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

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Harvard University, Economics of Health Equity Course
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Domestic Violence [between partners] (DV)

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

![Map showing prevalence of domestic violence by region.](image-url)
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:
  - ↓ DV: ↑ in women’s outside options, ↓ financial stress in the household.
  - ↑ DV: Husbands’ incentives to extract women’s resources, male backlash.

- Existing evidence:

- Job ≠ income:

  - ↓ DV: Husbands’ economic self-interest in the wife’s work capacity.
Addressing DV: Providing jobs to women

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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, ↑ in the husband’s earnings, ↓ DV.
  - Self-reports & universe of monthly hospitalizations for DV.

**Part II: Uncover the mechanisms:**
- ↓ in DV is plausibly driven by women’s employment.
- ↑ in the wife’s outside options and contribution to household resources.
- Exposure Reduction.
- ↑ in the husband’s cost of (physically) incapacitating the wife.
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Harvested Coffee Cherries
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.
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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**BEFORE**

- Couple X
- Domestic Market

**AFTER**

- Couple X
- Mill
- International Coffee Market
- Domestic Market
- Couple Y

**W_x:** Wage employment, **H_x:** Cost of incapacitating W↑
This Paper: Identification

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.

2. Diff-in-Diff Event Study Design

- 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.
- **∃ months st:** Incapacitation cost changes, other channels are fixed/ruled out w/ data.
- **Data:** Monthly hospitalizations for DV.
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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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  - **Seasonality**: Right after the harvest season, DV hospitalizations revert to its pre-harvest level.

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**
  - **↓ in DV:** ↑ in outside option, ↓ in financial stress, exposure reduction

- **↑ in DV:** Instrumental/Extractive violence, male backlash
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
  - ↓ in DV: ↑ in outside option, ↓ in financial stress, exposure reduction
  - ↑ in DV: Instrumental/Extractive violence, male backlash

→ Policy implication: Jobs vs. cash transfer to women.

Complements Hussam, Kelley, Lane and Zahra (2022).
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.

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
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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).
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• **Early 2000s:** A public-private partnership project helped farmers to establish cooperatives and build mills in their communities.
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.
What predicts mill placement? → Historical number of coffee trees (1999) and the FAO coffee suitability index.
Before a mill opening:

- Farmers harvest the cherries, clean, dry them and sort out the defectives by hand at home → sell the low-quality product in the local market for a low price.
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- W harvests the cherries with H. Drying and sorting are female-dominated tasks and selling is male-dominated.
  - H: Receives coffee income = His personal earnings = f(W’s labor)
  - W: No personal earnings.

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 ↑, value of W’s work capacity in harvesting ↑
- Demands paid labor for the sorting tasks that its machinery cannot do.
- W: Unpaid family worker → wage worker in the mill.
- H: W shares her personal earnings with H.
Context: Women’s employment in the coffee value chain

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Harvesting
Coffee Sorting in a Mill

Transportation
• 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’Haultfoeuille 2020, Sun and Abraham 2020
• 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 $\geq 18 \rightarrow$ DV.
  - Placebo Outcome: Universe of monthly non-DV hospitalizations.
• Context: Rapid Expansion of Coffee Mills in Rwanda

• Data

• **Empirical Strategy I and Results**
  • Self-reported data on labor market outcomes and DV

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Empirical Strategy I: Self-Reported Employment and DV

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

- **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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- **\( Mill_{ist} \):** Binary var coded as 1 if woman \( i \), in sector \( s \) and in year \( t \) resides within the CA and 0 otherwise.

- **\( X_{it} \):** Individual controls of the woman and her partner.

- **\( \lambda_c, \omega_m, \alpha_s, \gamma_{dt} \):** 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.
1. Within District Approach [Left]
   - Treatment: CA - 4 km buffer zone around a mill.
   - Control: Outside of the CA within the district. (≈ 800 km²)

2. Donut Approach [Right]
   - Control: Donut area between 4 and 8 km from a mill.
## Results: Self-Reported Women’s Employment and DV

