Minimum Wages and Informal Self-Employment: Evidence from Perú

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March 13th, 2025

How should we think about min. wages in developing countries?

1. Minimum wage can reduce monopsony power and improve *efficiency*
   - (i) Raise wages and employment (Manning, 2003; Autor et al., 2016; Azar et al., 2023)
   - (ii) Firms raise wages as response to competitors (Engbom & Moser, 2023)
   - (iii) Reallocate employment from low to high productivity firms (Dustmann et al., 2022)

2. Minimum wage can *redistribute* resources from firm owners to low-wage individuals (Cengiz et al., 2019; Giupponi et al., 2024; Berger et al., 2024)

3. Developing countries are characterized by a large informal sector
   - ✓ *"Not only formal and informal firms produce in the same industry but there is also a sizable interval in the productivity support where one can find both types of firms."* (Ulyssea, 2018)
   - ✓ Do the *efficiency* and *redistribution* channels work in the same way?

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   Answer: No, the size of informal sector reduces the efectiveness on both fronts

This paper

Q1. Is the informal sector key to understand the labor market impacts of the MW in developing countries?

- Firms' response to minimum wage increases
- Impact on workers employment and wage prospects

Q2. Does this policy makes some workers or households worse-off?

- Estimate changes in expenses and income (i.e., purchasing power)
- Separate redistributional analysis for formal workers and households

Contribution

1. **Minimum Wage**
   - Minimum wage impacts on labor market outcomes (Dustmann et al., 2022; Engbom & Moser, 2022; Azar et al., 2024)
   - Minimum wage and firms margins of response (Harastozi & Lindner, 2019)
   - Minimum wage and redistribution (Cengiz et al., 2019; Berger et al., 2024)

   Empirical Contribution: Analysis encompassing all of these in a developing country

2. **Informality in Labor Markets**
   - Theories of informality (Meghir et al., 2015; Ulyssea, 2019; Haanwinckel, 2024)
   - Informality and concentration in labor markets (Amodio et al., 2023)

   Theoretical Contribution: Novel framework of oligopsony + involuntary self-employment

Today's Talk

1. Conceptual Framework

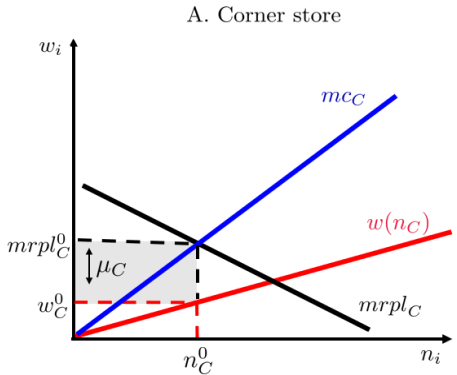
2. Institutional Setting & Data

3. Effects of minimum wage on formal firms

4. Effects of minimum wage on formal workers

5. Redistribution analysis: Winners and losers

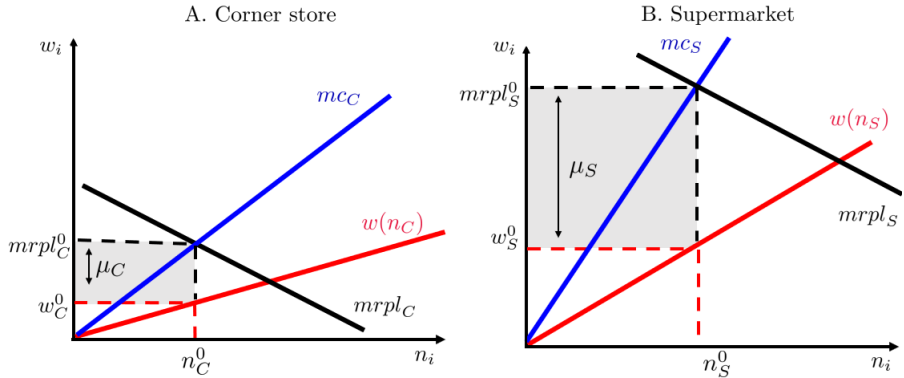
Monopsony 101: The labor market of store clerks



In the standard model $mc_C = \frac{1+\epsilon^*}{\epsilon^*} w(n_C)$, and $\epsilon^* := \frac{\partial \log n_C}{\partial \log w_C}$ is constant.

Source: Berger et al., 2023

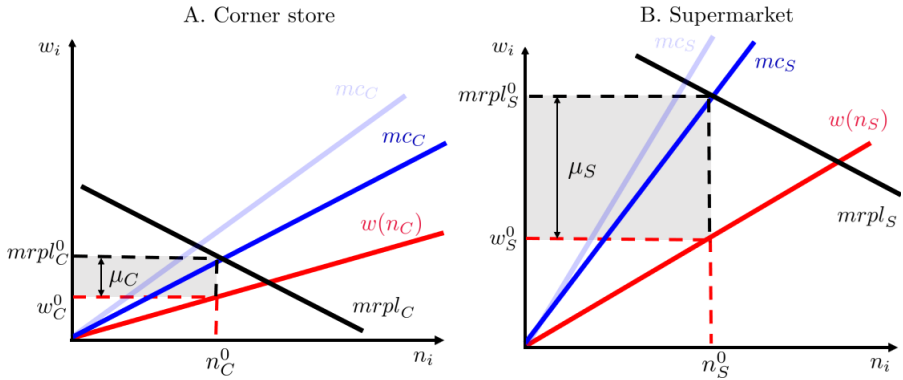
Oligopsony 101: The labor market of store clerks



It still holds that $mc_C = \frac{1+\epsilon^*}{\epsilon^*} w(n_C)$, but ϵ^* decreases with employment concentration.

