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

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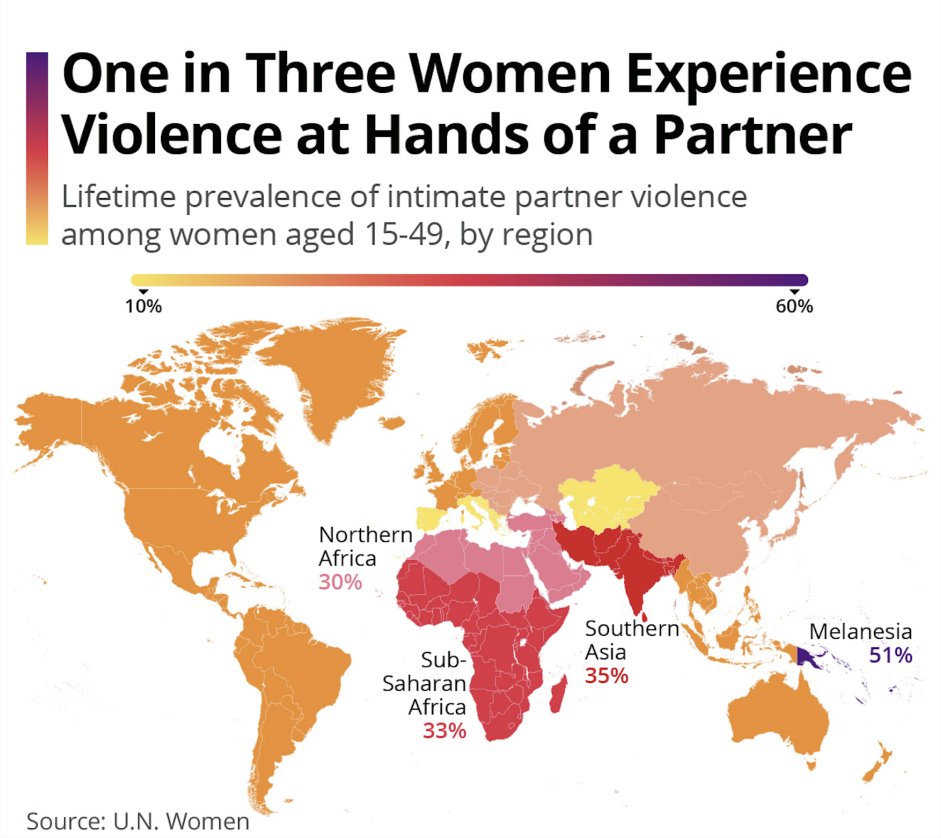
Domestic Violence [between partners] (DV)



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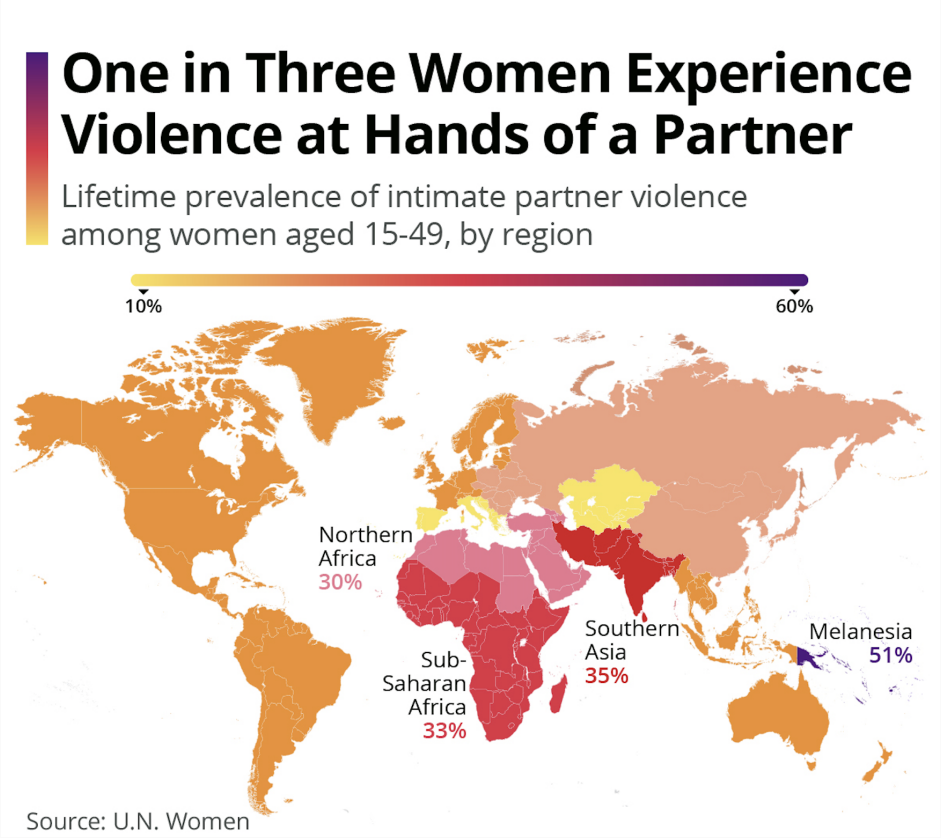

- Extreme form of gender inequality and a global health problem of epidemic proportions (WHO 2013).
- **Rwanda: 41.5% partnered women** reported ever experiencing DV as of 2019 (Rwanda National Institute of Statistics, 2019).

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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- **Existing evidence:**
  - The effects of **unearned income** (cash transfers, dowry). Angelucci 2008, Bobonis et al. 2013, Hidrobo et al. 2016, Haushofer et al. 2019, Bloch and Rao 2002, Calvi and Keskar 2021.
  - Study employment mainly as an **income shock**. Aizer 2010, Eswaran and Malhotra (2011), Anderberg et al. 2016, Bhalotra et al. 2021., Erten and Keskin 2021a, b, Kotsadam and Villanger 2022.

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- **Job $\neq$ income:**
  - Psychosocial benefits, confidence. Hussam, Kelley, Lane and Zahra 2022, 2023, McKelway 2023.
  - Exposure reduction. Dugan et al., 1999.
  - Earning income using **capacity to work**, health capital. Becker 1962, 2007; Goldin 2016.
    - DV creates economic costs. Adams-Prassl, Huttunen, Nix and Zhang 2023.
    - ↓ DV: Husbands' economic self-interest in the wife's work capacity.

This Paper

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- the wife's transition to paid employment, $\uparrow$ in the husband's earnings, $\downarrow$ DV.
    - Self-reports & **universe of monthly hospitalizations for DV.**

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  - Self-reports & **universe of monthly hospitalizations for DV.**

Part II: Uncover the mechanisms:

- $\downarrow$ in DV is plausibly driven by women's employment.
  - $\uparrow$ in the wife's outside options and contribution to household resources.
  - ~~Exposure Reduction.~~
  - $\uparrow$ in the husband's cost of (physically) incapacitating the wife.

This Paper: Key Features for Identification

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

Harvested Coffee Cherries

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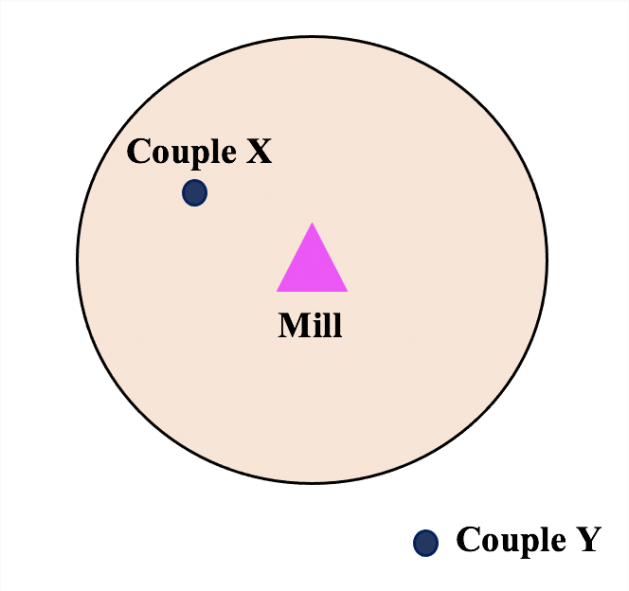
Coffee Mill: Coffee cherries (Harvest) $\xrightarrow{\text{Processing}}$ High-quality Beans $\rightarrow$ Export

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.



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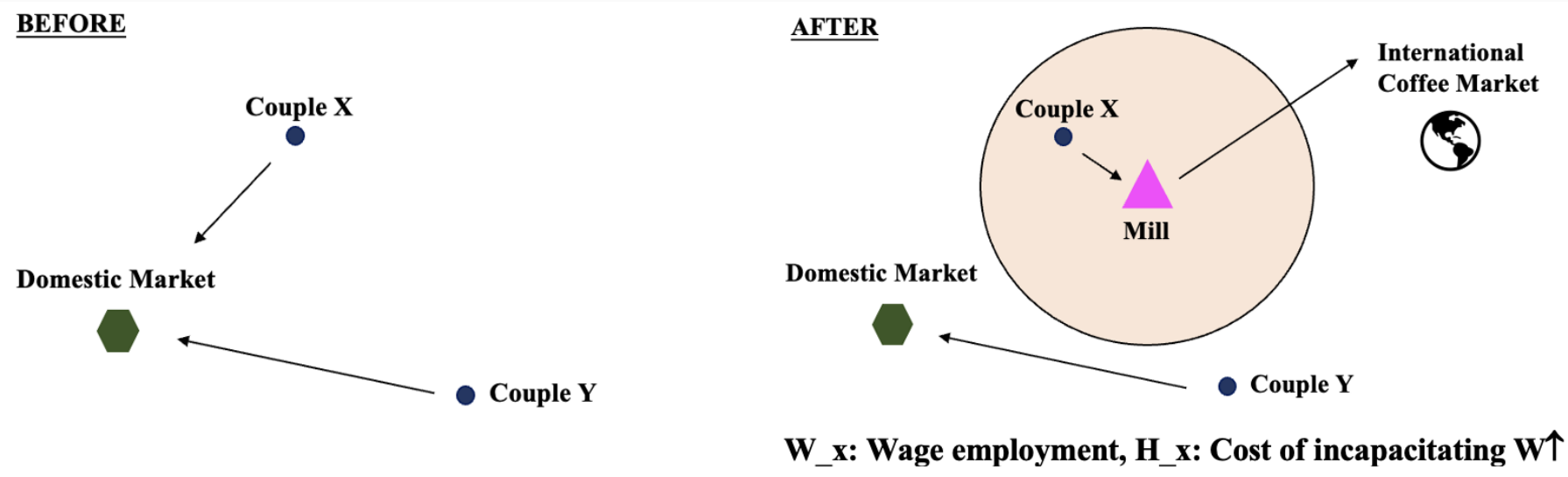
1. **Spatial Variation.**
   - **Catchment Area (CA):** Buffer zone around the mill.

