

Minimum Wages and Informal Self-Employment: Evidence from Perú

VSE Empirical Lunch

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Motivation

- Minimum wages are an important tool to boost wages at the bottom of the income distribution in developed countries
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- Low- and middle-income countries are characterized by a large informal sector. In many of these (e.g. Colombia, Venezuela, India, etc.) the face of the informality is this



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- Are there winners and losers among workers & households?

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What has been done so far

Informality and Development Ulyssea (2018); Dix-Carneiro, Goldberg, Meghir and Ulyssea (2024); Engbom and Moser (2022)

- Limitation: no concentration and self-employment shaping market power
- Adapted to context where intensive margin of informality is sizable

Self-Employment and Concentration Amodio et al. (2023)

- Limitation: Selection into self-employment à la Roy

Why do some countries have so many informal self-employed? Are the effects of the MW qualitatively different?

This paper

- **Question:** What are the minimum wage effects in the presence of large informal self-employment? Does it benefit low-wage workers and low-income households?
- **Data overview:**
 1. Employer-employee data linked to firm balance sheet data
 2. Employer-employee data linked to occupation-level informality measures from survey data
 3. Survey data that contain consumption info linked to price changes
- **Contributions:**
 1. Novel **estimates** of the effects of MW on workers and firms' margins of adjustment
 2. Provide **evidence** of how the **informal sector** presence **shapes** labor market effects and firms' margins of response
 3. **Evaluate** whether low-wage workers and low-income households do **benefit**, using the reduced form estimates

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Preview of the findings

- Sizeable negative employment effects driven by the presence of the informal sector
- Evidence of revenue & price increase driven by the absence of the informal sector
- Workers more likely to exit formal employment and size of formal sector decreases
- Increase in prices (pass-through) mostly occurs in goods consumed by rich people
- Back-of-the-envelope calculation shows that
 - Low-wage formal workers have more purchasing power after MW increase
 - Their wage increase is financed by high-wage workers
 - Low-wage formal workers don't live in poor households, hence those households are not better off

Roadmap

Model

Data

Empirical Strategy and Main Results

A Cost-Benefit Analysis

Concluding Remarks

Model

Goal of the model: show that informal sector makes MW more binding, and thus \uparrow MW reallocates workers to self-employment option

Ingredients:

- Heterogeneous Workers with productivity $\varepsilon \sim G(\cdot)$ who choose between firms $j \in \{1, \dots, J\}$ or self-employment
- Heterogeneous Formal Firms with productivity $z \sim F(\cdot)$ who choose wages and rejection cutoffs
- Imperfect competition for labor among firms
- Minimum wage \underline{y} in terms of earnings

Model timing

1. Firms post rejection cutoffs $\underline{\varepsilon}_j$ and wages w_j
2. Workers observe $(\underline{\varepsilon}_j, w_j)$, w_S , and choose employment option
3. Firms observe ε of workers who applied and hire those with $\varepsilon > \underline{\varepsilon}_j$
4. Production occurs and workers are paid. Rejected workers become self-employed

Workers

Workers indirect utility maximization given w_S and $(w_k, \varepsilon_k)_{k=1}^J$ yields

$$\begin{aligned}\mathbf{Pr}_{\text{informal}}(\varepsilon, \mathbf{w}) &= \frac{(\varepsilon w_S)^\lambda}{(\varepsilon w_S)^\lambda + \Omega_\varepsilon^\lambda} \\ \mathbf{Pr}_{\text{formal}, j}(\varepsilon, \mathbf{w}) &= \frac{\Omega_\varepsilon^\lambda}{(\varepsilon w_S)^\lambda + \Omega_\varepsilon^\lambda} \frac{\mathbf{1}\{\varepsilon \geq \underline{\varepsilon}_j\} \max\{\underline{y}, \varepsilon w_j\}^\beta}{\Omega_\varepsilon^\beta},\end{aligned}$$

$$\text{where } \Omega_\varepsilon = \left(\sum_{k=1}^J \mathbf{1}\{\varepsilon \geq \underline{\varepsilon}_k\} \max\{\underline{y}, \varepsilon w_k\}^\beta \right)^{1/\beta}$$

Informal due to choice or because firms do not want to hire them

Workers

Elasticity of labor supply is given by

$$\frac{\partial \log \ell(w_j, \underline{\varepsilon}_j, w_{-j})}{\partial \log w_j} = \beta$$

$$- (\beta - \lambda) \int_{\underline{\varepsilon}_j}^{\infty} \frac{\Omega_\varepsilon^\lambda}{(\varepsilon w_S)^\lambda + \Omega_\varepsilon^\lambda} \frac{(\varepsilon w_j)^{2\beta}}{\Omega_\varepsilon^{2\beta}} \varepsilon dG(\varepsilon) \left[\int_{\underline{\varepsilon}_j}^{\infty} \frac{\Omega_\varepsilon^\lambda}{(\varepsilon w_S)^\lambda + \Omega_\varepsilon^\lambda} \frac{(\varepsilon w_j)^\beta}{\Omega_\varepsilon^\beta} \varepsilon dG(\varepsilon) \right]^{-1}$$
$$- \lambda \int_{\underline{\varepsilon}_j}^{\infty} \frac{\Omega_\varepsilon^{2\lambda}}{[(\varepsilon w_S)^\lambda + \Omega_\varepsilon^\lambda]^2} \frac{(\varepsilon w_j)^{2\beta}}{\Omega_\varepsilon^{2\beta}} \varepsilon dG(\varepsilon) \left[\int_{\underline{\varepsilon}_j}^{\infty} \frac{\Omega_\varepsilon^\lambda}{(\varepsilon w_S)^\lambda + \Omega_\varepsilon^\lambda} \frac{(\varepsilon w_j)^\beta}{\Omega_\varepsilon^\beta} \varepsilon dG(\varepsilon) \right]^{-1}$$

Workers

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$$- (\beta - \lambda) \underbrace{\int_{\varepsilon_j}^{\infty} \frac{\Omega_\varepsilon^\lambda}{(\varepsilon w_S)^\lambda + \Omega_\varepsilon^\lambda} \frac{(\varepsilon w_j)^{2\beta}}{\Omega_\varepsilon^{2\beta}} \varepsilon dG(\varepsilon)}_{\text{Concentration within firm sector}} \left[\int_{\varepsilon_j}^{\infty} \frac{\Omega_\varepsilon^\lambda}{(\varepsilon w_S)^\lambda + \Omega_\varepsilon^\lambda} \frac{(\varepsilon w_j)^\beta}{\Omega_\varepsilon^\beta} \varepsilon dG(\varepsilon) \right]^{-1}$$

$$- \lambda \underbrace{\int_{\varepsilon_j}^{\infty} \frac{\Omega_\varepsilon^{2\lambda}}{[(\varepsilon w_S)^\lambda + \Omega_\varepsilon^\lambda]^2} \frac{(\varepsilon w_j)^{2\beta}}{\Omega_\varepsilon^{2\beta}} \varepsilon dG(\varepsilon)}_{\text{Concentration overall}} \left[\int_{\varepsilon_j}^{\infty} \frac{\Omega_\varepsilon^\lambda}{(\varepsilon w_S)^\lambda + \Omega_\varepsilon^\lambda} \frac{(\varepsilon w_j)^\beta}{\Omega_\varepsilon^\beta} \varepsilon dG(\varepsilon) \right]^{-1}$$

Then \uparrow concentration means $\partial \log \ell / \partial \log w_j \rightarrow 0$, and \downarrow concentration means $\partial \log \ell / \partial \log w_j \rightarrow \beta$

Firms

Firms observe ε of workers who applied and maximize profits

$$\max_{w_j, \underline{\varepsilon}_j} p_j f(\ell(w_j, \underline{\varepsilon}_j, w_{-j})) - w_j \ell(w_j, \underline{\varepsilon}_j, w_{-j})$$

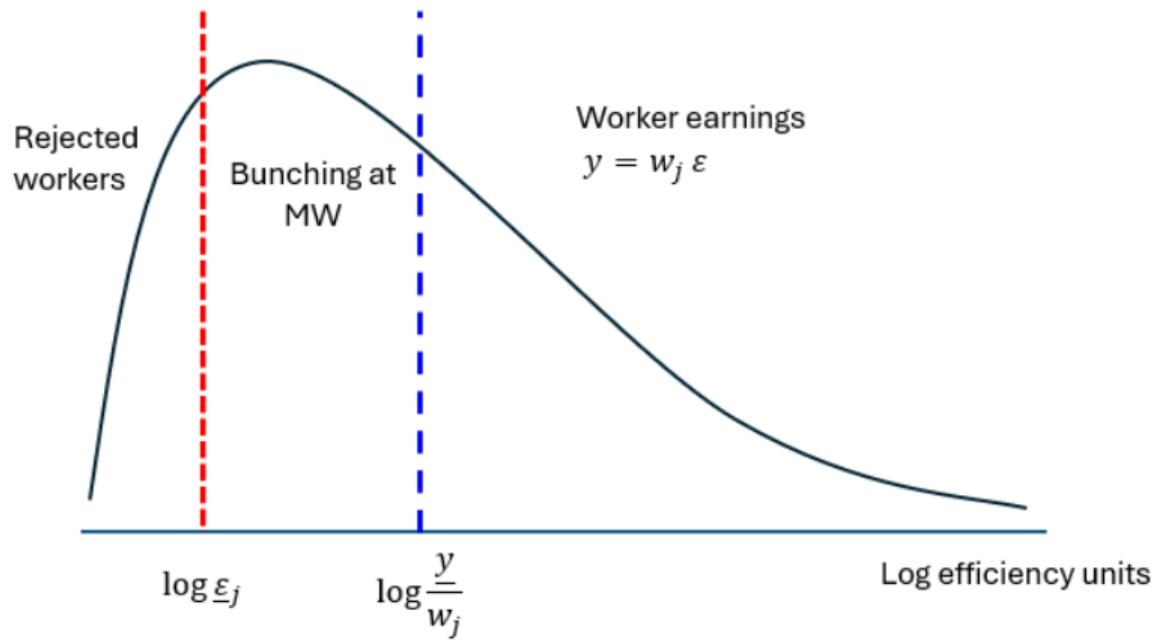
which yields

$$p_j f'(\ell) = \left(1 + \frac{1}{\frac{\partial \log \ell}{\partial \log w_j}}\right) w_j$$