**Source: Berger et al., 2023*

Key Idea 1: Informal sector makes labor mkt more competitive

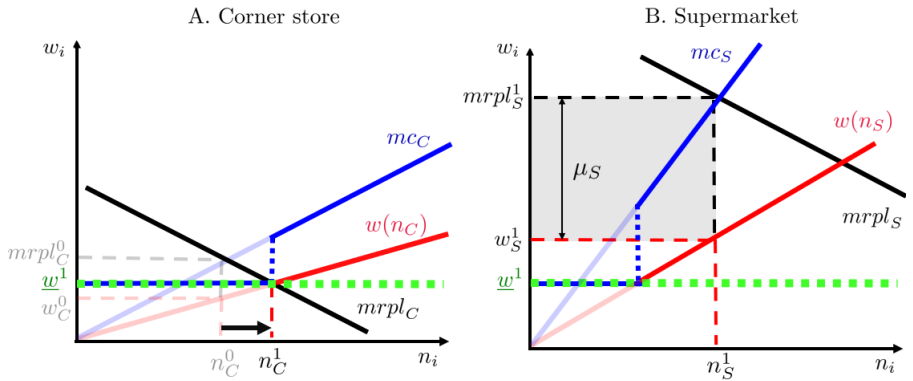


In the peruvian context, the informal sector concentrates ≈ 70% of employment!

**Figure based on Berger et al., 2023*

Key Idea 2: Min wages more likely to descale least productive firms

Case A. A low minimum wage

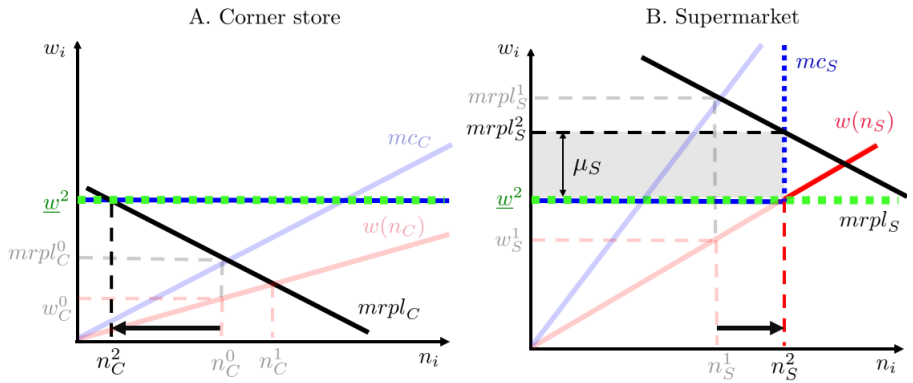


There's a very thin margin where the min. wage expands employment in the corner store.

**Source: Berger et al., 2023*

Key Idea 2: Min wages more likely to descale least productive firms

Case B. A high minimum wage



This is much more likely to happen, instead.

**Source: Berger et al., 2023*

Key Idea 3: Excess supply driven towards informal self-employment

Workers*

- Heterogeneity: Efficiency units (ε)

Firms*

- Choose a threshold $\underline{\varepsilon}_j$ and employment $\ell_j(w_j)$ that maximize profits
- Only hire workers such that $\varepsilon > \underline{\varepsilon}_j$

Consequences

- As minimum wage increase, firms "raise the bar" $\underline{\varepsilon}_j$
- Workers with $\varepsilon < \underline{\varepsilon}_j \ \forall j$ are involuntarily self-employed

**Based on Haanwinckel., 2024*

Today's Talk

1. Conceptual Framework ✓

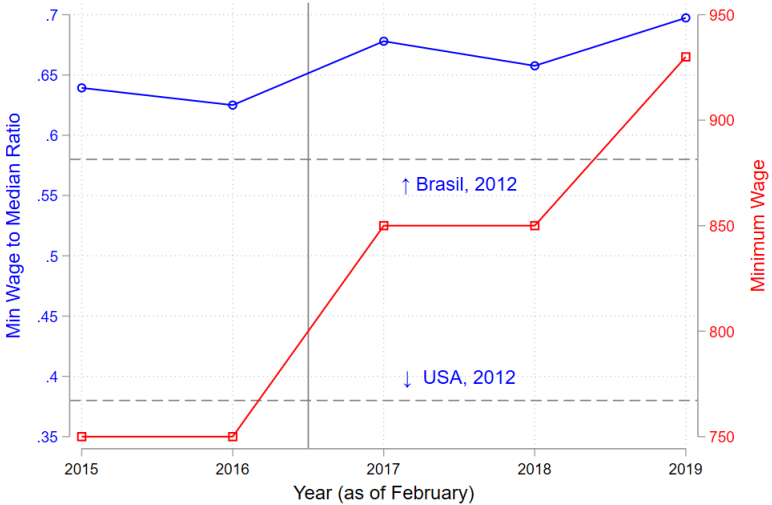
2. Setting and Data

3. Effects of minimum wage on formal firms

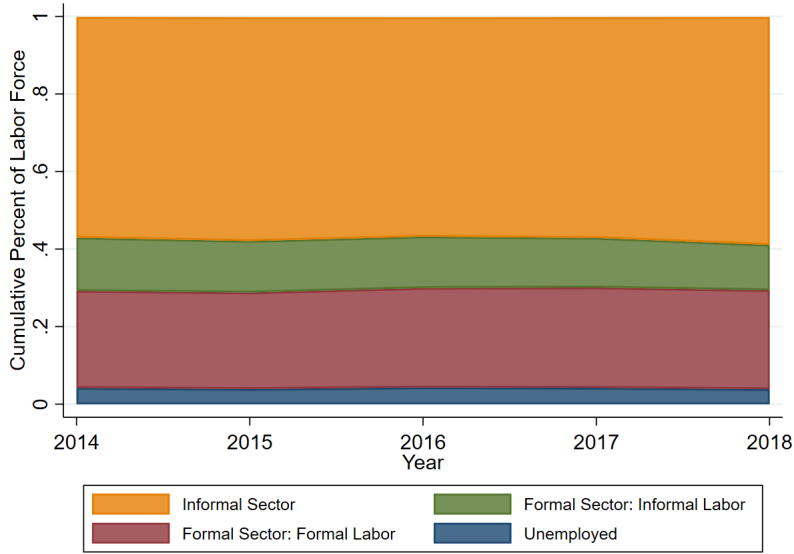
4. Effects of minimum wage on formal workers

