Minimum Wage, Informality, and Gender Gaps:
Evidence from Morocco

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Motivation

- Many low and middle-income countries are characterized by persistent and large gender gaps in the labor market:
  - Low female labor force participation and, conditional on participation, large gender pay gaps.
  - Additional constraints on women's work also create the conditions for employers to have greater monopsony power over female workers Sharma (2023).
- Government policies may help reduce these disparities, either directly or indirectly.
- One popular wage-setting policy is the **minimum wage**:
  - Widely used policy, including in low and middle-income countries. ▸ Map

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  1) **Intensive margin:** ↑ wages at the bottom of the wage distribution and ↓ pay inequality.
     - ⋆ If women over-represented at the bottom of the wage distribution, it can help reduce gender pay gap.
     - → Relevant for LMICs where larger gender pay gaps and weaker wage-setting institutions.

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  1) **Intensive margin:** ↑ wages at the bottom of the wage distribution and ↓ pay inequality.
     → Relevant for LMICs where larger gender pay gaps and weaker wage-setting institutions.
  2) **Extensive margin:** may reduce or expand employment depending on monopsony power of employers Azar et al. (2024)
     ⋆ **67% of the workforce is informal in LMICs** vs. 15% in high-income countries (ILO, 2023)
     → Additional extensive margin in LMICs: formal → informal.

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     → Relevant for LMICs where larger gender pay gaps and weaker wage-setting institutions.
  2) **Extensive margin:** may reduce or expand employment depending on monopsony power of employers Azar et al. (2024)
     → Additional extensive margin in LMICs: formal → informal.
  3) **Spillover to the uncovered (informal) sector:** has important welfare implications.
     ⋆ Lighthouse effect: informal wage adjustments mirroring formal sector Derenoncourt et al. (2021).
     ⋆ ... but may still lead to an increase in wage inequality Machado Parente (2024).
     → Depends on how integrated the formal and informal markets are.

This Paper: Minimum Wage, Gender Inequality and Informality

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- **This paper focuses on the Moroccan manufacturing sector:**
  - Main private formal sector with large initial gender pay gaps.
  - *Source of variation:* 24% real increase in the national minimum wage between 2009 and 2015.
  - *Combining admin and survey data:* track formal firms & workers + capture informal employment.

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- *How effective are the minimum wage increases at reducing the gender formal pay gap?*
  - Well enforced and biding changes, even more so for women.
  - → Reduction of the gender formal pay gap: 28 p.p. → 22 p.p. (21% reduction)

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- *How effective are the minimum wage increases at reducing the gender formal pay gap?*
  - → Reduction of the gender formal pay gap: 28 p.p. → 22 p.p. (21% reduction)
- *How do they impact formal and informal employment?*
  - No evidence of strong wage adjustment in the informal sector.
  - Displacement of low-wage female workers from the formal to the informal sector.
  - → Bounding exercises suggest that minimum wage remains effective at reducing the gender pay gap.

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  - → Reduction of the gender formal pay gap: 28 p.p. → 22 p.p. (21% reduction)
- *How do they impact formal and informal employment?*
  - → Bounding exercises suggest that minimum wage remains effective at reducing the gender pay gap.
- *Mechanisms: Role of firms and local labor markets dynamics in the gender differential impacts?*
  - Firm closures and more restricted formal outside options for women play a key role in explaining the gender differential employment impacts.

This paper: Literature & Contributions

Details

- **Minimum wage policies in low and middle-income countries**
  - → Contribution: Combine admin and survey data to measure impacts **on formal workers and firms** + **informality margin** in a lower-middle income country.
- **Role of firms in the distributional impact of minimum wage policies**
  - → Contribution: **Firm exit** disproportionately affect female workers and within local labor market composition determines the ability of female workers to stay formally employed.
- **Unintentional consequences of gender-neutral policies**
  - → Contribution: document the **differential gender impact of minimum wage policies** in setting with a large informal sector.

Roadmap

1) Context & Data

2) How effective are the minimum wage increases at reducing the gender formal pay gap?

3) How do minimum wage increases impact formal and informal employment?

4) Role of firms and local labor markets dynamics

5) Conclusion

Context: Morocco, A Lower Middle Income Country

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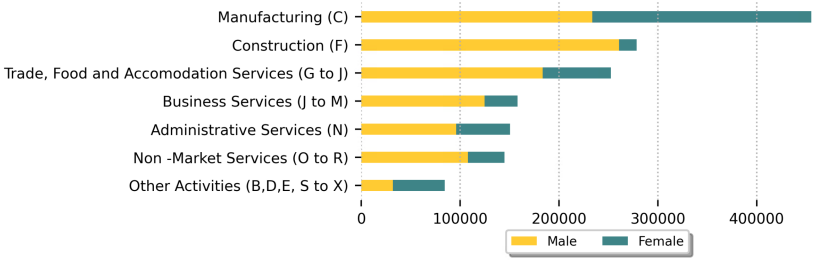
- Large informal sector = 60-80% of workers are informal.
  - Formal workers = Workers registered to the *Caisse Nationale de Securité Sociale* (CNSS).
    - Declared by their employers every month.
    - Covered by **health insurance** and access to paid leaves, family allowance, pension benefits, etc.
  - Informal workers = Workers not covered by the CNSS.
    - Includes informal workers in formal firms: In firms with 50+ employees, 12% of workers are informal.

Context: The Moroccan Manufacturing sector

- **Manufacturing = main formal sector**

Figure: Formal Employment by sectors (2008)



Context: The Moroccan Manufacturing sector

- **Manufacturing = main formal sector**
- **Large gender pay gap:** Women (=47% of workers) are paid 28% less than men in 2008.
  - For women: more mobility barriers and concentrated local labor markets [sector x province] LLM

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- **Mix of small and big firms**:
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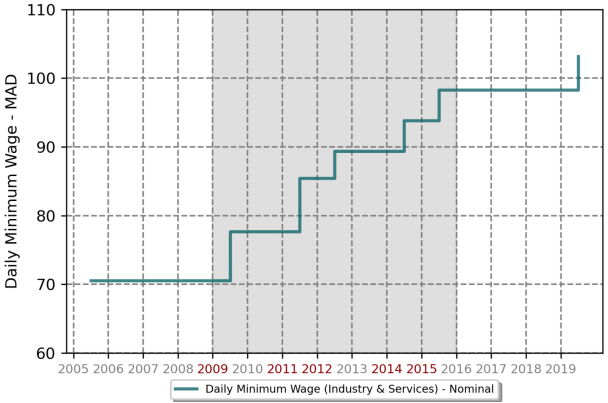
  - → May be differently impacted by the national minimum wage increases
- **Informal sector:** 56% of female and 58% of male workers are working informally.
  - Same type of work arrangements, but informal workers employed in smaller firms and earn less.
  - → Transitions from formal to informal may be an important margin.

