

Minimum Wages and Informality

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Introduction

Research question: what are the effects of minimum wage hikes in middle-income countries with a large informal sector?

1. Wage effects

- ▶ In the formal sector.
- ▶ In the informal sector, for employees working in formal vs. informal firms.

2. Displacement effects

- ▶ From formal sector to informal sector.
- ▶ From employment to non-employment.

We study this question in the context of Brazil.

The Brazilian context

Brazil is an ideal setting to study these questions:

1. Persistence of high wage inequality.
2. Large informal sector:
 - ▶ 46% of private workforce with no formal contract in 1999.
 - ▶ formal vs. informal employment
 - ▶ overall employment structure
 - ▶ emp. status
3. Large nationwide minimum wage increases in the 2000s.
 - ▶ Evolution of the Kaitz index in the formal sector
 - ▶ Macroeconomic context
4. Rich micro-data with information on formality status:
 - ▶ Combination of annual labor force surveys (PNAD), establishment surveys (ECINF) and census data to study informality.
 - ▶ Two margins of informality:
 - Informal employees in formal firms (intensive margin).
 - Informal employees in informal firms (extensive margin).
 - ▶ series

Main results

Using difference-in-differences strategies, we show the 2000s minimum wage hikes led to:

1. Large wage increases in formal sector where compliance is almost perfect.
2. Wage increases in the informal sector:
 - ▶ 88% pass-through to wages of informal employees working in formal firms (i.e. intensive margin).
 - ▶ 59% pass-through to wages of informal employees working in informal firms (i.e. extensive margin).
3. Small formal-to-informal reallocation elasticity with respect to the formal wage (-0.28).
4. Reallocation to informal employees driven by intensive margin of informality; no reallocation to extensive margin.

Contributions

1. Build long-run series on earnings distribution in the margins of informality
→ Opens possibility to use these series to look at effect of trade or other policies on informal sector.
2. Quantify wage increases in the informal sector (“lighthouse effects”) Fajnzylber (2001), Neri et al. (2001, 2006), Lemos (2009):
→ Reveals how the labor market functions in low- and middle-income countries. Ulyssea (2018, 2020), Haanwinckel and Soares (2020), Parente (2025), Jales (2018)
→ Consistent with evidence across age groups & within multi-establishment firms. Hazell et al. (2022), Giupponi and Machin (2024), Hjort et al. (2025)
3. Quantify role of min. wage on formalization:
→ Propose method to compute “own-wage reallocation elasticity” to benchmark effect of mw in low- and middle-income countries.
→ Role of mw vs. other domestic policies, trade & other economic forces. Dix-Carneiro et al. (2025)

Roadmap

1. **The bite of the minimum wage among informal workers**
2. Wage effects of the minimum wage
3. Minimum wage effects on the allocation of employment
4. Interpretation and implications
5. Conclusion

Full compliance with min. wage among formal employees

→ Large nationwide min. wage increases: min. wage binding at p6 over 1995-1999, at p13 in 2009.

► pnad vs. rais

Minimum wage also binding among informal employees

- Minimum wage also binding for informal employees ▶ gross vs. net pay
- Imperfect compliance among informal employees.
- Informal and formal sectors are integrated (Meghir, Narita and Robin (2015)).
- Built new long-run series for informal employees along intensive vs. extensive margins.

Long-run series on two margins of informality

Two challenges:

1. Info on margin of informality missing in PNAD pre-2011.
2. Info reported with missing values in PNAD post-2011 (between 25-28% over 2011-2015).

We build new long-run (1995-2015), homogenized series:

1. Start with info on margin of informality in PNAD 2011-2015 and impute these margins for PNAD 1995-2015.
2. Assign informal employees in construction, domestic services and agriculture to extensive margin of informality [▶ LM Xs](#) [▶ demog Xs](#) and impute the two margins for PNAD 1995-2015
3. Show the obtained patterns match the observed PNAD distributions from 2011-2015 [▶ here](#) and ECINF [▶ here](#)

→ We use these series to estimate pass-through of min. wage increases across two margins of informality.

Minimum wage binding on intensive margin

- Huge spike at min. wage, that increases as min. wage increases.
- Almost full-compliance with the policy.

▸ shares below mw

▸ both margins together

Minimum wage also binding on extensive margin

- Non-compliance concentrated on extensive margin.
- Almost no spike at the minimum wage among self-employed

▶ self-employed

Bite of the min. wage for incumbent informal employees

Q. What does the shifting of the spike at min. wage reflects?
Increase in wages of incumbent informal workers, or
changes in composition of workers?

	(1)	(2)	(3)	(4)
	Formal	Informal-Intensive	Informal-Extensive	Self-Employed
Non-employment	4.3	5.7	4.8	2.8
Strictly below the minimum wage	5.8	13.7	21.6	23.0
Around the minimum wage or above	89.9	80.6	73.6	74.3

→ 81% (74%) of intensive (extensive)-margin informal workers who were at or above the min. wage in year t are at or above the min. wage in year $t + 1$.

→ Shifting at spike cannot be solely explained by changes in the composition of workers.

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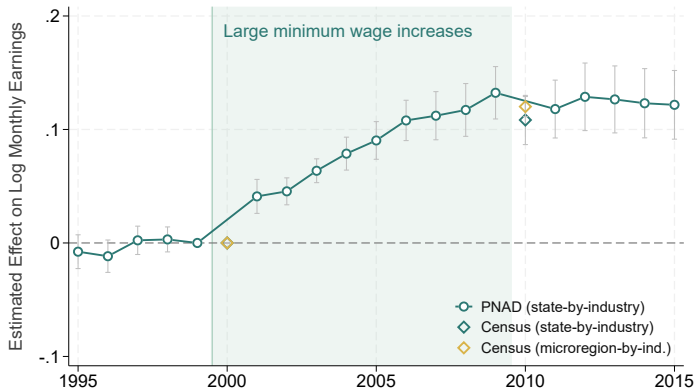
Quantifying wage effect: empirical strategy

$$\text{Monthly Earnings}_{it} = a + \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \beta_{\tau}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \\ + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$

- ▶ Monthly Earnings_{it}: log monthly earnings for individual i , industry j , state s and year t .
 - ▶ Share Affected_{s(i)j(i)}: share of private sector workers paid below 2009 mw at state-by-industry level in 1999. Defined among formal employees ▶ distrib. treat. var ▶ stded, informal ones ▶ distrib. treat. var and self-employed ▶ distrib. treat. var separately.
 - ▶ β_k measures effect of reform k years after base year 1999.
 - ▶ $\mathbb{X}_{it}$: individual-level controls (gender, race, exp., educ., (+²)) and state-level (log gdp per capita by state (+²)).
 - ▶ $\rho_{s(i)j(i)}$ and $\mu_{j(i)t}$: state-by-industry and year-by-industry FEs.
- **Identifying assumption:** absent 2000-2009 reforms, growth in earnings in strongly and weakly treated state-industries cells would have evolved similarly.

Quantifying wage effect in formal sector: DiD results

$$Y_{it} = a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$



- In 2009: $\sim +13.2$ log pts in strongly treated state-industries.
- Robust to other data sources (Census) and designs (state and microregion-by-industry) & to other definitions of the treatment and control groups [▶ here](#)

Quantifying wage effect for formal employees: robustness

$$Y_{it} = a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$

	Baseline	Robustness checks		
	(1)	(2)	(3)	(4)
<i>Strongly treated state × industry × 2009</i>				
Formal employees	0.132*** (0.012) 7.309 705,536	0.134*** (0.011) 7.309 705,536	0.129*** (0.013) 7.309 705,536	0.135*** (0.012) 7.309 705,536
Individual-level controls	X		X	X
State GDP controls	X	X	X	X
State × industry FEs	X	X	X	X
Industry × year FEs	X	X	X	X
Bolsa Familia expenditures			X	
Nb of inspectors 2002 × year FEs				X

→ Avg wage ↗ of 13% in strongly vs. weakly treated cells in 2009.

→ Robust to potential confounders such as ↗ skilled workforce, implementation of Bolsa Família & enforcement of the labor law.

Quantifying wage effect in formal sector by wage bins

$$\mathbb{1}_{it} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$

Outcome = indicator for wage falling within a specific wage bin.