   → 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.**



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

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2. **Diff-in-Diff Event Study Design** $\rightarrow$ Studying the incapacitation cost channel
    - **Spatial Variation:** Within-Outside of the CA. [Hospitals]
    - **Monthly Time Variation:** Mills operate during the harvest season, March-July.
        - **Event:** Beginning of the harvest season, March.
        - $\exists$ **months st:** Incapacitation cost changes, other channels are fixed/ ruled out w/ data.
    - **Data: Monthly hospitalizations for DV.**

This Paper: Preview of Results

Part I: Effect of Mill Exposure

- Women in the CAs are **15%** more likely to work for cash, **29%** less likely to self-report DV in the past 12 months.
- Mill exposure ↑ earnings for each spouse.
- Hospitals in the CAs are **14%** less likely to have a DV patient in a harvest month compared to one month before the harvest season.
    - **Seasonality:** Right after the harvest season, DV hospitalizations revert to its pre-harvest level.

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Part II: Mechanisms

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

Contributions and Related Literature

I. First paper to study the incapacitation cost channel behind the relationship between women's employment and DV and to provide causal evidence to support it.

- 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, Angelucci 2008, Haushofer et al. 2019, Dugan et al. 1999, Anderberg et al. 2016, Hidrobo et al. 2016, Bhalotra et al. 2019, Heath et al. 2020, Arenas-Arroyo et al. 2021, Chin 2011.

  - $\uparrow$ **in DV:** Instrumental/Extractive violence, male backlash
    Bloch and Rao, 2002, Macmillan and Gartner, 1999, Eswaran and Malhotra 2011, Bobonis et al. 2013, Heath 2014, Anderson and Genicot 2015, Erten and Keskin 2018, Erten and Keskin 2020, Calvi and Keskar 2021, Erten and Keskin 2021, Luke and Munshi 2011, Tur-Prats 2021, Alesina et al. 2020, Guarnieri and Rainer 2021

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$\rightarrow$ **Policy implication**: Jobs vs. cash transfer to women.
Complements Hussam, Kelley, Lane and Zahra (2022).

Contributions and Related Literature

II. The interventions and phenomena that increase female employment in developing countries may improve their health and physical security in the household.

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

    Qian 2008, Barros et al. 2011, Duflo 2012, Jensen 2012, Alesina et al. 2013, Andrabi et al. 2013, AlAzzawi 2014, Keats 2014, Angelucci et al. 2015, Banerjee et al., 2015, Gonzales et al., 2015, Grepin and Bharadwaj 2015, Heath and Mobarak 2015, Baird et al. 2016, Gaddis and Pieters 2016, Heath and Jayachandran 2017, Erten and Keskin 2018, Bursztyn et al. 2020, Field et al. 2021, McKelway 2021.

Outline

- Context: Rapid Expansion of Coffee Mills in Rwanda
- Data
- Empirical Strategy I and Results
  - Self-reported data on labor market outcomes and DV
- Empirical Strategy II and Results
  - Hospitalizations for DV
- Mechanisms
- External Validity
- Robustness Checks
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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).

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

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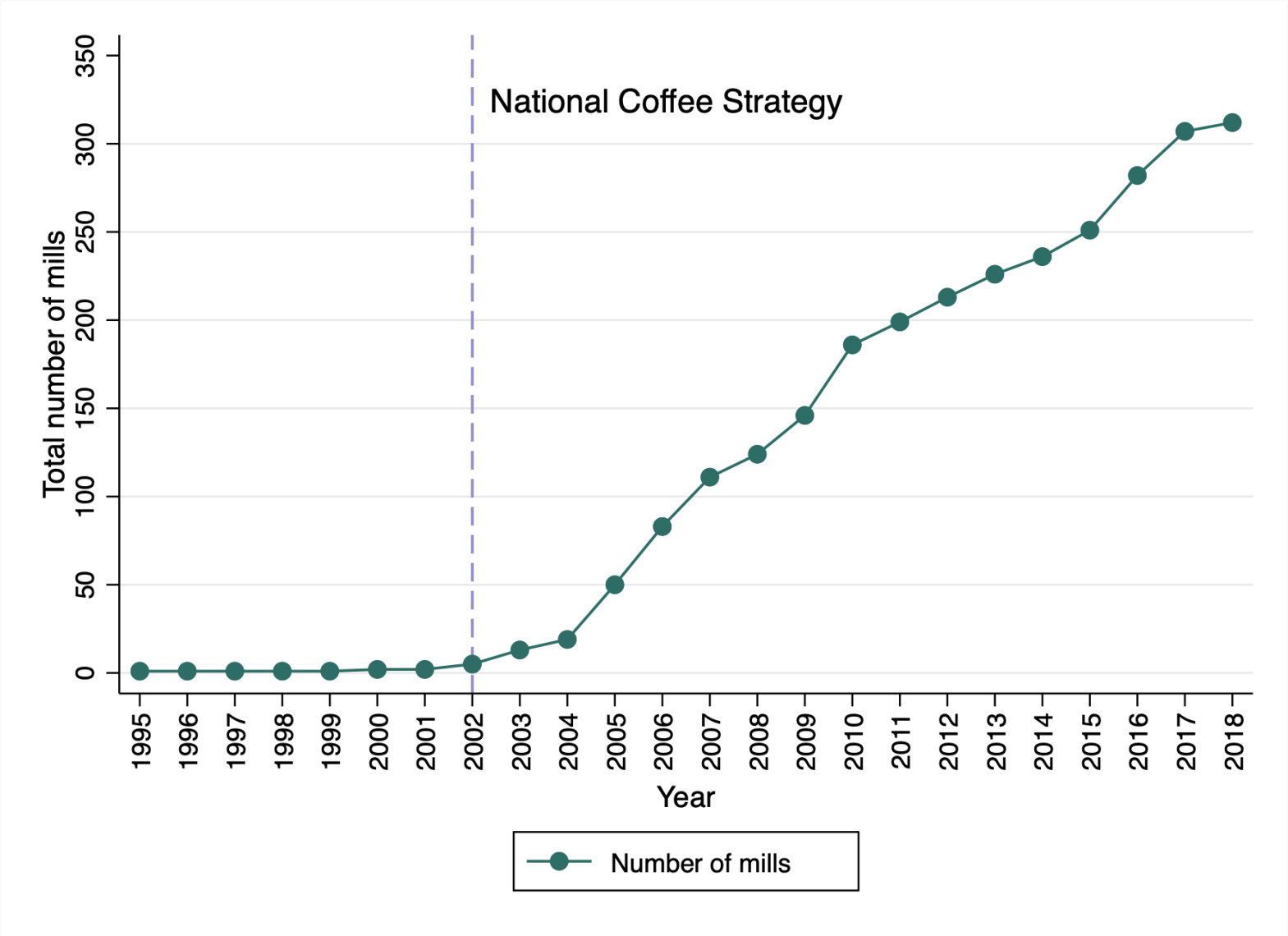
- **2002:** The government adopted the National Coffee Strategy which aimed to shift to mill-processed (high-quality) coffee production to participate in the international specialty coffee market (Boudreaux, 2011).

- **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:

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  - **H:** Receives coffee income = His personal earnings = f(W's labor)
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A mill (in the CAs):

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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.

Harvesting

Coffee Sorting in a Mill

Transportation

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Data

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

- 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.

- Integrated HH Living Conditions Survey (EICV) 2005/6, '11, '13/'14, '16/17
  - Individual **earnings** of couples.
  - Household **monthly consumption** and agricultural production (crops).
  - Not geocoded, log mills per capita at the district level.

- Hospital Management Information System Data (HMIS), 2012-2019
  - **Geocoded, monthly** panel data of hospitals.
  - **Universe of hospitalizations due to gender based violence**, age$>$18 $\rightarrow$ DV.
  - Placebo Outcome: Universe of monthly non-DV hospitalizations.

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Empirical Strategy I: Self-Reported Employment and DV

$$Y_{ist} = \beta_0 + \beta_1 Mill_{ist} + \mathbf{X_{ist}}\phi + \lambda_c + \omega_m + \alpha_s + \gamma_{dt} + (\mathbf{X_s} \times t)\theta + \epsilon_{ist}$$

- Y_{ist}: Binary var coded as 1 if woman i, in sector s, year t
  - Worked,
  - Worked for cash,
  - Experienced DV in the past 12 months.
- $Mill_{ist}$: Binary var coded as 1 if woman i, in sector s and in year t resides within the CA and 0 otherwise.