Empirical Strategy: Changes in the National Minimum Wage

Figure: Evolution of the Moroccan Daily Minimum Wage (SMIG)



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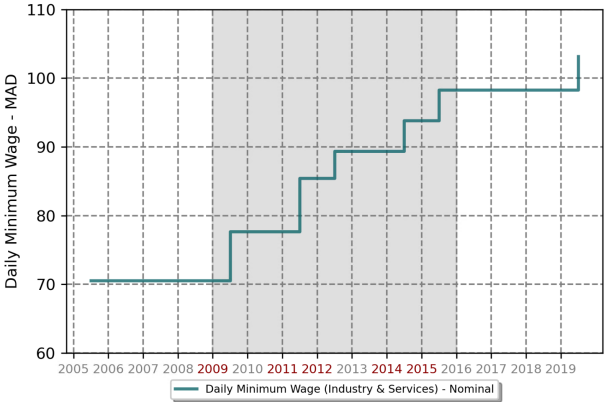

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DiD leveraging exposure at 3 levels:

- **Individual:** low wage vs. high wage workers.
- **Firm:** share of workers below the 2015 minimum wage in 2006-2008.
- **Local labor market (LLM):** share of workers below the 2015 minimum wage in 2006-2008.

Empirical Strategy: Data

1. **Employer-employee linked administrative data**: 2005 to 2018
   - Yearly aggregation of wages and number of worked days constructed based on employers' monthly declarations to the Moroccan Social Security.
   - Universe of the formal private sector ($\approx$ 3 millions workers/year).
2. **Labor force surveys**: 2007, 2008, 2013 to 2016
   - Representative household surveys ($\approx$ 150 k individuals/year).
     - **Panel dimension:** 50% of households resurveyed the following year.
   - Proxy for informality status (no health care coverage associated with job) but no wage data.
3. **Original data collection**: 2021
   - Nationally representative household survey with both formal and informal wages (N= 1,800).

Roadmap

1) Context & Data

2) How effective are the minimum wage increases at reducing the gender formal pay gap?

- Empirical strategy: Individual Exposure
- Impact on wage growth
- Reduction of the gender pay gap in the formal sector

3) How do minimum wage increases impact formal and informal employment?

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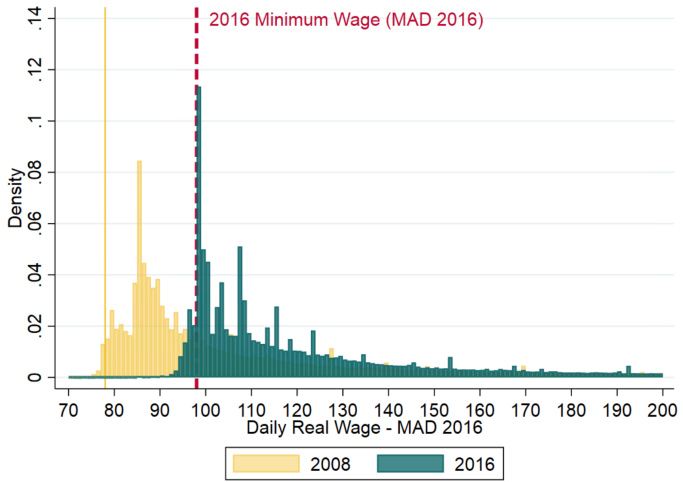
The minimum wage increases are binding

Figure: Distribution of Real Daily Wage, All Formal Workers – 2008 vs. 2016



Empirical strategy: Individual Exposure

- **What we want to do:**
  - Compare the trajectory of low-wage incumbent workers during the years of minimum wage increases to a counterfactual of what would have happened to them absent of any increase.

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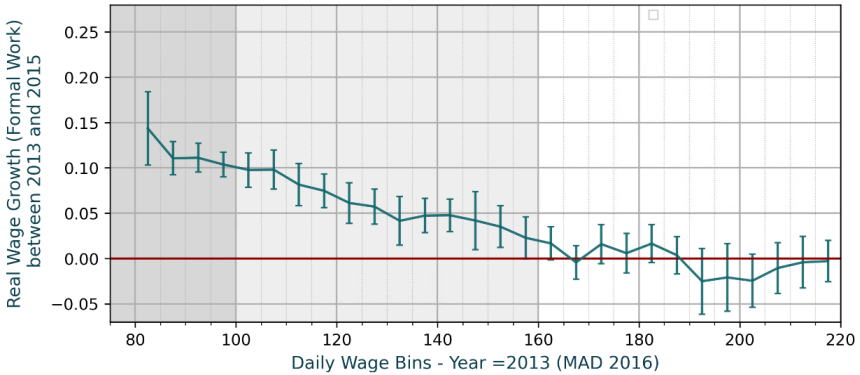
  - Compare the trajectory of low-wage incumbent workers during the years of minimum wage increases to a counterfactual of what would have happened to them absent of any increase.
- **Examine 2-year wage growth, in a DiD design** that leverages exposure at the individual level with two dimensions of comparison (Dustmann et al., 2022):
  - *Over time comparing years with vs. without a minimum wage change:*
    - **2006** $\rightarrow$ **2008** = the baseline reference period
  - *Over the wage distribution comparing wage bins affected vs. not affected by the increases*:
    - bottom **[80; 100]** MAD vs. top wage bins **]160; 300]** MAD.
- **Causal estimate** for the impact of minimum wage by controlling for **two potential confounders:**
  - *Mean reversion*: under the assumption that mean reversion is stable over time.
  - *Macroeconomic time effects*: under the assumption that they are constant over the wage distribution.

Impact on Wages: ↑ Wage Growth of Low-Wage Incumbent Workers

Figure: **Individual Approach** – Impact on incumbent wage growth ▸ Steps ▸ Baseline wage growth ▸ Placebo



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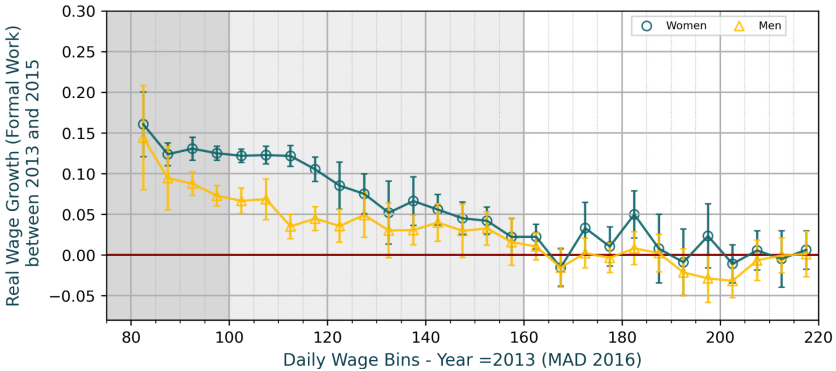