→ Effects concentrated at the bottom, starting in 2001. ▶ as in Census

→ Higher bite of mw pre-reform associated w/ ↗ in proba of wages at exactly 2009 mw in 2009 (↗ by 14 pts).

→ Robustness to mean reversion ▶ treat. var. in 1995 ▶ 1996 ▶ 1997 ▶ 1998

Quantifying wage effect for informal employees (intensive)

$$Y_{it} = a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$



- Treat. var. now defined among informal employees only.
- In 2009: $\sim +11.6$ log pts in strongly treated state-industries.
- Implied passthrough estimate of 88% for an equivalent change in the share of affected workers (11.6 vs. 13.2 log pts).
- Robustness to other data sources (Census), designs, and measure of margin of informality ▶ informality measure

Quantifying wage effects in intensive margin by wage bins

$$\mathbb{1}_{it} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$

Outcome = indicator for wage falling within a specific wage bin.

- Effects concentrated at the bottom of the distribution ▶ as in Census
- Intensive margin of informality reacts to min. wage as formal sector.

Quantifying wage effect for informal employees: robustness

$$Y_{it} = a + \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \beta_{\tau}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$

	Baseline	Robustness checks		
	(1)	(2)	(3)	(4)
<i>Strongly treated state × industry × 2009</i>				
Informal employees in formal firms	0.116*** (0.015) 7.014 145,132	0.132*** (0.018) 7.014 145,132	0.107*** (0.018) 7.014 145,132	0.130*** (0.017) 7.014 145,132
Individual-level controls	X		X	X
State GDP controls	X	X	X	X
State × industry FEs	X	X	X	X
Industry × year FEs	X	X	X	X
Bolsa Familia expenditures			X	
Nb of inspectors 2002 × year FEs				X

→ Robust to potential confounders such as ↗ skilled workforce, implementation of Bolsa Família & enforcement of the labor law.

Quantifying wage effect for informal employees (extensive)

$$Y_{it} = a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$



- Wage effects smaller on extensive margin than on intensive.
- They take longer to materialize ▶ robustness ▶ measure of informality
- Implied passthrough of 59% for an equiv. change in sh. affected workers (19 vs. 22 ppt) (i.e. wage effect of 7.8 vs. 13.2 log pts).
- Wage effects concentrated right below the min. wage

▶ by wage bin, PNAD 2009

▶ by wage bin, Census 2010

Quantifying wage effect for self-employed

$$Y_{it} = a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$



→ Wage effects are zero at state-by-industry level, i.e. 0% passthrough.

→ Zero wage effects along the wage distribution.

▶ by wage bin, PNAD 2009

▶ by wage bin, Census 2010

→ Robust to potential confounders.

▶ table

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Empirical strategies

We assess reallocation of employment away from formal sector with:

1. **A bunching difference-in-differences design**

→ to examine changes in the number of formal jobs along the wage distribution.

2. **A linear probability model**

→ to explicitly consider reallocation from the formal sector towards other modes of employment or non-employment.

→ to compute own-wage reallocation elasticity, i.e. the percent change in formal vs. other employment associated with a given percent increase in the formal wage from the min. wage.

Bunching DiD to study effects on distribution of jobs

$$\frac{E_{sjtk}^f}{E_{sj,1999}^{\text{all}}} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \alpha_{\tau\eta} \text{Share Affected}_{sj} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k=\eta]} + \zeta_{sjk} + \nu_{jtk} + \epsilon_{sjtk}$$

- ▶ $\frac{E_{sjtk}^f}{E_{sj,1999}^{\text{all}}}$: number of workers in wage bin k , state s , industry j , and year t , relative to 1999 employment in that state-by-industry cell $E_{sj,1999}^{\text{all}}$.
 - ▶ $\text{Share Affected}_{sj}$: share affected workers at state-by-industry level in 1999. As for wage effect, we use treatment variable defined among formal employees only. ▶ distribution
 - ▶ $\alpha_{\tau\eta}$: effect τ years after base year 1999 in wage bin η .
 - ▶ ζ_{sjk} and ν_{jtk} : state-by-industry-by wage-bin and year-by-industry-by-wage-bin fixed effects.
- **Identifying assumption:** frequency distribution of wages in less vs. highly exposed cells mirror each other before the period of large min. wage increases.

Missing and excess jobs: definitions

To assess reallocation effects on part of distribution at or below 2009:

- ▶ Missing jobs = $\Delta b = \sum_{\eta=-4}^{\eta=-1} \alpha_{2009,\eta}$
- ▶ Excess min. wage jobs = $\Delta a = \alpha_{2009,0}$

→ Directly affected reallocation is: $\Delta f = \frac{\Delta a + \Delta b}{\bar{b}_{1999}}$

i.e. % change in directly affected formal employment with $\bar{b}_{1999}$: sample avg share ≤ 2009 mw in 1999, averaged across state-by-industry cells.

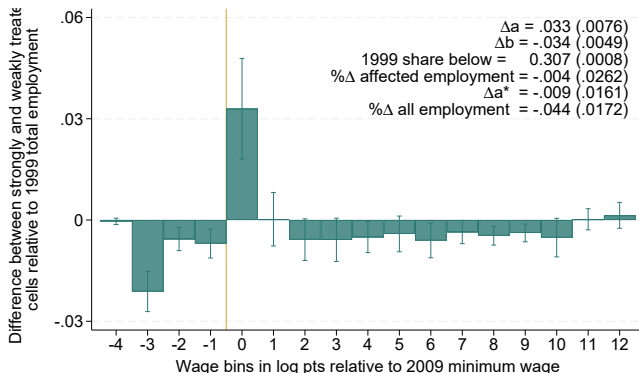
To assess overall reallocation effects:

- ▶ Missing jobs: as above.
- ▶ Excess overall jobs = $\Delta a^* = \sum_{\eta=0}^{\eta=16} \alpha_{2009,\eta}$

→ Overall reallocation is: $\Delta f^{\text{all}} = \sum_{\eta=-4}^{\eta=16} \alpha_{2009,\eta} - \alpha_{1999,\eta}$

Effect on the allocation of formal jobs, 2009

$$\frac{E_{sjtk}^f}{E_{sj,1999}^{\text{all}}} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \alpha_{\tau\eta} \text{Share Affected}_{sj} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k=\eta]} + \zeta_{sjk} + \nu_{jtk} + \epsilon_{sjtk}$$

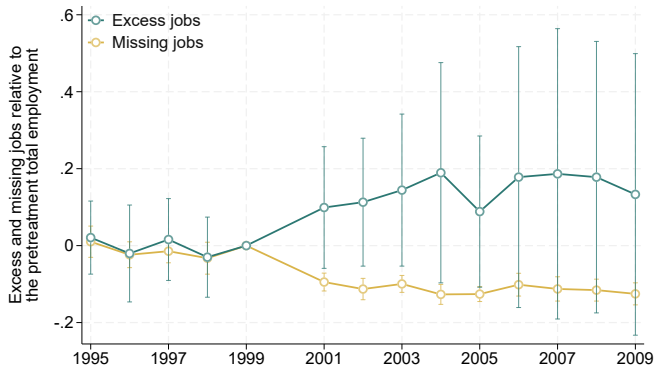


→ Reallocation in the part of the distribution that is very close to min. wage is effectively zero: -0.4%. ▶ Census w/ region × year FEs

→ Effect on reallocation across all wage bins is a ↘ in formal share of -4.4%. ▶ w/o NE ▶ w/o N ▶ w/o SE ▶ w/o S ▶ w/o CW

Effect on missing and excess jobs among formal employees

$$\frac{E_{sjtk}^f}{E_{sj,1999}^{\text{all}}} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \alpha_{\tau\eta} \text{Share Affected}_{sj} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k=\eta]} + \zeta_{sjk} + \nu_{jtk} + \epsilon_{sjtk}$$



→ Excess jobs defined here as all jobs above 2001 min. wage.

→ Flat pre-trend, followed by shift out of the bins below the 2001 min. wage into the bins above the 2001 min. wage.

Linear probability model to study reallocation effects

Reallocation effects towards other modes of employment:

$$\text{Formal employee}_{it} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \beta_{\tau}^{\text{emp}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \\ + a^{\text{emp}} + \mathbb{X}'_{it} \Gamma^{\text{emp}} + \rho_{s(i)j(i)}^{\text{emp}} + \mu_{j(i)t}^{\text{emp}} + \varepsilon_{it}^{\text{emp}}$$

- ▶ $\text{Formal employee}_{it}$ is an indicator for formal employee vs. informal employee, or self-employed.
- ▶ Coefficient of interest is $\beta_{\tau}^{\text{emp}}$ divided by the average formal employment share in 1999.

