Internal Organization of Firms and Minimum Wage Spillovers

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Introduction

➢ **Internal Organization of Firms, Compensation Policy, and Shocks**

Firms **reorganize in response to** demand, productivity, and trade **shocks**
Friedrich (2022); Caliendo et al. (2015, 2020); Gumpert et al. (2021)

Scarce evidence on how the **inner workings of the firm** affects the transmission of shocks

→ Economic shocks

→ Policy shocks

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➢ Minimum Wage as a Policy-Induced Cost Shock

MW directly raises low wages, and **spillover** effects amplify the shock
Cengiz et al. (2019); Dube (2019); Dustmann et al. (2022); Katz and Krueger (1992); Autor et al. (2016)

Growing but **limited understanding of the firm-level mechanisms** driving spillovers
Falk et al. (2006); Dube et al. (2019); Gregory and Zierahn (2022); Forsythe (2023); Phelan (2019)

No empirical **evidence** on the role of compensation policies on the distribution effects
Lazear and Rosen (1981); Gibbs and Hendricks (2004); Giupponi and Machin (2022)

Research Question

Does the organization of firms affect how shocks propagate?

Organization of firms and compensation policies

→ Rigid: Administrative pay system determine tier level wage

→ Flexible: Individual bargaining and pay-per-performance schemes

Shock

→ Minimum Wage as a Labour Cost Shock

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Do MW spillovers depend on the internal organization of firms?

In a nutshell

Theory:

1. I study a stylized personnel economics model of firm compensation policies
2. Augment it by introducing a minimum wage
   - → Guide measurement
   - → Derive testable implications

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Empirics: Leverage high-quality admin LinkEED data from Portugal to:

1. Causally estimate minimum wage spillovers, identify spillover workers
2. Measure internal organization of firms and associated compensation policies
3. Test the model's predictions

A Model of Firm-Level Compensation and Minimum Wage Spillovers

An Intuition-Oriented Summary

Model Environment

Consider a mass of risk-neutral firms, atomistic in the product market:

- → Can sell in the market output $Q = \sum q_i$ at price p
- → Each employ (two) risk-neutral workers in production $\quad q_i = e_i + \eta_i, \quad \forall i; \quad \eta_i \sim f(0, \sigma^2)$
- → Effort is costly $c'(e) > 0, c''(e) > 0$
- → Competitive market for labour $\implies$ no profits in equilibrium

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Exogenously different **compensation policies:**

Rigid Firms – Tournaments Lazear and Rosen (1981).

→ *Contract:* Base and promotion wages (W_0, W_1). A tournament determines promotion.

→ *Incentive condition*: $\quad c'(e) = \big(W_1 - W_0\big)\, g(0)$

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Flexible Firms – Piece Rates Lazear (2000)

- → *Contract:* $w_i = a + bq_i$
- → *Incentive Condition:* $\quad c'(e) = b$

Binding MW: Key Mechanisms

Rigid Firms: The incentive condition shows the mechanism

$$c'(e) = \big(W_1 - W_0\big)\, g(0)$$

A binding $MW > W_0$ compresses spread, decreasing e and production.
Firms raise W_1 to restore incentives $\implies$ **Spillovers**

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Flexible Firms: A **binding MW** imposes a piece rate cut and shifts the equilibrium

$$\Delta w \quad = \quad \underbrace{(mw - a^*)}_{\substack{\text{(1) direct base-pay effect} \\ > 0}} \quad + \quad \underbrace{e^{mw}\big(b^{mw} - b^*\big)}_{\substack{\text{(2) reduced piece rate} \\ < 0}} \quad + \quad \underbrace{b^*\big(e^{mw} - e^*\big)}_{\substack{\text{(3) reduced effort} \\ < 0}}$$

Minimum increases wages (1), but piece-rate cut (2) and effort (3) effects **mitigate** spillovers

Lessons for Empirics and Testable Implications

1. Flexible firms display within job-title wage dispersion, rigid firms do not.
   - $\rightarrow$ Flexible. $w_i = a + bq_i$
   - $\rightarrow$ Rigid. $w_i = W_0, \quad \forall i$

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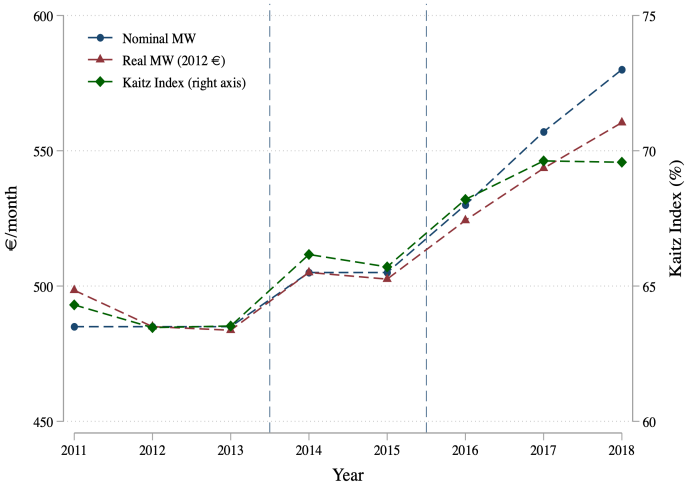
3. Spillovers depend on the **internal organization of firms**
   - → Firms with **rigid** hierarchies **react more**
     - → Wage spread is key to **preserve** the workforce's **incentives** to produce
     - → **Wage adjustment** is a **tier** and not a worker-level effect
   - → Firms with flexible wage-setting can better *absorb* the shock