<table>
<thead>
<tr>
<th></th>
<th>Within District</th>
<th></th>
<th></th>
<th></th>
<th>Donut</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mill</td>
<td>-0.00</td>
<td>0.07***</td>
<td>-0.10***</td>
<td>-0.00</td>
<td>0.06***</td>
<td>-0.07*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.02)</td>
<td>(0.03)</td>
<td>(0.01)</td>
<td>(0.02)</td>
<td>(0.04)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>10154</td>
<td>9068</td>
<td>3609</td>
<td>5409</td>
<td>4853</td>
<td>1830</td>
<td></td>
</tr>
<tr>
<td>Dependent variable mean</td>
<td>0.88</td>
<td>0.39</td>
<td>0.35</td>
<td>0.88</td>
<td>0.44</td>
<td>0.38</td>
<td></td>
</tr>
</tbody>
</table>

- Working ↔
- Working for cash ↑
- DV↓ in the past 12 months.
Results: Husbands’ Employment

<table>
<thead>
<tr>
<th></th>
<th>Within District</th>
<th></th>
<th>Donut</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>Work</td>
<td>Cash Work</td>
<td>Work</td>
<td>Cash Work</td>
</tr>
<tr>
<td>Mill</td>
<td>-0.00</td>
<td>0.03</td>
<td>-0.01</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td>(0.02)</td>
<td>(0.02)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Observations</td>
<td>4342</td>
<td>3790</td>
<td>2317</td>
<td>2110</td>
</tr>
<tr>
<td>Dependent variable mean</td>
<td>0.87</td>
<td>0.81</td>
<td>0.91</td>
<td>0.82</td>
</tr>
</tbody>
</table>

- Working ↔
- Working for cash ↔ in the past 12 months.

No sorting in agri occupations
### Results: Women’s and Their Husbands’ Earnings

<table>
<thead>
<tr>
<th></th>
<th>All Sample</th>
<th>Occupation: Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Log of Last Daily Earnings</td>
<td>Log of Last Daily Earnings</td>
</tr>
<tr>
<td></td>
<td>(1) Wife</td>
<td>(2) Husband</td>
</tr>
<tr>
<td>Log of Mills per capita in the District</td>
<td>0.94***</td>
<td>1.72***</td>
</tr>
<tr>
<td></td>
<td>(0.15)</td>
<td>(0.15)</td>
</tr>
<tr>
<td>Observations</td>
<td>4948</td>
<td>10055</td>
</tr>
<tr>
<td>Dependent variable mean</td>
<td>6.60</td>
<td>7.02</td>
</tr>
</tbody>
</table>

- Individual last daily earnings both for W and H ↑.
- Results are robust to IHS transformation.
• Context: Rapid Expansion of Coffee Mills in Rwanda

• Data

• Empirical Strategy I and Results
  • Self-reported data on labor market outcomes and DV

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• 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
Empirical Strategy II: Hospitalizations for DV

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

- **\( Y_{hdtm} \):** 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.
Empirical Strategy II: Hospitalizations for DV

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

- \( X_{ht} \): Time varying hospital controls.

- \( \lambda_h, \alpha_d, \sigma_m, \gamma_{ht} \): Hospital FE, District FE, Month FE, Prov-by-year FE.

- \( (X_d \times t) \): (Historical number of coffee trees, FAO-GAEZ coffee suitability index) × 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.
- Post-harvest levels of hospitalizations in the CAs are still lower compared to the cases from the hospitals outside of the CAs.
• Context: Rapid Expansion of Coffee Mills in Rwanda

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    in de Chaisemartin and D’Haultfoeuille 2020, Sun and Abraham 2020
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

- 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.

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<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>Large HH Purchases</td>
<td>Own Health</td>
</tr>
<tr>
<td>Mill</td>
<td>0.05** (0.02)</td>
<td>0.03 (0.02)</td>
</tr>
<tr>
<td>Observations</td>
<td>10154</td>
<td>10154</td>
</tr>
<tr>
<td>Dependent variable mean</td>
<td>0.69</td>
<td>0.74</td>
</tr>
</tbody>
</table>
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: Exposure Reduction

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<tbody>
<tr>
<td></td>
<td>(1) Work (2) Cash Work (3) Domestic Violence</td>
</tr>
<tr>
<td>Mill</td>
<td>-0.00 (0.02) 0.06* (0.03) -0.10* (0.06)</td>
</tr>
<tr>
<td>Observations</td>
<td>4804 3614 1579</td>
</tr>
<tr>
<td>Dependent variable mean</td>
<td>0.73 0.30 0.34</td>
</tr>
</tbody>
</table>

- 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.