Reallocation effects towards other modes of employment or non-employment:

- ▶ New outcome is formal employees vs. informal employees or self-employed, unemployed or not in the labor force.
- ▶ Treatment variable now defined at state level.

Quantifying own-wage reallocation elasticities

	Towards other sectors of employment		
	% Δ emp.	% Δ wage	Elast.
Panel A. PNAD, 2009			
	-0.036** (0.015) 1,835,377	0.128*** (0.011) 790,389	-0.282** (0.123) 1,835,584
Panel B. Census, 2010			
	-0.029** (0.013) 9,791,319	0.099*** (0.010) 4,463,483	-0.290* (0.152) 9,791,319
Individual-level controls	X	X	X
State GDP controls	X	X	X
State $\times$ industry FEs	X	X	X
Industry $\times$ year FEs	X	X	X

→ Own-wage reallocation elasticity out of formal employment towards other sectors is -.28 (i.e. high side of a small effect).

→ Sector that gained from reallocation out of formal saw wage gains too.

Quantifying own-wage reallocation elasticities

	Towards other sectors or non-employment		
	% Δ emp.	% Δ wage	Elast.
Panel A. PNAD, 2009			
	-0.038*** (0.014)	0.102*** (0.020)	-0.372** (0.189)
	2,564,493	791,288	2,564,493
Panel B. Census, 2010			
	-0.025 (0.023)	0.088*** (0.017)	-0.283 (0.299)
	14,997,254	4,463,483	14,997,254
Individual-level controls	X	X	X
State GDP controls	X	X	X
State FEs	X	X	X
Year FEs	X	X	X

→ Own-wage reallocation elasticity out of formal employment towards other sectors or non-employment is -.37 in PNAD.

→ Not statistically different from reallocation towards other sectors of employment, i.e. no disemployment effects.

Additional results on allocation of jobs

1. We find zero precisely estimated weekly hours elasticities in 2009 across all sectors of employment [▶ table](#)
 - No pre-trends in any sector of employment
 - [▶ formal](#) [▶ intensive-informal](#) [▶ extensive-informal](#) [▶ self-emp.](#)
 - Results obtained in PNAD consistent with Engbom, Moser (2022) using contracted hours in RAIS.
2. Formal employment seems to have shifted towards intensive-informal employment [▶ table](#)
 - No clear effect on extensive margin of informality.
 - Seems to generate declines in self-employment.

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How can we interpret these small reallocation elasticities?

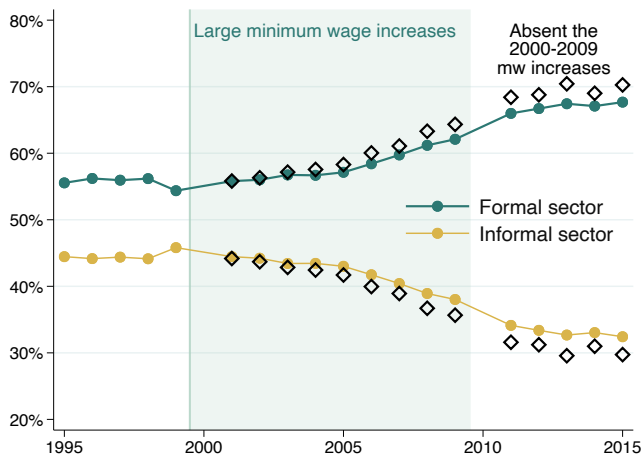
This might be bc mw nearly universally applied in formal firms.

How can we explain compliance with mw outside of formal sector?

1. High penalties associated with violating labor law.
 - Up to 7.5 (11) times the monthly min. wage in small (large) firms in 1999 [▶ formula](#)
 - > than penalty associated with evading social security contributions [▶ SSCs](#) [▶ incidence](#)
2. Fairness considerations within firms,
see e.g. [Maloney & Mendez \(2004\)](#), [Machin & Giupponi \(2024\)](#)
3. Competitive mechanisms may be at play.
 - Similar observable characteristics of min. wage workers in formal firms across contract types [▶ table](#)
4. Min. wage could serve as a numeraire for the economy
 - No evidence of bunching around multiples of mw

[▶ Census f](#) [▶ Census i](#) [▶ Census se](#) [▶ RAIS](#)

Implication for the formalization process



→ We assume no disemployment effects of the mw, reallocation to informal (not SE), and no GE effects.

→ Absent mw hikes, formalization process would have been sped up by one year.

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Conclusion

Using difference-in-differences strategies we document:

1. Wage $\nearrow$ among formal and informal employees on intensive margin for which there is perfect compliance with mw.
→ 88% passthrough to intensive-informal employees.
2. Wage gain for informal employees in extensive margin, although smaller (59% passthrough) and take longer to materialize; no wage gain among self-employed.
3. Small-sized reallocations out of formal employment:
→ Own-wage reallocation elasticity with respect to formal wage of -0.28.
→ Reallocations towards intensive salaried employment.

Final thoughts

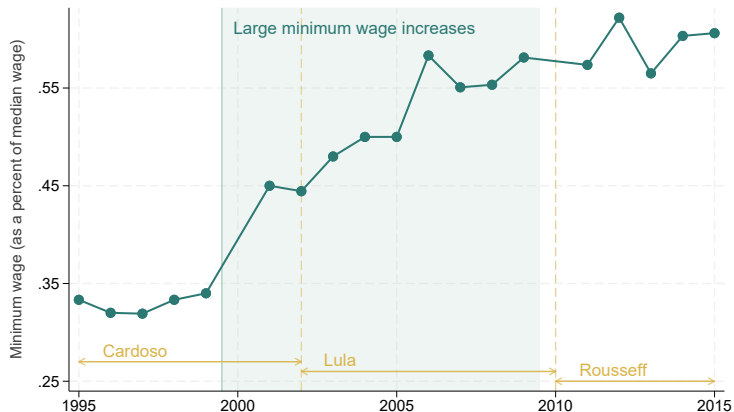
We find relatively small reallocation elasticities with important wage gains that should influence how we think about the minimum wage in low-and middle-income countries.

Avenues for future research:

1. Calls for new models of labor markets
 - With wage passthrough to informal workers,
 - & that integrate design of enforcement policies.
2. Need to gather empirical own-wage reallocation elasticities around the world.

Appendix

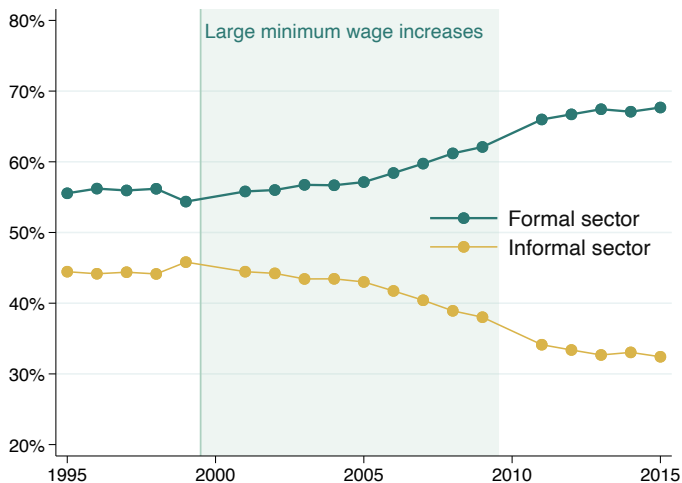
Evolution of the Kaitz index



→ Kaitz index computed among formal employees as min. wage over p50.