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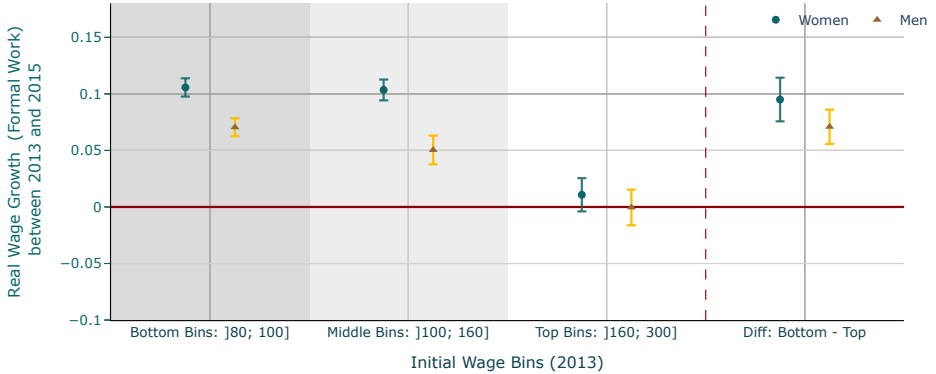

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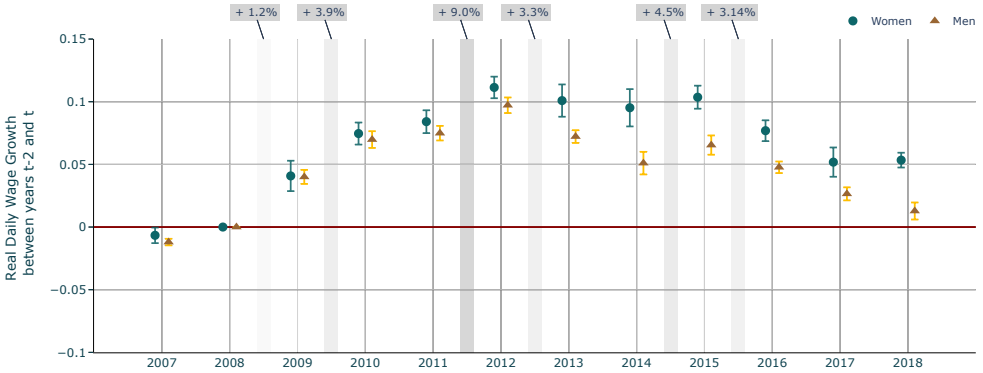
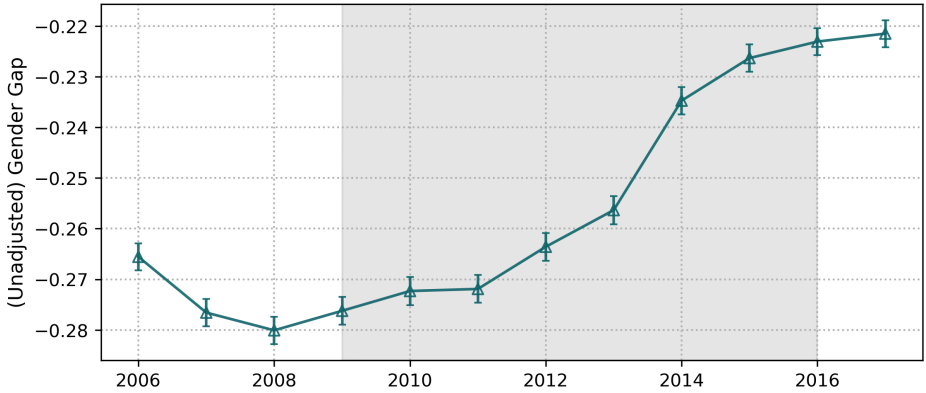


- +10 pp (+7pp) of additional 2-year wage growth for female (male) workers.

Impact on Wages: ↓ Gender Pay Gaps in the Formal Sector

Figure: Reduction in the gender wage gap as minimum wage increases



$$\log(w_{it}) = \alpha_t + \gamma_t \times 1\left[\text{gender}_i = F\right] + \epsilon_{it}$$

Takeaways

1) *How effective are the minimum wage increases at reducing the gender formal pay gap?*
   - *Direct effects on workers initially below the minimum wage:* ↑ **8.5 p.p.** in the 2-year daily wage growth.
   - *Spillover effects on workers up to 1.6 x the minimum wage:* ↑ **6.5 p.p.** in the 2-year daily wage growth.
   - Both direct and spillover effects are bigger for women: **+ 2.1 p.p. and +4.4 p.p.** for women vs. men.

   → Reduction of the gender formal pay gap by 21% from 2008 to 2016: 28% to 22%.

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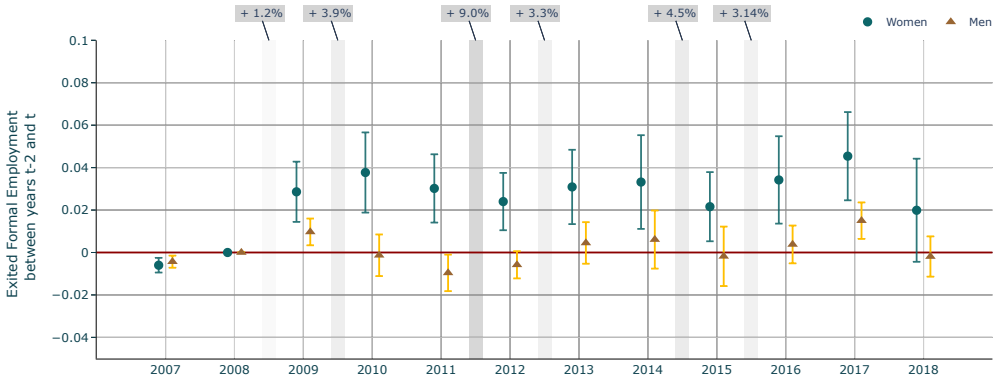
Impact on Employment: ↑ Exit Formal Sector for Women

Figure: **Individual approach –** Impact on the probability of leaving formal employment between years $t-2$ and t, relative to 2006 to 2008 for low wage workers ▸ Exit Firm



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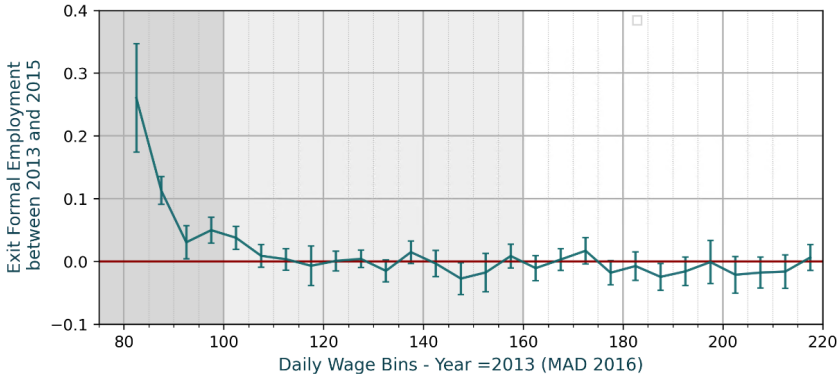
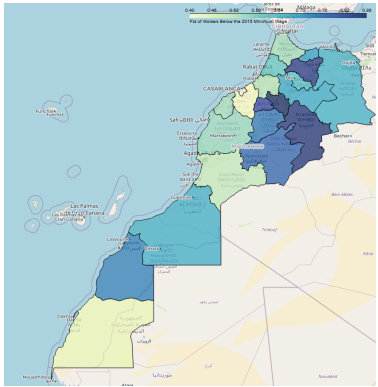