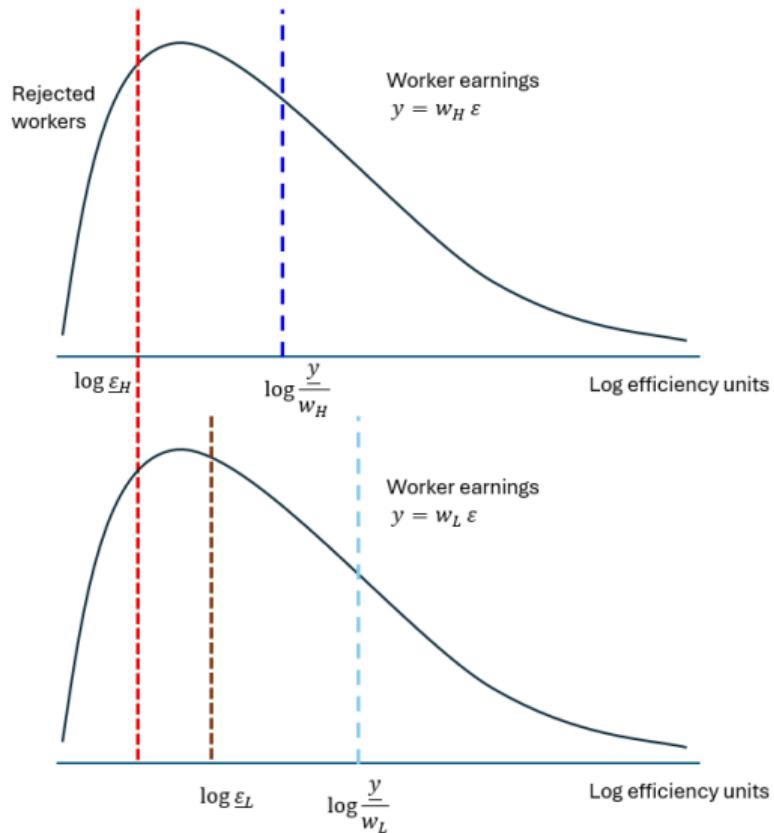
$$p_j f'(\ell) \underline{\varepsilon}_j = \underline{y}$$

MW in low- and middle-income countries where ε tends to be low and firms are unproductive can potentially harm many workers

Comparative Statics



Comparative Statics



Roadmap

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Data Sources

- Employer-Employee Dataset (*Planilla Electrónica*) 2015-2019
 - ✓ Matched employer-employee of the universe of formal firms
 - ✓ Info on earnings, occupation, industry, other worker characteristics
- Firm-level Census (*Encuesta Económica Anual*) 2014-2018
 - ✓ Census of medium and large formal firms
 - ✓ Info on firms balance sheet
 - ✓ Product-level info for manufacturing sector
- Household Survey (*Encuesta Nacional de Hogares*) 2014-2018
 - ✓ Annual survey of households, representative at national/state level (cross-sec & panel)
 - ✓ Info on working status (employed/self-emp/formal/informal), industry, occ, hh-level consumption

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Empirical Strategy: Firm Approach

- Exploit a national MW increase in 2016 ▶ MW Increase
- Construct fraction of affected workers at the firm in $t = 2016$.
- Run model the following regression:

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

- **Identification assumption:** outcomes at firms with high exposure FA_j should've followed similar trend to firms with low exposure FA_j .
- Effect at $t = 2015$ is our pre-trend test.

▶ Who are the most affected firms?

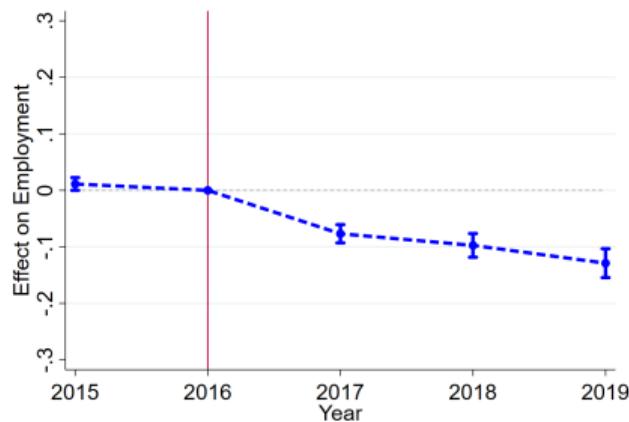
Firm employment and wage effects

$$\frac{y_{jt} - y_{j2016}}{y_{j2016}} = \alpha_t + \beta_t \text{FA}_j + \gamma_t X_{jt} + \epsilon_{jt}$$

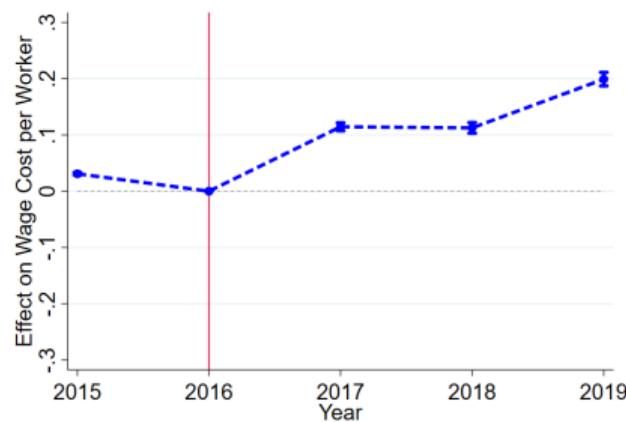
► Linearity of FA (employment)

► Linearity of FA (wage)

Employment effects



Wage effects



► How does it compare to the literature?

Exposure to the informal sector

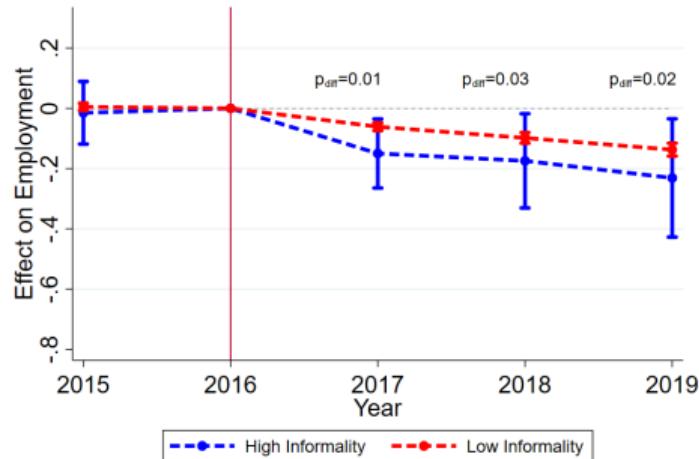
- I observe the occupations of every worker at a firm in the matched employer-employee dataset
- Using survey data I can know the share of workers at occupation o that are part of the informal sector
- Classify an occupation occ as informal if belongs to the top quartile of this share
- Compute the measure at year $t = 2016$

$$\text{FI}_j = \frac{1}{N_j} \sum_i^{N_j} \mathbf{1}\{\text{occ}_i \text{ is informal}\}$$

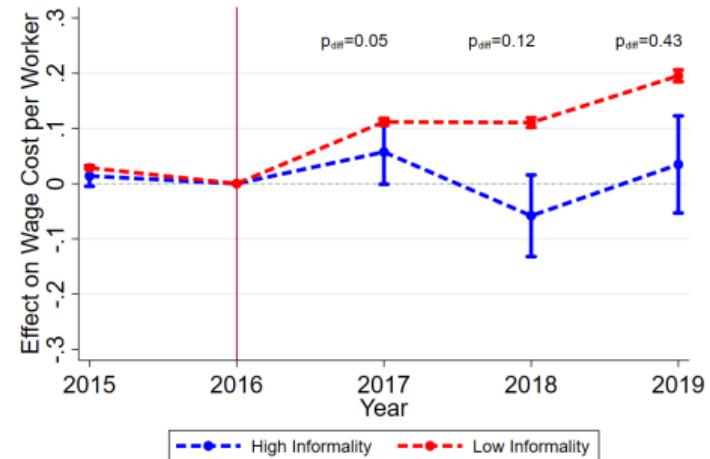
Employment effects and exposure to informal sector

$$\frac{y_{jt} - y_{j2016}}{y_{j2016}} = \alpha_t^0 + \alpha_t^1 FA_j + \beta_t^0 FA_j + \beta_t^1 FI_j + \beta_t FA_j FI_j + \gamma_t X_{jt} + \epsilon_{jt}$$

