Share of Primary-Educated Men in 2002	-0.14	-0.40
	(1.20)	(1.19)
Number of daughters per Woman in 2002	-0.22	-0.13
	(0.22)	(0.22)
Share of Women in a Consensual Union in 2002	-1.20	-0.57
	(0.78)	(0.77)
Share of Women in a Polygamous Marriage in 2002	0.17	-1.80
	(1.94)	(1.94)
Share of Women without Assets in 2002	0.32	0.02
	(0.57)	(0.57)
Genocide Intensity Index at the Commune Level	-0.02	-0.04
	(0.04)	(0.03)
District FE	✓	✓
Number of Observations	348	348
Dependent variable mean	0.26	0.39
Adjusted R^2	0.24	0.39

Notes: This table presents linear regressions at the sub-district level, estimating the determinants of having the first mill during the rapid expansion period (2005–2010) in column (1) and having a mill by the end of the sample period (2018) in column (2). The dependent variable is an indicator for whether a mill was present in the sub-district during the respective time period. The FAO-GAEZ coffee suitability index and the genocide intensity index are both standardized. The data is at the sub-district level. District fixed effects are included. *** p<.01, ** p<.05, * p<.1.

Sub-district Level Baseline Characteristics that Predict Mill Opening II

Table A48: Sub-district Level Baseline Characteristics that Predict Mill Opening, Including Baseline Domestic Violence

	(1) First Mill in 2006-10	(2) Mill by 2018
Log Coffee Trees in 1999	0.02***	0.04***
	(0.01)	(0.01)
FAO-GAEZ Coffee Suitability Index	0.07	0.05
	(0.05)	(0.05)
Share of Women Experiencing Domestic Violence in 2005	-0.11	-0.30
	(0.18)	(0.18)
Log Population in 2002	-0.66	-0.97
	(0.65)	(0.67)
Log Female Population in 2002	0.59	0.96
	(0.66)	(0.67)
Share of Self-Employed Women in 2002	0.19	-0.68
	(0.69)	(0.70)
Share of Unpaid Worker Women in 2002	0.40	-0.35
	(0.74)	(0.75)
Share of Primary-Educated Women in 2002	0.25	0.98
	(1.52)	(1.55)
Share of Primary-Educated Men in 2002	-1.03	-0.25
	(1.51)	(1.55)
Number of daughters per Woman in 2002	-0.23	-0.37
	(0.28)	(0.29)
Share of Women in a Consensual Union in 2002	-0.93	-0.84
	(1.08)	(1.11)
Share of Women in a Polygamous Marriage in 2002	2.03	0.16
	(2.43)	(2.48)
Share of Women without Assets in 2002	-0.68	0.19
	(0.73)	(0.75)
Genocide Intensity Index at the Commune Level	-0.00	-0.04
	(0.05)	(0.05)
District FE	✓	✓
Number of Observations	195	195
Dependent variable mean	0.21	0.30
Adjusted R^2	0.23	0.37

Notes: This table presents linear regressions at the sub-district level, estimating the determinants of having the first mill during 2006–2010 in column (1), corresponding to the rapid expansion period following 2005 and having a mill by the end of the sample period (2018) in column (2). The dependent variable is an indicator for whether a mill was present in the sub-district during the respective time period. The share of women experiencing domestic violence is measured at the sub-district level as the fraction of women reporting physical or sexual domestic violence in the past 12 months in the 2005 DHS. To construct this baseline domestic violence rate, women residing within the 5 km radius catchment area of mills opened by 2005 (i.e., in or before 2005) are excluded. I use the 5 km radius rather than the 4 km radius to define the catchment area for this exclusion. This choice is motivated by the robustness check in Figure A10, which shows that the decrease in domestic violence remains present when the catchment area is defined using a 5 km radius. Variables for 2002 are constructed from census data. The FAO-GAEZ coffee suitability index and the genocide intensity index are both standardized. The data is at the sub-district level. District fixed effects are included. *** p<.01, ** p<.05, * p<.1.

Summary Stats for Women: DHS

Results DHS

Table A2: Summary Statistics for Women: Demographic Health Survey (DHS)

	All		Outside a Mill's CA		Within a Mill's CA	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Panel A: Main dependent variables						
Worked in the past 12 months	0.88	0.33	0.88	0.33	0.89	0.31
Worked for cash in the past 12 months	0.37	0.48	0.35	0.48	0.47	0.50
Experienced domestic violence in the past 12 months	0.31	0.46	0.31	0.46	0.35	0.48
Panel B: Characteristics (Used as Controls)						
Christian	0.96	0.19	0.96	0.19	0.97	0.16
Age (Controlled via age group fixed effects)	32.79	7.76	32.65	7.70	33.08	7.87
Occupation: Agricultural self-employed	0.74	0.44	0.70	0.46	0.84	0.36
Education: No education	0.20	0.40	0.20	0.40	0.18	0.39
Education: Primary not completed	0.49	0.50	0.48	0.50	0.54	0.50
Education: Primary completed	0.18	0.38	0.18	0.38	0.19	0.39
Education: More than primary	0.13	0.34	0.15	0.35	0.09	0.29
Year of first marriage (Controlled via fixed effects)	1999.51	9.59	2000.29	9.49	1998.37	9.19
Panel C: Other Characteristics (Not Used as Controls)						
Marital status: Married	0.59	0.49	0.58	0.49	0.64	0.48
Marital status: Living together	0.28	0.45	0.30	0.46	0.24	0.43
Marital status: Divorced	0.05	0.23	0.05	0.23	0.06	0.23
Marital status: Not living together	0.07	0.26	0.07	0.26	0.06	0.24
Age at first marriage	20.78	3.73	20.76	3.76	20.99	3.71
Number of unions: One	0.90	0.30	0.90	0.30	0.90	0.30
Total children ever born	3.64	2.46	3.59	2.44	3.70	2.47
Observations	21087		15925		3244	

Notes: This table presents summary statistics for women in my sample from the Demographic Health Survey (DHS). Panel A reports the main dependent variables, while Panel B includes control variables (women's characteristics) used in the specification associated with the dataset. Age is controlled via age group fixed effects, measured in five-year age groups. Year of first marriage fixed effects (measured in years and collected for ever-married women) are included to account for shocks to the marriage market. I also include (women's) interview month and interview year fixed effects in the specification, where the results are robust to their exclusion. Panel C provides additional characteristics related to marital status and family dynamics (not used as controls). The sample is split by women living within or outside the catchment area of a mill (Mill's CA), which is defined as a 4 km radius buffer around a mill. The domestic violence module was administered to a randomly selected subsample of the full DHS sample, and thus, my sample for the domestic violence outcomes consists of approximately 6,000 ever-married women.

Summary Stats for Men: DHS

Table A3: Summary Statistics for Men: Demographic Health Survey (DHS)

	All		Outside a Mill's CA		Within a Mill's CA	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Panel A: Main dependent variables						
Worked in the past 12 months	0.91	0.29	0.93	0.26	0.89	0.32
Worked for cash in the past 12 months	0.83	0.38	0.83	0.38	0.84	0.37
Panel B: Controls (Used as Controls)						
Christian	0.95	0.21	0.95	0.22	0.97	0.17
Age (Controlled via age group fixed effects)	37.94	9.88	37.78	9.86	38.40	9.97
Occupation: Agricultural self-employed	0.51	0.50	0.45	0.50	0.66	0.47
Education: No education	0.18	0.39	0.18	0.39	0.18	0.38
Education: Primary not completed	0.48	0.50	0.46	0.50	0.53	0.50
Education: Primary completed	0.20	0.40	0.21	0.41	0.19	0.39
Education: More than primary	0.14	0.34	0.15	0.36	0.10	0.30
Year of first marriage (Controlled via fixed effects)	1998.02	11.10	1998.78	11.00	1996.60	10.88
Panel C: Other Characteristics (Not Used as Controls)						
Marital status: Married	0.68	0.47	0.66	0.47	0.75	0.44
Marital status: Living together	0.29	0.45	0.31	0.46	0.22	0.41
Marital status: Divorced	0.02	0.13	0.02	0.13	0.02	0.13
Marital status: Not living together	0.02	0.13	0.02	0.14	0.02	0.13
Age at first marriage	24.24	4.72	24.20	4.77	24.49	4.54
Number of unions: One	0.86	0.35	0.87	0.34	0.86	0.35
Observations	9542		7245		1467	

Notes: This table presents summary statistics for men in my sample from the Demographic Health Survey (DHS). In each survey cycle, half of the households were randomly selected for the male survey, which is why the sample size for men is smaller compared to women. The majority of these men are the husbands of currently married women in the DHS sample, aligning closely with the female sample structure. Panel A reports the main dependent variables, while Panel B includes control variables used in the specification associated with the dataset. Age is controlled via age group fixed effects, measured in five-year age groups. Year of first marriage fixed effects (measured in years and collected for ever-married women) are included to account for shocks to the marriage market. I also include (men's) interview month and interview year fixed effects in the specification, where the results are robust to their exclusion. Panel C provides additional characteristics related to marital status and family dynamics (not used as controls). The sample is split by men living within or outside the catchment area of a mill (Mill's CA), which is defined as a 4 km radius buffer around a mill. Please refer to the details in Appendix A3.2 for the differences in the working-for-cash variable across women and men.