- ↓ in DV even among couples with no change in exposure.
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

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

- Wife in agriculture - Husband in a non-agricultural manual job.
  - \( \uparrow \) in the wife’s earnings, **no change in the husband’s earnings.**

- DV\( \downarrow \) even among couples where an \( \uparrow \) in HH resources is only via women’s paid employment.
  - \( \uparrow \) in the wife’s contribution to HH earnings is a plausible mechanism.
    - Extractive violence is not the dominant mechanism.
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 → No change in DV hospitalizations within the year.

- No major ↑ in the value of women’s work capacity for their unpaid tasks within the year.

- Women mostly do not engage in paid employment.
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
Do the results indicate that providing jobs to women decreases 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.
• 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.
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, 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
- 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
Robustness Checks

• Pre-trends
  • Exploit the number of years individuals are exposed to a mill opening using an event study.

• Placebo Test
  • Treatment: Women in areas that do not have a mill yet.

• Recent econometrics literature on DID and event studies
  • Results are robust to using estimators proposed in de Chaisemartin and D’Haultfœuille (2020) and Sun and Abraham (2020).

• Measuring mill exposure
  • Different CA sizes: 5 and 10 km
  • Within CA: 2 km buffer vs. the donut between 2 and 4 km.
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 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.
    → Climate change-induced weather shocks, automating agriculture.
Thank you!
Appendix
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

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

**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**

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Not Exposed to a mill</th>
<th>Exposed to a mill</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Mean</td>
</tr>
<tr>
<td><strong>Panel A: Main dependent variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worked in the past 12 months</td>
<td>0.88</td>
<td>0.33</td>
<td>0.88</td>
</tr>
<tr>
<td>Worked for cash in the past 12 months</td>
<td>0.39</td>
<td>0.49</td>
<td>0.36</td>
</tr>
<tr>
<td>Experienced domestic violence in the past 12 months</td>
<td>0.34</td>
<td>0.47</td>
<td>0.34</td>
</tr>
<tr>
<td><strong>Panel B: Controls</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Husband lives in the house</td>
<td>0.88</td>
<td>0.32</td>
<td>0.88</td>
</tr>
<tr>
<td>Husband’s age</td>
<td>42.64</td>
<td>9.79</td>
<td>42.36</td>
</tr>
<tr>
<td>Husband’s Occupation: Agricultural</td>
<td>0.70</td>
<td>0.46</td>
<td>0.69</td>
</tr>
<tr>
<td>Husband’s education in years</td>
<td>4.34</td>
<td>3.75</td>
<td>4.34</td>
</tr>
<tr>
<td>Occupation: Agricultural</td>
<td>0.75</td>
<td>0.43</td>
<td>0.74</td>
</tr>
<tr>
<td>Marital status: Married</td>
<td>0.74</td>
<td>0.44</td>
<td>0.71</td>
</tr>
<tr>
<td>Monogamy (No other wives)</td>
<td>0.89</td>
<td>0.31</td>
<td>0.88</td>
</tr>
<tr>
<td>Number of unions: One</td>
<td>0.84</td>
<td>0.37</td>
<td>0.84</td>
</tr>
<tr>
<td>Age at first marriage</td>
<td>19.85</td>
<td>3.31</td>
<td>19.73</td>
</tr>
<tr>
<td>Years since marriage</td>
<td>16.72</td>
<td>6.45</td>
<td>16.56</td>
</tr>
<tr>
<td>Education in years</td>
<td>4.00</td>
<td>3.53</td>
<td>3.90</td>
</tr>
<tr>
<td>Muslim</td>
<td>0.02</td>
<td>0.13</td>
<td>0.02</td>
</tr>
<tr>
<td>Christian</td>
<td>0.96</td>
<td>0.19</td>
<td>0.96</td>
</tr>
<tr>
<td>Has children aged 5 and under</td>
<td>0.75</td>
<td>0.43</td>
<td>0.76</td>
</tr>
<tr>
<td>Type of residence: Rural</td>
<td>0.84</td>
<td>0.37</td>
<td>0.83</td>
</tr>
<tr>
<td>Household has a radio</td>
<td>0.62</td>
<td>0.49</td>
<td>0.61</td>
</tr>
<tr>
<td>Household’s main floor material is cement</td>
<td>0.17</td>
<td>0.38</td>
<td>0.17</td>
</tr>
<tr>
<td>Household has electricity</td>
<td>0.14</td>
<td>0.34</td>
<td>0.13</td>
</tr>
<tr>
<td>Household wealth is above the median</td>
<td>0.51</td>
<td>0.50</td>
<td>0.51</td>
</tr>
<tr>
<td>Observations</td>
<td>12300</td>
<td></td>
<td>9209</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Never Treated Sector Level</th>
<th>Before Treatment Sector Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
</tr>
<tr>
<td><strong>Panel A: Main dependent variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worked in the past 12 months</td>
<td>0.83</td>
<td>0.37</td>
</tr>
<tr>
<td>Worked for cash in the past 12 months</td>
<td>0.18</td>
<td>0.39</td>
</tr>
<tr>
<td>Experienced domestic violence in the past 12 months</td>
<td>0.22</td>
<td>0.42</td>
</tr>
<tr>
<td><strong>Panel B: Controls</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Husband lives in the house</td>
<td>0.89</td>
<td>0.31</td>
</tr>
<tr>
<td>Husband’s age</td>
<td>41.03</td>
<td>9.67</td>
</tr>
<tr>
<td>Husband’s Occupation: Agricultural</td>
<td>0.71</td>
<td>0.45</td>
</tr>
<tr>
<td>Husband’s education in years</td>
<td>4.25</td>
<td>3.90</td>
</tr>
<tr>
<td>Occupation: Agricultural</td>
<td>0.72</td>
<td>0.45</td>
</tr>
<tr>
<td>Marital status: Married</td>
<td>0.61</td>
<td>0.49</td>
</tr>
<tr>
<td>Monogamy (No other wives)</td>
<td>0.86</td>
<td>0.34</td>
</tr>
<tr>
<td>Number of unions: One</td>
<td>0.83</td>
<td>0.37</td>
</tr>
<tr>
<td>Age at first marriage</td>
<td>19.65</td>
<td>3.36</td>
</tr>
<tr>
<td>Years since marriage</td>
<td>14.99</td>
<td>6.83</td>
</tr>
<tr>
<td>Education in years</td>
<td>3.58</td>
<td>3.61</td>
</tr>
<tr>
<td>Muslim</td>
<td>0.02</td>
<td>0.15</td>
</tr>
<tr>
<td>Christian</td>
<td>0.96</td>
<td>0.21</td>
</tr>
<tr>
<td>Has children aged 5 and under</td>
<td>0.85</td>
<td>0.36</td>
</tr>
<tr>
<td>Type of residence: Rural</td>
<td>0.80</td>
<td>0.40</td>
</tr>
<tr>
<td>Household has a radio</td>
<td>0.53</td>
<td>0.50</td>
</tr>
<tr>
<td>Household’s main floor material is cement</td>
<td>0.15</td>
<td>0.35</td>
</tr>
<tr>
<td>Household has electricity</td>
<td>0.07</td>
<td>0.25</td>
</tr>
<tr>
<td>Household wealth is above the median</td>
<td>0.51</td>
<td>0.50</td>
</tr>
<tr>
<td>Observations</td>
<td>2348</td>
<td></td>
</tr>
</tbody>
</table>