Employment effects

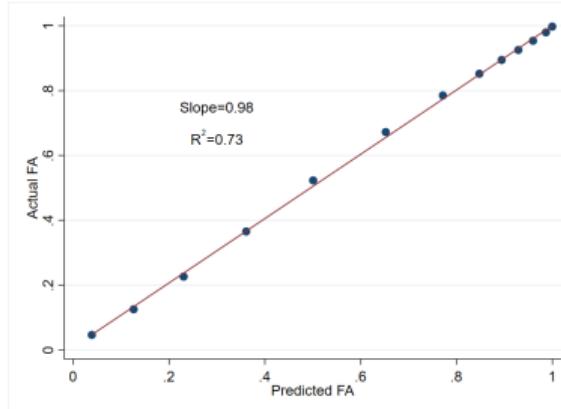


Wage effects



Firm design on balance sheet data

- 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

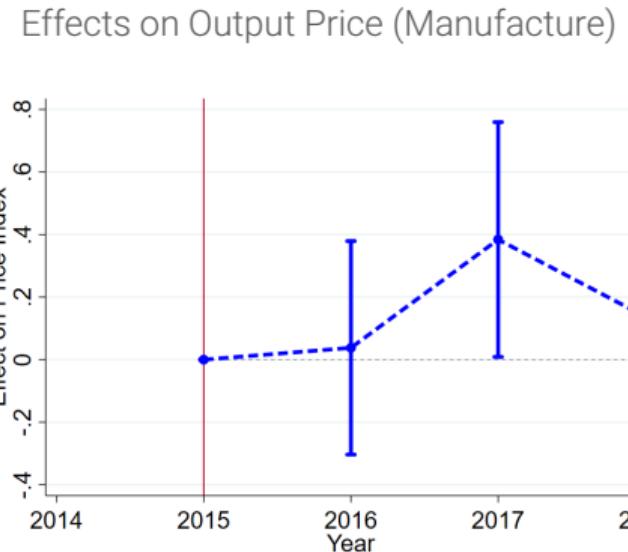
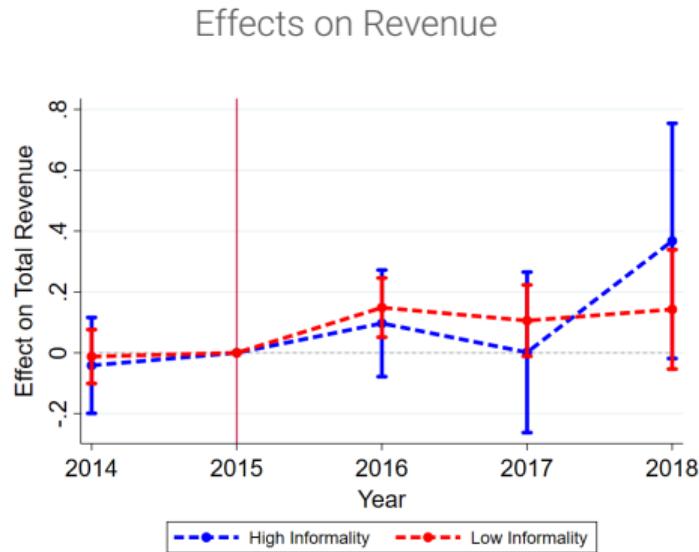


Firms' margins of adjustment (excl. closures)

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

Revenues and the informal sector

Compare provinces with high vs low presence of informality



▶ Price changes using HH survey

Incidence of the MW

	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 ($\Delta MisclItems$)	0.0453	0.0442
Incidence on consumers ($\Delta Rev - \Delta Mat - \Delta MisclItems$)	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

Empirical Strategy: Worker Approach

- Construct 15 small earnings bins.
- Run model separately for pre-treatment period $t = 2016$ and post-treatment $t = 2017$ *:

$$y_{i,t} - y_{i,t-1} = \sum_{b=1}^{15} \gamma_{t,b} \mathbf{1}\{earnings_{i,t-1} \in bin_b\} + \beta X_{i,t-1} + \epsilon_{i,t} \quad (2)$$

- **Identification assumption:** $\gamma_{2016,b} = \gamma_{2017,b}$, $b \in \{1, \dots, 15\}$ in the absence of MW hike.
Macroeconomic effects are constant over time.
- Upper tail shouldn't be affected so $\gamma_{2016,15} = \gamma_{2017,15}$ is a falsification test.

Empirical Strategy: Worker Approach

- Re-parametrize such that we obtain $\gamma_{2017,b}$ relative to $\gamma_{2016,b}$ for every bin b .
- Formally, the baseline model is:

$$y_{i,t} - y_{i,t-1} = \sum_{b=1}^{15} \gamma_{2016,b} \mathbf{1}\{earnings_{i,t-1} \in bin_b\} + \\ \sum_{b=1}^{15} \delta_b \mathbf{1}\{earnings_{i,t-1} \in bin_b\} \times POST_t + \beta X_{i,t-1} + \epsilon_{i,t} \quad (3)$$

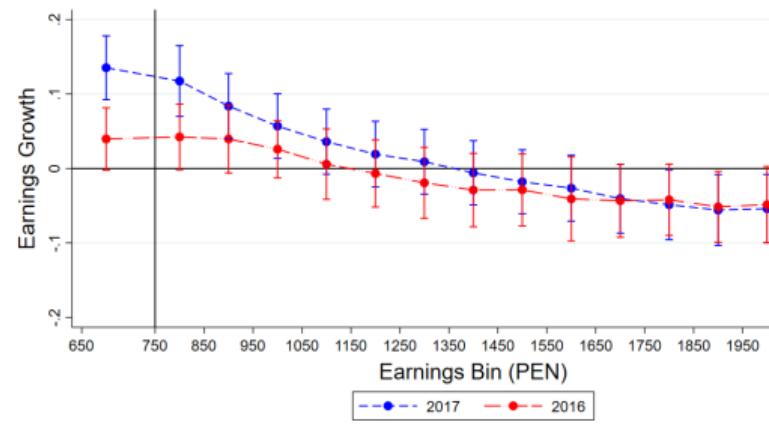
where $\delta_b := \gamma_{2017,b} - \gamma_{2016,b}$ and $POST_t = \mathbf{1}\{Year_t = 2017\}$.

- Under ID assumption, δ_b captures the causal effect of MW on bin b .

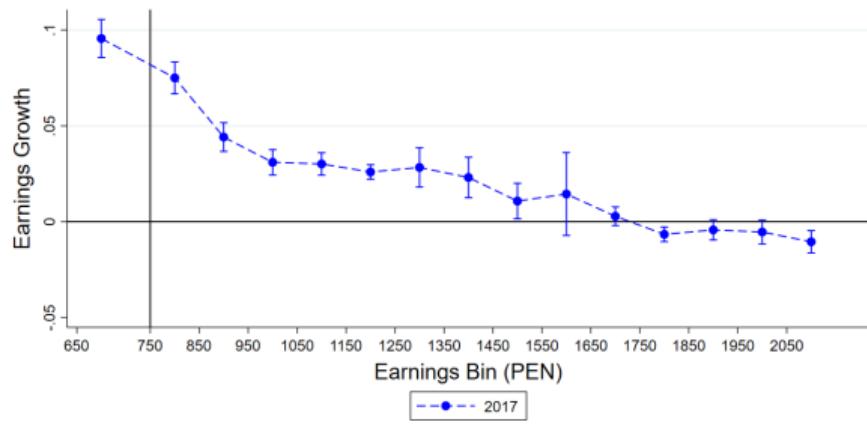
► Who are the most affected workers?

Worker wage effects

Wage Changes



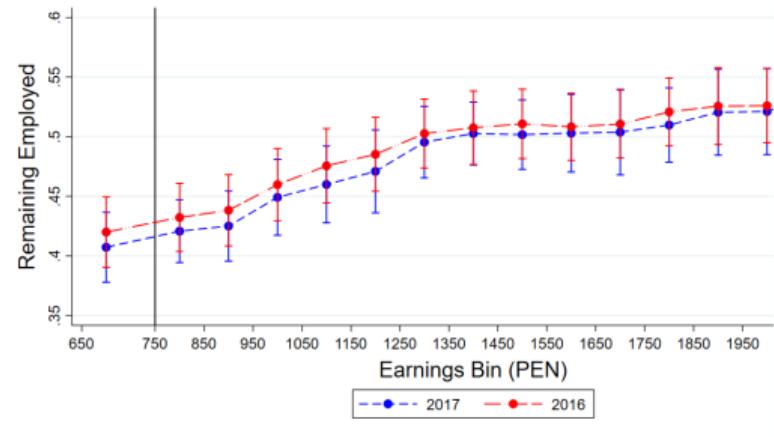
Wage Effects



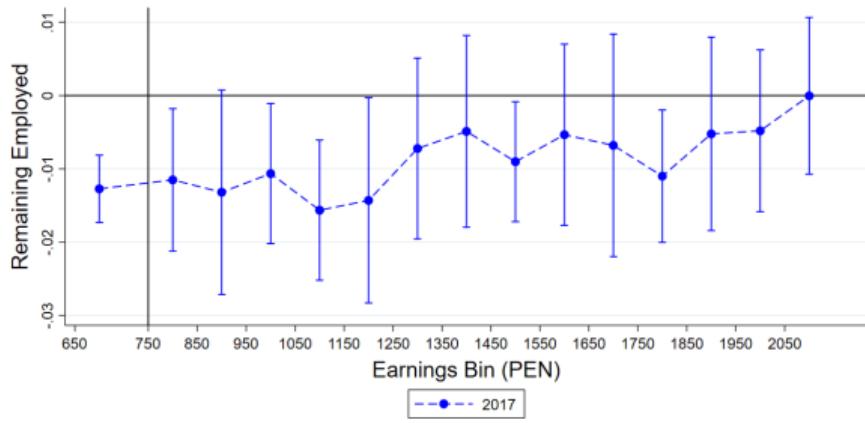
► Do wage effects come from reallocation?