Table A7: Dynamic Impact of a Mill Opening on Ever-Married Women Working and Working for Cash in the Past 12 Months

	Work-Related Variables Measured Over the Past 12 Months	
	(1) Working	(2) Working for Cash
Mill x Event Time -7- -3	0.03	-0.01
	(0.02)	(0.03)
Mill x Event Time -2	0.02	0.01
	(0.02)	(0.04)
Mill x Event Time -1	0.00	0.00
	(.)	(.)
Mill x Event Time 0-1	0.02	-0.03
	(0.02)	(0.03)
Mill x Event Time 2-3	0.01	0.06**
	(0.02)	(0.03)
Mill x Event Time 4-6	0.01	0.06**
	(0.02)	(0.03)
Observations	21052	18453
Dependent variable mean	0.88	0.37

Notes: This table reports coefficients from regressions of work-related outcomes on the interaction between residing in a mill's catchment area and event-year dummies, using equation (1). The dependent variables, drawn from the Demographic Health Surveys (DHS), measure whether a woman worked in the past 12 months (Column 1) and whether she worked for cash in the past 12 months (Column 2). The sample for working for cash is restricted to women who reported working in the past 12 months, as defined by the survey question, which explains the smaller number of observations in Column 2. The sample consists of ever-married women whose partner or most recent partner is alive. The event of interest is the opening of a mill. Event time is measured in years relative to the mill opening, with 0 indicating the year of the first mill's opening in the catchment area, negative values representing years before, and positive values representing years after. The omitted category is one year before the mill's opening. Event time years are grouped to ensure a balanced number of observations across years. All regressions control for individual characteristics, including women's religion, education, age-group fixed effects (measured in five-year age groups), survey month and year fixed effects, year of first marriage fixed effects, sub-district fixed effects, and district-by-harvest year fixed effects. In Column 2, I control for agricultural occupation (Since I later show that agricultural occupation does not change with treatment, it is considered a predetermined characteristic/variable and can therefore be used as a control.). I cannot control for agricultural occupation when 'worked in the past 12 months' is the dependent variable, given that the occupation information is not collected for women who did not work in the past 12 months. This is the only dependent variable for which I cannot control for agricultural occupation in my DHS analysis. The catchment area is defined using a 4 km buffer around the mills. Standard errors are clustered at the sub-district level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A10: Dynamic Impact of a Mill Opening on Ever Married Women's Occupation

	(1) Managers	(2) Sales	(3) Agricultural Self-Employed	(4) Agricultural Employee	(5) Manual Skilled	(6) Manual Unskilled
Mill x Event Time -7- -3	0.00	0.00	0.01	-0.02	0.00	-0.02
	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.02)
Mill x Event Time -2	-0.01	0.01	0.02	0.01	-0.01	-0.01
	(0.01)	(0.02)	(0.03)	(0.01)	(0.01)	(0.02)
Mill x Event Time -1	0.00	0.00	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)	(.)	(.)
Mill x Event Time 0-1	0.01	-0.00	-0.04*	0.01	-0.01	0.02
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
Mill x Event Time 2-3	0.00	-0.02*	-0.00	0.01	-0.01	0.02
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
Mill x Event Time 4-6	0.00	-0.02	-0.00	0.00	-0.00	0.02*
	(0.01)	(0.01)	(0.02)	(0.01)	(0.00)	(0.01)
Observations	18474	18474	18474	18474	18474	18474
Dependent variable mean	0.03	0.07	0.74	0.08	0.02	0.06

Notes: This table reports coefficients from regressions of occupational categories on the interaction between residing in a mill's catchment area and event-year dummies, using equation (1). The dependent variables, drawn from the Demographic Health Surveys (DHS), indicate whether a woman's occupation falls into one of six categories: Managers (Column 1), Sales (Column 2), Agricultural Self-Employed (Column 3), Agricultural Employee (Column 4), Skilled Manual Worker (Column 5), and Unskilled Manual Worker (Column 6). The occupation question is asked to women who reported working. The sample consists of ever-married women whose partner or most recent partner is alive. The event of interest is the opening of a mill. Event time is measured in years relative to the mill opening, with 0 indicating the year of the first mill's opening in the catchment area, negative values representing years before, and positive values representing years after. The omitted category is one year before the mill opening. Event time years are grouped to ensure a balanced number of observations across years. All regressions control for individual characteristics, including women's religion, education, age-group fixed effects (five-year age groups), survey month and year fixed effects, year of first marriage fixed effects, sub-district fixed effects, and district-by-harvest-year fixed effects. The catchment area is defined using a 4 km buffer around the mills. Standard errors are clustered at the sub-district level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Results

Table A11: Dynamic Impact of a Mill Opening on Ever-Married Men's Working, Working for Cash in the Past 12 Months and Occupation (Mostly Husbands of Ever-Married Women)

	Work		Occupation					
	(1) Work	(2) Cash Work	(3) Managers	(4) Sales	(5) Agricultural Self-Employed	(6) Agricultural Employee	(7) Manual Skilled	(8) Manual Unskilled
Mill x Event Time -7- -2	-0.03	0.02	0.02	0.02	0.00	0.00	-0.04	0.01
	(0.03)	(0.04)	(0.02)	(0.01)	(0.04)	(0.02)	(0.02)	(0.02)
Mill x Event Time -1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Mill x Event Time 0-1	-0.01	0.01	0.01	0.01	-0.01	0.03	-0.04	0.01
	(0.04)	(0.03)	(0.02)	(0.02)	(0.04)	(0.02)	(0.03)	(0.02)
Mill x Event Time 2-3	-0.03	0.02	-0.01	0.02	-0.06*	0.02	-0.01	0.04
	(0.03)	(0.04)	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
Mill x Event Time 4-6	0.03	0.02	0.01	0.00	0.02	-0.01	-0.04*	0.02
	(0.03)	(0.03)	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)	(0.02)
Observations	9525	8615	8622	8622	8622	8622	8622	8622
Dependent variable mean	0.91	0.83	0.05	0.05	0.51	0.13	0.13	0.10