Institutional Setting

Minimum Wage

Monthly Full Time



2014 Hike

485€ → 505€ (4.12%)

2016 Hike

505€ → 530€ (4.95%)

Constant pre-hike

→ 2012-2013

→ 2014-2015

Wage Setting Environment

Wage setting in Portugal as a 3-component model:
Card and Cardoso (2022)

$$w_{it} = \underbrace{mw_t}_{government} + \underbrace{f_{it}(mw_t)}_{unions\ and\ industry\ associations} + \underbrace{c_{it}(f_{it})}_{workers\ and\ firms}$$

$\rightarrow$ $w_{it} \equiv ln\ W_{it}$ is the *log* wage (W_{it}) of worker i in year t

1. $mw_t \equiv ln\ MW_t$ is the *log* ***national minimum wage*** (MW_t)
2. $f_{it} \equiv ln\ \frac{F_{it}}{MW_t}$ is *log* ***wage floor*** (F_{it}) relative to minimum wage, set at the ***job title*** level
   $\rightarrow$ ***job title***: category within agreement. Collection of tasks + hierarchy component.
3. $c_{it} \equiv ln\ \frac{W_{it}}{F_{it}}$ is the *log* ***wage cushion*** (C_{it}), expressed as total wage relative to wage floor

The Labor Cost Shock: Identifying and Measuring MW Spillovers

Estimating Spillovers

Goal: Compare the reaction of wages to a MW hike along the wage distribution.
Dustmann et al. (2022)

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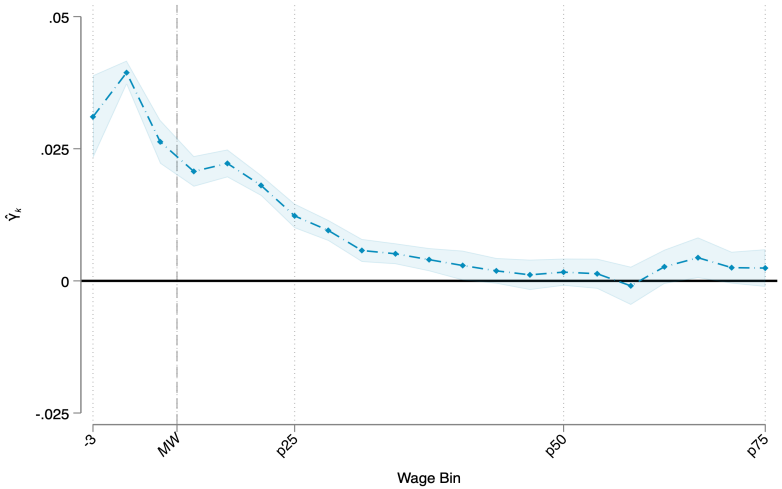
Empirical Strategy: Generalized Difference-in-Differences

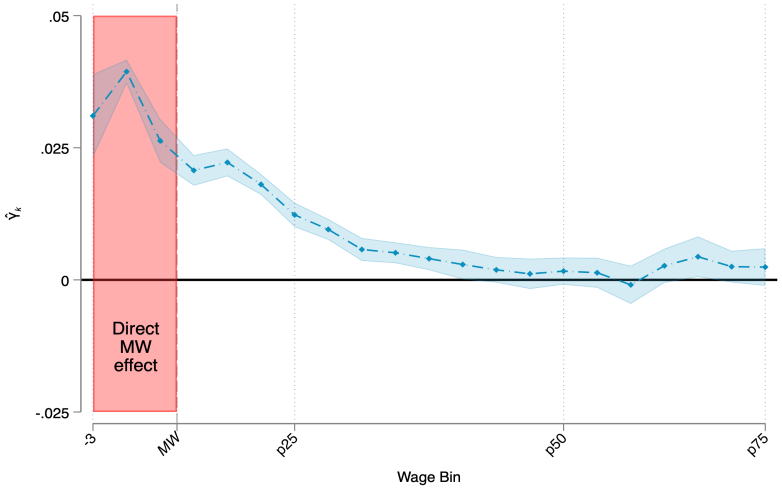
$$\Delta w_{ikt} = \sum_k \left(\delta_k \mathbf{1}\{b_i = k\} + \boldsymbol{\gamma_k} \mathbf{1}\{b_i = k\} \times MW_t \right) + X'\Gamma + \eta_c + \varepsilon_{it}$$