5. Redistribution analysis: Winners and losers

MW has large bite and its timing is mostly politically driven



In the Peruvian context, informal sector ≈ informal self-employment



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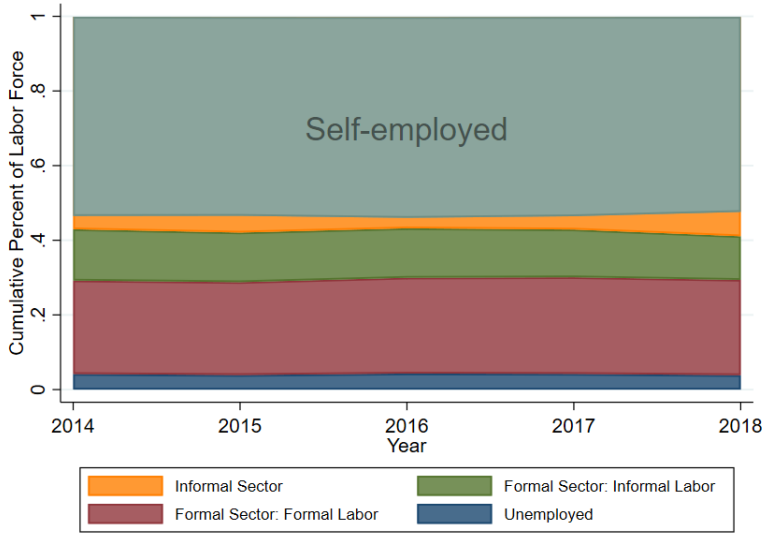

Data Sources

- Employer-Employee Dataset (*Planilla Electrónica*) 2015-2019
  - ✓ Universe of formal sector firms
  - ✓ Allows to follow worker labor market outcomes (wages, occupation, sector, hours) and firms over time

- Firm-level Census (*Encuesta Económica Anual*) 2014-2018
  - ✓ Census of medium and large formal firms
  - ✓ Contains detailed information on firms' balance sheet
  - ✓ Fuzzy matched to employer-employee data ▸ Construction

- Household Survey (*Encuesta Nacional de Hogares*) 2014-2018
  - ✓ Annual survey of households, representative at national/state level (cross-sec & panel)
  - ✓ Detailed information on working status (employed/self-emp/formal/informal), industry, occ, hh-level consumption

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Empirical Strategy I: Firm Approach (Harasztosi & Lindner, 2019)

- FA_j : fraction of workers earning below the new minimum wage in February 2016.
- Estimate the following model:

$$\frac{y_{jt} - y_{j2016}}{y_{j2016}} = \alpha_t + \beta_t FA_j + \gamma_t X_{jt} + u_{jt} \quad (1)$$

- **ID Assumption:** the outcomes in low versus high exposed firms would have followed similar trends in absence of a minimum wage increase.
- To explore the salience of informal sector I interact the model above with a firm-specific measure of informality exposure (FI_j):
  - Informal occupation: above median of the share of workers under informality status
  - FI_j : fraction of low-wage workers in the firm that are in informal occupations

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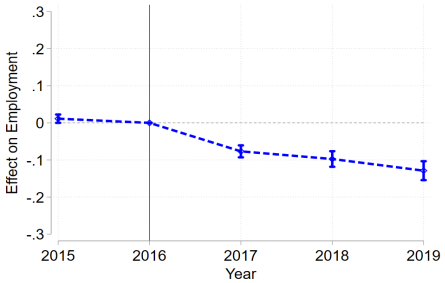
Effect on Employment and Average Wage

$$\frac{y_{jt}-y_{j2016}}{y_{j2016}} = \alpha_t + \beta_t \underbrace{FA_j}_{\text{Fraction below MW in 2016}} + \gamma_t X_{jt} + u_{jt}$$

▸ Linearity of FA (employment) ▸ Linearity of FA (wage)

Employment effects



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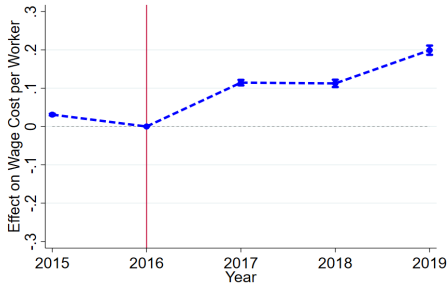

▸ How does it compare to the literature? ▸ Who are the most affected firms?

Effect on Employment and Average Wage

$$\frac{y_{jt}-y_{j2016}}{y_{j2016}} = \alpha_t + \beta_t \underbrace{FA_j}_{\text{Fraction below MW in 2016}} + \gamma_t X_{jt} + u_{jt} \quad \Longrightarrow \text{ own-wage elasticity} = -0.85!$$

▸ Linearity of FA (employment) ▸ Linearity of FA (wage)

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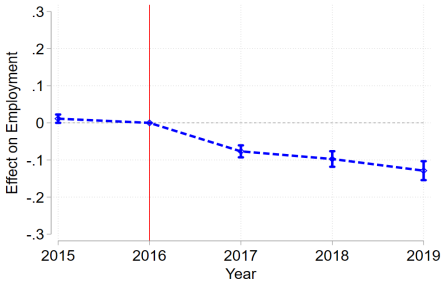

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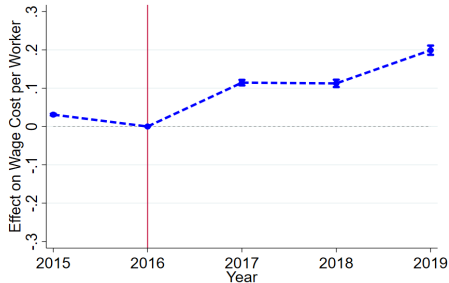

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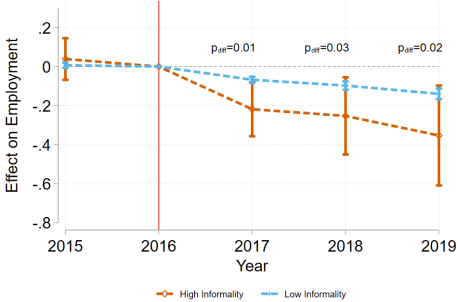
Effects by Informality

$$\frac{y_{jt}-y_{j2016}}{y_{j2016}} = \alpha_t^0 + \alpha_t^1 \text{FA}_j + \beta_t^0 \text{FA}_j + \beta_t^1 \underbrace{\text{FI}_j}_{\text{Fraction informal occupation in 2016}} + \beta_t \text{FA}_j \times \text{FI}_j + \gamma_t X_{jt} + \epsilon_{jt}$$