Worker employment effects

Employment Changes



Employment Effects

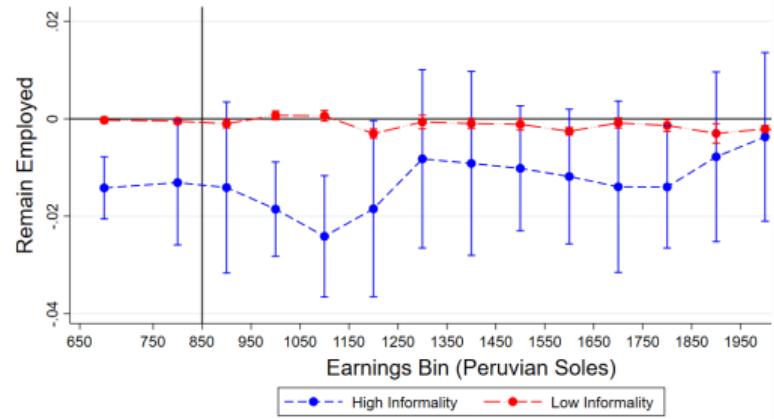


► Do wage effects come from reallocation?

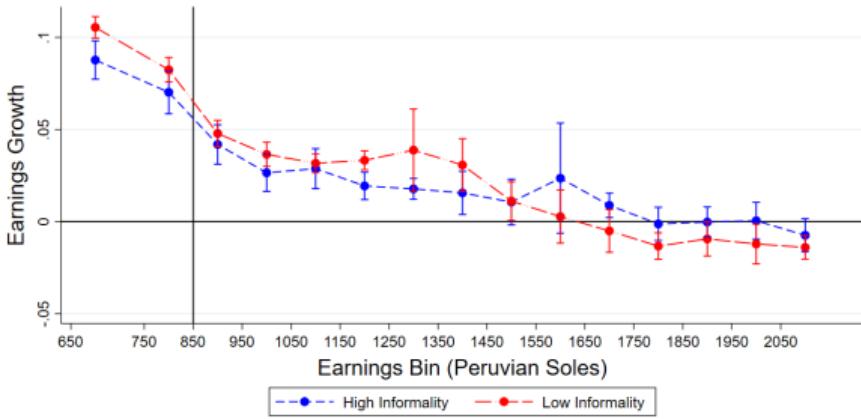
Employment and exposure to informal sector

Compare workers who were at occupations highly exposed to informality vs others

Employment Effects



Wage Effects



- ▶ Do they switch to informal labor contracts or exit formal sector?

Roadmap

Model

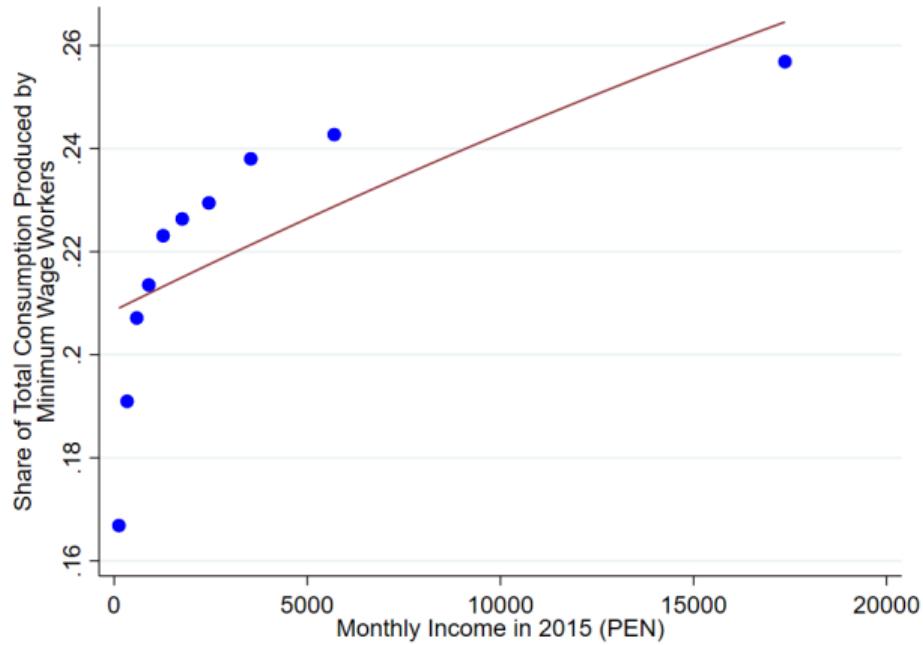
Data

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A Cost-Benefit Analysis

Concluding Remarks

Who pays for the MW?



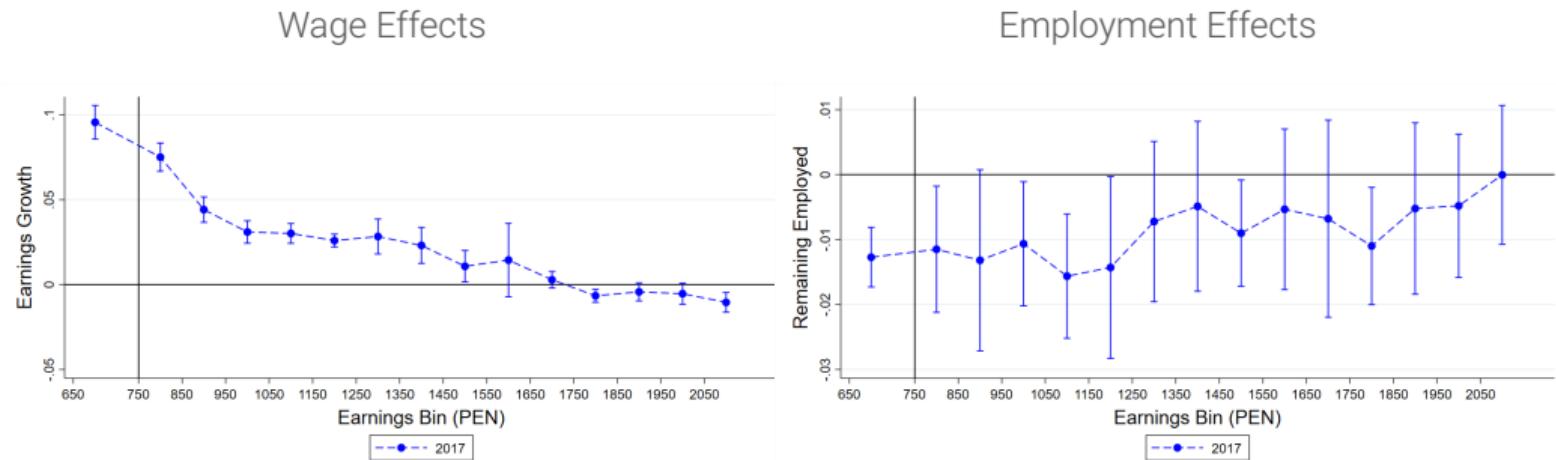
▶ Construction of this graph

Who gains from the MW?