→ Went from 0.34 in 1999 to .58 in 2009. [▶ back](#)

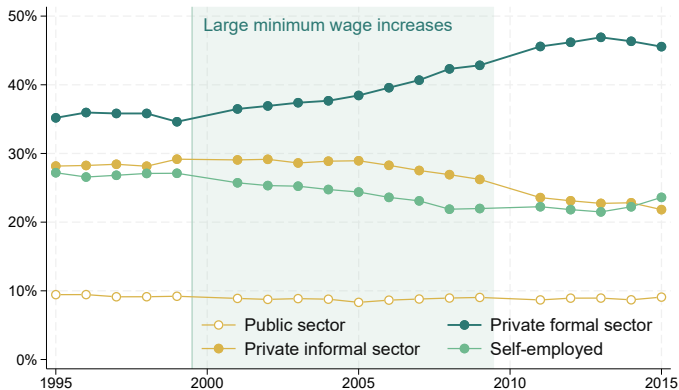
Evolution of the structure of the formal vs. informal sector



→ The informal sector represents 46% of employment in 1999 and 38% in 2009.

→ Sample: employees (incl. formal and informal domestic workers), aged 25-55. [▶ back](#)

Evolution of the structure of employment

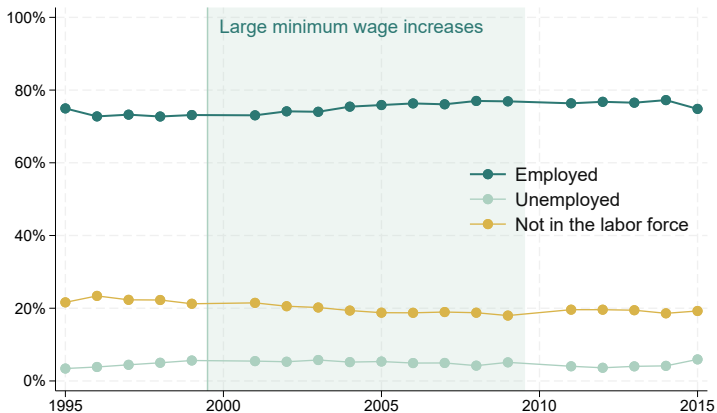


→ Among employed adults, 34.6% were employed in the private formal sector, 29.2% in the private informal sector, and 9.2% in the public sector. 27.1% were self-employed.

→ Sample: all workers (incl. domestic workers), aged 25-55.

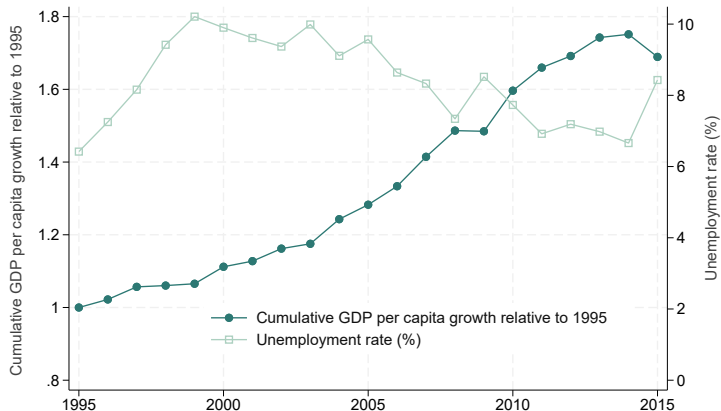
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Evolution of employment status



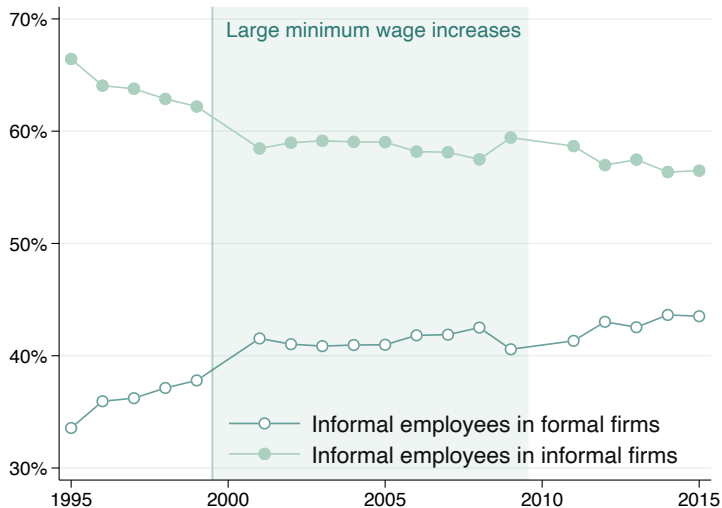
→ Sample: adult population aged 25-55. [▶ back](#)

GDP growth and unemployment rate



► back

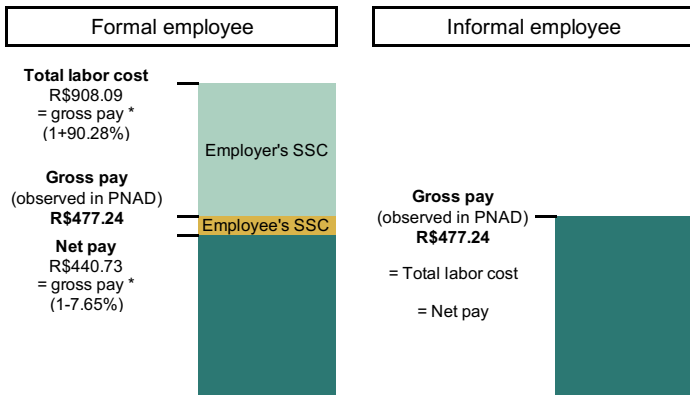
Evolution of the two margins of informality



► back

Full compliance with minimum wage in formal sector

Net vs. gross pay for formal vs. informal workers at the mw

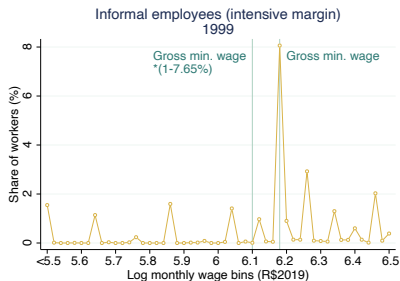
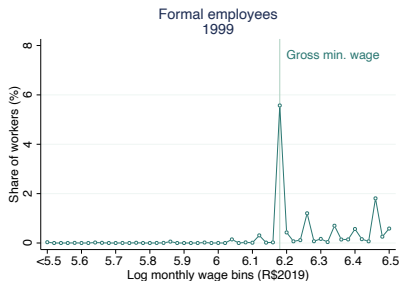


→ Total employer contributions are 90.3% of the gross min. wage for a formal employee.

→ No income tax at the level of min. wage.

→ Net pay of informal employee at the min. wage in 1999 is 7.65% higher than that of a formal employee

Informal employees pocket employee social contributions



→ “Zooming in” closer to the mw reveals bunching at gross mw but no bunching at gross $\text{mw} \times (1-7.65\%)$ among informal employees, therefore pocketing employee contributions.

→ Net pay of informal employee at the min. wage in 1999 is 7.65% higher than that of a formal employee.

► back to earnings distrib.

► back to interpretation

Informal emp. labor market characteristics, PNAD 2011

	Intensive margin		Extensive margin	
	Observed	Proxied	Observed	Proxied
<i>Industry</i>				
Agriculture, forestry and fishing	0.05	0.00	0.23	0.44
Mining and extractive industries	0.00	0.01	0.00	0.00
Manufacturing	0.12	0.15	0.04	0.00
Construction	0.06	0.00	0.17	0.22
Wholesale and Retail Trade	0.20	0.21	0.03	0.00
Hotels and restaurants	0.07	0.10	0.02	0.00
Transportation, communication and electricity, gas, water	0.06	0.08	0.03	0.00
Finance, insurance, real estate and repair services	0.13	0.14	0.04	0.00
Public administration	0.19	0.12	0.00	0.00
Education, health and social work	0.04	0.12	0.00	0.00
Domestic services	0.00	0.00	0.42	0.34
Entertainment, recreation and other services	0.07	0.08	0.02	0.00

→ 82% of all informal employees in informal firms employed in agriculture, construction and domestic services.