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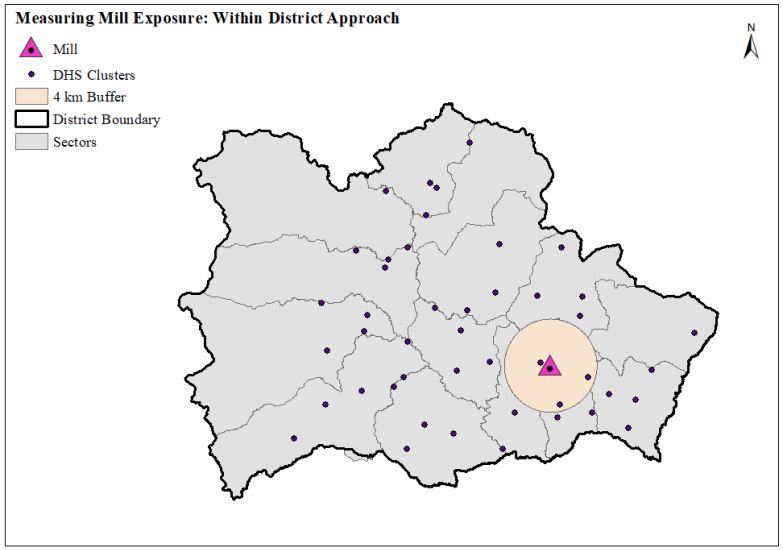
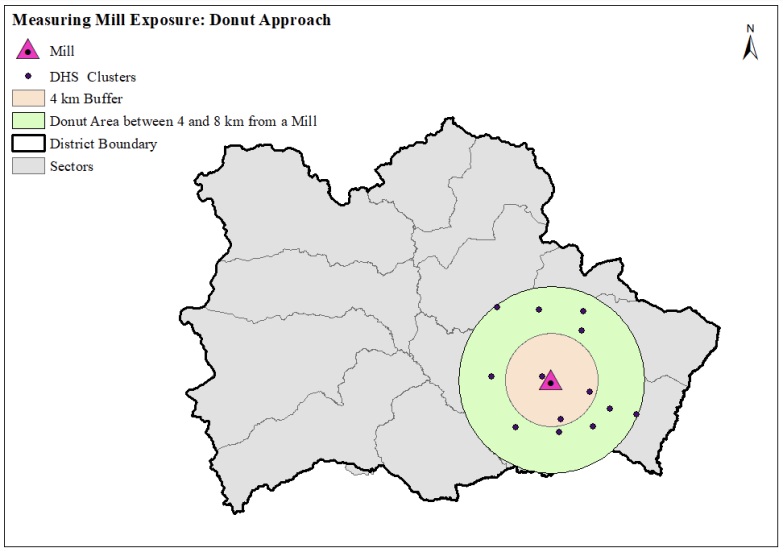
- $\mathbf{X_{it}}$: Individual controls of the woman and her partner.
- λ_c, ω_m, α_s, γ_{dt}: Cohort FE, Year of Marriage FE, Sector FE, District-by-yr FE.
- $(X_s \times t)$: (Historical number of coffee trees, FAO-GAEZ coffee suitability index) $\times$ linear time-trends.

Measuring Mill Exposure: DHS Clusters





1. Within District Approach [Left]
   - 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]
   - Control: Donut area between 4 and 8 km from a mill.

Results: Self-Reported Women's Employment and DV

	Within District			Donut		
	(1) Work	(2) Cash Work	(3) Domestic Violence	(4) Work	(5) Cash Work	(6) Domestic Violence
Mill	-0.00	0.07***	-0.10***	-0.00	0.06***	-0.07*
	(0.01)	(0.02)	(0.03)	(0.01)	(0.02)	(0.04)
Observations	10154	9068	3609	5409	4853	1830
Dependent variable mean	0.88	0.39	0.35	0.88	0.44	0.38

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

Appendix DHS | No change in occupations

Results: Husbands' Employment

	Within District		Donut	
	(1) Work	(2) Cash Work	(3) Work	(4) Cash Work
Mill	-0.00	0.03	-0.01	0.04
	(0.02)	(0.02)	(0.02)	(0.04)
Observations	4342	3790	2317	2110
Dependent variable mean	0.87	0.81	0.91	0.82

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

No sorting in agri occupations

Results: Women's and Their Husbands' Earnings

	All Sample Log of Last Daily Earnings		Occupation: Agriculture Log of Last Daily Earnings	
	(1) Wife	(2) Husband	(3) Wife	(4) Husband
Log of Mills per capita in the District	0.94***	1.72***	1.12***	1.71***
	(0.15)	(0.15)	(0.15)	(0.17)
Observations	4948	10055	4192	7237
Dependent variable mean	6.60	7.02	6.39	6.68

- Individual last daily earnings both for W and H ↑.
- Results are robust to IHS transformation.

IHS Specification IB

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    in de Chaisemartin and D'Haultfœuille 2020, Sun and Abraham 2020

Empirical Strategy II: Hospitalizations for DV

$$Y_{hdtm} = \beta_0 + \sum_{m=1}^{12} Mill_{hd} \times \beta_m \mathbb{1}[\tau = m] + \mathbf{X_{ht}}\phi + \lambda_h + \alpha_d + \sigma_m + \gamma_{pt} + (\mathbf{X_d} \times t)\theta + \epsilon_{hdtm}$$

- 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.
- $Mill_{hd}$: Binary variable coded as 1 if hospital h in district d is located within the CA and 0 otherwise.

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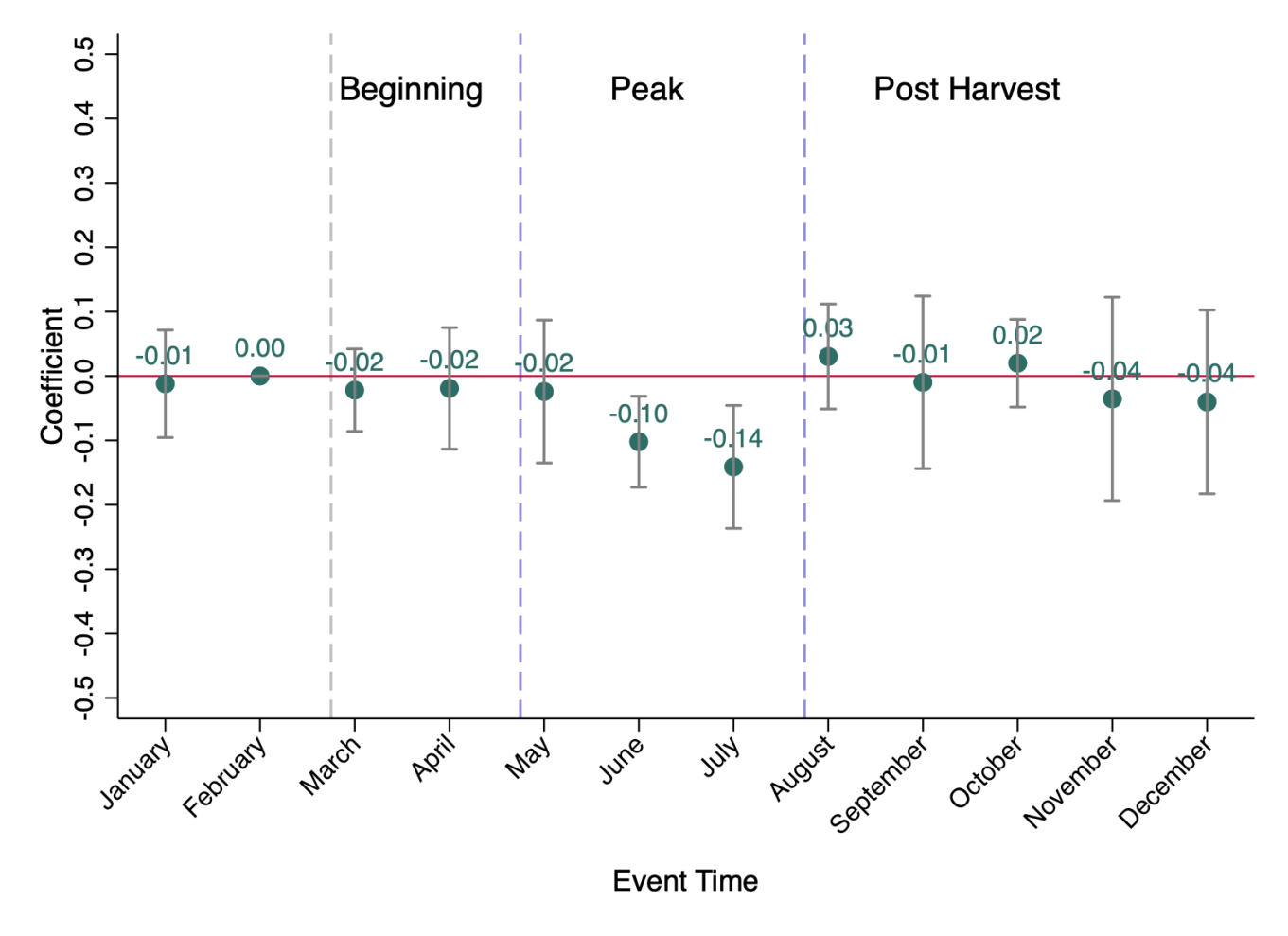
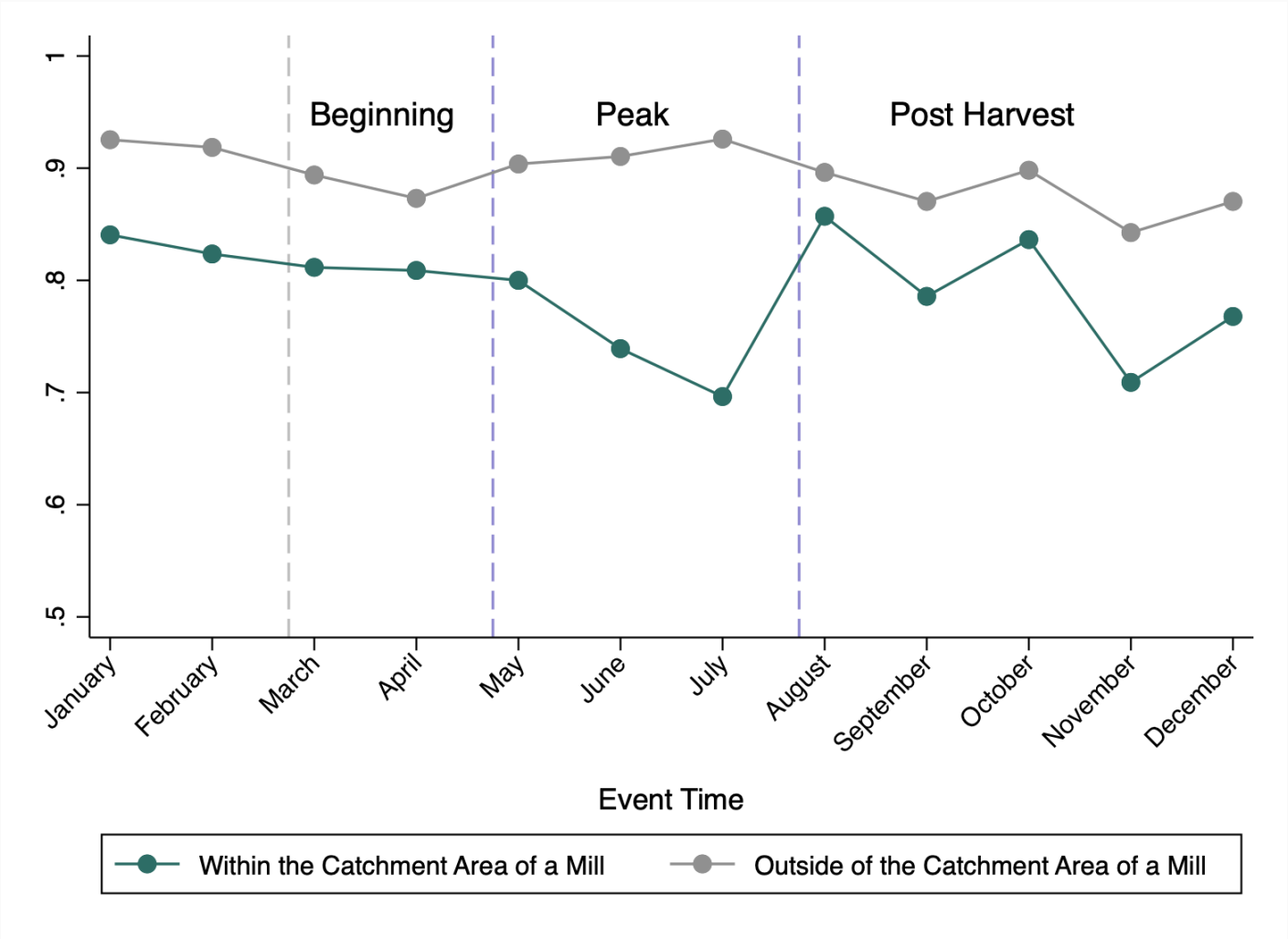
- $\mathbf{X_{ht}}$: Time varying hospital controls.
- λ_h, α_d, σ_m, γ_{ht}: **Hospital FE**, District FE, Month FE, Prov-by-year FE.
- $(X_d \times t)$: (Historical number of coffee trees, FAO-GAEZ coffee suitability index) $\times$ linear time-trends.