The change in expected income at bin b is given by

$$\frac{\Delta I_b}{w_b} := \frac{\Delta w_b}{w_b} + \frac{(w_b^{\inf} - w_b)}{w_b} \Delta \mathbf{P}_b(\text{leave}) \quad (4)$$

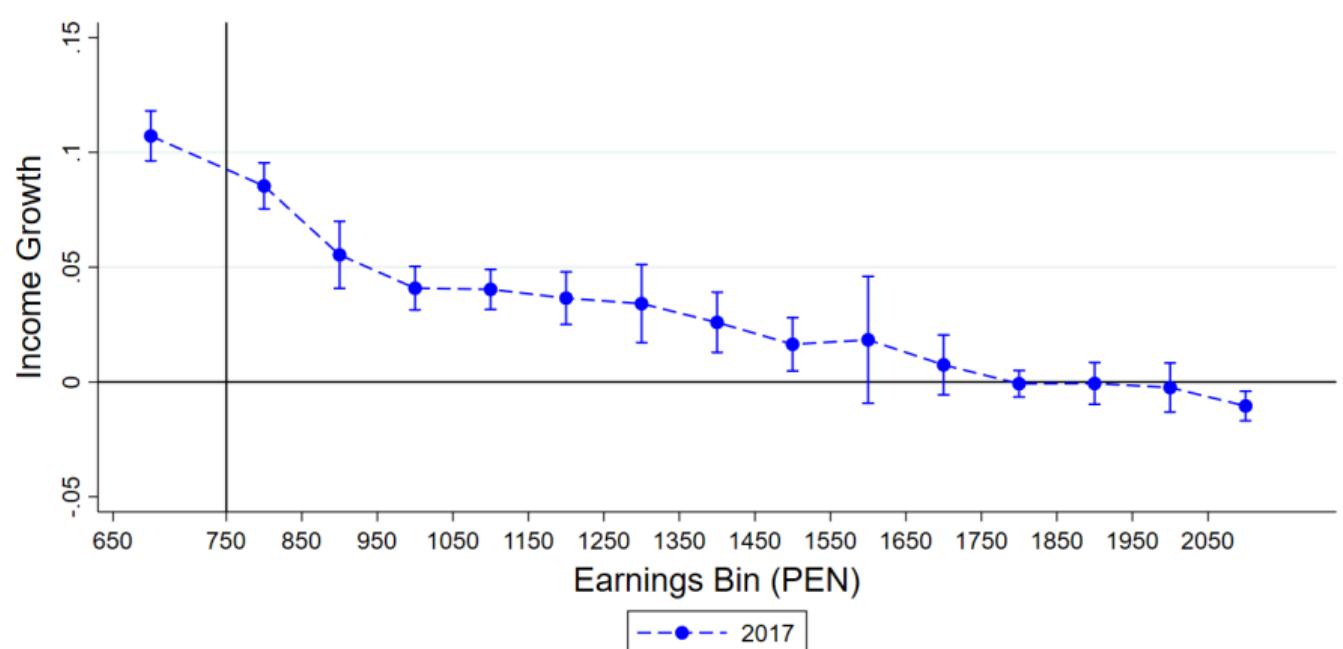
where $\frac{\Delta w_b}{w_b}$ and $\Delta \mathbf{P}_b(\text{leave})$ are obtained from worker design.



Who gains from the MW?

The obtained results are

Expected income changes of formal workers



A cost-benefit analysis of the MW

Under the following conditions

1. No income effect in the informal sector ▶ Income in informal sector

2. No substitution effects away from products that use MW workers ▶ Substitution Effects

then the reduced form estimates are sufficient to evaluate the changes in purchasing power.

A back-of-the-envelope calculation: individuals

I compute the change in purchasing power for a worker earning in bin b as

$$\underbrace{\frac{\Delta I_b}{w_b}}_{\text{Effect on exp income (a)}} - \underbrace{\frac{\Delta p_{MW}}{p_{MW,0}}}_{\text{Effect on price of MW products (c)}} \underbrace{s_{MW,b}^e E_b}_{\text{Per capita expense in MW products (d)}}$$

Baseline wage (b)

- (a) : I use the estimates from the bin-approach on indiv. income.
- (b) : I use the mean dependent variable from the bin-approach on indiv. income.
- (c) : I use estimates from the firm design (on labor cost + passthrough, and manufacture prices), and hh design (on food prices).
- (d) : I compute the mean share of expenses in MW products $s_{MW,b}^e$ and hh expenses E_b among individuals at bin b .

A back-of-the-envelope calculation: individuals

Baseline bin $t - 1$	[650, 750)	[750, 850)	[950, 1050)	[1050, 1150)	[1150, 2050)	[2050, max)
Panel A. Income Change						
Mean MW formal wage (\bar{w}_b)	746	818	903	1,001	1,479	2,630
Effect exp. income ($\Delta I_b / w_b$)	0.11	0.08	0.05	0.04	0.02	0.00
$\Delta I_b / w_b \times \bar{w}_b$	82.06	65.44	45.15	40.04	29.58	0.00
Panel B. Expenses Change						
Share cons by MW workers (s_{MW}^e)	0.23	0.23	0.24	0.24	0.24	0.26
Mean per cap. expenses (E_b)	590	643	700	613	792	1379
ΔE_b (labor cost): $0.98 \times 0.123 \times s_{MW}^e E_b$	16.35	17.82	20.25	17.73	22.91	43.22
ΔE_b (manuf. price): $0.40 \times s_{MW}^e E_b$	54.28	59.15	67.20	58.85	76.03	143.42
ΔE_b (food price): $0.08 \times s_{MW}^e E_b$	10.85	11.83	13.44	11.77	15.21	28.68

A back-of-the-envelope calculation: households

I compute the change in purchasing power for a household at decile d as

$$\underbrace{\frac{\Delta I_{MW}}{I_{MW}}}_{\text{Effect on indiv. income (a)}} - \underbrace{\frac{\Delta p_{MW}}{p_{MW,0}}}_{\text{Effect on price of MW products (c)}} \underbrace{s_{MW,d}^e E_d}_{\text{Expense in MW products (d)}}$$

Formal emp. low wage income (b)

where I compute

$$\frac{\Delta I_{MW}}{I_{MW}} = \frac{1}{5} \sum_{b=1}^5 \Delta I_b / w_b$$

A back-of-the-envelope calculation: households

HH income decile	1	2	3	4	5	6	7	8	9	10
Panel A. Income Change										
Share formal emp	0.01	0.03	0.11	0.19	0.26	0.34	0.46	0.60	0.72	0.82
Share MW formal emp (s_{MW}^l)	0.00	0.02	0.05	0.1	0.13	0.15	0.19	0.21	0.22	0.15
Mean MW formal income (I_{MW}^l)	1	7	40	128	242	316	462	570	705	586
$\frac{\Delta I_{MW}}{I_{MW}} \times I_{MW}^l$	0.00	0.42	2.40	7.68	14.52	18.96	27.72	34.20	42.30	35.16
Panel B. Expenses Change										
Share cons by MW workers (s_{MW}^e)	0.16	0.19	0.2	0.21	0.22	0.22	0.23	0.23	0.24	0.27
Mean expenses (E)	639	732	991	1,206	1,485	1,786	2,069	2,466	2,964	4,801
ΔE (labor cost): $0.98 \times 0.123 \times s_{MW}^e E$	12.32	16.76	23.89	30.52	39.38	47.36	57.36	68.36	85.74	156.25
ΔE (manuf. price): $0.40 \times s_{MW}^e E$	40.90	55.63	79.28	101.3	130.7	157.2	190.3	226.8	284.5	518.5
ΔE (food price): $0.08 \times s_{MW}^e E$	8.18	11.13	15.85	20.26	26.14	31.43	38.07	45.37	56.91	103.7

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Conclusions

1. Informal sector shapes the response to the MW through market power
2. MW hike induced workers' exit from the formal sector but on average they are expected to increase their income
3. Surviving firms pass-through these costs onto consumers, and richer households are the ones who bear most of it
4. If poorer households were composed by formal workers they would receive most of these gains, but that's not the case
5. Taken together, these results suggest that low-wage formal workers are better off, but poor households are not

Thank you!

Who are the most affected firms?

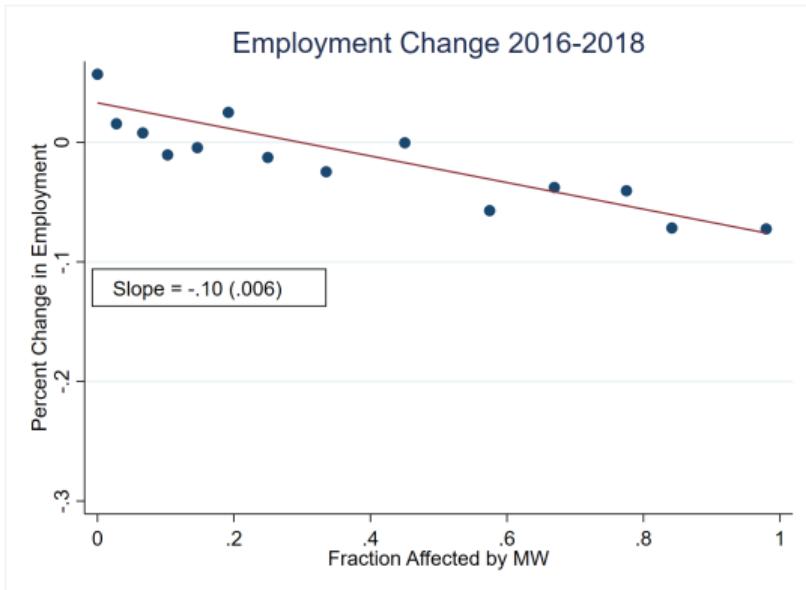
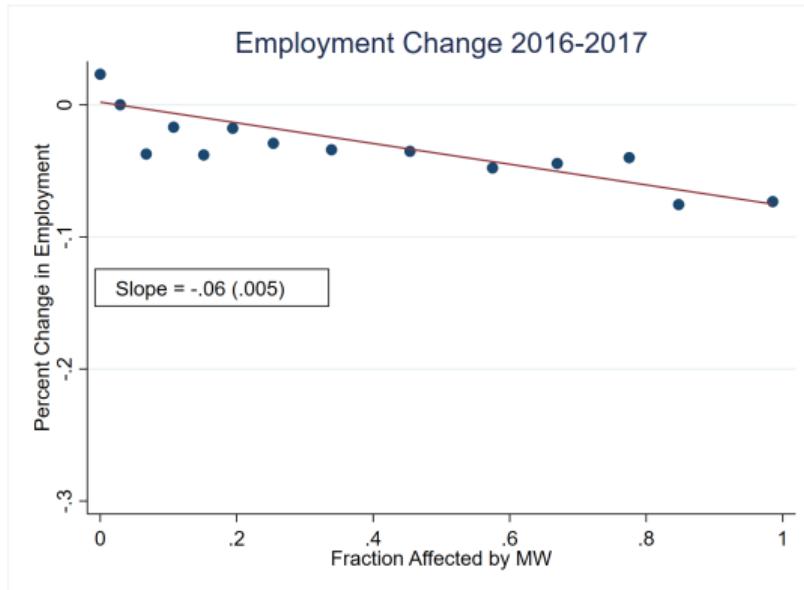
	Quartiles of FA_j in 2016			
	Q1	Q2	Q3	Q4
Lima	0.47	0.41	0.38	0.39
Avg Wage (PEN)	2480.81	1693.09	1170.64	888.55
Number of Workers	129.60	157.78	127.36	16.20
Firm Age	16.03	14.44	11.53	9.39
Manufacture	0.18	0.21	0.19	0.22
Commerce	0.35	0.31	0.30	0.31
Services	0.04	0.06	0.12	0.15
Observations	5,875	5,908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