Notes: This table reports coefficients from regressions of work-related outcomes on the interaction between residing in a mill's catchment area and event-year dummies, using equation (1). The dependent variables, drawn from the Demographic Health Surveys (DHS), measure whether a man worked in the past 12 months (Column 1) and whether he worked for cash in the past 12 months (Column 2). The sample for working for cash is restricted to men who reported working in the past 12 months, which explains the smaller number of observations in Column 2. From Columns 3-8, the table reports coefficients from regressions of occupational categories on the interaction between residing in a mill's catchment area and event-year dummies, using equation (1). The dependent variables indicate whether a man's occupation falls into one of six categories: Managers (Column 3), Sales (Column 4), Agricultural Self-Employed (Column 5), Agricultural Employee (Column 6), Skilled Manual Worker (Column 7), and Unskilled Manual Worker (Column 8). The occupation question is asked to men who reported working, which explains the smaller number of observations in Column 3-8 compared to Column 1. The sample consists of ever-married men whose partner or most recent partner is alive. The majority of these men are the husbands of currently married women in the DHS sample, aligning closely with the female sample structure. The event of interest is the opening of a mill. Event time is measured in years relative to the mill opening, with 0 indicating the year of the first mill's opening in the catchment area, negative values representing years before, and positive values representing years after. The omitted category is one year before the mill's opening. Event time years are grouped to ensure a balanced number of observations across years. All regressions control for individual characteristics, including men's religion, education, age-group fixed effects (measured in five-year age groups), survey month and year fixed effects, year of first marriage fixed effects, sub-district fixed effects, and district-by-harvest-year fixed effects. In Column 2, I additionally control for agricultural occupation, as this variable is only collected for men who report working. Since I show that agricultural occupation does not change with treatment, it can be considered a predetermined characteristic/variable in this specification and can therefore be used as a control. The catchment area is defined using a 4 km buffer around the mills. Standard errors are clustered at the sub-district level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

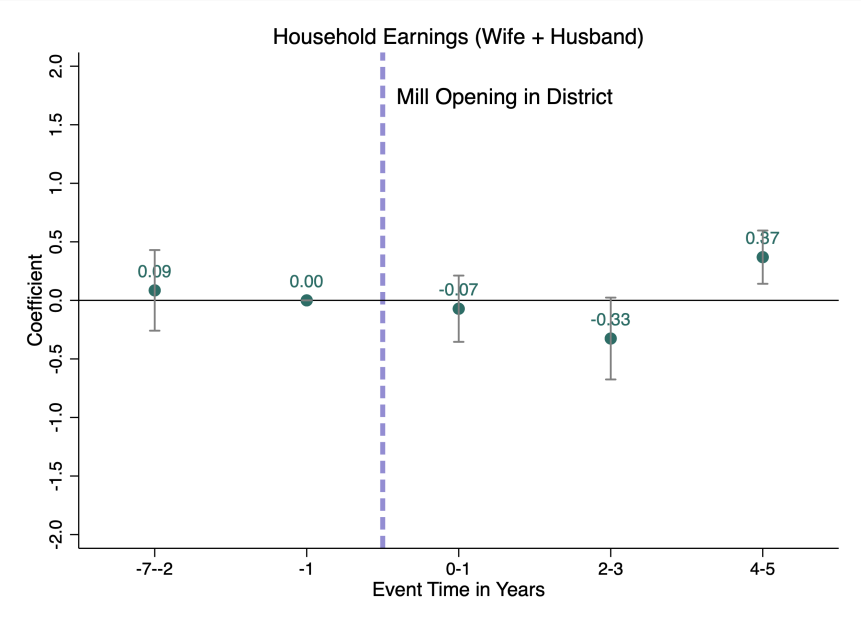
Results

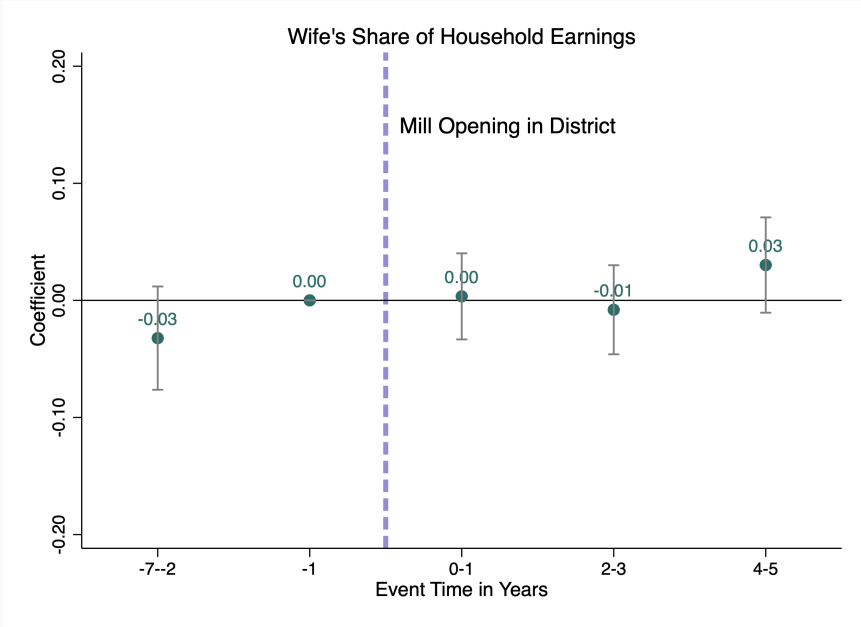
Table A12: Dynamic Impact of a Mill Opening on Household Earnings (Measured as the Sum of the Wife's and Husband's Last Daily Earnings) and the Wife's Share of Household Earnings

	(1) Household Earnings (Wife + Husband)	(2) Wife's Share of Household Earnings
Mill in District x Event Time -7- -2	0.09	-0.03
	(0.18)	(0.02)
Mill in District x Event Time -1	0.00	0.00
	(.)	(.)
Mill in District x Event Time 0-1	-0.07	0.00
	(0.14)	(0.02)
Mill in District x Event Time 2-3	-0.33*	-0.01
	(0.18)	(0.02)
Mill in District x Event Time 4-5	0.37***	0.03
	(0.12)	(0.02)
Observations	5336	5336
Dependent variable mean	593.49	0.12

Notes: This table reports coefficients from the regression of household earnings and the wife's share of household earnings on the interaction between residing in a district with a mill and event-year dummies, using equation (2). The dependent variables are constructed from the Integrated Household Living Conditions Survey (EICV). Column 1 presents the results for household earnings, defined as the sum of the wife's and husband's last daily earnings from wage employment, and is estimated using a Poisson pseudo-likelihood regression. Column 2 presents results for the wife's share of household earnings, defined as the ratio of the wife's last daily earnings to household earnings, and is estimated using a linear regression model. The event of interest is the opening of a mill in a district. I define spatial variation by whether couples reside in a district with a mill, not the catchment area, given that the data are not geocoded. A district encompasses a larger geographical area than both a catchment area and a sub-district. Following the opening of the first mill, the number of mills in a district increases over time, raising the likelihood that an individual is exposed to a mill. As expected, the mill's effects emerge a few years post-opening rather than immediately in year zero. Event time is measured in years, with 0 indicating the year of the first mill's opening in the district, negative values representing years before, and positive values representing years after. The omitted category is one year before the mill's opening. Event time years are grouped to ensure a balanced number of observations across years. The sample consists of linked wife-husband pairs. The regression controls for individual characteristics, including the wife's and husband's education, agricultural occupation, age-group fixed effects (measured in five-year age groups), survey month fixed effects, district fixed effects, and harvest year fixed effects. Standard errors are clustered at the district level. The earnings sample includes linked wife-husband pairs surveyed within 7 years before and 5 years after a mill opening, maintaining alignment with the DHS analysis event window. The sample excludes couples residing in Kigali (the capital) due to its distinct, highly urbanized labor market with earnings levels differing significantly from the rest of the country. Including Kigali yields similar results. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Results: Effect on Household Earnings and the Wife's Share





- Household Earnings (sum of the wife's and husband's last daily earnings) ↑.
- **Not geo-coded data:** Specification identifies effects at a broader geog unit.
  → **Slow response is expected.**
- Pseudo-likelihood poisson regression is used following Chen and Roth, 2024.

Results EICV

Results: (Ever-Married) Women's and Men's Earnings

	Last Daily Earnings	
	(1) Woman	(2) Man
Mill in District x Event Time -7- -2	0.17	0.18
	(0.16)	(0.49)
Mill in District x Event Time -1	0.00	0.00
	(.)	(.)
Mill in District x Event Time 0-1	-0.41	0.19
	(0.28)	(0.20)
Mill in District x Event Time 2-3	-0.07	-0.19
	(0.17)	(0.15)
Mill in District x Event Time 4-5	0.28**	0.64**
	(0.12)	(0.25)
Observations	6211	6495
Dependent variable mean	174.55	529.22

- Individual last daily earnings both for women and men (mostly husbands) ↑.
- Not geo-coded data: Specification identifies effects at a broader geog unit.
  → Slow response is expected.
- Pseudo-likelihood poisson regression is used following Chen and Roth, 2024.