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.
<table>
<thead>
<tr>
<th></th>
<th>Husband</th>
<th></th>
<th>Women</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td></td>
</tr>
<tr>
<td>Occupation:</td>
<td>Occupation:</td>
<td>Education in Years</td>
<td>Education in Years</td>
<td></td>
<td>Civil</td>
<td></td>
</tr>
<tr>
<td>Mill</td>
<td>Agricultural</td>
<td></td>
<td>Agricultural</td>
<td></td>
<td>Marriage</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>variable mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mill</td>
<td>0.00</td>
<td>0.03</td>
<td>-0.00</td>
<td>0.01</td>
<td>-0.01</td>
<td></td>
</tr>
<tr>
<td>(0.02)</td>
<td>(0.14)</td>
<td></td>
<td>(0.02)</td>
<td>(0.13)</td>
<td>(0.02)</td>
<td></td>
</tr>
</tbody>
</table>

|                | Women |                           | Household |                            |                |                           |
|                |       |                           |           |                            |                |                           |
| (1) Age at:    |       |                           | (3)       |                            |                |                           |
| First Marriage |       |                           | Residence: |                            |                |                           |
|                |       |                           | Rural     |                            |                |                           |
| Mill           | 0.02  | -0.00                     | 0.03      | 0.01                      | 0.02           |                           |
| (0.05)         | (0.01) |                          | (0.02)    | (0.01)                    | (0.01)         |                           |

|                |       |                           |           |                            |                |                           |
| Dependent      |       |                           |           |                            |                |                           |
| variable mean  |       |                           |           |                            |                |                           |
| Mill           | 10413 | 10413                     | 10413     | 10413                     | 10413          |                           |
| Observations   |       |                           |           |                            |                |                           |
| Dependent      |       |                           |           |                            |                |                           |
| variable mean  |       |                           |           |                            |                |                           |