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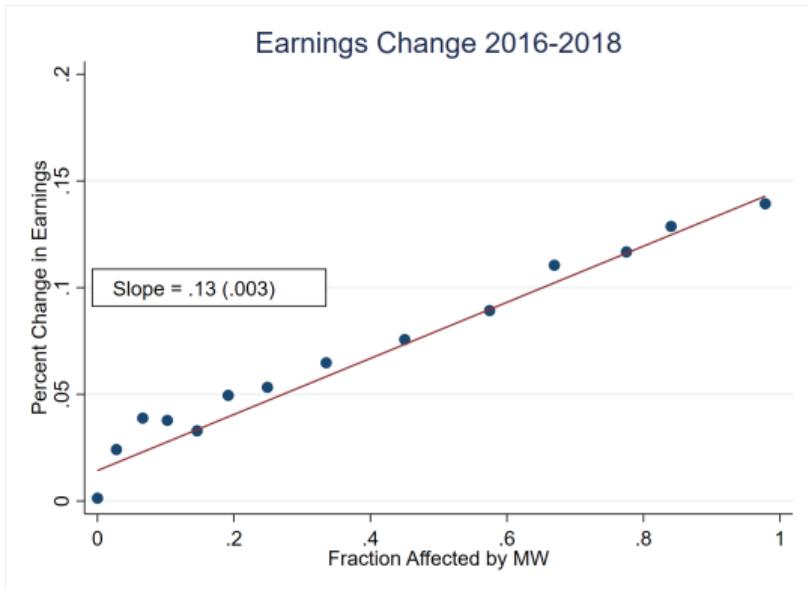
Who are the MW workers?

	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

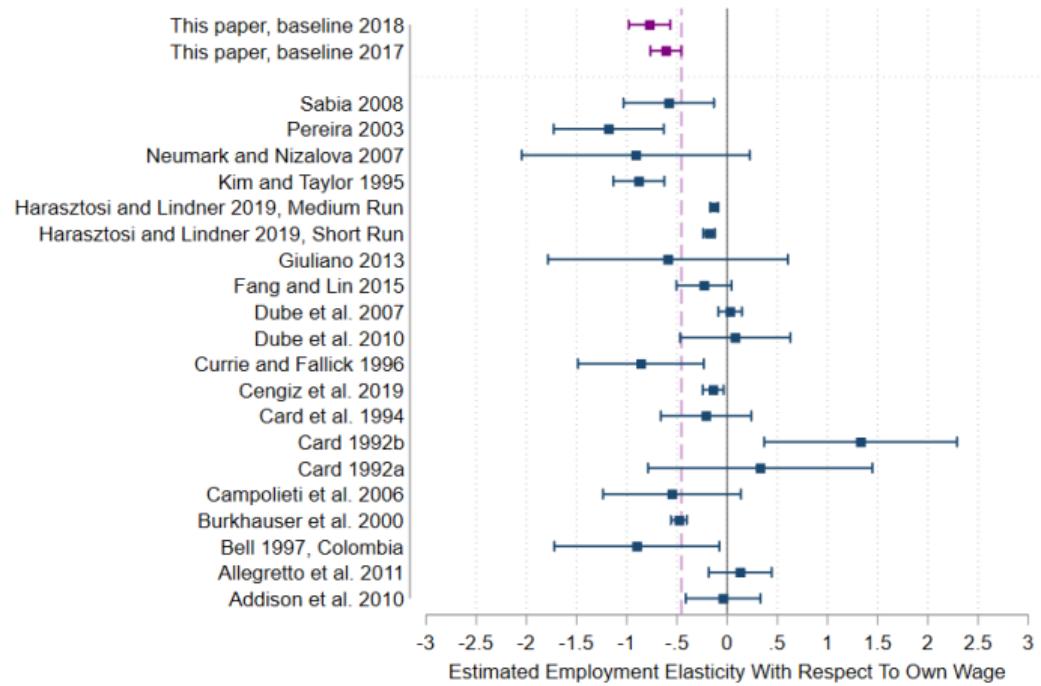
Is the relationship approx. linear?



Is the relationship approx. linear?

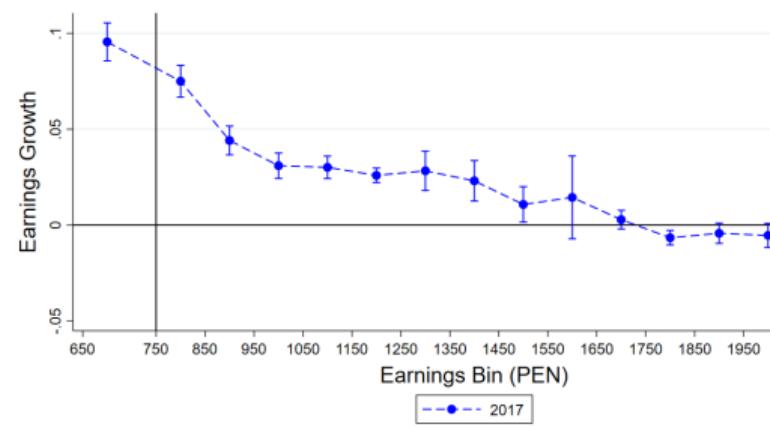


Own-wage elasticity in recent literature

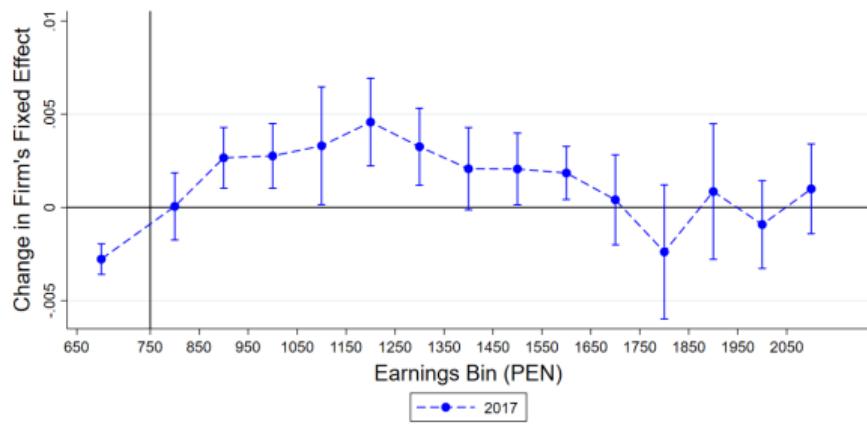


Minimal gains from reallocation

Wage Effects

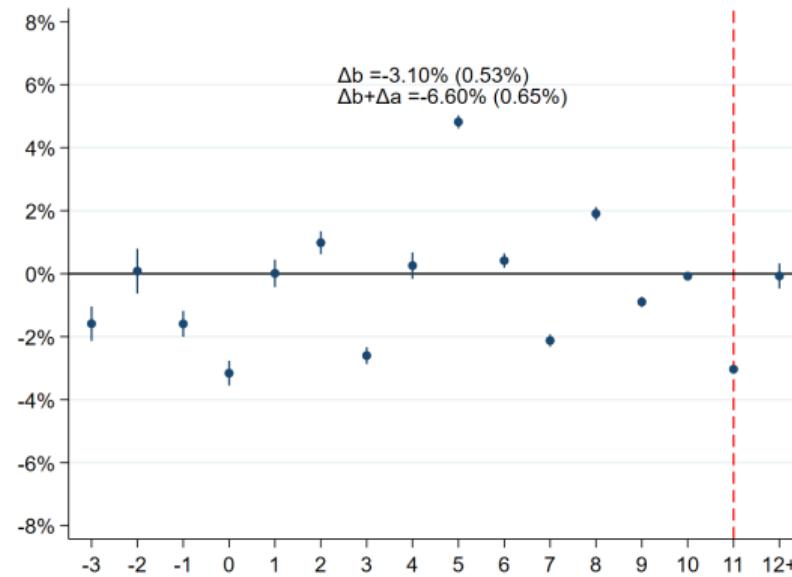


Reallocation Effects



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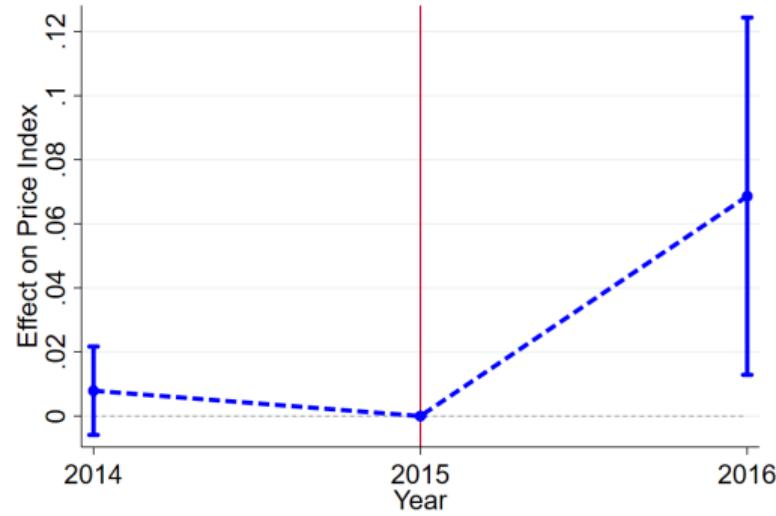
Size of the formal sector