Results

Table A16: Dynamic Impact of a Mill Opening on Ever-Married Women Experiencing Self-Reported Domestic Violence in the Past 12 Months: Physical or Sexual, Physical Only, Sexual Only

	Experiencing Domestic Violence in the Past 12 Months		
	(1) Physical or Sexual	(2) Physical	(3) Sexual
Mill x Event Time -6- -2	-0.02	0.00	-0.02
	(0.04)	(0.03)	(0.03)
Mill x Event Time -1	0.00	0.00	0.00
	(.)	(.)	(.)
Mill x Event Time 0-1	-0.13***	-0.09**	-0.07**
	(0.04)	(0.04)	(0.03)
Mill x Event Time 2-3	-0.09**	-0.08**	-0.05*
	(0.04)	(0.04)	(0.03)
Mill x Event Time 4-6	-0.07	-0.08*	-0.03
	(0.05)	(0.04)	(0.03)
Observations	5992	5991	5973
Dependent variable mean	0.32	0.29	0.11

Notes: This table reports coefficients from regressions of self-reported domestic violence outcomes on the interaction between residing in a mill's catchment area and event-year dummies, using equation (1). The dependent variables, drawn from the Demographic Health Surveys (DHS), measure whether a woman experienced physical or sexual violence (Column 1), physical violence only (Column 2), and sexual violence only (Column 3) in the past 12 months. The domestic violence module was administered to a randomly selected subsample of the full DHS sample, which explains the smaller number of observations compared to the work variables. Within this subsample, the analysis includes ever-married women whose partner or most recent partner is alive. Partnered women answer the questions for their current partners, while divorced or separated women answer them for their most recent partners. The event of interest is the opening of a mill. Event time is measured in years relative to the mill opening, with 0 indicating the year of the first mill's opening in the catchment area, negative values representing years before, and positive values representing years after. The omitted category is one year before the mill's opening. Event time years are grouped to ensure a balanced number of observations across years. All regressions control for individual characteristics, including women's religion, education, agricultural occupation, age-group fixed effects (measured in five-year age groups), survey month and year fixed effects, year of first marriage fixed effects, sub-district fixed effects, and district-by-harvest year fixed effects. The catchment area is defined using a 4 km buffer around the mills. Standard errors are clustered at the sub-district level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Results

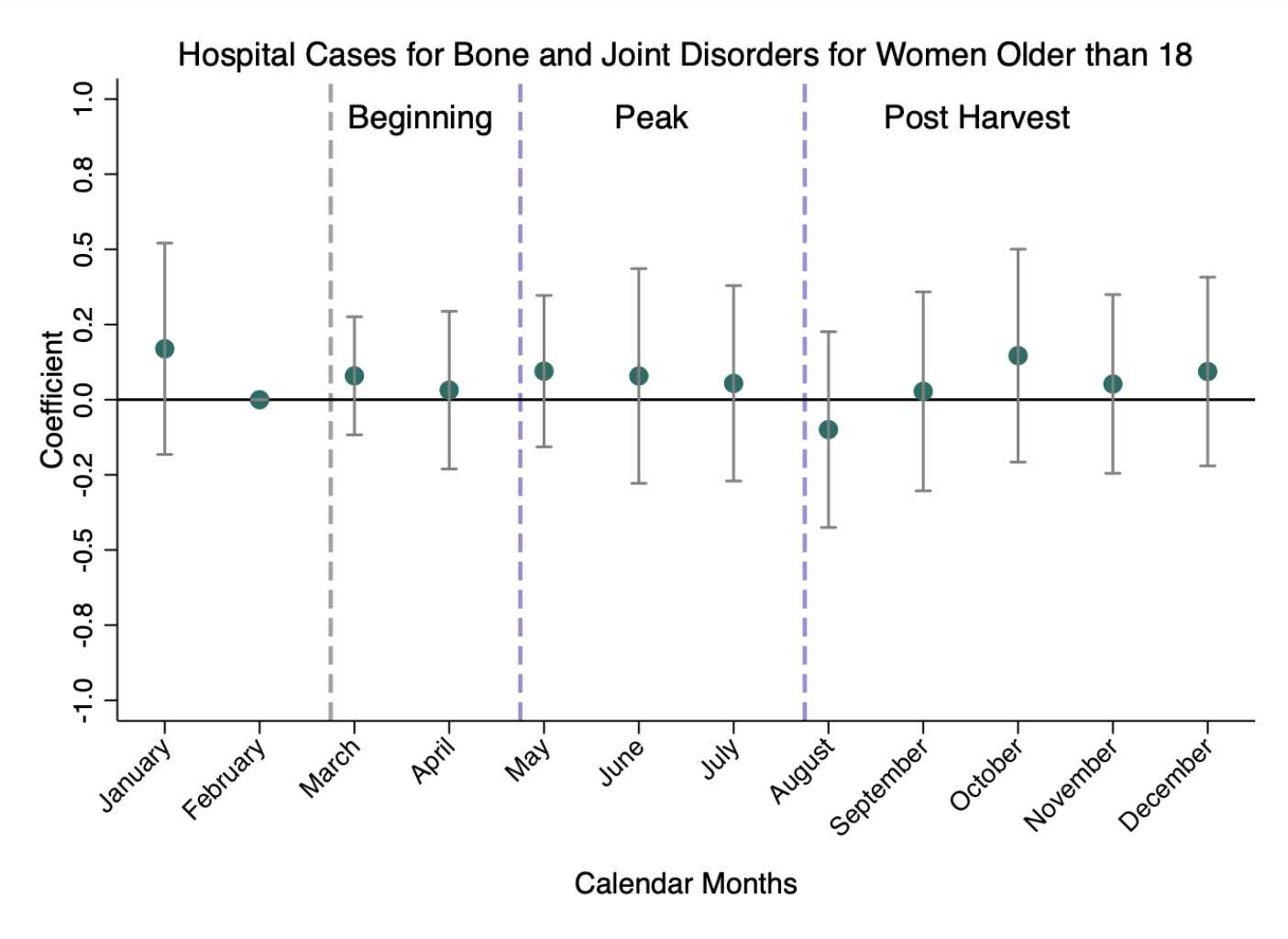
Table A21: Dynamic Impact of a Mill Opening on Ever-Married Women Experiencing Self-Reported Domestic Violence in the Past 12 Months: Emotional Only

	Experiencing Domestic Violence in the Past 12 Months
	(1)
	Emotional
Mill x Event Time -6- -2	-0.03
	(0.04)
Mill x Event Time -1	0.00
	(.)
Mill x Event Time 0-1	-0.02
	(0.08)
Mill x Event Time 2-3	-0.01
	(0.04)
Mill x Event Time 4-6	0.00
	(0.05)
Observations	3468
Dependent variable mean	0.09

Notes: This table reports coefficients from regressions of self-reported emotional domestic violence on the interaction between residing in a mill's catchment area and event-year dummies. The dependent variable, drawn from the Demographic Health Surveys (DHS), indicates whether a woman experienced emotional domestic violence in the past 12 months. The sample consists of ever-married women whose partner or most recent partner is alive. Partnered women answer the questions for their current partners, while divorced or separated women answer them for their most recent partners. Unlike physical and sexual violence, emotional violence was not collected in the 2010 DHS round, which results in a smaller sample size compared to other domestic violence outcomes. The event of interest is the opening of a mill. Event time is measured in years relative to the mill opening, with 0 indicating the year of the first mill's opening in the catchment area, negative values representing years before, and positive values representing years after. The omitted category is one year before the mill opening. Event time years are grouped to ensure a balanced number of observations across years and match the grouping for household decision-making results. The regression control for individual characteristics, including women's religion, education, agricultural occupation, age-group fixed effects (five-year age groups), survey month and year fixed effects, year of first marriage fixed effects, sub-district fixed effects, and district-by-harvest-year fixed effects. The catchment area is defined using a 4 km buffer around the mills. Standard errors are clustered at the sub-district level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Placebo Test: Women's Monthly Hospital Cases for non-DV

Results HMIS



- No change within the year.