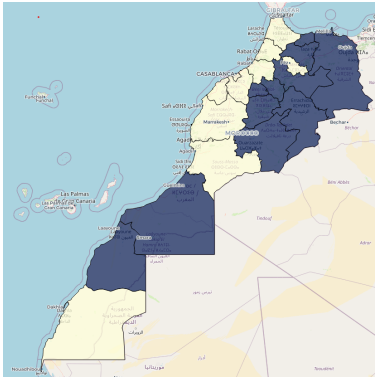
Impact on Employment: Province Exposure to Minimum Wage Increases

$$\text{Exp}_{\text{p}} = \frac{1}{3}\sum_{t=2006}^{2008} \text{Exp}_{\text{pt}} \quad \text{with} \quad \text{Exp}_{\text{pt}} = \frac{\sum_{i \in p} 1\{MW - w_{it} > 0\}}{\sum_{i \in p} 1}$$

(a) Continuous province exposure



(b) Strongly exposed provinces



Impact on Employment: ↑ Transition to Informal Sector for Female Workers

Formal

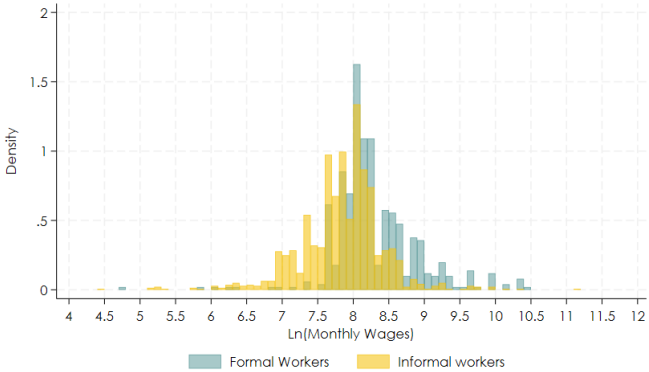
Table: Female workers are more likely to transition from formal to informal employment

	LFS: Formal to Informal		LFS: Formal to Unemployment		LFS: Formal to Out of LF	
	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
Strong Exp. x 2013-2015	0.0507**	0.0345	0.0020	0.0015	0.0059	0.0246
	(0.0199)	(0.0318)	(0.0069)	(0.0146)	(0.0089)	(0.0422)
N	11,051	24,720	11,051	24,720	11,051	24,720

- In provinces more strongly exposed to the minimum wage increases, female workers are significantly more likely to transition from formal to informal employment.

Impact on Gender Pay Gap: Informal Wages are Lower and Don't Seem to Adjust

Figure: Distribution of formal and informal wages (2021)



- Informal workers earn 34% less on average (both formal and informal workers work ≈ 45h/week).
- Accounting for displacement: **weaker but still significant narrowing of the gender pay gap.** ▸ Graph

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   → Reduction of in the gender formal pay gap: 28 p.p. → 22 p.p. (21% reduction)

2) *How do they impact formal and informal employment?*

   - No significant effects on overall employment and displacement for men.
   - Displaced low-wage female workers transition to the informal sector that pays on average 34% less.

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Firm and local labor market dynamics: Overview

Model of imperfectly competitive labor markets Berger et al. (2022b) ▸ Model .

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P1 **More exposed firms are more likely to exit; women over-represented in these firms.** ▸ Firm out

- Firm exit explains 30-40% of the formal disemployment effect for low-wage female workers.

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- Transitions from formal to informal are concentrated in LLMs with few formal outside options.

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P3 **Positive reallocation effects for workers that remain formally employed.** ▸ Reallocation

- Displaced women who remain in formal employment transition to better-paying/larger employers.
- Often the main employers in their local labor market: ↑ LLM concentration for women.

Conclusion

- In the Moroccan manufacturing sector, I show that increases in the national minimum wage lead to:
  - A direct boost in the wages of workers who initially earn below the minimum wage, along with spillover effects for workers higher up in the wage distribution.
  - Displacement effects toward informality for low-wage female workers, with no impact for men.
  - A reduction in the gender pay gap, even when accounting for transitions to the informal sector.
  - Reallocation to better-paying employers for workers with stronger outside options in their LLM.

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  - A reduction in the gender pay gap, even when accounting for transitions to the informal sector.
  - Reallocation to better-paying employers for workers with stronger outside options in their LLM.
- Policy implications:
  - Minimum wage can be an effective lever to reduce wage inequality and gender pay gaps.
  - To help attenuate the negative impacts, interventions that specifically target (a) low-wage female workers with weaker outside options and support them in their job search and (b) smaller/less productive firms that still constitute a main source of female employment.

Thank You!

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Appendix TOC

Minimum wage policies across the world

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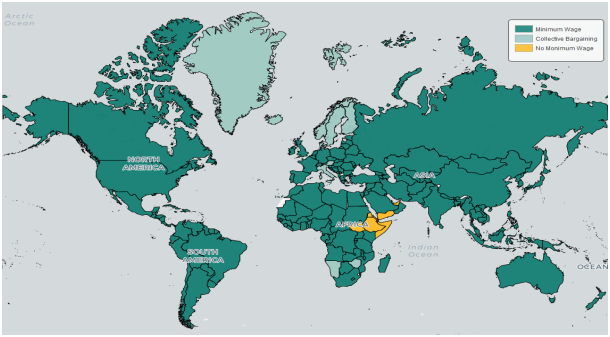

- Introduction in Egypt in the private sector: FY 2021-2022.
- Countries without national minimum wage legislation:
  - Austria; Denmark; Finland; Iceland; Italy; Norway; Sweden
  - Bahrain; Brunei Darussalam; Singapore; United Arab Emirates; Yemen.
  - Djibouti; Eritrea; Ethiopia; Namibia; Somalia; South Sudan; Zimbabwe.
  - Nauru; Saint Lucia; Tonga.

Literature & Contributions

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- **Minimum wage policies in low and middle-income countries**
  - High-income countries: Card and Krueger, 1994; Dube, 2019; Cengiz et al., 2019; Dustmann et al., 2022
  - More limited in lower-income setting: Lemos et al. (2004); Bosch and Manacorda (2010); Magruder (2013); Jales (2018); Engbom et al. (2022)

  → Contribution: Combine admin and survey data to measure impacts **on formal workers and firms** + informality margin in a lower-middle income country.