Employment Changes: High vs low premia provinces

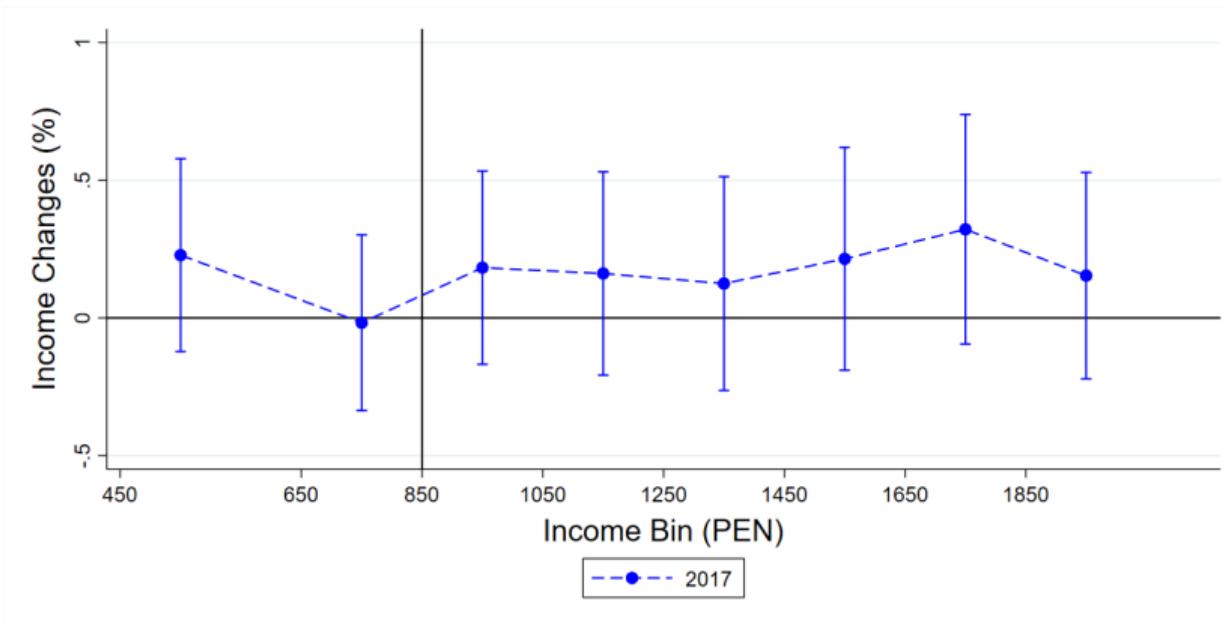
Evidence on Laspeyres index

Change in food price index



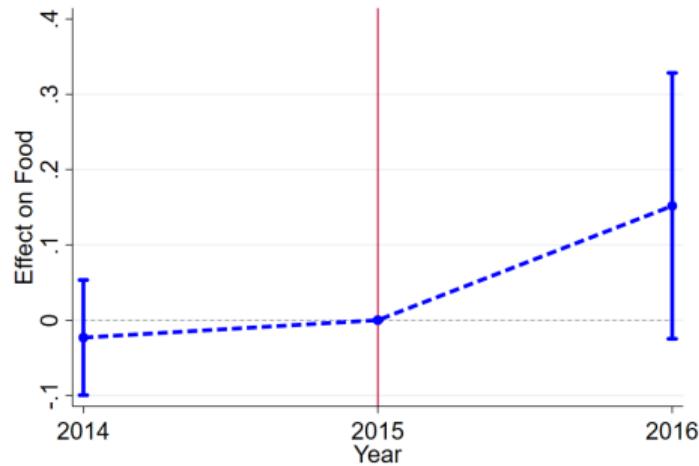
Income in the Informal Sector

Changes in Income for Informal Workers

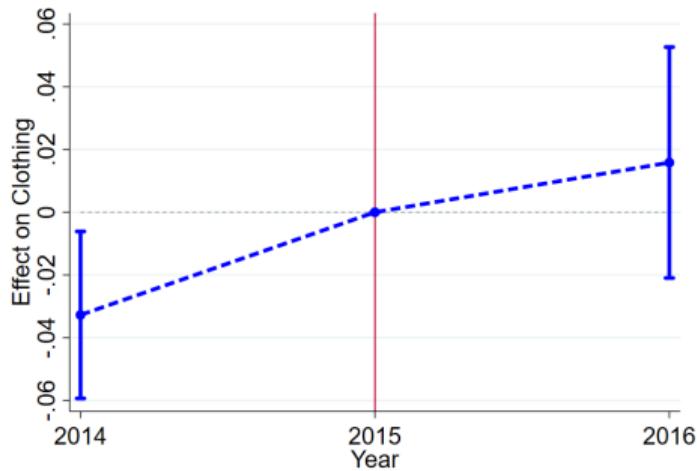


Changes in Expense Shares

Food



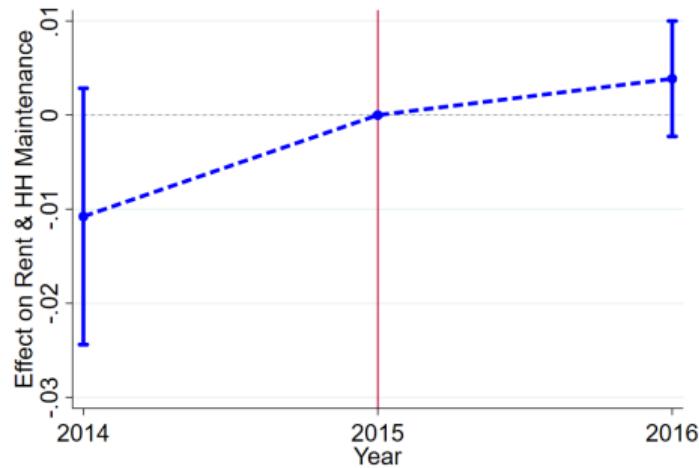
Clothing



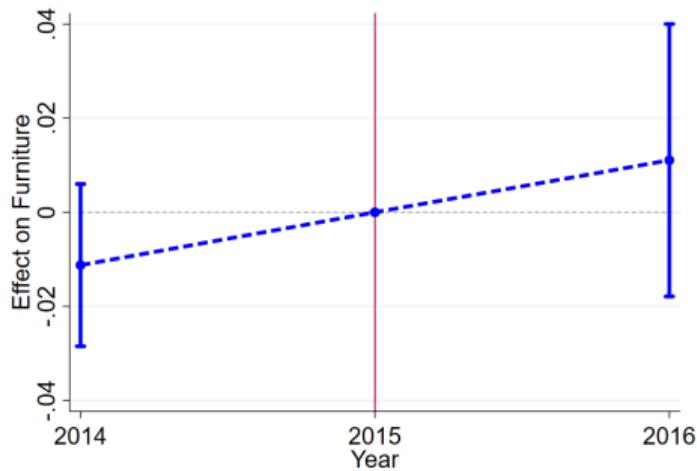
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Changes in Expense Shares