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
<table>
<thead>
<tr>
<th></th>
<th><strong>Husband</strong></th>
<th></th>
<th><strong>Women</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>(1)</strong> Occupation: Agricultural</td>
<td><strong>(2)</strong> Education in Years</td>
<td><strong>(3)</strong> Occupation: Agricultural</td>
<td><strong>(4)</strong> Education in Years</td>
</tr>
<tr>
<td>Mill</td>
<td>-0.01 (0.02)</td>
<td>-0.08 (0.15)</td>
<td>0.01 (0.02)</td>
<td>-0.07 (0.16)</td>
</tr>
<tr>
<td>Observations</td>
<td>5283</td>
<td>5283</td>
<td>5283</td>
<td>5283</td>
</tr>
<tr>
<td>Dependent variable mean</td>
<td>0.68</td>
<td>4.47</td>
<td>0.74</td>
<td>4.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th><strong>Women</strong></th>
<th></th>
<th><strong>Household</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mill</td>
<td>0.00 (0.06)</td>
<td>-0.00 (0.01)</td>
<td>0.04 (0.03)</td>
<td>0.01 (0.01)</td>
</tr>
<tr>
<td>Observations</td>
<td>5283</td>
<td>5283</td>
<td>5283</td>
<td>5283</td>
</tr>
<tr>
<td>Dependent variable mean</td>
<td>20.16</td>
<td>0.96</td>
<td>0.81</td>
<td>0.21</td>
</tr>
</tbody>
</table>

*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*
## Results DHS: Women’s Occupation

<table>
<thead>
<tr>
<th></th>
<th>(1) Managers</th>
<th>(2) Sales</th>
<th>(3) Agricultural Self-Employed</th>
<th>(4) Agricultural Employee</th>
<th>(5) Manual Skilled &amp; Unskilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mill</td>
<td>0.00</td>
<td>-0.01</td>
<td>-0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.02)</td>
<td>(0.01)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>Observations</td>
<td>4962</td>
<td>4962</td>
<td>4962</td>
<td>4962</td>
<td>4962</td>
</tr>
<tr>
<td>Dependent variable mean</td>
<td>0.03</td>
<td>0.07</td>
<td>0.75</td>
<td>0.07</td>
<td>0.05</td>
</tr>
</tbody>
</table>

- No change in occupations.
## Results DHS: Husbands’ Occupation

<table>
<thead>
<tr>
<th></th>
<th>(1) Managers</th>
<th>(2) Sales</th>
<th>(3) Agricultural Self-Employed</th>
<th>(4) Agricultural Employee</th>
<th>(5) Manual Skilled &amp; Unskilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mill</td>
<td>0.01</td>
<td>0.03*</td>
<td>-0.04</td>
<td>0.00</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.02)</td>
<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Observations</td>
<td>2107</td>
<td>2107</td>
<td>2107</td>
<td>2107</td>
<td>2107</td>
</tr>
<tr>
<td>Dependent variable mean</td>
<td>0.05</td>
<td>0.06</td>
<td>0.62</td>
<td>0.07</td>
<td>0.17</td>
</tr>
</tbody>
</table>

- No sorting in agricultural occupations.
\[ Y_{idt} = \beta_0 + \beta_1 \text{Mill}_{idt} + \mathbf{X}_{it} \phi + \lambda_c + \alpha_d + \gamma_{dt} + (X_d \times t) \theta + \epsilon_{idt}. \] (1)

- \( Y_{idt} \): Log earnings of woman/husband \( i \), in district \( d \) and year \( t \).
- \( \text{Mill}_{idt} \): 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.
- \( \lambda_c, \omega_m, \alpha_d, \gamma_{dt} \): 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.
<table>
<thead>
<tr>
<th>IHS of Women’s Last Daily Earnings</th>
<th>(1) All Sample</th>
<th>(2) Occupation: Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of Mills per capita in the District</td>
<td>3.55***</td>
<td>3.77***</td>
</tr>
<tr>
<td></td>
<td>(0.24)</td>
<td>(0.26)</td>
</tr>
<tr>
<td>Observations</td>
<td>18176</td>
<td>17375</td>
</tr>
<tr>
<td>Dependent variable mean</td>
<td>6.60</td>
<td>6.39</td>
</tr>
</tbody>
</table>
Placebo Test: Women’s Monthly Hospitalizations for non-DV

• No change within the year.