Employment effects



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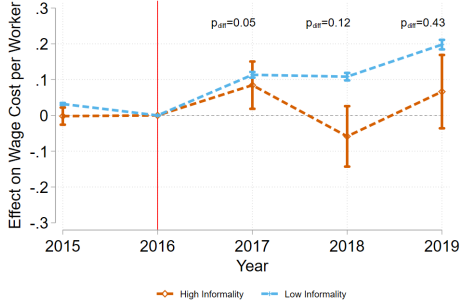

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5. Redistribution analysis: Winners and losers

Empirical Strategy II: Worker approach (Dustmann et al., 2022)

- Split workers into 15 earnings bins (100 PEN width)
- Compare changes before minimum wage (2015 vs 2016) to changes after minimum wage (2016 vs 2017)
- Estimate the following model:

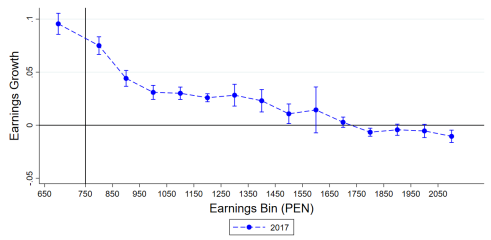
$$y_{i,t} - y_{i,t-1} = \sum_{b=1}^{15} \gamma_{2016,b} \mathbf{1}\{earnings_{i,t-1} \in bin_b\} + \sum_{b=1}^{15} \delta_b \mathbf{1}\{earnings_{i,t-1} \in bin_b\} \times \mathbf{1}\{t = 2017\} + \beta X_{i,t-1} + \epsilon_{i,t}$$

- **ID Assumption:** macroeconomic time effects and mean reversion are stable over time.

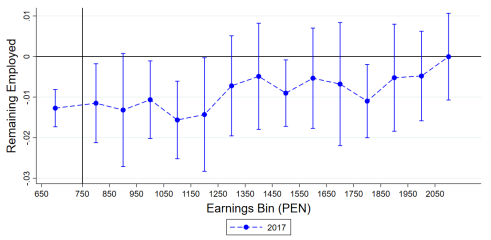
Effects on Employment and Wage

$$y_{i,t} - y_{i,t-1} = \sum_{b=1}^{15} \gamma_{2016,b} \mathbf{1}\{earnings_{i,t-1} \in bin_b\}$$
$$+ \sum_{b=1}^{15} \delta_b \mathbf{1}\{earnings_{i,t-1} \in bin_b\} \times \mathbf{1}\{t = 2017\} + \beta X_{i,t-1} + \epsilon_{i,t}$$

Wage Effects (conditional on employment)



Employment Effects

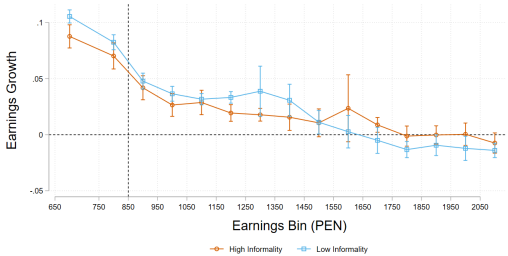


▸ Do wage effects come from reallocation?

Effects by Informality

Compare workers in informal occupations vs those who are not

Wage Effects (conditional on employment)



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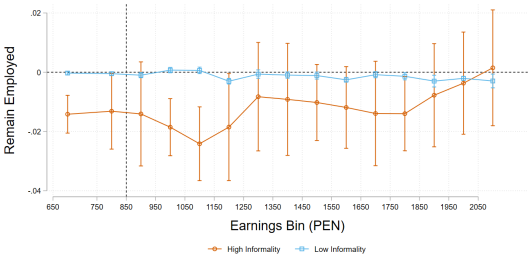

I also provide evidence that the size of the formal sector is indeed reduced. ▸ Evidence

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5. Redistribution analysis: Winners and losers

Change in expenses due to minimum wage $\left(\underset{\underline{w}}{\Delta}\text{Expenses}\right)$

$$\underset{\underline{w}}{\Delta}\ \text{Expenses} = \underset{\underline{w}}{\Delta}\ \textit{Labor Cost} \times \textit{Pass-through} \times \textit{Share of consumption in MW-produced goods} \times \textit{Total Expenses}$$

- $\underset{\underline{w}}{\Delta}$ *Labor Cost:* use firm approach on firm balance sheet data ($\approx$ 12.3%) ▸ Table
- *Pass-through:* use firm approach on the decomposition ▸ Table

$$\frac{\Delta \textit{LaborCost}}{\textit{Revenue2016}} = \underbrace{\frac{\Delta \textit{Revenue}}{\textit{Revenue2016}} - \frac{\Delta \textit{Material}}{\textit{Revenue2016}} - \frac{\Delta \textit{MiscItems}}{\textit{Revenue2016}}}_{\text{Consumers Pay } (\approx 98\ \%)} - \underbrace{\frac{\Delta \textit{Depr}}{\textit{Revenue2016}} - \frac{\Delta \textit{Profit}}{\textit{Revenue2016}}}_{\text{Firm Owners Pay } (\approx 2\ \%)}.$$

- *Share of consumption in MW-produced goods:* follow Macurdy (2015) to estimate at household level using Peruvian Input-Output Table ▸ Figure

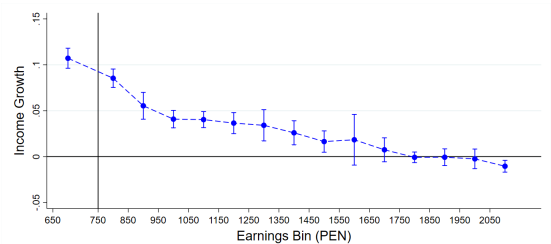
Changes in Income due to minimum wage $\left(\underset{\underline{w}}{\Delta}\text{Income}\right)$