HH Maintenance



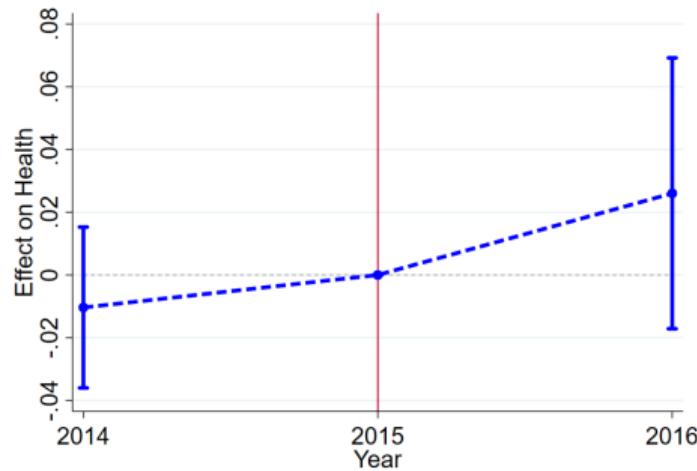
Furniture



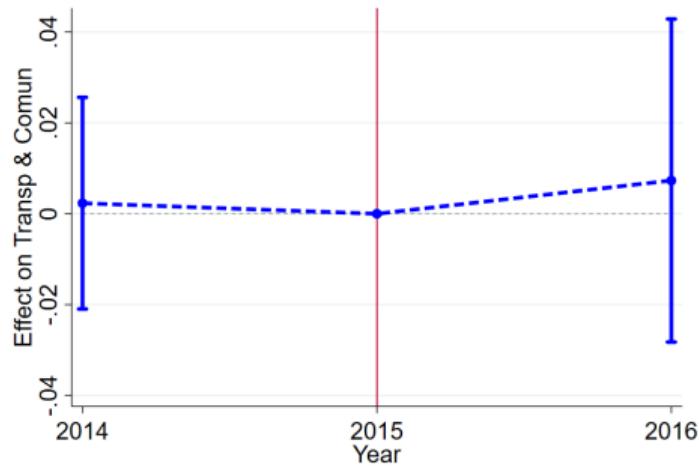
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Changes in Expense Shares

Health



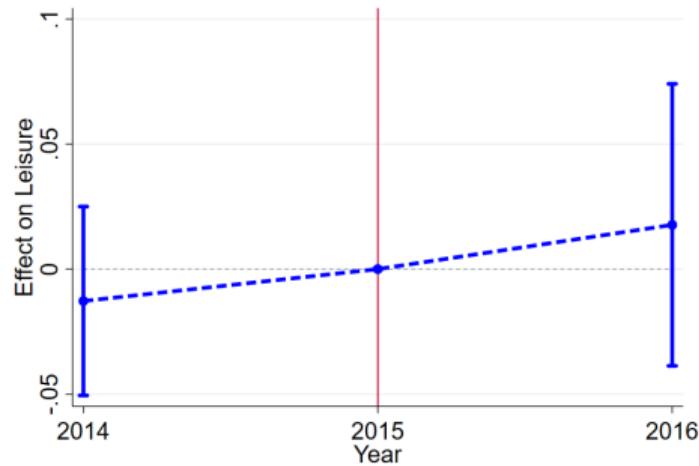
Transportation & Communication



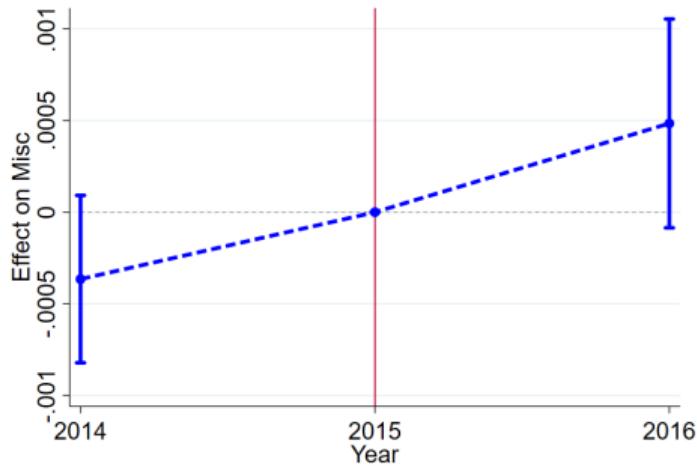
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Changes in Expense Shares

Leisure



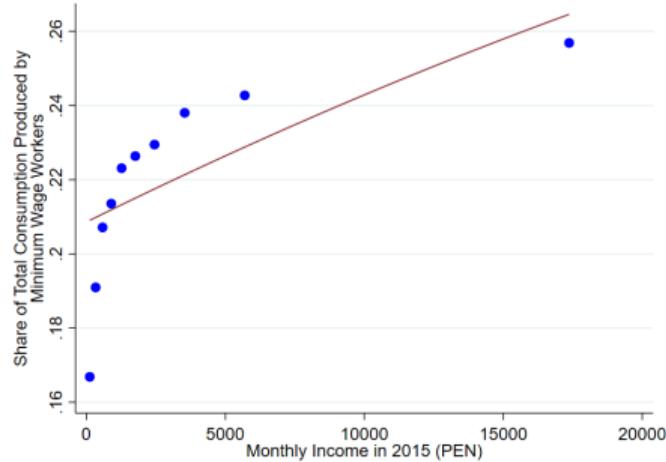
Miscellaneous Expenses



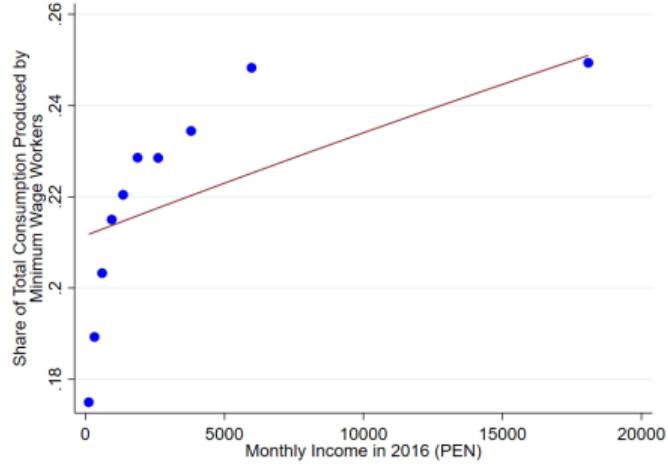
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MW Consumption Post-Policy

MW Consumption Pre



MW Consumption Post



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Imputation of Earnings

To address censoring at the 95th percentile of each year, I impute upper tail earnings following CCK(2016).

- I create 10-year age cells (20 to 29, 30 to 39, ..., 50 to 59), and 6 education cells (missing, no qualifications, secondary, some post sec, univ graduate, post graduate).
- I construct the mean log-earnings of individual i in all other periods, and for all their coworkers. For singleton workers or singleton firms I use the sample mean of gender $g(i)$.

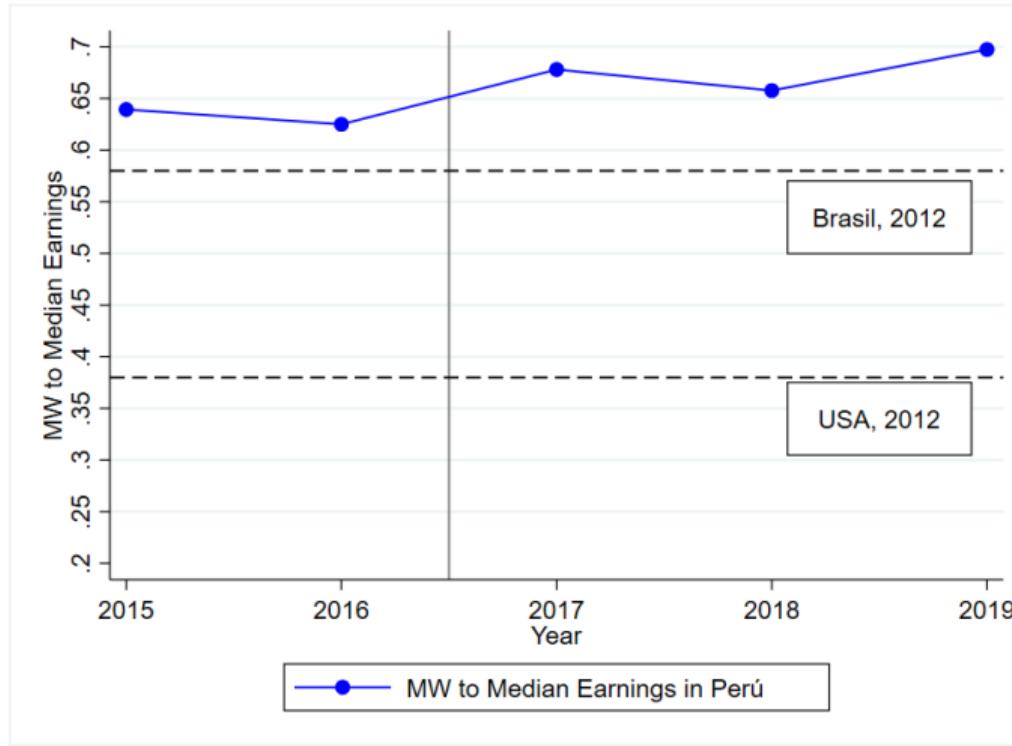
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Imputation of Earnings

- I fit a series of Tobit models separately by year, gender, educ, and age range cells that include the following variables: age, mean log earnings, in other years, fraction of censored earnings in other years, number of full-time employees of gender g and its square, dummy for 11 or more employees, fraction of univ graduates at the firm, mean log wage co-workers and fraction of coworkers with censored earnings, dummy for singleton individuals, and a dummy for employees of 1-worker firms.
- If $y \sim N(X'\beta, \sigma)$ and censoring is such that $y \geq c$ is censored. Let $k = \Phi[(c - X'\beta)/\sigma]$, where $\Phi(\cdot)$ is the standard normal CDF. Let $u \sim U[0, 1]$, then

$$y^u = X'\beta + \sigma\Phi^{-1}[k + u(1 - k)]$$

Increase in the Minimum Wage in Perú



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Who pays for the MW?

- 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

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