Women's Monthly Hospitalizations (GBV + Non-GBV)

Results HMIS

Table A16: Dynamic Impact of the Start of Mill Operations on All Hospitalizations (Gender-Based and Non-Gender-Based Violence) for Women Older than 18

	All Hospitalizations: Women
	(1) Older than 18
Hospital in Mill Catchment x Month 1	-0.03
	(0.05)
Hospital in Mill Catchment x Month 2	0.00
	(.)
Hospital in Mill Catchment x Month 3	0.04
	(0.04)
Hospital in Mill Catchment x Month 4	0.02
	(0.04)
Hospital in Mill Catchment x Month 5	0.05
	(0.05)
Hospital in Mill Catchment x Month 6	-0.04
	(0.04)
Hospital in Mill Catchment x Month 7	0.02
	(0.06)
Hospital in Mill Catchment x Month 8	0.04
	(0.04)
Hospital in Mill Catchment x Month 9	0.08
	(0.05)
Hospital in Mill Catchment x Month 10	0.03
	(0.07)
Hospital in Mill Catchment x Month 11	-0.02
	(0.05)
Hospital in Mill Catchment x Month 12	0.07
	(0.07)
Observations	1216
Dependent variable mean	395.89

Notes: This table reports coefficients from the regression of all recorded hospitalizations (e.g., gender-based and non-gender based) for women older than 18 on the interaction between a hospital being in a mill's catchment area and calendar-month dummies, using equation (3). The dependent variable is drawn from the Hospital Management Information System (HMIS) and is recorded as the total number of hospitalizations in a given month for the women older than 18. The variable is measured in logs. The sample consists of 43 public hospitals in Rwanda that recorded monthly gender-based violence cases during 2012-2019, out of the 48 public hospitals in the country by 2019. The event of interest is the start of the mill's operations, which begin in March and coincide with the start of the coffee harvest season. The harvest season peaks between May and July and is followed by the post-harvest period from August to December, when mill operations have ended. Calendar months are used, with February as the reference month. All regressions control for hospital fixed effects, month fixed effects, and province-by-harvest year fixed effects. The catchment area is defined using a 4 km buffer around the mills. Standard errors are clustered at the district level. The analysis includes the years 2016–2019 instead of 2012–2019 due to data availability and sample size considerations. While the primary HMIS sample excludes 2016 and 2017 (drought years), I drop only 2017 here (the more severe drought year) to ensure sufficient statistical power. This robustness check examines whether women were systematically less likely to seek hospital care during the harvest months due to an increased opportunity cost of going to the hospital. In Rwanda, healthcare is accessible through a community-based health insurance system, making a public hospital care nearly free for most citizens. Additionally, drought conditions could reduce work opportunities rather than increase the opportunity cost of seeking medical care, potentially making women more likely to visit hospitals (e.g., non-gender-based violence cases). Therefore, finding no decline in hospital visits during the harvest months serves as a meaningful validity check, suggesting that women do not systematically avoid hospitals during this period. Kabgayi District Hospital switched from being outside to within a mill's catchment area following a mill opening nearby in 2017. The results are robust to both correcting the treatment/control group status (the approach used here) and dropping this hospital from the sample. *** p<0.01, ** p<0.05, * p<0.1.

- No change within the year.

Reporting to the Hospital: Women's Non-GBV Injuries: Falls

Results HMIS

Table A26: Dynamic Impact of the Beginning of Mill Operations on Non-Gender-Based Violence Injuries: Falls

	Non-Gender-Based Injuries: Falls
	(1)
	Women Older than 19
Hospital in Mill Catchment x Month 1	-0.06
	(0.04)
Hospital in Mill Catchment x Month 2	0.00
	(.)
Hospital in Mill Catchment x Month 3	0.01
	(0.04)
Hospital in Mill Catchment x Month 4	-0.02
	(0.03)
Hospital in Mill Catchment x Month 5	-0.02
	(0.05)
Hospital in Mill Catchment x Month 6	-0.06
	(0.04)
Hospital in Mill Catchment x Month 7	-0.04
	(0.05)
Hospital in Mill Catchment x Month 8	-0.05
	(0.06)
Hospital in Mill Catchment x Month 9	-0.02
	(0.04)
Hospital in Mill Catchment x Month 10	0.03
	(0.06)
Hospital in Mill Catchment x Month 11	-0.04
	(0.05)
Hospital in Mill Catchment x Month 12	0.02
	(0.05)
Observations	1198
Dependent variable mean	0.39

Notes: This table reports coefficients from the regression of hospital cases for non-gender-based violence injuries for women older than 19 on the interaction between a hospital being in a mill's catchment area and calendar-month dummies, using equation (3). The dependent variable is drawn from the Hospital Management Information System (HMIS) and is not recorded under the "Gender-Based Violence" section in the monthly hospital report forms; instead, these cases are recorded under the "Injuries" section. These cases include both cases requiring a hospital stay and cases receiving care without hospitalization. The dependent variable is a binary indicator for whether a hospital recorded any hospitalization due to injuries due to falls for women. The sample consists of 43 public hospitals in Rwanda that recorded monthly gender-based violence cases during 2012-2019, out of the 48 public hospitals in the country by 2019. The event of interest is the start of the mill's operations, which begin in March and coincide with the start of the coffee harvest season. The harvest season peaks between May and July and is followed by the post-harvest period from August to December, when mill operations have ended. Calendar months are used, with February as the reference month. All regressions control for hospital fixed effects, month fixed effects, and province-by-harvest year fixed effects. The catchment area is defined using a 4 km buffer around the mills. Standard errors are clustered at the district level. The analysis includes the years 2016–2019 instead of 2012–2019 due to data availability and sample size considerations. While the primary HMIS sample excludes 2016 and 2017 (drought years), I drop only 2017 here (the more severe drought year) to ensure sufficient statistical power. This robustness check examines whether women were systematically less likely to seek hospital care during the harvest months due to an increased opportunity cost of going to the hospital. In Rwanda, healthcare is accessible through a community-based health insurance system, making a public hospital care nearly free for most citizens. Additionally, drought conditions could reduce work opportunities rather than increase the opportunity cost of seeking medical care, potentially making women more likely to visit hospitals (e.g., non-gender-based violence cases). Therefore, finding no decline in hospital visits during the harvest months serves as a meaningful validity check, suggesting that women do not systematically avoid hospitals during this period. Kabgayi District Hospital switched from being outside to within a mill's catchment area following a mill opening nearby in 2017. The results are robust to both correcting the treatment/control group status (the approach used here) and dropping this hospital from the sample. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

- No change within the year.

Reporting to the Hospital: Women's Help Seeking Behavior

Table A27: Dynamic Impact of a Mill Opening on Ever-Married Women's Help Seeking Behavior Following Domestic Violence (Question Asked to Women Who Reported Ever Experiencing Domestic Violence)