Literature & Contributions

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- **Minimum wage policies in low and middle-income countries**
  - → Contribution: Combine admin and survey data to measure impacts **on formal workers and firms** + informality margin in a lower-middle income country.
- **Role of firms in the distributional impact of minimum wage policies**
  - Employment margin and firm exit: Draca et al. (2011) 2011 [UK]; Harasztosi and Lindner (2019) 2019 [Hungary]; Luca and Luca (2019) 2019 [US]
  - Adding the gender dimension to theoretical framework developped in: Berger et al. (2022a); Berger et al. (2022b).
  - → Contribution: **Firm exit** disproportionately affect female workers and within local labor market composition determines the ability of female workers to stay formally employed.

Literature & Contributions

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- **Minimum wage policies in low and middle-income countries**
  - → Contribution: Combine admin and survey data to measure impacts **on formal workers and firms** + informality margin in a lower-middle income country.
- **Role of firms in the distributional impact of minimum wage policies**
  - → Contribution: **Firm exit** disproportionately affect female workers and within local labor market composition determines the ability of female workers to stay formally employed.
- **Unintentional consequences of gender-neutral policies**
  - Antecol et al. (2018); Biasi and Sarsons (2021); Carry (2022); Sharma 2023.
  - MW & gender gaps: Autor et al. (2016); Caliendo and Wittbrodt (2022); Blau et al. (2023); ?.
  - MW & racial gaps in Brazil: Derenoncourt et al. (2021)
  - → Contribution: First paper to document the **differential gender impact of minimum wage policies** in setting with a large informal sector.

Literature & Contributions

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- **Minimum wage policies in low and middle-income countries**
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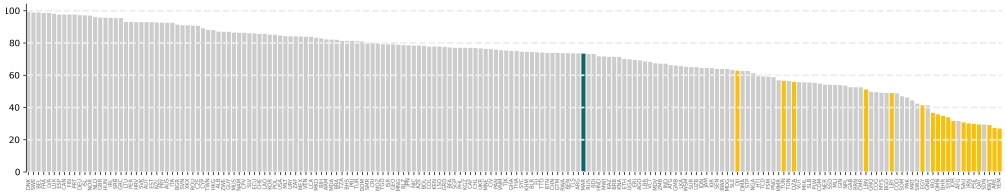
Labor Market Context: Legal Barriers tend to be Weaker than Other Countries in the Region

Back

Figure: *Women, Business and the Law* Indicator: 2008



Note: Morocco in Green; other MENA countries in yellow. *Source*: World Bank, ILO.

- Morocco scores quite high compared to other MENA countries on the *Women, Business and the Law* (WBL) indicator.
  - WBL is an indicator collected and computed by the World Bank Group to quantify the laws and regulations that affect women's economic opportunities (e.g. the law prohibits discrimination in employment based on gender and mandates equal remuneration for work of equal value; there is legislation on sexual harassment in employment).
  - The higher the indicator is, the better the country in terms of *de jure* gender equality.

Labor Market Context: Legal Barriers tend to be Weaker than Other Countries in the MENA Region

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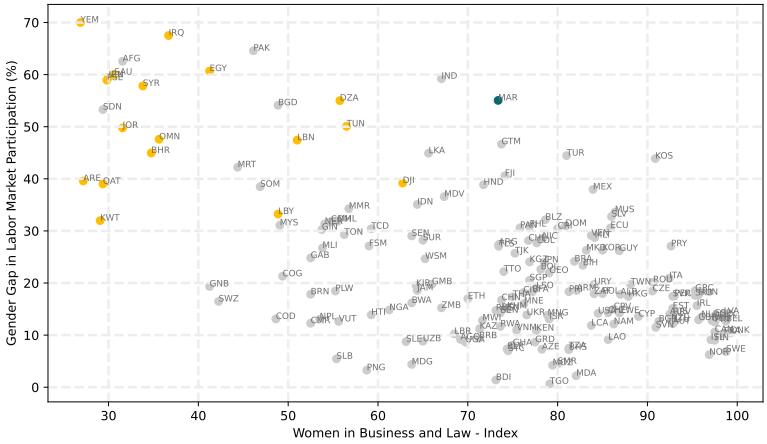
Figure: *Women, Business and the Law* Indicator & Gender Gap in LFP: 2008



Moroccan Manufacturing Sector: The Main Formal Private Sector

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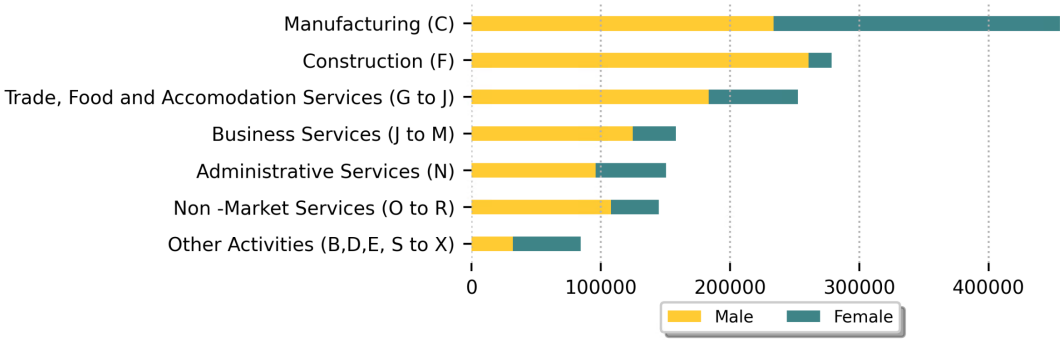
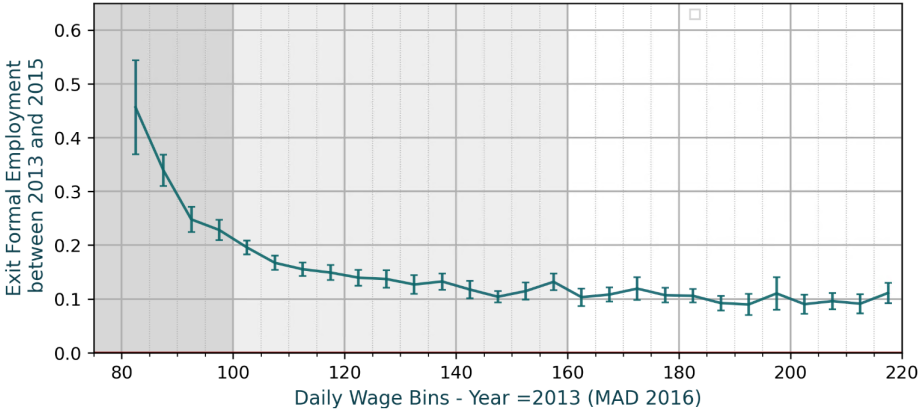
Figure: Employment by sectors (2008)



Methodology: Probability of exiting formal employment

Back

Figure: Probability of exiting formal employment between between t-2 and t by bins of initial wages