→ We assign all informal employees in these three sectors to the extensive margin in our imputed series on the two margins of informality. [▶ back](#)

Informal emp. demographic characteristics, PNAD 2011

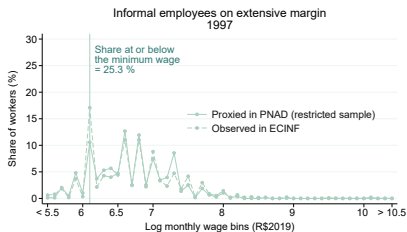
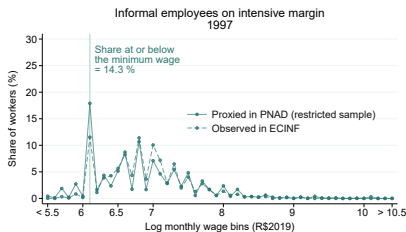
	Intensive margin		Extensive margin	
	Observed	Proxied	Observed	Proxied
Median monthly earnings (in R\$2019)	2,129	1,765	973	825
Age	36.5	36.4	38.0	38.6
Work experience	21.4	21.5	26.5	27.6
Tenure	4.8	5.0	6.2	8.3
<i>Gender</i>				
Male	0.63	0.55	0.53	0.59
Female	0.37	0.45	0.47	0.41
<i>Race</i>				
White	0.50	0.47	0.34	0.33
Nonwhite	0.50	0.53	0.66	0.67
<i>Education</i>				
Less than high school	0.45	0.47	0.81	0.85
High school completed	0.41	0.40	0.17	0.13
College completed	0.14	0.13	0.02	0.01

→ Observed and proxied series align well in terms of demographic characteristics. [▶ back](#)

Observed vs. proxied series in PNAD 2011-2015

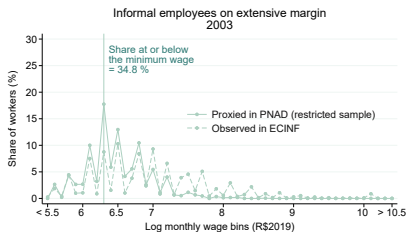
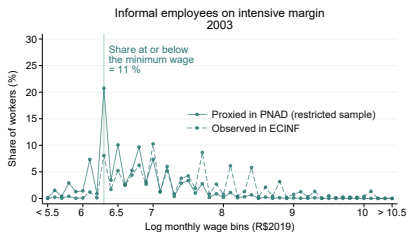
- The observed and proxied series in PNAD align remarkably from 2011-2015 in intensive margin.
- Same remarkable match for the extensive margin [▶ back](#)

Observed ECINF vs. proxied PNAD 1997



→ PNAD sample restricted to employees of small firms (5 workers or fewer) and excludes domestic workers to better approximate the ECINF sample [▶ back](#)

Observed ECINF vs. proxied PNAD 2003



→ PNAD sample restricted to employees of small firms (5 workers or fewer) and excludes domestic workers to better approximate the ECINF sample [▶ back](#)

Min. wage binding on both intensive and extensive margins

→ Huge spike at min. wage, that increases as min. wage increases. [▶ back](#)

Share of workers strictly below the minimum wage



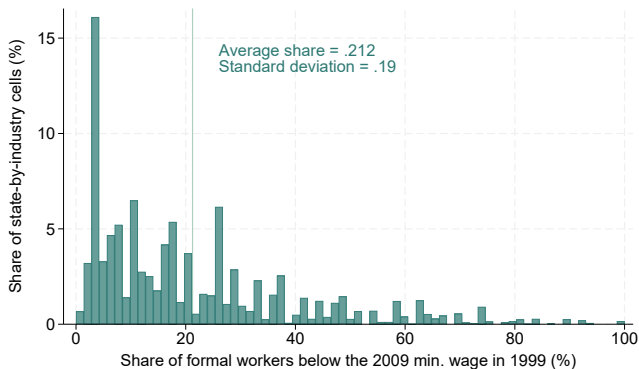
→ Shares among formal maintained below 1%.

→ Shares in intensive double between 1999 (7.3%) and 2009 (15.7%).

→ Also true for shares in extensive (from 23% to 40%), with levels of non-compliance 3× higher than in intensive [▶ back](#)

Minimum wage less binding among self-employed

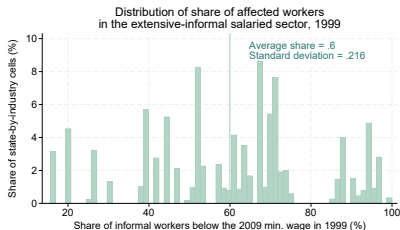
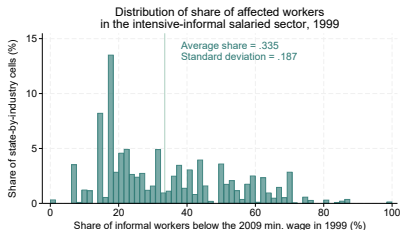
Distribution of share of affected workers in formal, 1999



→ 279 state-by-industry cells.

→ Average of share of affected workers in the formal sector weighted by the number of formal employees in each state-by-industry cell. [▶ back](#)

Distribution of share of affected workers in informal, 1999



→ 281 state-by-industry cells (216 in intensive margin vs. 72 in extensive margin).

→ Average of share of affected workers in intensive(extensive)-informal salaried sector weighted by the number of intensive(extensive)-informal employees in each state-by-industry cell. [▶ back](#)

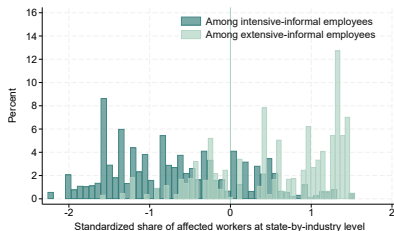
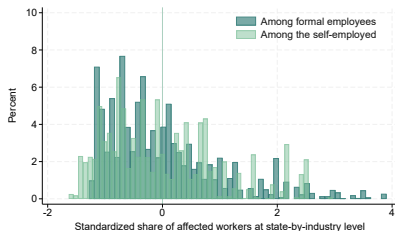
Distribution of share of affected workers among self-employed, 1999



→ 240 state-by-industry cells.

→ Average of share of affected workers among self-employed weighted by the number of self-employed in each state-by-industry cell. [▶ back](#)

Distribution of standardized treatment variable for wage effects



→ Treatment variables used in the individual-level dataset.

[▶ back](#)

Step 1: Quantifying effects on earnings in formal sector

$$\text{Monthly Earnings}_{ijst} = \alpha + \delta_{kj} + \sum_k \beta_k \text{Strongly}_{sj} \times \delta_{t+k} + \mathbb{X}'_{ijst} \Gamma + \delta_{sj} + \varepsilon_{ijst}$$

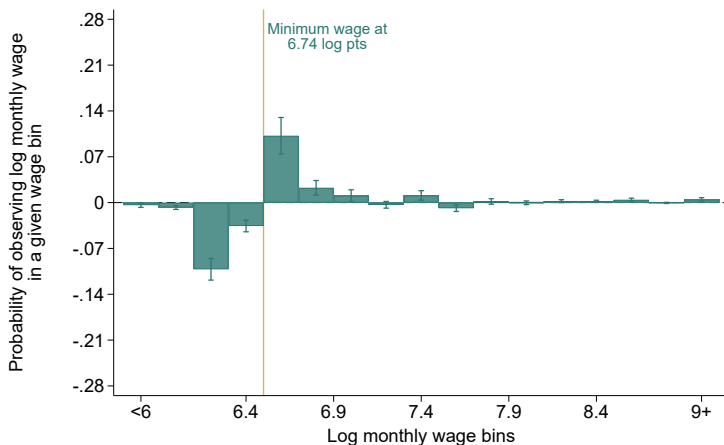


→ Results robust to other definitions of the treatment variable (Q2 to Q4 vs. Q1 on the left panel, and Q2-Q3 vs. Q1)

► Back

Wage effect in formal sector by wage bins, Census 2010

$$\mathbb{1}_{it} = \sum_{\substack{\tau=2000 \\ \tau=2000}}^{2010} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$



→ Exact same pattern and magnitudes as in PNAD 2009.