Examples: Osteoarthritis, Gout, Rheumatoid arthritis, Lupus, Bursitis. Fractures are excluded.
### Mechanisms: Increase in Women’s Bargaining Power

**BP Mechanism**

**Within District Donut**

<table>
<thead>
<tr>
<th>Mill</th>
<th>Joint (1)</th>
<th>Wife (2)</th>
<th>Husband (3)</th>
<th>Joint (4)</th>
<th>Wife (5)</th>
<th>Husband (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.06*</td>
<td>-0.04</td>
<td>-0.02</td>
<td>0.06*</td>
<td>-0.03</td>
<td>-0.03</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.02)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Observations</th>
<th>2638</th>
<th>2638</th>
<th>2638</th>
<th>1506</th>
<th>1506</th>
<th>1506</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable mean</td>
<td>0.87</td>
<td>0.10</td>
<td>0.04</td>
<td>0.88</td>
<td>0.09</td>
<td>0.03</td>
</tr>
</tbody>
</table>

- Making decisions on using contraception jointly with the husband

- **Notes:**
  - Mill: 0.06* (0.03)
  - Joint: 0.06* (0.03)
  - Wife: -0.04 (0.03)
  - Husband: -0.02 (0.02)
  - Observations: 2638
  - Dependent variable mean: 0.87

*Statistically significant at the 5% level.*
### Placebo Test: Outcome Variables before a Mill Opening

#### Robustness

<table>
<thead>
<tr>
<th></th>
<th>Within District</th>
<th>Donut</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Work (2) Cash (3) Violence</td>
<td>(4) Work (5) Cash (6) Violence</td>
</tr>
<tr>
<td>Mill</td>
<td>0.02 (0.02)</td>
<td>0.01 (0.01)</td>
</tr>
<tr>
<td></td>
<td>0.03 (0.03)</td>
<td>0.02 (0.04)</td>
</tr>
<tr>
<td></td>
<td>0.06 (0.05)</td>
<td>0.05 (0.06)</td>
</tr>
<tr>
<td>Observations</td>
<td>7314</td>
<td>3533</td>
</tr>
<tr>
<td>Dependent variable mean</td>
<td>0.87</td>
<td>0.98</td>
</tr>
</tbody>
</table>

- **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.
- **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 ↑.**

<table>
<thead>
<tr>
<th></th>
<th>4 km</th>
<th>5 km</th>
<th>10 km</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Work</td>
<td>(2) Cash</td>
<td>(3) Violence</td>
</tr>
<tr>
<td>Mill</td>
<td>-0.00 (0.01)</td>
<td>0.06*** (0.02)</td>
<td>-0.09*** (0.03)</td>
</tr>
<tr>
<td></td>
<td>(4) Work</td>
<td>(5) Cash</td>
<td>(6) Violence</td>
</tr>
<tr>
<td></td>
<td>-0.01 (0.01)</td>
<td>0.04* (0.02)</td>
<td>-0.06* (0.04)</td>
</tr>
<tr>
<td></td>
<td>(7) Work</td>
<td>(8) Cash</td>
<td>(9) Violence</td>
</tr>
<tr>
<td></td>
<td>-0.01 (0.01)</td>
<td>-0.02 (0.02)</td>
<td>0.01 (0.04)</td>
</tr>
</tbody>
</table>

| 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  |
### Within CA

#### Robustness

<table>
<thead>
<tr>
<th></th>
<th>(1) Work</th>
<th>(2) Cash Work</th>
<th>(3) Domestic Violence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mill</strong></td>
<td>-0.00</td>
<td>0.06*</td>
<td>-0.10*</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td>(0.03)</td>
<td>(0.06)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>4804</td>
<td>3614</td>
<td>1579</td>
</tr>
<tr>
<td><strong>Dependent variable mean</strong></td>
<td>0.73</td>
<td>0.30</td>
<td>0.34</td>
</tr>
</tbody>
</table>
Transportation of harvest within the CA Context