Methodology: Probability of exiting formal employment

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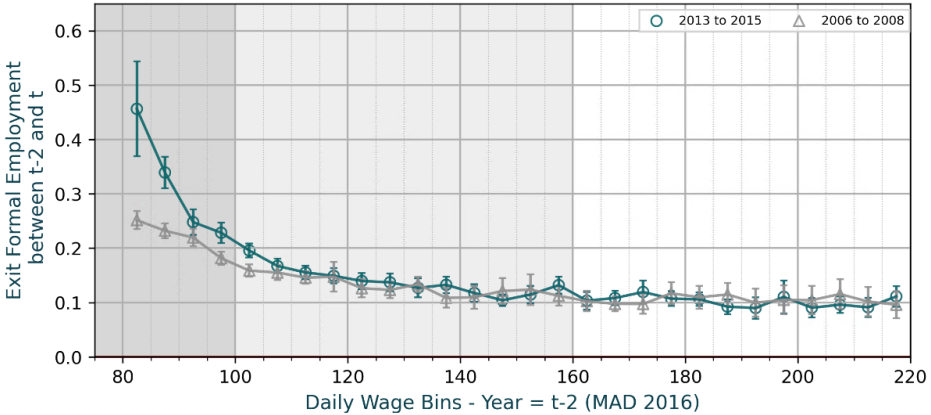

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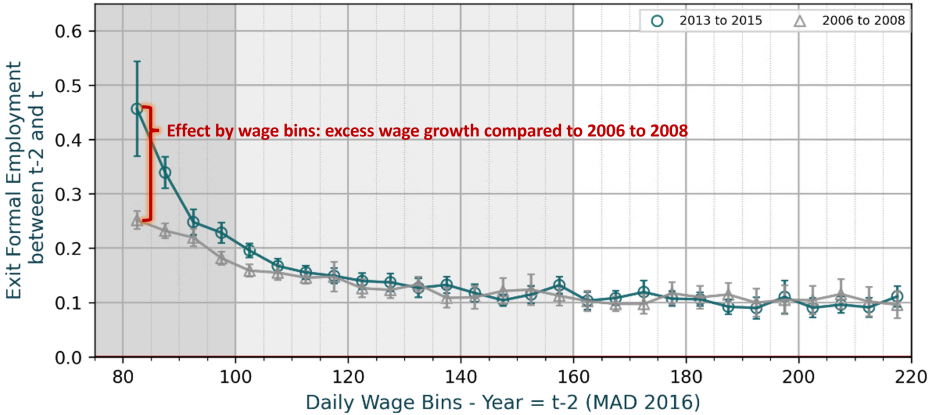

How do minimum wage increases impact wages?

Baseline wage growth

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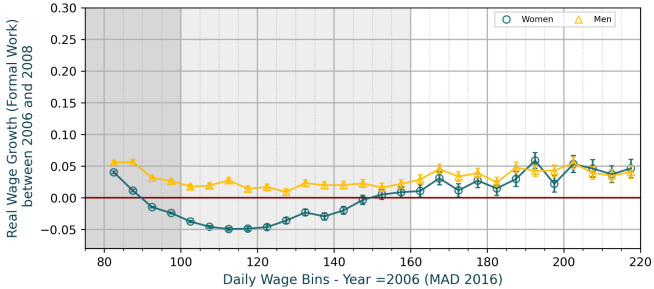
- **Steps:**
  - Assign workers to their initial wage bins based on their wage at $t-2$: $1\,[w_{it-2} \in \gamma]$.
  - Consider as outcome the individual wage growth between $t-2$ and t: $\Delta y_{i,t} = y_{i,t} - y_{i,t-2}$.

Figure: Initial wage growth between 2006 and 2008 by initial workers' wage bins



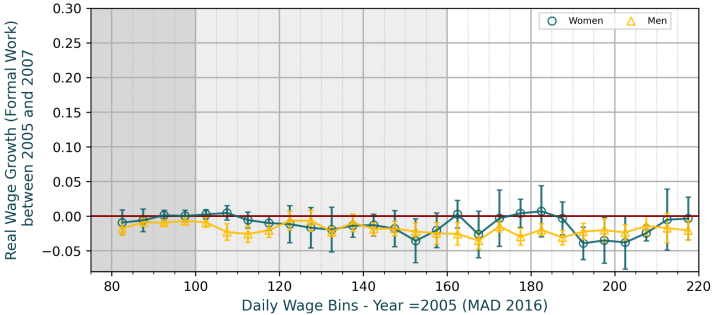
  - Within bin comparison of wage growth before and after the increases.

How do minimum wage increases impact wages?

Back

Placebo Test

Figure: Wage growth between 2005 and 2007, relative to the wage growth between 2006 and 2008 by initial workers' wage bins



Impact on Employment: ↑ Separation from Employers for Women

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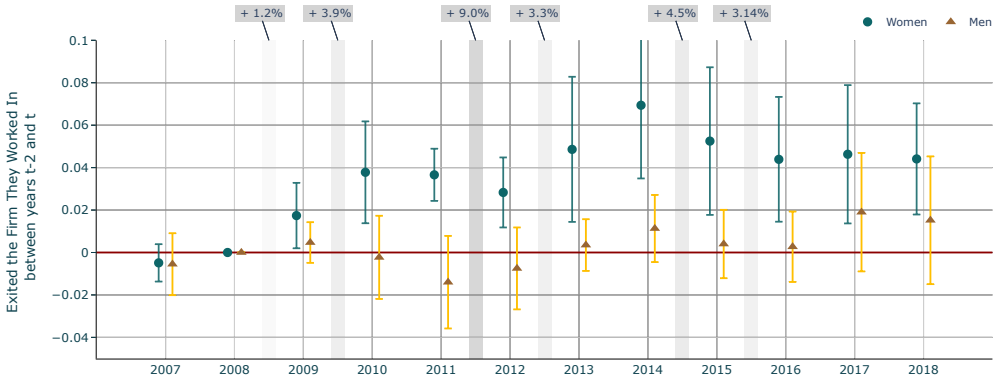
Figure: **Individual approach –** Impact on the probability of leaving employers between years $t-2$ and t, relative to 2006 to 2008 for low wage workers



Where do female low-wage workers transition to?

- Understanding whether female low-wage workers **transition to informality, unemployment or out of the labor force** has important welfare implications.
  - Employer-employee datasets don't have any information beyond the formal sector.
  - Labor force surveys capture labor status transitions but do not contain information on wages.
- **Approach:** Provinces are units defined in both datasets and I can exploit variation in exposure to minimum wage increases across provinces with exposure defined as:

$$\text{Exp}_{\text{p}} = \frac{1}{3}\sum_{t=2006}^{2008} \text{Exp}_{\text{pt}} \quad \text{with} \quad \text{Exp}_{\text{pt}} = \frac{\sum_{i \in p} 1\{MW - w_{it} > 0\}}{\sum_{i \in p} 1}$$

  - d_{it}: number of days worker i worked in province p at year t.
  - w_{it}: refers to her associated daily wage; MW: minimum wage for the year 2015.