[▶ back](#)

Quantifying wage effects using treat. var. defined in 1995

$$\mathbb{1}_{it} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$

→ Shows robustness to mean reversion that could arise from potential measurement error in our treatment variable [▶ back](#)

Quantifying wage effects using treat. var. defined in 1996

$$\mathbb{1}_{it} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$

→ Shows robustness to mean reversion that could arise from potential measurement error in our treatment variable [▶ back](#)

Quantifying wage effects using treat. var. defined in 1997

$$\mathbb{1}_{it} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$

→ Shows robustness to mean reversion that could arise from potential measurement error in our treatment variable [▶ back](#)

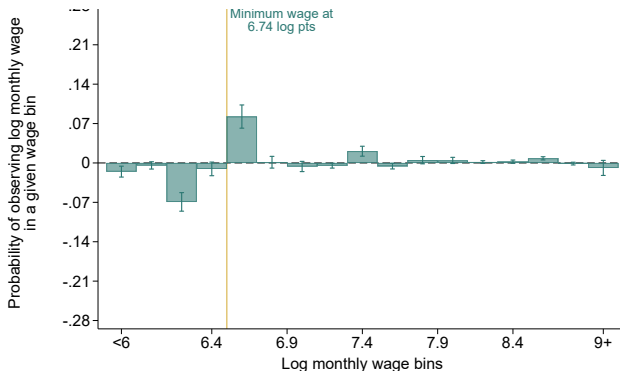
Quantifying wage effects using treat. var. defined in 1998

$$\mathbb{1}_{it} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$

→ Shows robustness to mean reversion that could arise from potential measurement error in our treatment variable [▶ back](#)

Wage effect among intensive-informal emp. by wage bins, Census 2010

$$\mathbb{1}_{it} = \sum_{\tau=2000}^{2010} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$

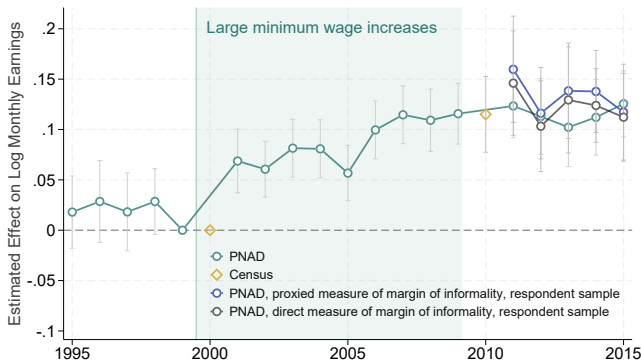


→ Exact same pattern and magnitudes as in PNAD 2009.

[▶ back](#)

Results on avg wages among intensive-informal workers using direct measure of informality

$$Y_{it} = a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$



→ Consistent results when using our industry proxy for firm formality but restricted to sample of workers who directly report their firm's formality.

→ & when using direct response for firm's formality status.

Quantifying wage effects in extensive margin by wage bins

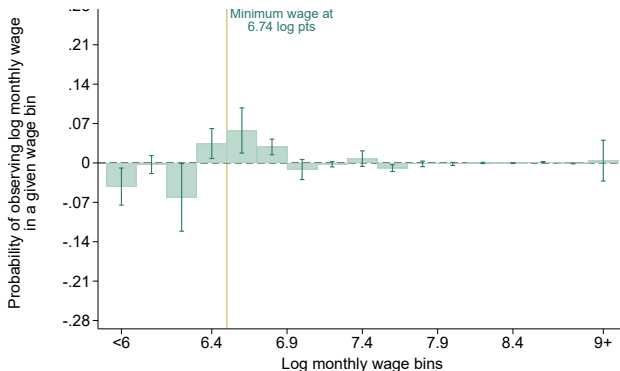
$$\mathbb{1}_{it} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$

Outcome = indicator for wage falling within a specific wage bin.

→ Not full compliance with min. wage in the extensive margin of informality [▶ back](#)

Wage effect among extensive-informal emp. by wage bins, Census 2010

$$\mathbb{1}_{it} = \sum_{\tau=2000}^{2010} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$



→ Exact same pattern and magnitudes as in PNAD 2009.

[▶ back](#)

Quantifying wage effects for all informal emp. by wage bins

$$\mathbb{1}_{it} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$

Outcome = indicator for wage falling within a specific wage bin.

- In 2009, post-period wages concentrated at level of 2009 min. wage.
- Not full compliance with min. wage among all informal employees

Quantifying wage effect for informal employees: robustness

$$Y_{it} = a + \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \beta_{\tau}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$

Strongly treated state × industry × 2009

Informal employees in informal firms	0.090**	0.101***	0.150***	0.094**
	(0.035)	(0.034)	(0.032)	(0.036)
	6.367	6.367	6.367	6.367
	141,208	141,208	141,208	141,208

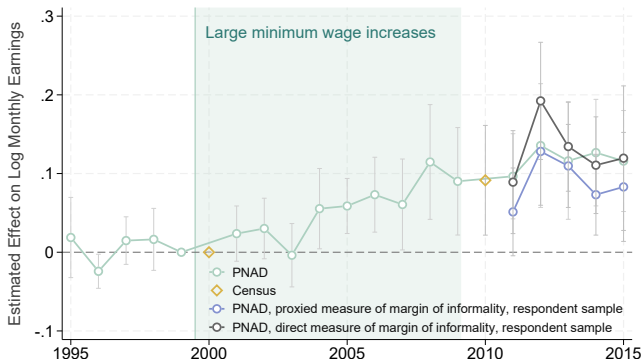
Individual-level controls	X		X	X
State GDP controls	X	X	X	X
State x industry FEs	X	X	X	X
Industry x year FEs	X	X	X	X
Bolsa Familia expenditures			X	
Nb of inspectors 2002 x year FEs				X

→ Robust to potential confounders such as ↗ skilled workforce, implementation of Bolsa Família & enforcement of the labor law.

▶ back

Results on avg wages among extensive-informal workers using direct measure of informality

$$Y_{it} = a + \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \beta_{\tau}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$



→ Consistent results when using our industry proxy for firm formality but restricted to sample of workers who directly report their firm's formality.

→ & when using direct response for firm's formality status.

Quantifying wage effects for self-employed by wage bins

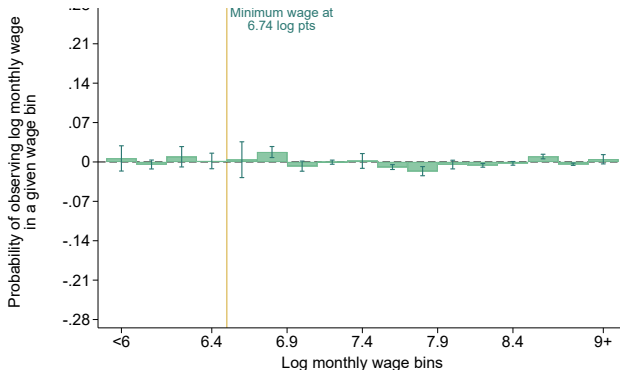
$$\mathbb{1}_{it} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$

Outcome = indicator for wage falling within a specific wage bin.

→ No effect among self-employed [▶ back](#)

Wage effect among self-employed by wage bins, Census 2010

$$\mathbb{1}_{it} = \sum_{\tau=2000}^{2010} \sum_{\eta=-4}^{12} \tilde{\beta}_{\tau\eta}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k(i)=\eta]} + \tilde{\rho}_{s(i)j(i)k(i)} + \tilde{\mu}_{j(i)tk(i)} + \tilde{\varepsilon}_{it}$$



→ Exact same pattern and magnitudes as in PNAD 2009.

[▶ back](#)

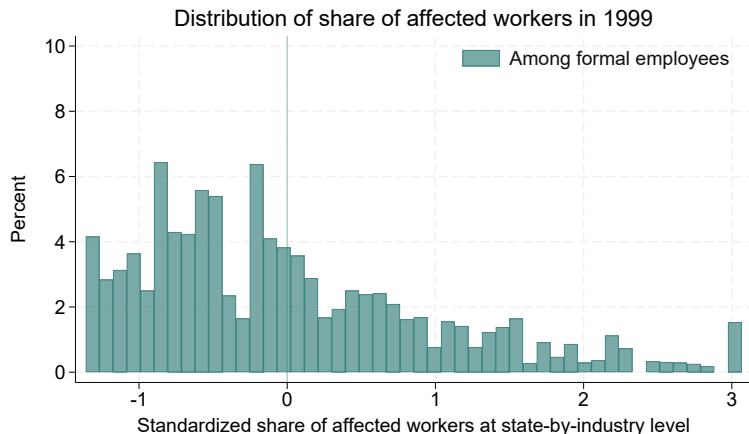
Quantifying wage effects for self-employed: robustness

$$Y_{it} = a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{wage}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$

	Baseline	Robustness checks		
	(1)	(2)	(3)	(4)
<i>Strongly treated state × industry × 2009</i>				
Self-employed	-0.021 (0.030) 7.055 329,581	-0.005 (0.031) 7.055 329,581	0.027 (0.031) 7.055 329,581	-0.009 (0.028) 7.055 329,581
Individual-level controls	X		X	X
State GDP controls	X	X	X	X
State × industry FEs	X	X	X	X
Industry × year FEs	X	X	X	X
Bolsa Familia expenditures			X	
Nb of inspectors 2002 × year FEs				X

→ Zero effect among self-employed. [► back](#)

Distribution of standardized treatment variable for employment effects



→ Treatment variable used in the state-by-industry panel.