Women's Monthly Hospitalizations for DV



- Compared to one month before the beginning of the harvest season:
  1. Hospitals in the CAs are less likely to have a DV patient during the peak.
  2. No change in the post-harvest months.
- Placebo: No change in non-DV hospitalizations within the year. Placebo with non-DV

Women's Monthly Hospitalizations for DV (Means)



- Post-harvest levels of hospitalizations in the CAs are still lower compared to the cases from the hospitals outside of the CAs.

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Mechanisms

Potential mechanisms behind the effect of a mill on DV:

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

Mechanisms: Increase in Women's Bargaining Power

	Within District			Donut		
	(1) Large HH Purchases	(2) Own Health	(3) Family Visit	(4) Large HH Purchases	(5) Own Health	(6) Family Visit
Mill	0.05**	0.03	0.02	0.04*	0.01	-0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Observations	10154	10154	10154	5409	5409	5409
Dependent variable mean	0.69	0.74	0.82	0.71	0.75	0.82

- Making decisions on large HH purchases alone or jointly with the husband ↑
  - Relative to the husband/a family member is making the decision for her.

- Similar results for being the decision maker for using contraception. Contraception

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- Extractive violence
- Increase in the cost of women's incapacitation

Mechanisms: Exposure Reduction

	Within District		
	(1) Work	(2) Cash Work	(3) Domestic Violence
Mill	-0.00	0.06*	-0.10*
	(0.02)	(0.03)	(0.06)
Observations	4804	3614	1579
Dependent variable mean	0.73	0.30	0.34

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

Mechanisms: Increase in the Household Earnings

	Couples with Different Occupations	
	(1) Woman's Log of Last Daily Earnings: Agriculture	(2) Husband's Log of Last Daily Earnings: Non-Agriculture
Log of Mills per capita in the District	2.78***	-0.42
	(0.68)	(0.91)
Observations	2291	1089
Dependent variable mean	5.08	7.51

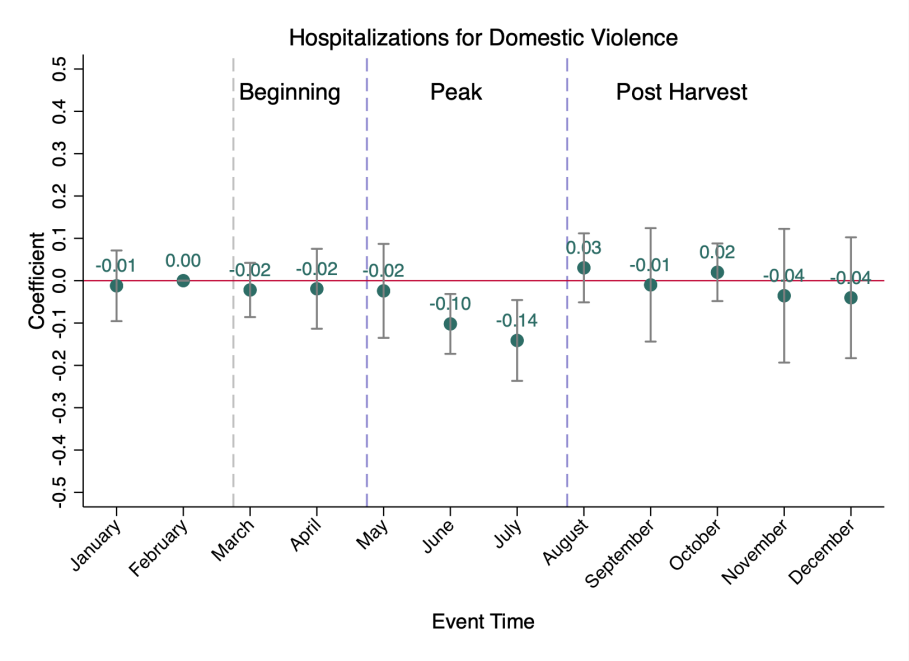
- Wife in agriculture - Husband in a non-agricultural manual job.
  - ↑ in the wife's earnings, **no change in the husband's earnings.**
- DV↓ even among couples where an ↑ in HH resources is only via women's paid employment.
  - ↑ in the wife's contribution to HH earnings is a plausible mechanism.
    - Extractive violence is not the dominant mechanism.

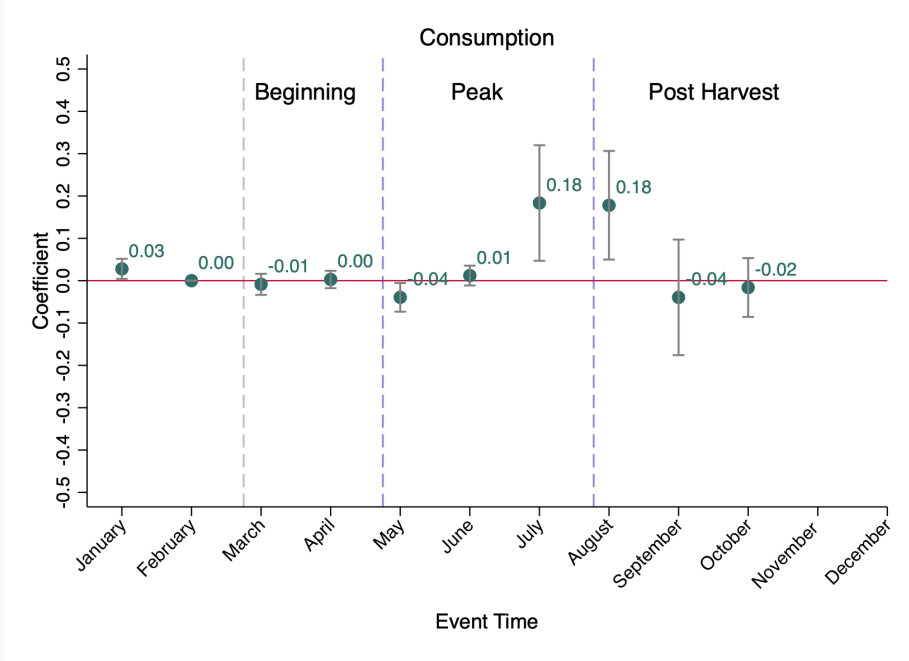
Mechanisms

Potential mechanisms behind the effect of a mill on DV:

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

Mechanisms: Increase in the Cost of Women's Incapacitation



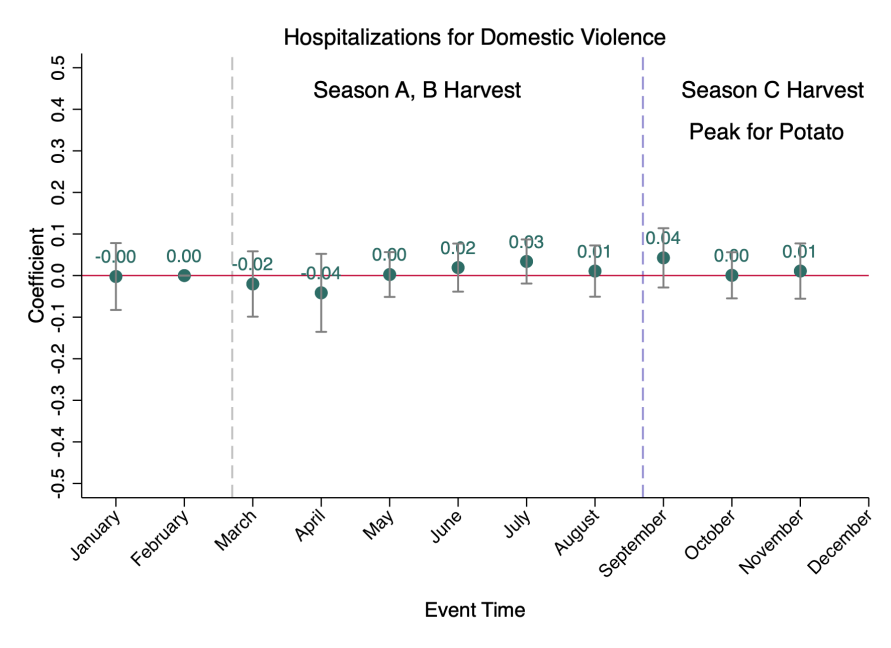


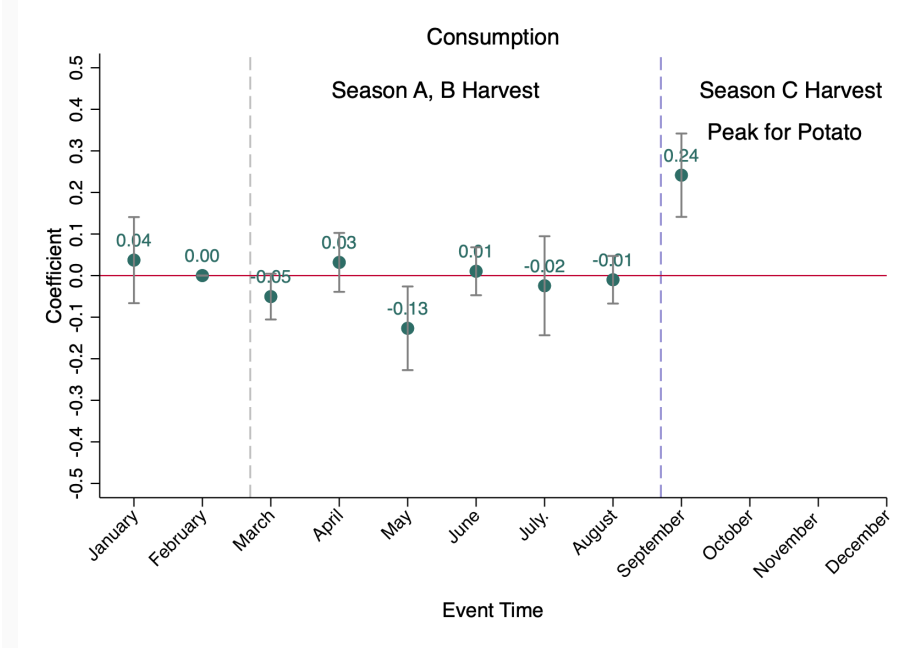
1. When incapacitation cost ↓ in August, DV reverts to its pre-harvest level.
2. ~~Income effect for hospitalizations~~: During August, **no change in DV & higher consumption relative to pre-harvest.**
3. Keeping women's outside options fixed: Plausibly, the wife's outside option in the CA is similar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

→ Seasonality of the cost of women's incapacitation supports seasonality of DV hospitalizations.

Mechanisms: Increase in the Cost of Women's Incapacitation

- **Irish Potato Regions:** When the value of the wife's work capacity is fixed within the year $\rightarrow$ **No change** in DV hospitalizations within the year.





$\star$ No major $\uparrow$ in the value of women's work capacity for their unpaid tasks within the year.

$\star$ Women mostly do not engage in paid employment.

Mechanisms

Potential mechanisms behind the effect of a mill on DV:

- **Increase in women's outside options, thus, bargaining power.** ✓
- ~~Exposure Reduction~~
- **Increase in household earnings** ✓
  - ~~Due to husbands' earnings only~~
  - **Due to women's earnings only**
- ~~Extractive violence~~
- **Increase in the cost of women's incapacitation** ✓
  - ~~Income effect for DV hospitalizations~~

Outline

- Context: Rapid Expansion of Coffee Mills in Rwanda
- Data
- Empirical Strategy I and Results
  - Self-reported data on labor market outcomes and DV
- Empirical Strategy II and Results
  - Hospitalizations for DV
- Mechanisms
- **External Validity**
- Robustness Checks
  - Robust to recent estimators proposed in the DID literature.
    in de Chaisemartin and D'Haultfœuille 2020, Sun and Abraham 2020

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.

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- **Theoretical Framework:** Providing jobs to women $\downarrow$ 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.

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- **Theoretical Framework:** Providing jobs to women $\downarrow$ 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, 2021).

  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

- Context: Rapid Expansion of Coffee Mills in Rwanda
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- Empirical Strategy II and Results
  - Hospitalizations for DV
- Mechanisms
- External Validity
- **Robustness Checks**
  - Robust to recent estimators proposed in the DID literature.
    in de Chaisemartin and D'Haultfœuille 2020, Sun and Abraham 2020

Robustness Checks

- Pre-trends
  - Exploit the number of years individuals are exposed to a mill opening using an event study. Event Study
- Placebo Test
  - Treatment: Women in areas that do not have a mill yet. Placebo
- Recent econometrics literature on DID and event studies
  - Goodman-Bacon (2021) decomposition, test proposed in de Chaisemartin and D'Haultfœuille (2020).
  - Results are robust to using estimators proposed in de Chaisemartin and D'Haultfœuille (2020) and Sun and Abraham (2020). DCDH SA
- Measuring mill exposure
  - Different CA sizes: 5 and 10 km Different CA
  - Within CA: 2 km buffer vs. the donut between 2 and 4 km. Within CA

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 $\downarrow$ DV when the husband has economic self-interest in the wife's work capacity.
  - $\uparrow$ in women's outside options and contribution to HH resources 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.

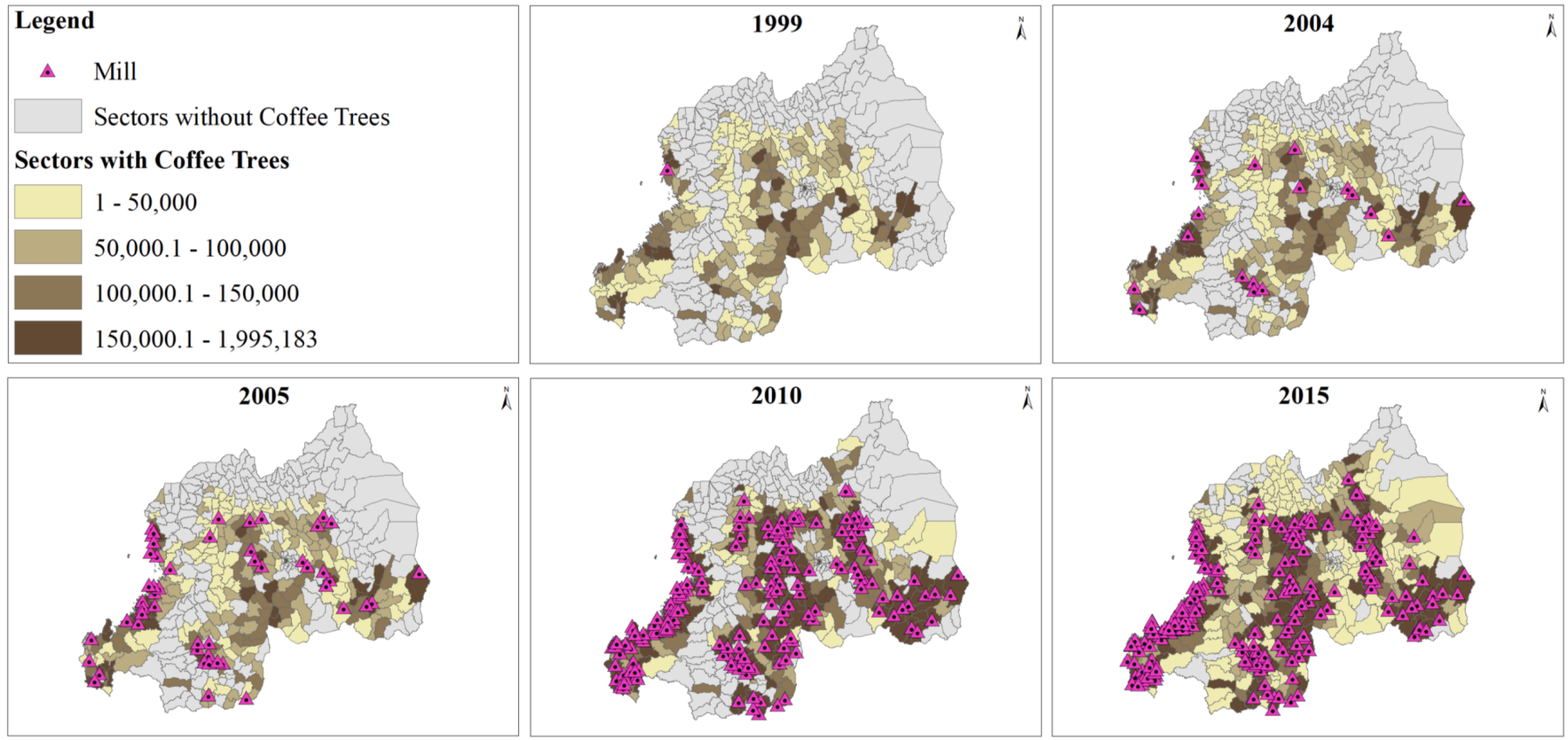
  $\rightarrow$ Climate change-induced weather shocks, automating agriculture.