Province Approach: Impact on leaving formal employment

Back

$$\mathbb{Y}_{ilt} = \gamma_l + \lambda_t + \sum_{\tau \neq 2008} \beta_\tau \text{Exp}_l + X_{it} + \epsilon_{ilt}$$

Table: Female workers are more likely to transition out of formal employment in most affected provinces

	CNSS: Stay Formal			LFS: Stay Formal		
	All	Female	Male	All	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
Strong Exp. x 2013-2015	-0.0052***	-0.0180***	-0.0002	-0.0404***	-0.0575***	-0.0357
	(0.0023)	(0.0020)	(0.0022)	(0.0196)	(0.0216)	(0.0479)
	0.021	0.000	0.897	0.0091	0.0077	0.3397
N	1,246,506	607,594	638,912	35,771	11,051	24,720

- In provinces more strongly affected by minimum wage increases, female workers are significantly more likely to transition out of formal employment.

Appendix TOC

Theoretical Framework

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Goals of framework:

- Explain how initial monopsony power over workers may differ between female and male workers.
- Characterize how increases in the minimum wage have different impacts on firms based on their productivity and initial monopsony power.
  - May lead to different impacts on female versus male workers due to gender segregation.
- Highlight how the composition of firms within local labor markets plays a role in explaining the overall impacts.

Theoretical Framework: Model Setup that builds on Berger et al. (2022, 2024) ▸ Back

Model setup:

- **Local labor markets (LLMs):** defined as sector $\times$ province cells ▸ LLMs
  - 269 Moroccan LLMs. ▸ LLMs
- **Firms** (j)**:** **differ in productivity**, compete for workers à la Cournot ▸ emp share
  - Median LLM: 9 firms employ women and 16 firms employ men.
- **Workers** $(g \in m, f)$**:** labor supply modeled as a discrete choice of firms in two stages ▸ Nested CES
  - Elasticity of substitution across firms (η_g) with $\eta_m > \eta_f$
  - Elasticity of substitution across LLMs (θ_g), where $\theta_m > \theta_f$

Theoretical Framework: Equilibrium

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Three types of firms within local labor markets:

- **[CA] firm constrained by minimum wage but with** $mrlp > \underline{w}$ $w_j \uparrow; n_j \uparrow$
  - The firm needs to pay its workers a higher wage, $\underline{w}$.
  - Increase in the marginal cost of a worker $\Rightarrow$ increase in labor demand.
- **[CB] firm constrained by minimum wage and rationed by** $mrlp \geq w_g$ $w_j \uparrow; n_j \downarrow$
  - The firm needs to pay its workers a higher wage, $\underline{w}$.
  - The labor supply shrinks because the firms let go of excess workers until $mrlp = \underline{w}$.
  - Worker no longer on their labor supply curve $\Rightarrow$ disemployment.
- **[U] firm unconstrained by minimum wage** $w_j \uparrow\downarrow; n_j \uparrow\downarrow$

Theoretical Framework: Supportive Descriptive Evidence

Definition of LLM = cells of Province [30] x Manufacturing Sub-Sector [11]

Back

Table: Local labor markets: key descriptive statistics in 2008

	All	Women	Men
	(1)	(2)	(3)
Conditional on having at least one worker in the LLM:			
Number of LLM	269	252	269
Avg number of workers per LLM	1688	867	876
Median number of workers per LLM	243	39	199
Avg number of employers per LLM	49	31	46
Median number of employers per LLM	17	9	16
Median share of LLM employment for largest LLM employer	34.6%	39.5%	34.2%
Median share of LLM employment for 2 largest LLM employers	55.7%	62.8%	53.8%
Median share of LLM employment for 3 largest LLM employers	66.5%	74.2%	66.7%
Median Employment HHI	0.21	0.27	0.20
Mean Employment HHI (weighted by number of workers)			

Theoretical Framework: Supportive Descriptive Evidence

Definition of LLM = cells of Province [30] x Manufacturing Sub-Sector [11]

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Table: Local labor markets: within and across transition patterns between 2007 and 2008

	All (1)	Women (2)	Men (3)
Conditional on having at least one worker:			
Number of LLM (when $N^g_{worker} > 0$)	269	252	269
Number of firms (when $N^g_{worker} > 0$)	13,085	7,786	12,424
Share of workers transitioning to another firm (from 2007 to 2008)	9.6%	9.8%	9.3%
Out of workers transitioning, percent staying in…			
Province	77%	85%	70%
Manufacturing	67%	80%	55%
Manufacturing Sub-sectors	57%	74%	41%
LLM: Province x Sub-sectors cell	50%	67%	33%

Theoretical Framework: Supportive Descriptive Evidence

Number of employers by labor market

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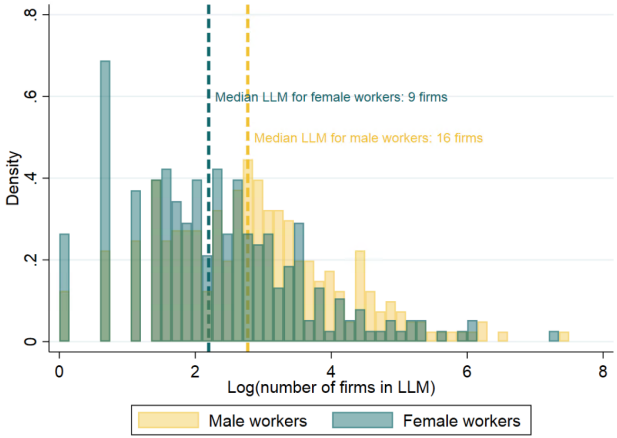
Figure: Number of Employers by labor market



Theoretical Framework: Supportive Descriptive Evidence

Employment share of two main employers

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Figure: Employment share of two main employers

Theoretical Framework: Supportive Descriptive Evidence

HHI per LLM

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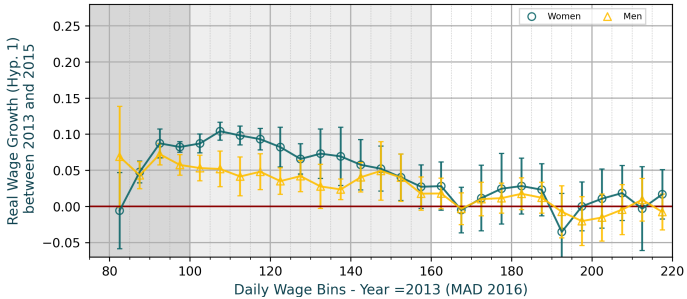
Figure: Distribution of HHI

Impact on Gender Pay Gap: Net Impact on Wages

Back

- **Bounding exercise:** assumptions about wages when the worker exits the formal sector

Hyp 1: $\tilde{w}_{it} = w_{it-2} \times (1 + g_{t-2 \to t}) \times \kappa_{informal} \implies \Delta y_{it} = (1 + g_{t-2 \to t}) \times \kappa_{informal} - 1$



- The positive gender differential impacts persist for workers above the minimum wage.
- Accounting for displacement: **weaker but still significant narrowing of the gender pay gap** (does not take into account other benefits associated with formal employment).