Alt. Approach

$$\underset{\underline{w}}{\Delta}\text{Income} = \textit{Percentage Change in Income} \times \textit{Initial Income}$$

where the pct change in income is given by

$$\frac{\underset{\underline{w}}{\Delta} I_b}{w_b} := \underbrace{\frac{\underset{\underline{w}}{\Delta} w_b}{w_b}}_{\text{Worker approach}} + \underbrace{\frac{(w_b^{\text{inf}} - w_b)}{w_b}}_{\text{Estimate from ENAHO}} \underbrace{\Delta \mathbf{Prob}_b(\text{become informal})}_{\text{Worker approach}}$$



Redistribution analysis by worker earnings bins (in monthly PEN)

Baseline bin $t-1$	$[650, 750)$	$[750, 850)$	$[950, 1050)$	$[1050, 1150)$	$[1150, 2050)$	$[2050, \max)$
Panel A. Income Change						
Mean formal wage	746	818	903	1,001	1,479	2,630
ΔIncome	82.06	65.44	45.15	40.04	29.58	0.00
Panel B. Expenses Change						
Mean per capita expenses	590	643	700	613	792	1379
ΔExpenses	16.35	17.82	20.25	17.73	22.91	43.22
ΔIncome - ΔExpenses	65.71	47.62	25.25	22.31	6.67	-43.22

Redistribution analysis by household income deciles (in monthly PEN)

HH income decile	1	2	3	4	5	6	7	8	9	10
Panel A. Income Change										
Prop. formal employment	0.01	0.03	0.11	0.19	0.26	0.34	0.46	0.60	0.72	0.82
Prop. formal employment near MW	0.00	0.02	0.05	0.1	0.13	0.15	0.19	0.21	0.22	0.15
Mean formal wage near MW	1	7	40	128	242	316	462	570	705	586
ΔIncome	0.00	0.42	2.40	7.68	14.52	18.96	27.72	34.20	42.30	35.16
Panel B. Expenses Change										
Mean expenses	639	732	991	1,206	1,485	1,786	2,069	2,466	2,964	4,801
ΔExpenses	12.32	16.76	23.89	30.52	39.38	47.36	57.36	68.36	85.74	156.25
ΔIncome - ΔExpenses	-12.32	-16.34	-21.49	-22.84	-24.86	-28.40	-29.64	-34.16	-43.44	-121.09

Conclusion

1. Informal sector shapes the response to the minimum wage:
   - ✓ Reduce market power in formal sector, thus making markets more competitive
   - ✓ Increasing min wages is more likely to descale the least productive firms.
   - ✓ Excess supply is not reallocated to more productive firms
   - ✓ Consistent with a model of oligopsony and involuntary self-employment
2. There are some winners and losers
   - ✓ Purchasing power of rich individuals decreases
   - ✓ Purchasing power of low-wage formal workers increases (mostly in the middle-class)
   - ✓ Purchasing power of low-income household decreases (but very little)
3. Min wages are not that effective, but also not hurtful to the poor. They do transfer resources from rich households towards the middle class.

Thank you!

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Appendix

Who are the most affected firms?

	Quartiles of FA_j in 2016			
	Q1	Q2	Q3	Q4
Lima	0.47	0.41	0.38	0.39
Avg Wage (PEN)	2480.81	1693.09	1170.64	888.55
Number of Workers	129.60	157.78	127.36	16.20
Firm Age	16.03	14.44	11.53	9.39
Manufacture	0.18	0.21	0.19	0.22
Commerce	0.35	0.31	0.30	0.31
Services	0.04	0.06	0.12	0.15
Observations	5,875	5,908	5,849	5,845

◂ Back

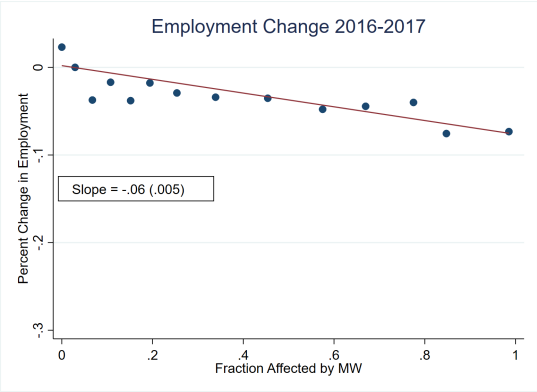
Who are the MW workers?

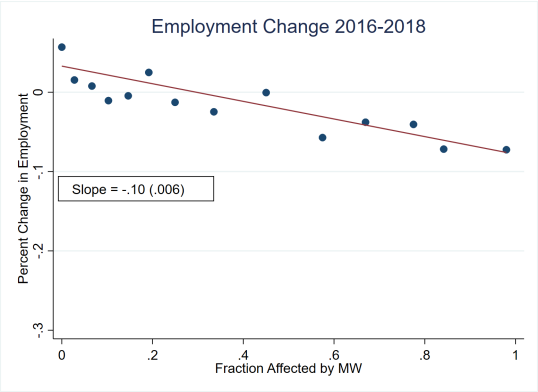
	Earnings bin in 2016 (PEN)		
	$650 < y_{t-1} \leq 850$	$850 < y_{t-1} \leq 1250$	$1,250 < y_{t-1} \leq 3,250$
Lima	0.14	0.18	0.18
Female	0.42	0.38	0.27
By education			
Share low skilled	0.05	0.05	0.03
Share medium skilled	0.48	0.50	0.44
Share high skilled	0.47	0.45	0.53
By age			
Share less than 24	0.09	0.08	0.02
Share 24-44	0.63	0.72	0.76
Share 45-65	0.27	0.19	0.22
By contract			
Permanent	0.36	0.22	0.30
Part-time	0.02	0.01	0.01

Back

Is the relationship approx. linear?