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?

Sector 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: FAO-GAEZ coffee suitability and genocide intensity index are both standardized. The data is at the sector level. *** p<.01, ** p<.05, * p<.1

Table A2: Summary Statistics for Women: DHS Women's Recode

	All		Not Exposed to a mill		Exposed to a mill	
	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	0.88	0.32
Worked for cash in the past 12 months	0.39	0.49	0.36	0.48	0.45	0.50
Experienced domestic violence in the past 12 months	0.34	0.47	0.34	0.47	0.37	0.48
Panel B: Controls						
Husband lives in the house	0.88	0.32	0.88	0.32	0.87	0.33
Husband's age	42.64	9.79	42.36	9.81	43.47	9.67
Husband's Occupation: Agricultural	0.70	0.46	0.69	0.46	0.71	0.45
Husband's education in years	4.34	3.75	4.34	3.80	4.34	3.59
Occupation: Agricultural	0.75	0.43	0.74	0.44	0.77	0.42
Marital status: Married	0.74	0.44	0.71	0.45	0.80	0.40
Monogamy (No other wives)	0.89	0.31	0.88	0.32	0.92	0.27
Number of unions: One	0.84	0.37	0.84	0.37	0.85	0.36
Age at first marriage	19.85	3.31	19.73	3.28	20.19	3.38
Years since marriage	16.72	6.45	16.56	6.50	17.21	6.27
Education in years	4.00	3.53	3.90	3.57	4.29	3.40
Muslim	0.02	0.13	0.02	0.14	0.01	0.11
Christian	0.96	0.19	0.96	0.19	0.97	0.17
Has children aged 5 and under	0.75	0.43	0.76	0.43	0.72	0.45
Type of residence: Rural	0.84	0.37	0.83	0.38	0.86	0.35
Household has a radio	0.62	0.49	0.61	0.49	0.63	0.48
Household's main floor material is cement	0.17	0.38	0.17	0.38	0.17	0.38
Household has electricity	0.14	0.34	0.13	0.34	0.15	0.36
Household wealth is above the median	0.51	0.50	0.51	0.50	0.51	0.50
Observations	12300		9209		3091	

Notes: Sample consists of partnered women who married before the expansion of the mills. "Exposed to the mill" represents being in the catchment area of a mill. Catchment area radius is 4 km.

Summary Stats: DHS - Baseline

Table A3: Summary Statistics for Women based on Treatment Status: 2005 DHS Women's Recode (Before Rapid Expansion/Baseline)

	Never Treated Sector Level		Before Treatment Sector Level	
	Mean	Std. Dev.	Mean	Std. Dev.
Panel A: Main dependent variables				
Worked in the past 12 months	0.83	0.37	0.84	0.36
Worked for cash in the past 12 months	0.18	0.39	0.19	0.40
Experienced domestic violence in the past 12 months	0.22	0.42	0.22	0.41
Panel B: Controls				
Husband lives in the house	0.89	0.31	0.86	0.34
Husband's age	41.03	9.67	41.91	9.55
Husband's Occupation: Agricultural	0.71	0.45	0.82	0.38
Husband's education in years	4.25	3.90	3.66	3.32
Occupation: Agricultural	0.72	0.45	0.79	0.41
Marital status: Married	0.61	0.49	0.70	0.46
Monogamy (No other wives)	0.86	0.34	0.88	0.33
Number of unions: One	0.83	0.37	0.83	0.38
Age at first marriage	19.65	3.36	19.92	3.28
Years since marriage	14.99	6.83	15.53	7.06
Education in years	3.58	3.61	3.58	3.24
Muslim	0.02	0.15	0.02	0.13
Christian	0.96	0.21	0.97	0.17
Has children aged 5 and under	0.85	0.36	0.82	0.38
Type of residence: Rural	0.80	0.40	0.87	0.34
Household has a radio	0.53	0.50	0.54	0.50
Household's main floor material is cement	0.15	0.35	0.10	0.31
Household has electricity	0.07	0.25	0.03	0.16
Household wealth is above the median	0.51	0.50	0.46	0.50
Observations	2348		1123	

Notes: Sample consists of partnered women who married before the expansion of the mills. "Treatment" represents a mill opening. Since a mill serves only to its catchment area, after treatment is at the catchment area level rather than the sector level. Catchment area radius is 4 km.

Balance Check I

Table A11: Balance Check: Within District Approach

	Husband		Women		
	(1) Occupation: Agricultural	(2) Education in Years	(3) Occupation: Agricultural	(4) Education in Years	(5) Civil Marriage
Mill	0.00	0.03	-0.00	0.01	-0.01
	(0.02)	(0.14)	(0.02)	(0.13)	(0.02)
Observations	10413	10413	10413	10413	10413
Dependent variable mean	0.69	4.35	0.74	4.03	0.74
	Women			Household	
	(1) Age at: First Marriage	(2) Religion: Christian	(3) Residence: Rural	(4) Cement Floor	(5) Electricity
Mill	0.02	-0.00	0.03	0.01	0.02
	(0.05)	(0.01)	(0.02)	(0.01)	(0.01)
Observations	10413	10413	10413	10413	10413
Dependent variable mean	19.89	0.97	0.83	0.18	0.14

Notes: Robust standard errors clustered at the sector level are in parentheses. 4 km catchment area is used for the treatment group. Within district approach is used for the control group. The estimates are based on DHS data and estimated with the main specification presented in Section 5.2.1
*** p<.01, ** p<.05, * p<.1

Balance Check II

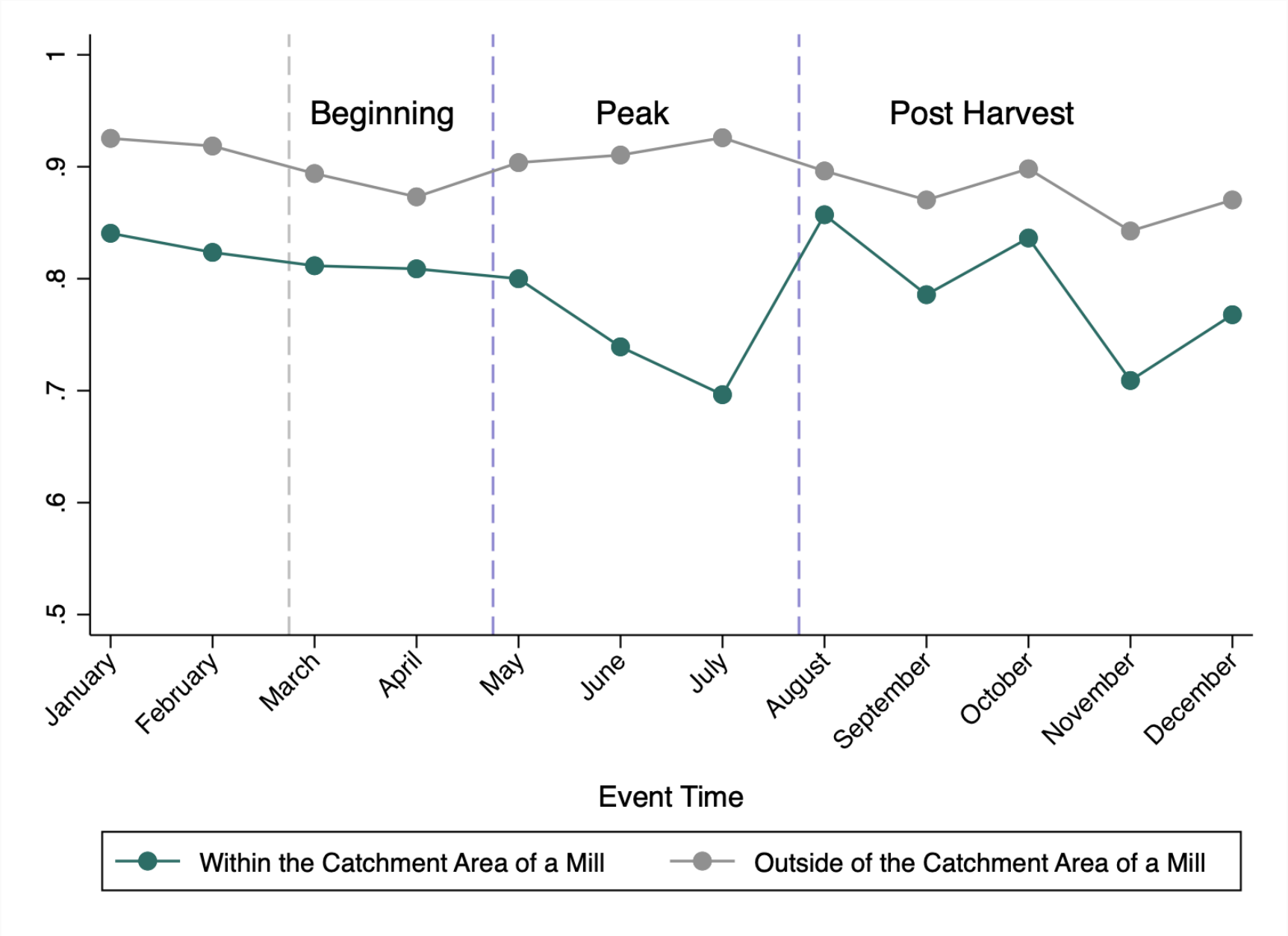
Table A12: Balance Check: Donut Approach

	Husband		Women		
	(1) Occupation: Agricultural	(2) Education in Years	(3) Occupation: Agricultural	(4) Education in Years	(5) Civil Marriage
Mill	-0.01	-0.08	0.01	-0.07	-0.02
	(0.02)	(0.15)	(0.02)	(0.16)	(0.02)
Observations	5283	5283	5283	5283	5283
Dependent variable mean	0.68	4.47	0.74	4.40	0.79
	Women		Household		
	(1) Age at: First Marriage	(2) Religion: Christian	(3) Residence: Rural	(4) Cement Floor	(5) Electricity
Mill	0.00	-0.00	0.04	0.01	0.02
	(0.06)	(0.01)	(0.03)	(0.01)	(0.01)
Observations	5283	5283	5283	5283	5283
Dependent variable mean	20.16	0.96	0.81	0.21	0.17

Notes: Robust standard errors clustered at the sector level are in parentheses. 4 km catchment area is used for the treatment group. Donut approach is used for the control group. The estimates are based on DHS data and estimated with the main specification presented in Section 5.2.1 *** p<.01, ** p<.05, * p<.1

Summary Stats: HMIS

Results HMIS



Results DHS: Women's Occupation

	(1) Managers	(2) Sales	(3) Agricultural Self-Employed	(4) Agricultural Employee	(5) Manual Skilled & Unskilled
Mill	0.00	-0.01	-0.01	0.01	0.01
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)
Observations	4962	4962	4962	4962	4962
Dependent variable mean	0.03	0.07	0.75	0.07	0.05

- No change in occupations.