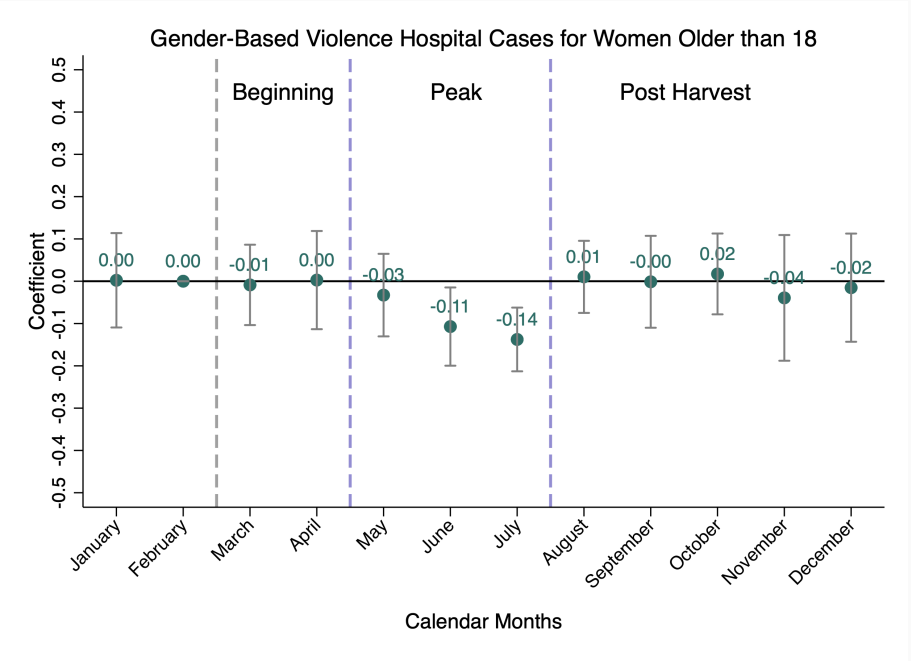
	(1) Ever Sought Help for Domestic Violence
Mill x Event Time -6- -2	0.11 (0.08)
Mill x Event Time -1	0.00 (.)
Mill x Event Time 0-1	-0.03 (0.07)
Mill x Event Time 2-3	-0.02 (0.10)
Mill x Event Time 4-6	-0.02 (0.06)
Observations	3204
Dependent variable mean	0.44

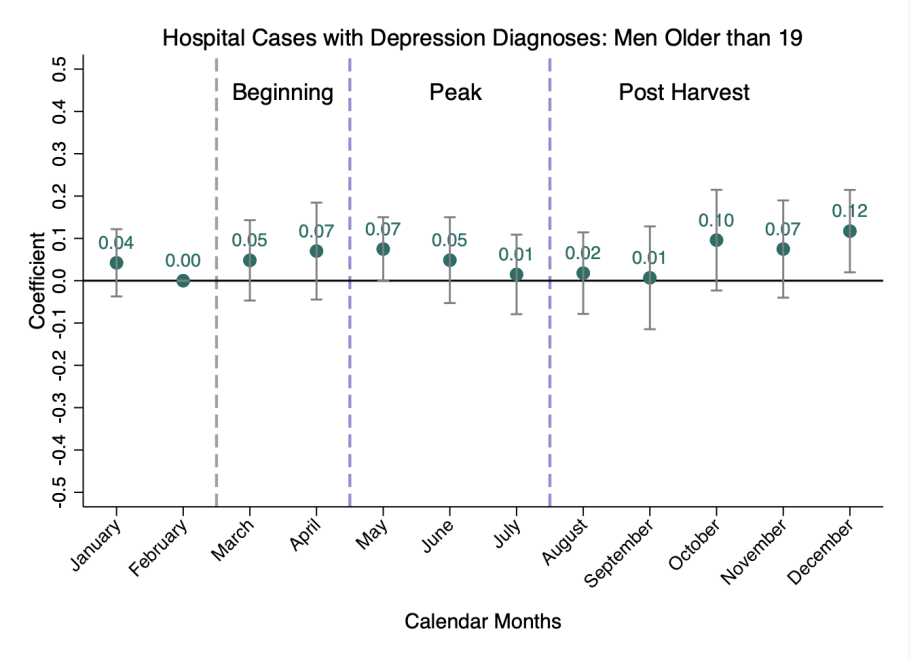
Notes: This table reports coefficients from regressions of self-reported help seeking behavior on domestic violence on the interaction between residing in a mill's catchment area and event-year dummies, using equation (1). The dependent variable, drawn from the Demographic Health Surveys (DHS), measures whether a woman who experienced physical or sexual violence ever sought help from anyone (own family, husband's family, current or former partner, friend, neighbor, religious leader, doctor or medical personnel, police, lawyer or a social service organization). The help-seeking question is asked only to women who report experiencing physical or sexual violence. The domestic violence module was administered to a randomly selected subsample of the full DHS sample, which explains the smaller number of observations compared to the work variables. Within this subsample, the analysis includes ever-married women whose partner or most recent partner is alive. Partnered women answer the questions for their current partners, while divorced or separated women answer them for their most recent partners. The event of interest is the opening of a mill. Event time is measured in years relative to the mill opening, with 0 indicating the year of the first mill's opening in the catchment area, negative values representing years before, and positive values representing years after. The omitted category is one year before the mill's opening. Event time years are grouped to ensure a balanced number of observations across years. All regressions control for individual characteristics, including women's religion, education, agricultural occupation, age-group fixed effects (measured in five-year age groups), survey month and year fixed effects, year of first marriage fixed effects, sub-district fixed effects, and district-by-harvest year fixed effects. The catchment area is defined using a 4 km buffer around the mills. Standard errors are clustered at the sub-district level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

- No change after the mill opening.

Hospital Cases with Depression Diagnoses for Men

IC Mechanism I

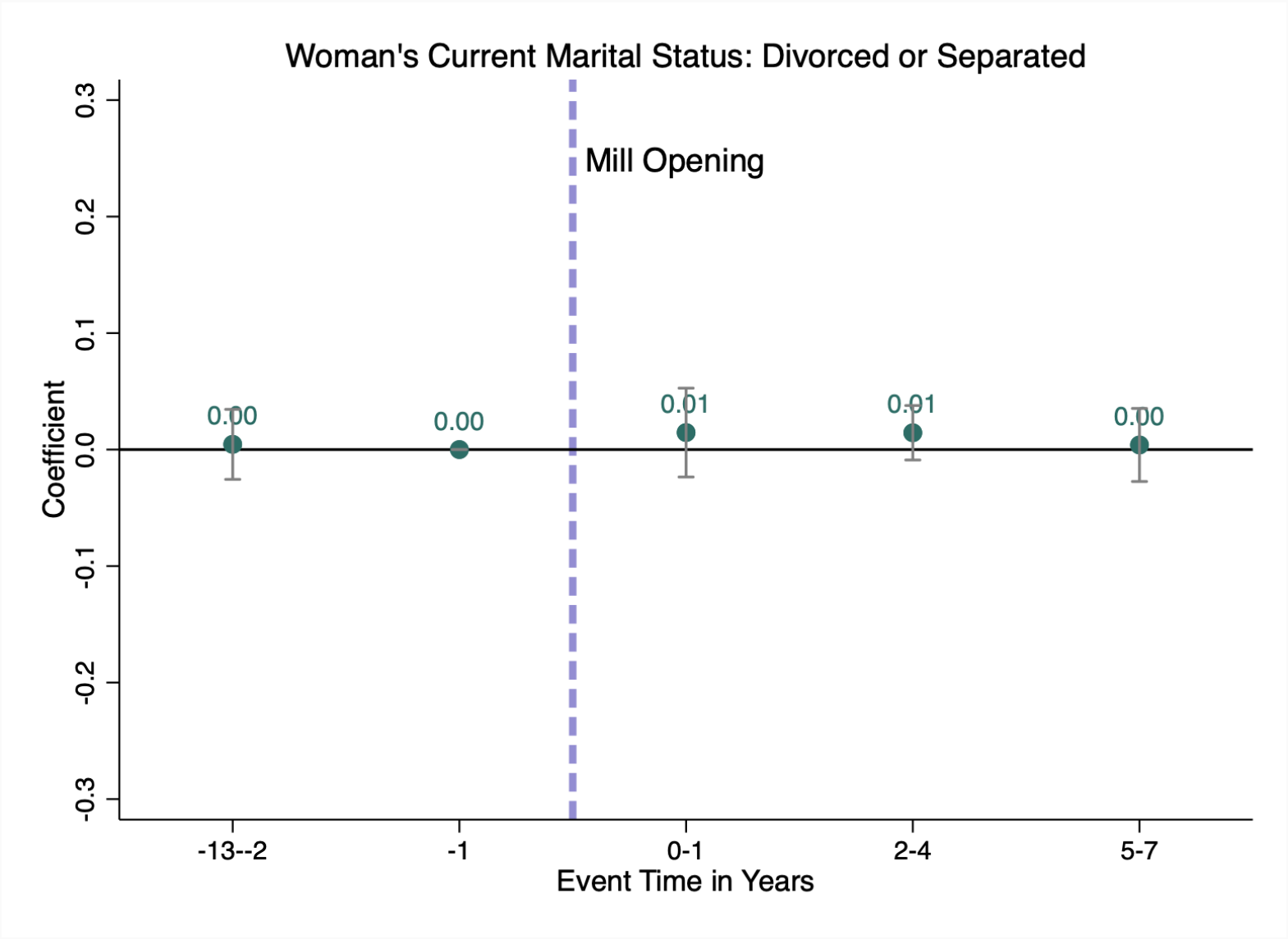




- **Hospital cases with depression diagnoses for men older than 19 do not show a seasonal pattern around the end of the harvest season.**
- Clinical depression is an imperfect proxy for financial stress since it can stem from non-financial reasons. Still, if financial stress were the sole driver of the seasonal pattern in violence, we might expect depression diagnoses among men to show a similar seasonal pattern.