Effect on the allocation of formal jobs w/o Northeast

$$\frac{E_{sjtk}^f}{E_{sj,2000}^{\text{all}}} = \sum_{\substack{\tau=2000 \\ \tau \neq 2000}}^{2010} \sum_{\eta=-4}^{12} \alpha_{\tau\eta} \text{Share Affected}_{sj} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k=\eta]} + \zeta_{sjk} + \nu_{jtk} + \gamma_{rtk} + \epsilon_{sjtk}$$



→ Small declines in formal jobs across bins in the middle of the earnings distribution driven by Northeast. [▶ back](#)

Effect on the allocation of formal jobs w/o North

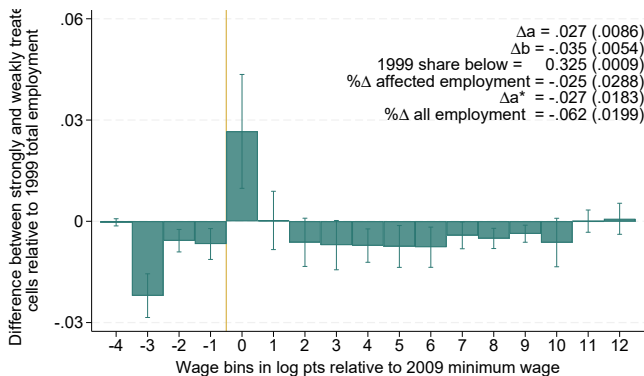
$$\frac{E_{sjtk}^f}{E_{sj,1999}^{\text{all}}} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \alpha_{\tau\eta} \text{Share Affected}_{sj} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k=\eta]} + \zeta_{sjk} + \nu_{jtk} + \epsilon_{sjtk}$$



→ Small declines in formal jobs across bins in the middle of the earnings distribution not driven by North. [▶ back](#)

Effect on the allocation of formal jobs w/o Southeast

$$\frac{E_{sjtk}^f}{E_{sj,1999}^{\text{all}}} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \alpha_{\tau\eta} \text{Share Affected}_{sj} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k=\eta]} + \zeta_{sjk} + \nu_{jtk} + \epsilon_{sjtk}$$



→ Small declines in formal jobs across bins in the middle of the earnings distribution not driven by Southeast. [▶ back](#)

Effect on the allocation of formal jobs w/o South

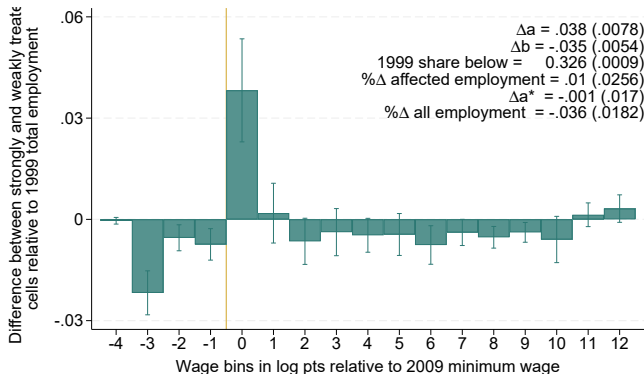
$$\frac{E_{sjtk}^f}{E_{sj,1999}^{\text{all}}} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \alpha_{\tau\eta} \text{Share Affected}_{sj} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k=\eta]} + \zeta_{sjk} + \nu_{jtk} + \epsilon_{sjtk}$$



→ Small declines in formal jobs across bins in the middle of the earnings distribution not driven by the South. [▶ back](#)

Effect on the allocation of formal jobs w/o Central-West

$$\frac{E_{sjtk}^f}{E_{sj,1999}^{\text{all}}} = \sum_{\substack{\tau=1995 \\ \tau \neq 1999}}^{2015} \sum_{\eta=-4}^{12} \alpha_{\tau\eta} \text{Share Affected}_{sj} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k=\eta]} + \zeta_{sjk} + \nu_{jtk} + \epsilon_{sjtk}$$



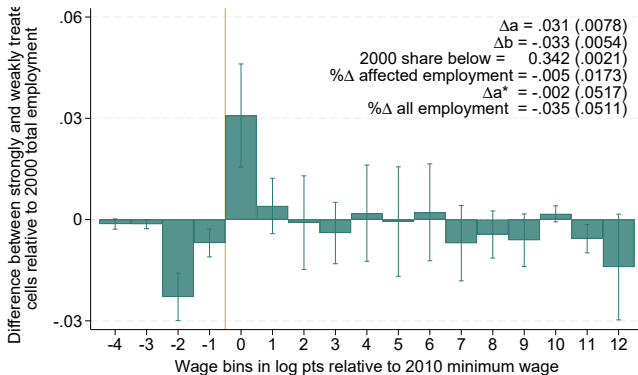
→ Excludes the Central-West region.

[▶ back](#)

→ Small declines in formal jobs across bins in the middle of the earnings distribution not driven by Central-West.

Effect on total share of formal employment in Census 2010

$$\frac{E_{sjtk}^f}{E_{sj,2000}^{\text{all}}} = \sum_{\substack{\tau=2000 \\ \tau \neq 2000}}^{2010} \sum_{\eta=-4}^{12} \alpha_{\tau\eta} \text{Share Affected}_{sj} \times \mathbb{1}_{[t=\tau]} \times \mathbb{1}_{[k=\eta]} + \zeta_{sjk} + \nu_{jtk} + \gamma_{rtk} + \epsilon_{sjtk}$$



→ Includes region $\times$ year FEs to absorb any confounding regional shocks.

→ Reallocation across all wage bins is -3.5% in Census, i.e. to PNAD 2009 without region $\times$ year FEs [▶ back](#)

Effect on weekly hours in 2009

Log weekly hours $_{it}$ =

$$a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{hours}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$

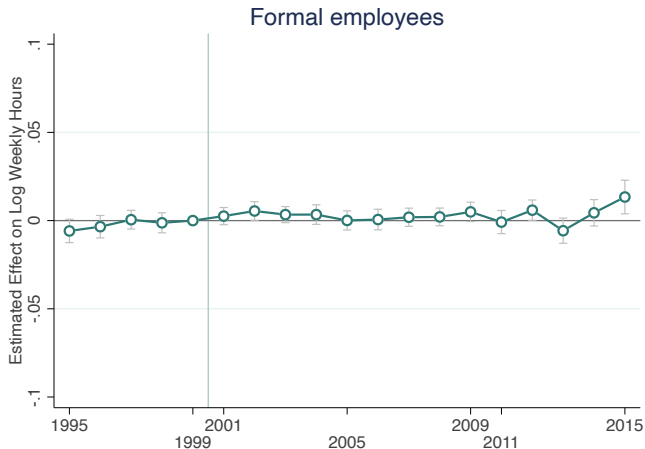
	%Δ hours	%Δ wage	Hours elasticity
Formal employees	0.003 (0.003)	0.128*** (0.011)	0.020 (0.025)
Informal employees			
Intensive margin	0.015 (0.010)	0.100*** (0.015)	0.149 (0.103)
Extensive margin	-0.002 (0.026)	0.121*** (0.042)	-0.016 (0.216)
Self-employed	0.009 (0.010)	-0.017 (0.022)	-0.508 (0.818)

→ Weekly hours is zero across sectors of employment [▶ back](#)