Results DHS: Husbands' Occupation

Results DHS Husbands

	(1) Managers	(2) Sales	(3) Agricultural Self-Employed	(4) Agricultural Employee	(5) Manual Skilled & Unskilled
Mill	0.01	0.03*	-0.04	0.00	0.01
	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)
Observations	2107	2107	2107	2107	2107
Dependent variable mean	0.05	0.06	0.62	0.07	0.17

- No sorting in agricultural occupations.

Empirical Strategy IB: Earnings

Results EICV

$$Y_{idt} = \beta_0 + \beta_1 Mill_{idt} + \mathbf{X_{it}}\phi + \lambda_c + \alpha_d + \gamma_{dt} + (\mathbf{X_d} \times t)\theta + \epsilon_{idt}. \quad (1)$$

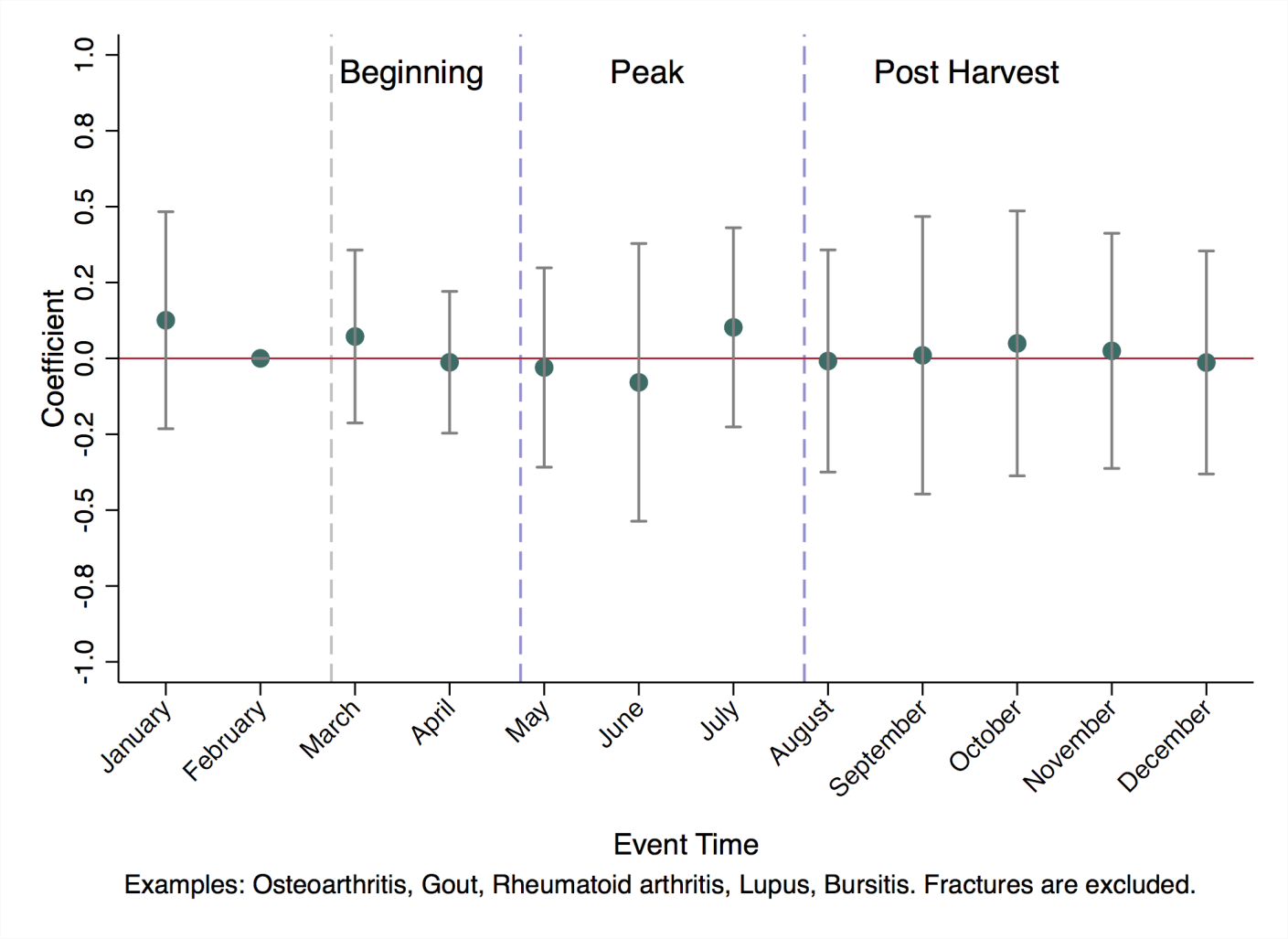
- Y_{idt}: Log earnings of woman/husband i, in district d and year t.
- $Mill_{idt}$: Log of the total number of mills per capita in the district of residence of a woman/husband i at year t.
- $\mathbf{X_{it}}$: Individual controls of the woman and her partner.
- λ_c, ω_m, α_d, γ_{dt} : Cohort FE, District FE, District-by-year FE.
- $(X_d \times t)$: (Historical number of coffee trees, FAO-GAEZ coffee suitability index) $\times$ linear time-trends.

IHS Transformation

Results EICV

	IHS of Women's Last Daily Earnings	
	(1) All Sample	(2) Occupation: Agriculture
Log of Mills per capita in the District	3.55***	3.77***
	(0.24)	(0.26)
Observations	18176	17375
Dependent variable mean	6.60	6.39

Placebo Test: Women's Monthly Hospitalizations for non-DV



Examples: Osteoarthritis, Gout, Rheumatoid arthritis, Lupus, Bursitis. Fractures are excluded.

- No change within the year.

Results HMIS

Mechanisms: Increase in Women's Bargaining Power

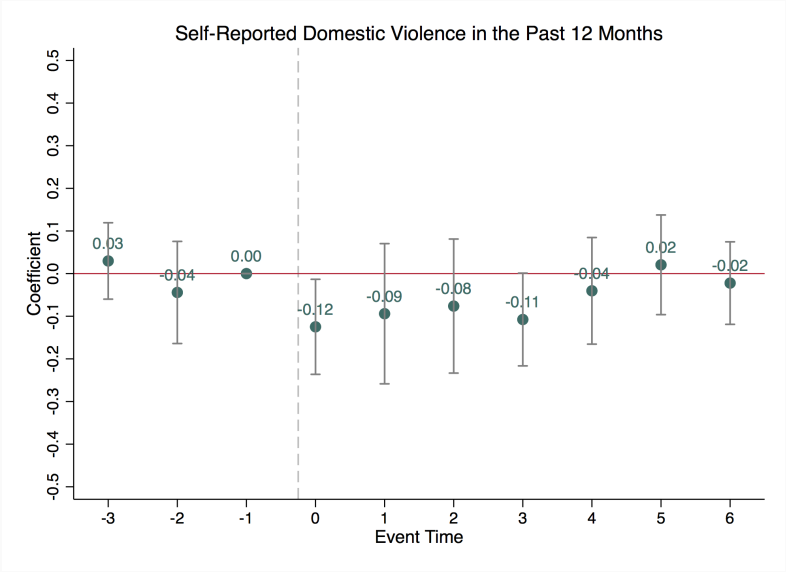
BP Mechanism

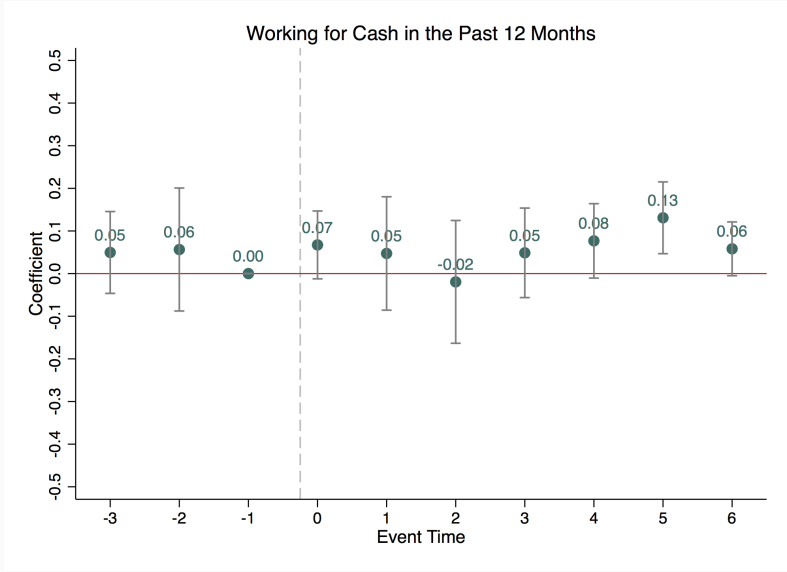
	Within District			Donut		
	(1) Joint	(2) Wife	(3) Husband	(4) Joint	(5) Wife	(6) Husband
Mill	0.06*	-0.04	-0.02	0.06*	-0.03	-0.03
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.02)
Observations	2638	2638	2638	1506	1506	1506
Dependent variable mean	0.87	0.10	0.04	0.88	0.09	0.03