Figure 6: Linearity of FA measure

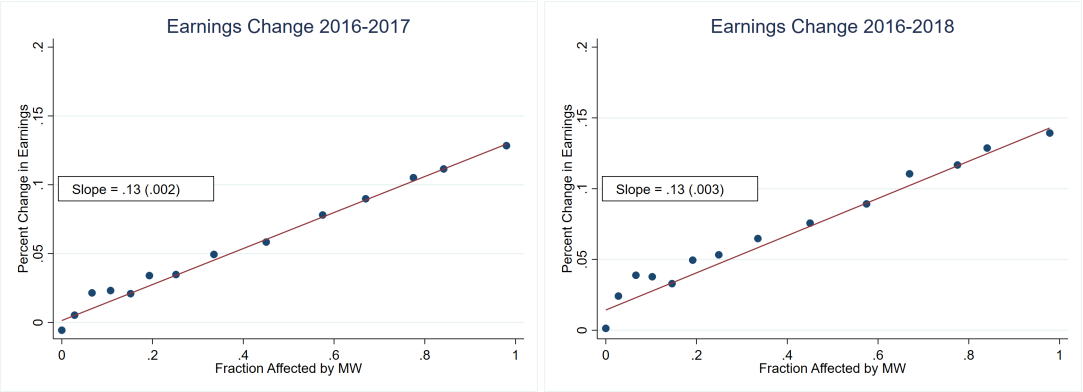




Back

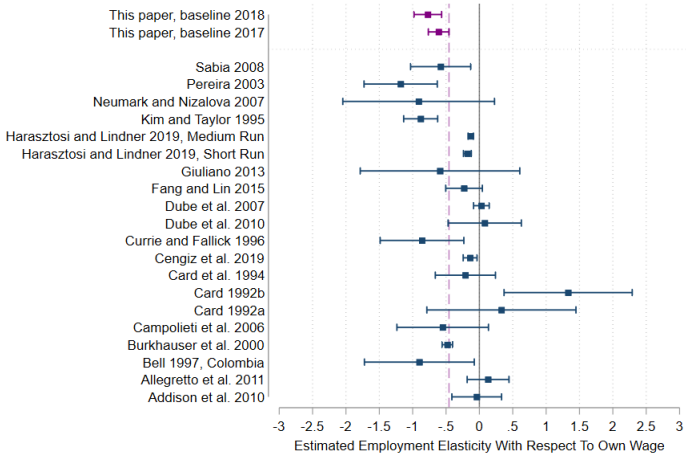
Is the relationship approx. linear?

Figure 7: Linearity of FA measure



Back

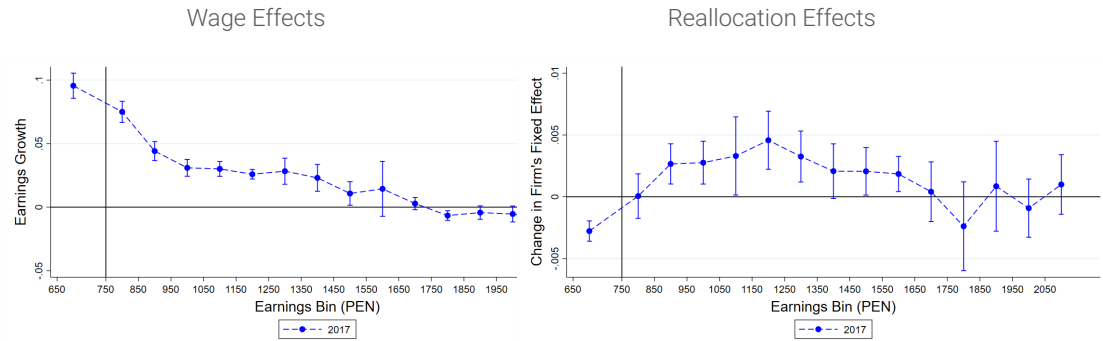
Own-wage elasticity in recent literature



Back

Small gains from reallocation

Figure 8: Wage and reallocation effects of the minimum wage



Back

Who pays for the MW? (Macurdy, 2015)

- Compute how much is industry s exposed to the MW

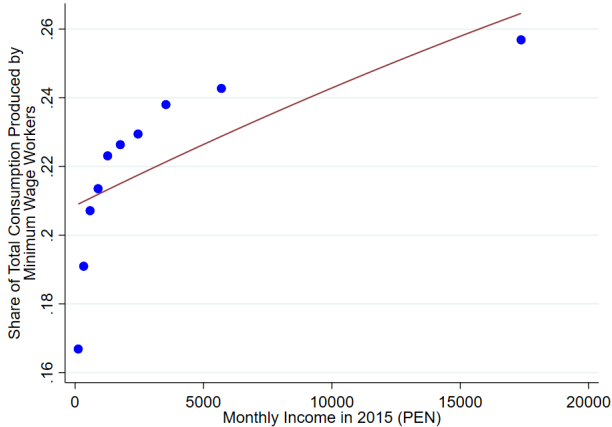
$$e_s = (I - BU)^{-1} B \frac{\text{wagebill}_s^{MW}}{\text{wagebill}_s} \times \frac{2}{3}$$

  - $B(i,j)$: share of commodity j produced by industry s
  - $U(i,j)$: share of commodity j used by industry s
- Using budget information in ENAHO, I match every product to a particular industry that produces it
- Compute the following measure

$$\text{Sh. cons produced by MW workers} = \sum_s \text{share of expenses in s} \times e_s$$

Back

Who pays for the MW? (Macurdy, 2015)



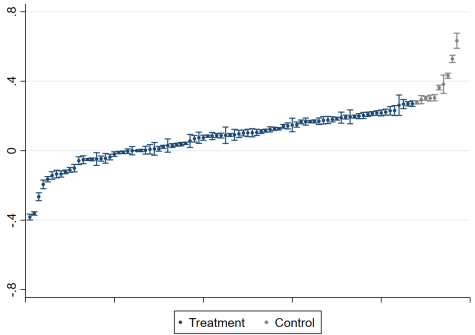
Back Computation

Aggregate employment effects at formal sector (Giuponni et al., 2024)

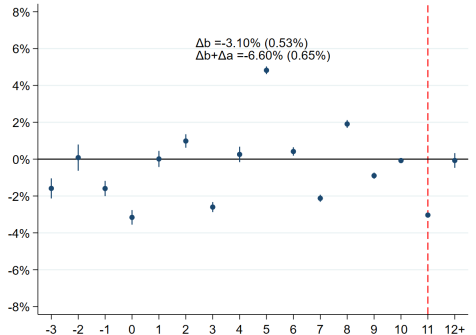
Back

1. Obtain place effects: $\ln w_{it} = \ln \lambda_{r(i,t)} + \theta_t + X'_{it}\beta + u_{it}$
2. Obtain *skill levels* $w^*_{it} = \exp(\ln w_{it} - \ln \lambda_{r(i,t)})$
3. $\Delta\%$Employment in low-wage regions compared to those of same *skill level* at high-wage regions