Mechanisms: Women's Bargaining Power

BP Mechanism



Mechanisms: Women's Bargaining Power

Table A32: Dynamic Impact of a Mill Opening on Married Women's Participation in Household Decision Making (Alone or Jointly with the Husband): All, Financial and Non-Financial Decisions

	Household Decisions Index		
	(1) All Decisions	(2) Financial Decisions: Large Household Purchases	(3) Non-Financial Decisions: Family Visit, Own Health, Contraception
Mill x Event Time -13- -2	0.05	0.03	0.05
	(0.03)	(0.04)	(0.03)
Mill x Event Time -1	0.00	0.00	0.00
	(.)	(.)	(.)
Mill x Event Time 0-1	0.11**	0.13**	0.09**
	(0.04)	(0.06)	(0.04)
Mill x Event Time 2-4	0.01	0.01	0.01
	(0.04)	(0.05)	(0.04)
Mill x Event Time 5-7	0.02	-0.03	0.04
	(0.04)	(0.06)	(0.04)
Observations	16763	16747	16762
Dependent variable mean	0.23	0.22	0.23

Notes: This table reports coefficients from regressions of household decision-making outcomes on the interaction between residing in a mill's catchment area and event-year dummies, using equation (1). The dependent variables are drawn from the Demographic Health Surveys (DHS) and are measured as standardized indices. A higher index value indicates that the wife is more likely to make decisions either alone or jointly with her husband, rather than her husband or someone else in the family usually making the decisions for her. Column 1 presents an index of all household decisions, Column 2 focuses on decisions regarding large household purchases (financial decisions), and Column 3 includes decisions about family visits, own healthcare, and contraception (non-financial decisions). Since this question is collected only among couples, the sample consists of married women. Event time is measured in years relative to the mill opening, with 0 indicating the year of the first mill's opening in the catchment area, negative values representing years before, and positive values representing years after. The omitted category is one year before the mill's opening. Event time years are grouped to ensure a balanced number of observations across years. All regressions control for individual characteristics, including women's religion, education, agricultural occupation, age-group fixed effects (measured in five-year age groups), survey month and year fixed effects, year of first marriage fixed effects, sub-district fixed effects, and district-by-harvest year fixed effects. The catchment area is defined using a 4 km buffer around the mills. Standard errors are clustered at the sub-district level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Mechanisms and Women's Employment

The evidence supporting the increase in the cost of women's physical incapacitation does not negate the role of increased outside options and household income, as shown in household surveys.

1. Hospital cases reflect severe domestic violence cases. Evidence for the incapacitation cost mechanism does not rule out the possibility that the income effect contributes to reducing non-severe domestic violence, where women do not require hospital care and instead self-report in the annual household survey.
2. The hospital data cover 2012–2019, when most mills had already been built and the number of hospitals within a mill's catchment area was fixed. Thus, the hospital data capture within-year changes in the difference in the probability that a hospital has a domestic violence patient between hospitals inside and outside mill catchment areas once mills are built, but they do not measure the effect of a mill opening, as the household surveys do.

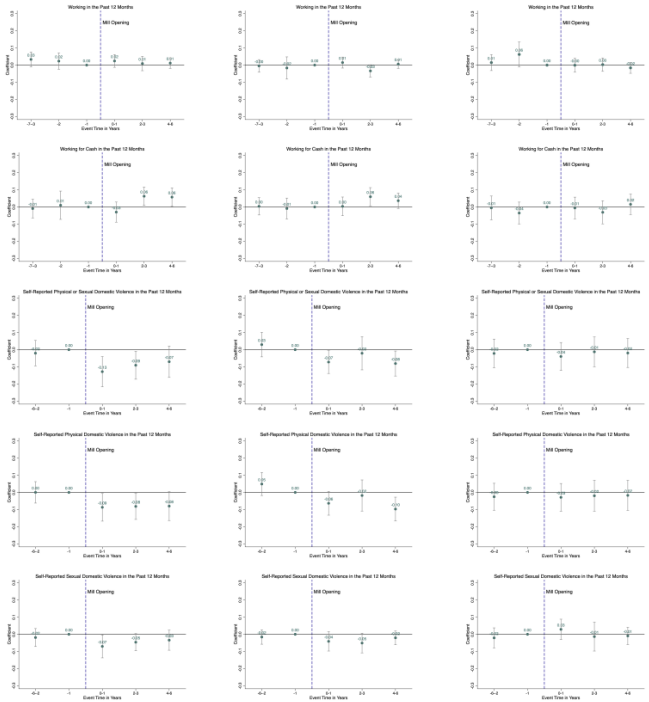
Mechanisms Summary

Different CA

Robustness

Figure A10: Effect of a Mill Opening on Ever-Married Women's Working, Working for Cash and Self-Reported Domestic Violence in the Past 12 Months Using Different Buffer Radii

Column 1: Buffer Radius is 4 km Column 2: Buffer Radius is 5 km Column 3: Buffer Radius is 10 km



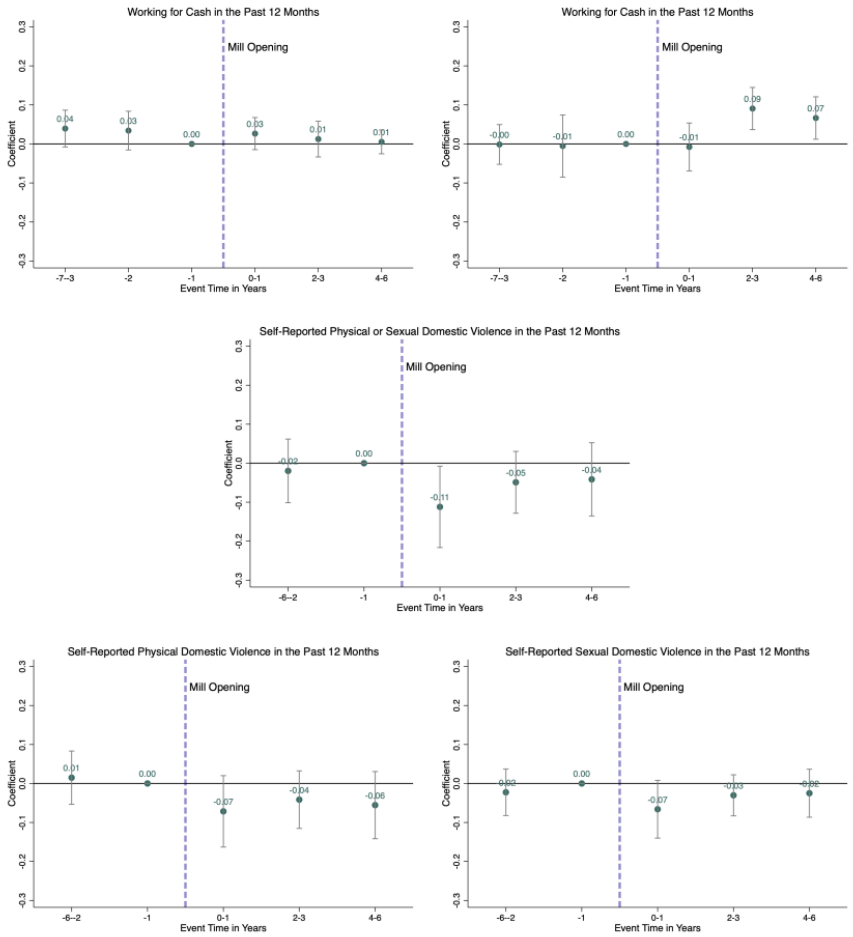
Notes: This figure presents robustness checks for the effect of a mill opening on women's working, working for cash, and self-reported domestic violence in the past 12 months. Column 1 replicates the main results, using a 4 km buffer radius to define a mill's catchment area. Columns 2 and 3 expand the buffer radius to 5 km and 10 km, respectively, to test the sensitivity of the estimates to different definitions of exposure. The dependent variables are drawn from the Demographic Health Surveys (DHS), and regressions follow equation (1). The event of interest is the opening of a mill, marked by the purple dashed line. Event time is measured in years, where 0 indicates the year of the mill's opening, negative values represent years before, and positive values represent years after. Event time years are grouped to ensure a balanced number of observations across years. The y-axis shows the change in the probability of the outcome relative to one year before the mill's opening (the omitted category). Standard errors are clustered at the sub-district level, and 95% confidence intervals are displayed.