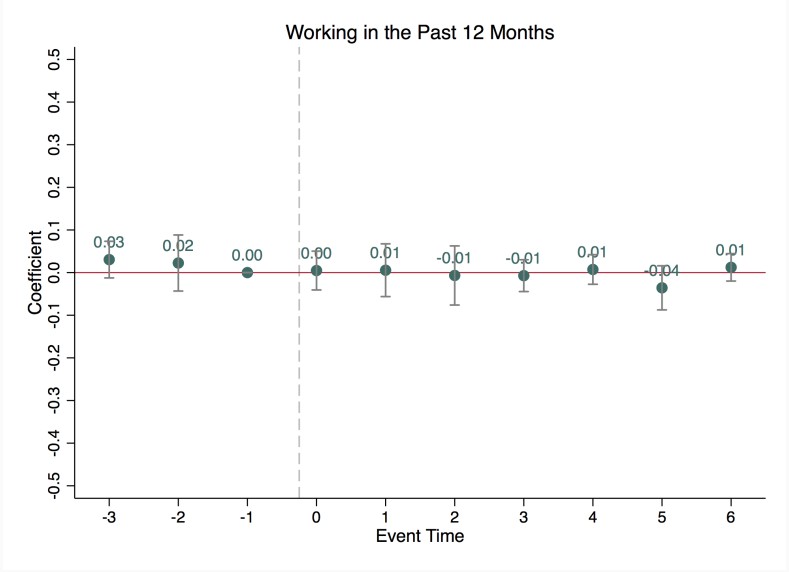
- Making decisions on using contraception jointly with the husband ↑

Event Study

Robustness







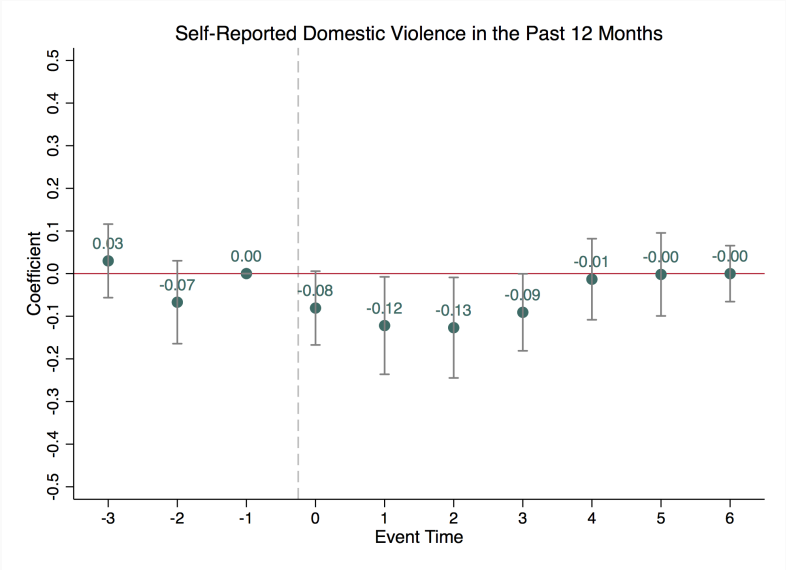
Placebo Test: Outcome Variables before a Mill Opening

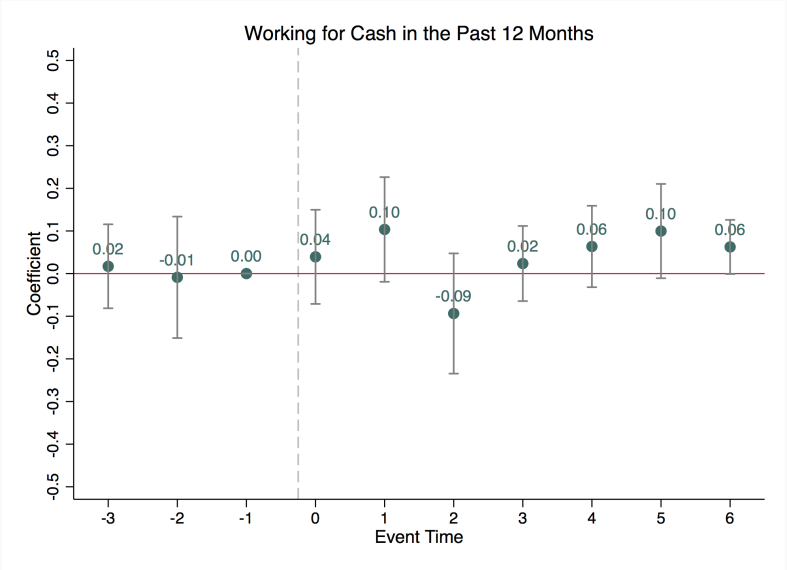
Robustness

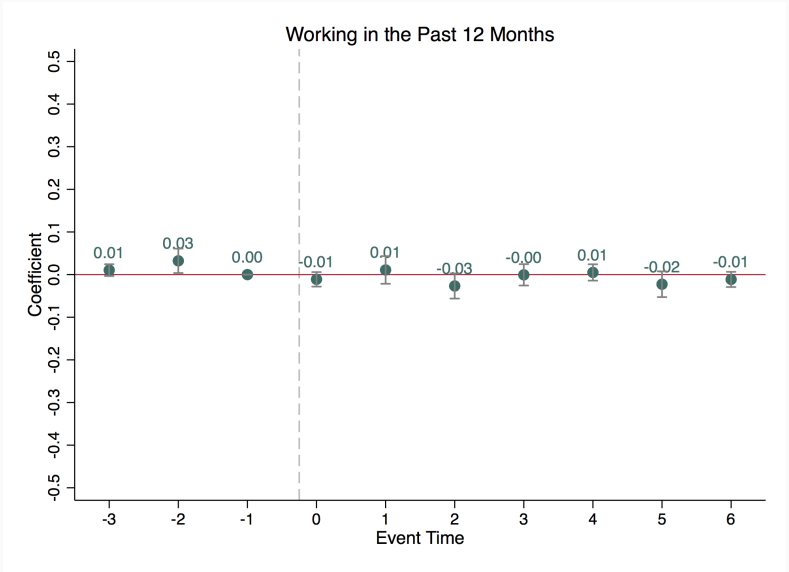
	Within District			Donut		
	(1) Work	(2) Cash	(3) Violence	(4) Work	(5) Cash	(6) Violence
Mill	0.02	0.03	0.06	0.01	0.02	0.05
	(0.02)	(0.03)	(0.05)	(0.01)	(0.04)	(0.06)
Observations	7314	6455	2651	3533	3534	1494
Dependent variable mean	0.87	0.56	0.34	0.98	0.55	0.35

- Treatment: Women in areas that will receive a mill and become CAs in the upcoming years.
- Control: Outside of the future CAs.
- Falsely assuming that the treatment group is exposed to a mill.
- Outcome variables are balanced across the groups before a mill.

Sun and Abraham (2020) Robustness

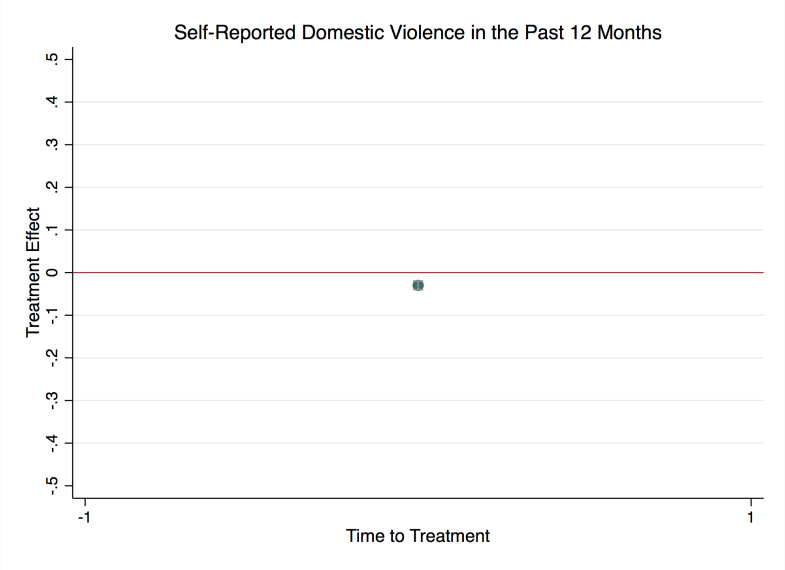






de Chaisemartin and D'Haultfœuille (2020)

Robustness



Different CA

Robustness

	4 km			5 km			10 km		
	(1) Work	(2) Cash	(3) Violence	(4) Work	(5) Cash	(6) Violence	(7) Work	(8) Cash	(9) Violence
Mill	-0.00	0.06***	-0.09***	-0.01	0.04*	-0.06*	-0.01	-0.02	0.01
	(0.01)	(0.02)	(0.03)	(0.01)	(0.02)	(0.04)	(0.01)	(0.02)	(0.04)
Observations	10471	9321	3692	10471	9321	3692	10471	9321	3692
Dependent variable mean	0.87	0.58	0.35	0.87	0.58	0.35	0.87	0.58	0.35

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

Within CA

Robustness

	Within District		
	(1) Work	(2) Cash Work	(3) Domestic Violence
Mill	-0.00	0.06*	-0.10*
	(0.02)	(0.03)	(0.06)
Observations	4804	3614	1579
Dependent variable mean	0.73	0.30	0.34

Coffee Sorting in a Mill

back

Transportation of harvest within the CA

Context

Harvesting Coffee Cherries

Context