Effect on weekly hours among formal employees

Log weekly hours $_{it}$ =

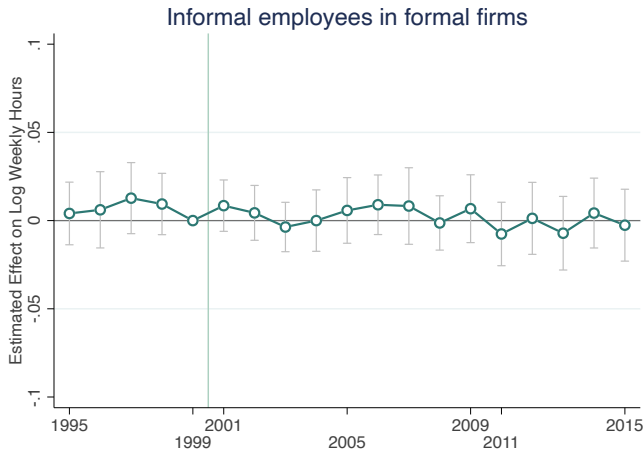
$$a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{hours}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$



Effect on weekly hours among intensive-informal employees

Log weekly hours $_{it}$ =

$$a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{hours}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$



Effect on weekly hours among extensive-informal employees

Log weekly hours_{it} =

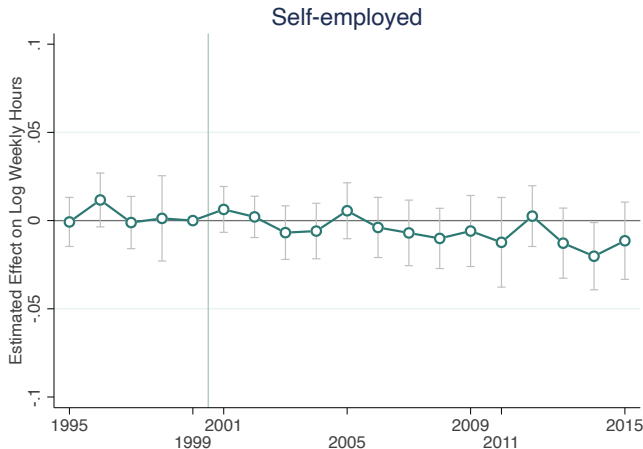
$$a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{hours}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}_{it}' \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$



Effect on weekly hours among self-employed

Log weekly hours $_{it}$ =

$$a + \sum_{\tau=1995}^{2015} \beta_{\tau}^{\text{hours}} \text{Share Affected}_{s(i)j(i)} \times \mathbb{1}_{[t=\tau]} + \mathbb{X}'_{it} \Gamma + \rho_{s(i)j(i)} + \mu_{j(i)t} + \varepsilon_{it}$$



% change in share of workers in total private workforce

	% Δ emp.
Formal employees	-0.033** (0.016)
Informal employees	
Intensive margin	0.045* (0.027)
Extensive margin	-0.024 (0.048)
Self-employed	-0.046** (0.022)

→ Suggestive evidence that formal workforce shifted towards intensive-informal employment.

→ No clear effect among extensive-informal employees.

→ Decreases in self-employment [▶ back](#)

Penalties associated with minimum wage violations

They vary by firm size according to coeff. ρ_s comprised btwn .08 for small firms (10- workers) and .4 for large (100+ workers) ones:

$$\begin{aligned}\text{Penalty}_{\text{mw}} &= (.6 + \rho_s) * \text{fine} \\ &= (.6 + \rho_s) * 1,513.14 \text{ UFIR} \\ &= (.6 + \rho_s) * 11 \times \text{gross monthly minimum wage (in 1999)}\end{aligned}$$

We think of these penalties as lower bounds because:

1. The penalty is doubled in case of recidivism.
2. Workers can claim the difference between their salary & the min. wage – which comes on top of the penalty.
3. Indirect costs of violating mw law, i.e. proba of workers' whistleblowing might ↗.
4. There are non-monetary costs associated with mw violation

Workers characteristics around min. wage, 2015 (1/2)

	Formal employees	Informal employees	
		Intensive margin	Extensive margin
<i>Industry</i>			
Agriculture, forestry and fishing	0.06	0.08	0.31
Mining and extractive industries	0.00	0.00	0.00
Manufacturing	0.20	0.13	0.06
Construction	0.08	0.06	0.36
Wholesale and Retail Trade	0.24	0.22	0.07
Hotels and restaurants	0.07	0.10	0.05
Transportation, communication and electricity, gas, water	0.08	0.06	0.05
Finance, insurance, real estate and repair services	0.14	0.10	0.06
Public administration	0.01	0.15	0.00
Education, health and social work	0.09	0.04	0.01
Entertainment, recreation and other services	0.03	0.06	0.04

→ Workers around the min. wage have similar observable Xs within formal firms across arrangement types.

→ This limits heterogeneity around min. wage, which is the part of the distrib. where most informal workers on intensive margin are.

Workers characteristics around min. wage, 2015 (2/2)

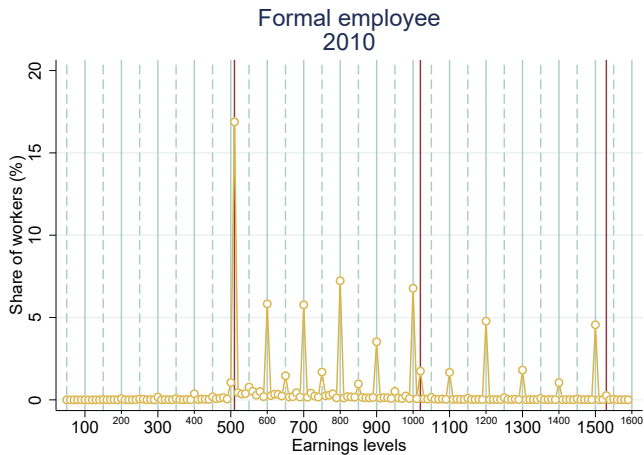
	Formal	Informal employees	
	employees	Intensive margin	Extensive margin
<i>Occupation</i>			
Managerial	0.02	0.02	0.01
Scientific and artistic	0.02	0.04	0.01
Mid-level technicians	0.06	0.06	0.01
Administrative service workers	0.17	0.13	0.02
Service workers	0.23	0.25	0.10
Retail service workers	0.13	0.13	0.05
Agriculture workers	0.06	0.08	0.31
Manufacturing, construction and repair workers	0.31	0.29	0.50
Armed forces and other occupations	0.00	0.00	0.00

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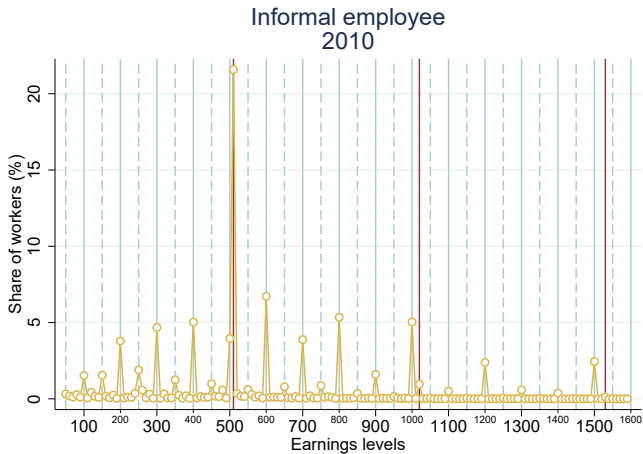
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Bunching at around multiples of the min. wage, Census



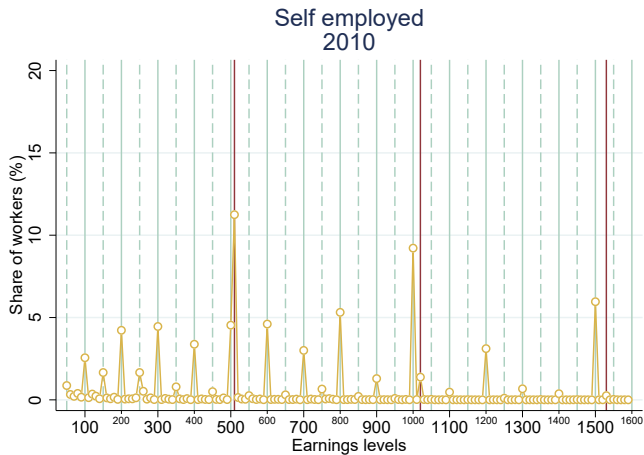
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Bunching at around multiples of the min. wage, Census



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Bunching at around multiples of the min. wage, Census



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Bunching at around multiples of the min. wage, RAIS