Empirical Strategy: DiD Leveraging Firm Exposure

Back

- **Idea:** Compare firms more vs. less exposed to the increases in the national minimum wage.
- **Exposure:**

$$\mathrm{Exp_j} = \frac{1}{3}\sum_{t=2006}^{2008} \mathrm{Exp_{jt}} \quad \text{with} \quad \mathrm{Exp_{jt}} = \frac{\sum_{i \in j} 1\{MW > w_{it}\}}{N_{jt}}$$

  - N_{it}: is the number of workers i that worked in firm j at year t; w_{it}: refers to her associated daily wage; MW: minimum wage level of 2015.

- **Main DiD Specification**: for an outcome $\mathbb{Y}_{jpt}$ of firm j, in the province p and at year t:

$$\mathbb{Y}_{jpt} = \gamma_j + \lambda_t + \sum_{\tau \neq y_{pre}} \beta_\tau \mathrm{Exp}_j + \epsilon_{jpt}$$

  - With λ_t: year fixed effects; γ_j: firm fixed effects;

P1: 40% of Formal Sector Exit is Explained by Firm Closing

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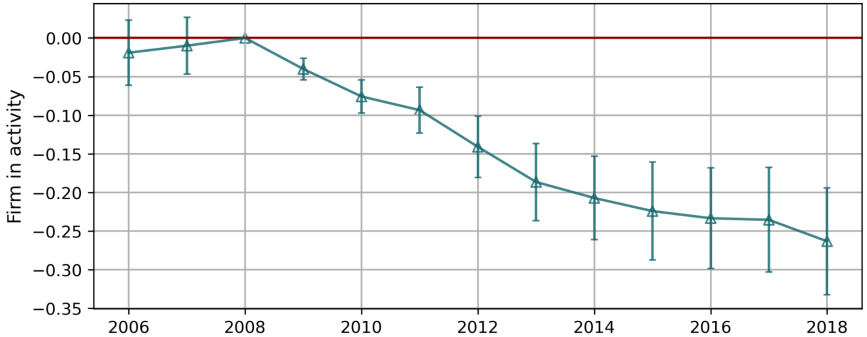
Figure: **Firm approach** – Impact on the probability that the firm remains active in the formal labor market Exp



$$\mathbb{Y}_{jlt} = \gamma_j + \lambda_t + \sum_{\tau \neq y_{pre}} \beta_\tau \text{Exp}_j + \epsilon_{jlt}$$

→ *Individual approach:* Firm exit explain 40% if the formal disemployment effect on female workers.

Outside Option Index

Back

- To proxy for the available set of job opportunities, I compute by gender an outside option index for sector s, province p, and at time t Schubert and Stansbury 2022

$$oo_{s,p,t} = \pi_{p \to p} \Bigg[\underbrace{\pi_{s \to s} \cdot \frac{s_{s,p,t}}{s_{s,t}} \cdot \bar{w}_{s,p,t}}_{\text{within LLM (=sector x province) oo}} + \underbrace{\sum_{s' \neq s}^{S} \pi_{s \to s'} \cdot \frac{s_{s',p,t}}{s_{s',t}} \cdot \bar{w}_{s',p,t}}_{\text{within province outside sector oo}} \Bigg] + \underbrace{\sum_{p' \neq p}^{P} \pi_{p \to p'} \sum_{s'}^{S} \pi_{s \to s'} \cdot \frac{s_{s',p',t}}{s_{s',t}} \cdot \bar{w}_{s',p',t}}_{\text{outside province oo}}$$

- $\pi_{s \to s'}$ = initial empirical transition rate.
- $s_{s',p,t}$ = the share of sector s' in province p. I compute it for each gender separately.
- $\bar{w}_{s',l,t}$ = the wage in sector s' in province p and at time t.

P2: Women with Smaller Set of Job Option Are More Hit

Back

- Split workers based on **outside option index (OOI)** that captures (i) probability of transitioning to another LLM; (ii) wage in this LLM. Exact Definition

Table: **Individual Approach** – Heterogeneity by Outside Option Index, Female Workers

	Probability of Leaving Formal Employment After Two Years:			
	All	Bottom Tercile of OOI	Middle Tercile of OOI	Top Tercile of OOI
	(1)	(2)	(3)	(4)
Years 2010-2016	0.023	0.045	0.013	0.009
	(0.011)**	(0.006) ***	(0.007)*	(0.017)
N	1,649,695	570,130	567,769	519,782

P3: Reallocation to better-paying formal employers

Back

- **Outcome of interest:** upward mobility from lower-paying to higher-paying firms using:

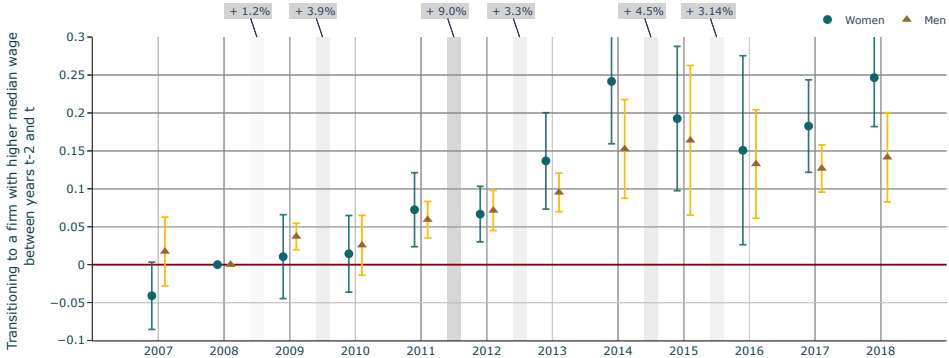
$$\Delta y_{i,t} = q^{t-2}_{j(i,t)} - q^{t-2}_{j(i,t-2)}$$

  - where $q^{\delta}_{j(i,t)}$ corresponds to a characteristic at time δ for the firm j where worker i is employed at time t.
  - I rank firms in a given year based on their median wage (for both genders) and consider that it is a transition from a lower-paying to a higher-paying firm when there is a rank increase greater than 15%.

P3: Reallocation to better-paying formal employers

Back

Figure: Impact on the individual probability of transitioning to a higher-paying employer between years $t-2$ and t, relative to 2006 to 2008 for low wage workers



P4: Net Impact on LLM concentration

Back

- Local labor market = province x sub-sectors.

Figure: Strong vs. Weakly Affected Local Labor Markets: Herfindahl–Hirschman Index $HHI_l = \sum_{j=1}^{M_l} s_{jl}^2$