Distribution of Province Premia



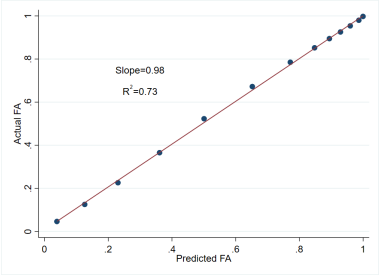
Employment Effects



Firm design on balance sheet data

Back

- Cannot directly compute fraction affected in firm-level census
- Share common variables with employer-employee data: employment counts (by gender, contracts) and average wage cost per worker
- Regression forest using random 75% sample of employer-employee obs as training data to predict FA_j on firm-level census



Expenses - Firms' margins of adjustment (excl. closures)

Back

	2015 and 2016	2015 and 2017	2015 and 2014
Panel A. Change in total labor cost			
Fraction affected	**0.123**	**0.219**	0.031
	(0.039)	(0.051)	(0.022)
Panel B. Change in revenue			
Fraction affected	**0.074**	**0.051**	0.011
	(0.036)	(0.046)	(0.027)
Panel C. Change in materials			
Fraction affected	0.079	-0.140	-0.147
	(0.152)	(0.176)	(0.151)
Panel D. Change in capital			
Fraction affected	0.135	0.165	0.006
	(0.068)	(0.087)	(0.055)
Panel E. Change in profits (relative to revenue in 2015)			
Fraction affected	-0.002	-0.006	-0.008
	(0.010)	(0.012)	(0.008)
Observations	3,440	3,185	4,343
Controls	Yes	Yes	Yes

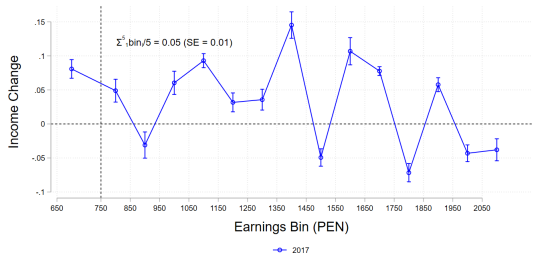
Expenses - Incidence of the MW

Back

	Changes 2016	Changes 2017
Change in total labor cost relative to revenue in 2015	0.0243	0.0327
Ch in revenue rel to revenue in 2015 ($\Delta Revenue$)	0.0757	0.0614
Ch in materials rel to revenue in 2015 ($\Delta Material$)	0.0065	-0.0028
Ch in miscitems rel to revenue in 2015 ($\Delta MiscItems$)	0.0453	0.0442
Incidence on consumers ($\Delta Rev - \Delta Mat - \Delta MiscItems$)	0.0239	0.02
Ch in profits rel to revenue in 2015 ($\Delta Profit$)	-0.0007	-0.0095
Ch in depreciation rel to revenue in 2015 ($\Delta Depr$)	0.0004	-0.0032
Incidence on firm owners ($-\Delta Profit - \Delta Depr$)	0.004	0.0127
Fraction paid by consumers (percent)	**98.35**	**61.12**
Fraction paid by firm owners (percent)	1.65	38.88

Alternative Income Change

1. Fit a model that predicts how much a formal employee at $t-1$ would earn in the informal sector at t
2. Impute observations that correspond to non-employment in EE data
3. Re-run the worker approach



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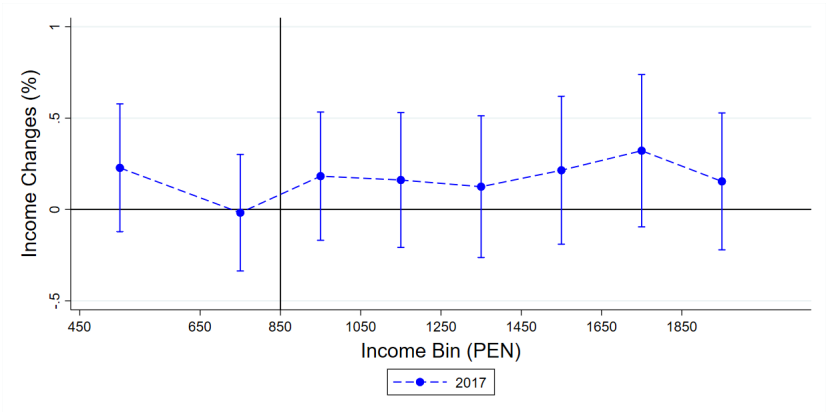
Income in the Informal Sector

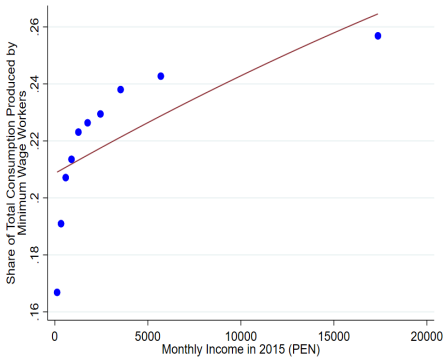
Figure 10: Changes in Income for Informal Workers