- Buffer radius ↑ = Couples who reside in the periphery of the 4 km catchment area are now in the treatment group. Effects fade out as buffer radius ↑.

Donut Approach Results

Robustness

Figure A11: Dynamic Impact of a Mill Opening on Ever-Married Women's Working, Working for Cash and Experiencing Self-Reported Domestic Violence in the Past 12 Months: Physical or Sexual, Physical Only, Sexual Only using the Donut Approach



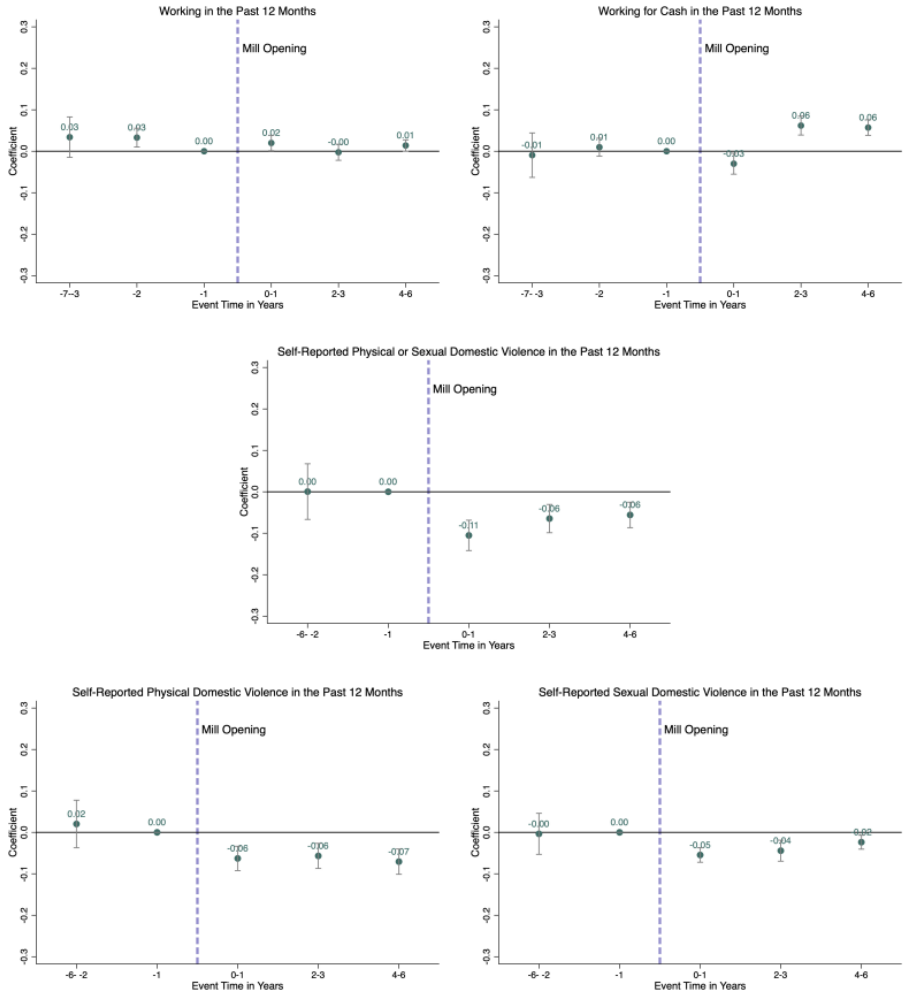
Notes: This figure replicates the main analysis using the donut approach. Under this approach, the treatment group consists of DHS clusters within a 4 km radius circular buffer around the mills, and the control group consists of DHS clusters in the donut-shaped area between 4 and 8 km from the mills. The outcome variables and event-year structure remain the same as in Figures 4 and 6. Since the donut approach uses a more geographically restricted control group, the sample is smaller than in the main specification: approximately 12,600 observations for working, 11,000 for working for cash, and 3,600 for the domestic violence outcomes. Standard errors are clustered at the sub-district level, and 95% confidence intervals are displayed.

Table A42: Dynamic Impact of a Mill Opening on Ever-Married Women's Current Marital Status (Divorced or Separated) Among Pre-Mill Marriages

	Current Marital Status: Divorced or Separated	
	(1) First Marriage Began Before Mill Opening (Includes Women with Multiple Unions)	(2) First Marriage Began Before Mill Opening (One Lifetime Union)
Mill x Event Time -13- -2	0.00	0.00
	(0.02)	(0.02)
Mill x Event Time -1	0.00	0.00
	(.)	(.)
Mill x Event Time 0-1	0.01	-0.01
	(0.02)	(0.02)
Mill x Event Time 2-4	0.01	0.02
	(0.01)	(0.01)
Mill x Event Time 5-7	-0.01	0.00
	(0.02)	(0.02)
Observations	18555	16496
Dependent variable mean	0.13	0.12

Notes: This table reports coefficients from regressions of women's current marital status being divorced or separated on the interaction between residing in a mill's catchment area and event-year dummies, using equation (1). Column 1 presents results for ever-married women whose first marriage took place before the mill opening and includes women with multiple unions. Column 2 presents results for ever-married women whose first marriage took place before the mill opening and restricts the sample to women who married only once in their lives. Because the year of marriage is observed only for the first union, Column 2 provides the closest approximation in the data to a sample of women who married before the mill opening and remained married at the time of treatment. The dependent variable, drawn from the Demographic Health Surveys (DHS), is a binary indicator for whether a woman is currently divorced or separated at the time of the survey. The sample consists of ever-married women whose partner or most recent partner is alive. Event time is measured in years relative to the mill opening, with 0 indicating the year of the first mill's opening in the catchment area, negative values representing years before, and positive values representing years after. The omitted category is one year before the mill opening. Event time years are grouped to ensure a balanced number of observations across years. All regressions control for individual characteristics, including women's religion, education, agricultural occupation, age-group fixed effects (five-year age groups), survey month and year fixed effects, year of first marriage fixed effects, sub-district fixed effects, and district-by-harvest-year fixed effects. The catchment area is defined using a 4 km buffer around the mills. Standard errors are clustered at the sub-district level. I used the minimum and maximum event years –13 and 7 when using the divorce outcome variable, as in the household decision-making analysis, given that I discuss these two variables in parallel in Section 6.1. I used these specific minimum and maximum event years (instead of –6 and 6, as in the main results) because the household decision-making variables are defined for married women only, resulting in a smaller sample size compared to the sample in the main results. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Figure A12: Dynamic Impact of a Mill Opening on Ever-Married Women's Working, Working for Cash and Experiencing Self-Reported Domestic Violence in the Past 12 Months: Physical or Sexual, Physical Only, Sexual Only in the Past 12 Months using Sun and Abraham (2020)



Notes: This figure replicates the main analysis using the method proposed by Sun and Abraham (2020). The sample, outcome variables, and event-year structure remain the same as in Figures 4 and 6. Standard errors are clustered at the sub-district level, and 95% confidence intervals are displayed.

Coffee Sorting in a Mill

back



Transportation of harvest within the CA

Context





Harvesting Coffee Cherries

Context