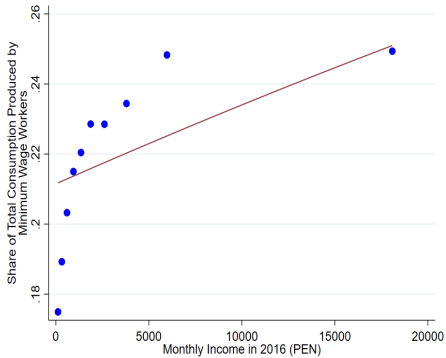
**Source: ENAHO*

MW Consumption around MW increase

MW Consumption Pre



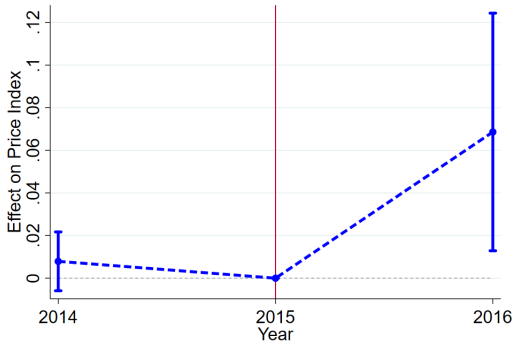
MW Consumption Post



**Source: ENAHO*

Laspeyre Prices from Survey Data

Figure 12: Change in food price index



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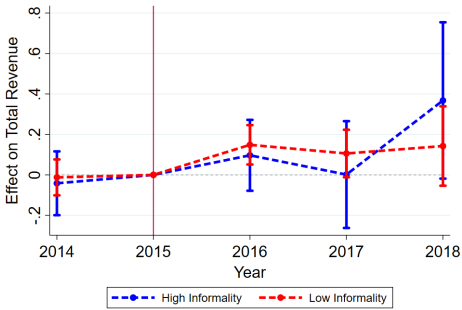
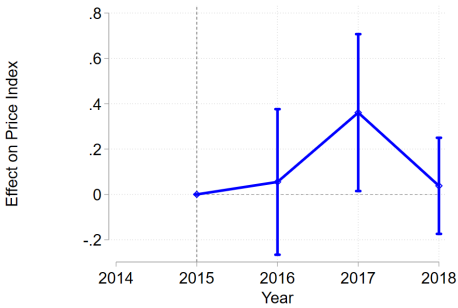
Laspeyre Prices from Balance Sheet Data

Compare provinces with high vs low presence of informality

Effects on Revenue



Effects on Output Price (Manufacture)



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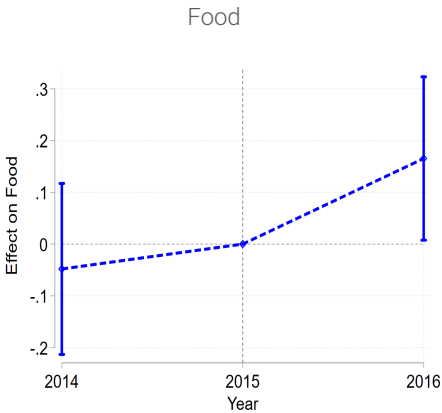
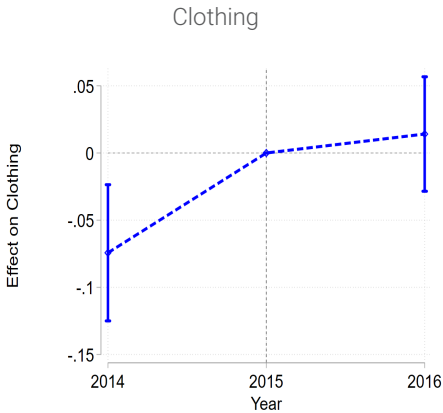
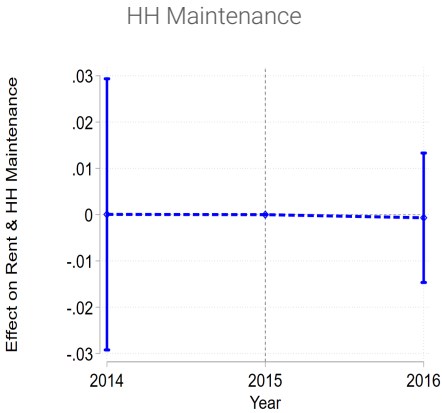
Changes in Expense Shares

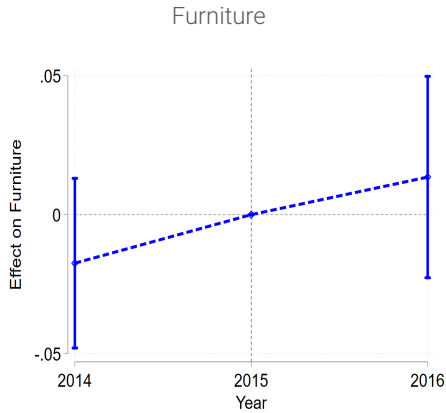




**Source: ENAHO*

Changes in Expense Shares

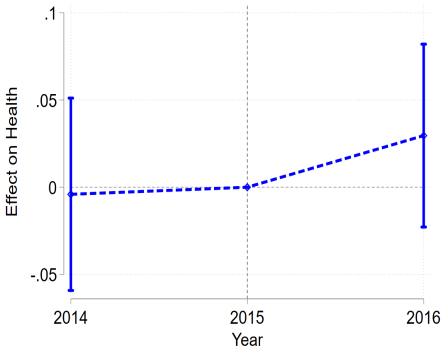




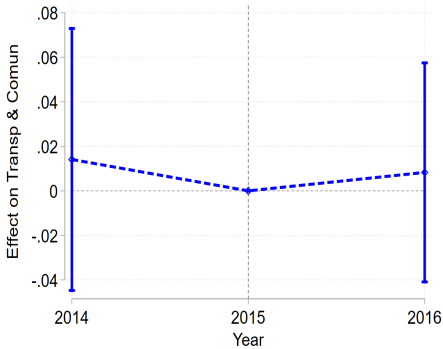
**Source: ENAHO*

Changes in Expense Shares

Health



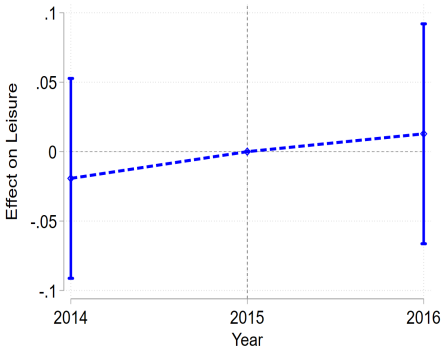
Transportation & Communication



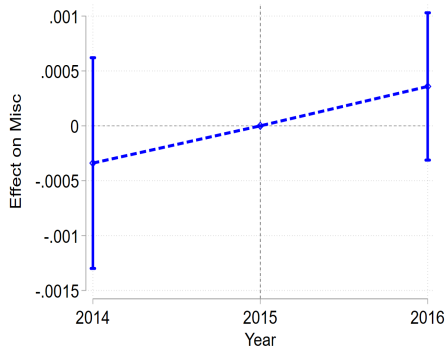
**Source: ENAHO*

Changes in Expense Shares

Leisure



Miscellaneous Expenses



**Source: ENAHO*