- $\Delta w_{ikt} = {}_{ikt} - w_{ik,t-1}$ wage growth of individual i in bin k between $t-1$ and t
- $b_i = k$: if k is worker i's wage bin, in intervals of width $h = mw_t - mw_{t-1}$. $k < 0$ if $w_{i,t-1} < mw_t$
- MW_t: minimum wage hike year
- $\boldsymbol{\gamma_k}$ is the key coefficient: wage growth in bin k **caused by the MW**
- δ_k nets out bin-level baseline growth
- Pre-Treatment Controls X: worker, firm, and sector-level covariates, η_c are MW hike cycle FE

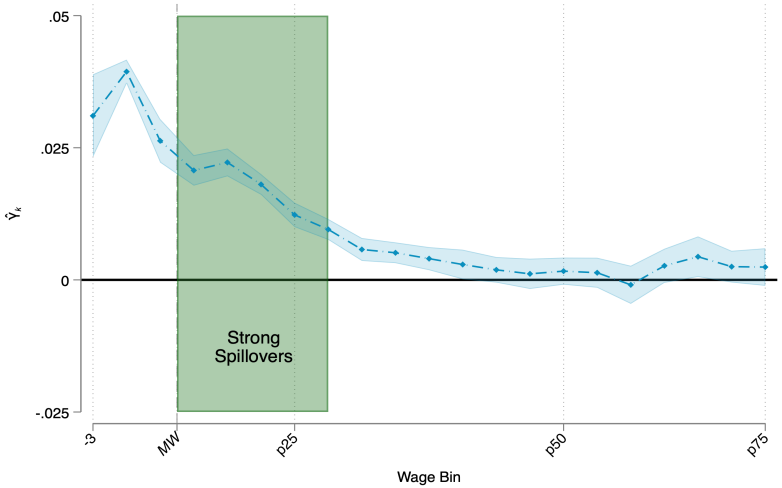
Effects of MW Along the Wage Distribution



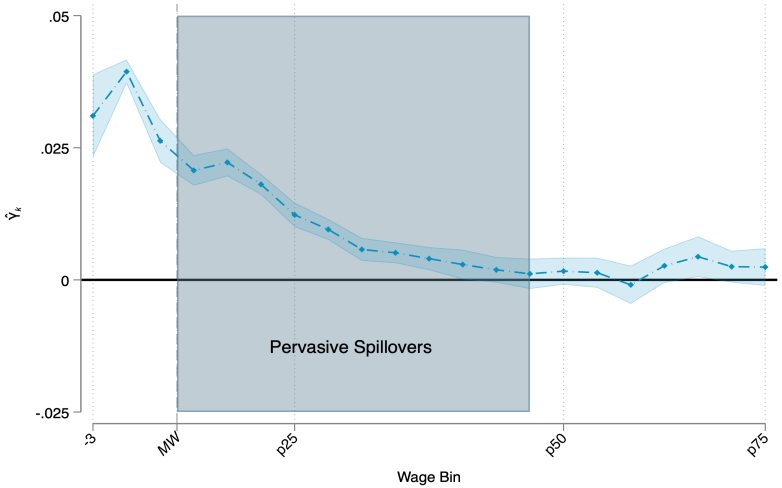
Direct Effect on MW Workers



Strong Spillovers

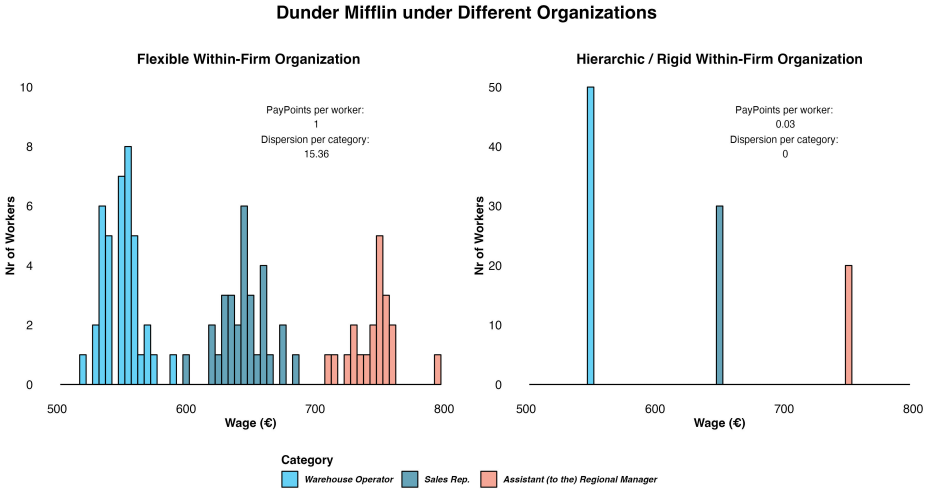


Pervasive Spillovers



Measuring Within-Firm Organization and Compensation Policies

Illustrative Example



Within-Firm Organization: Measurement

Firm Ridigity decreases in:

$$PayPoints_{f,t} = \frac{|\mathcal{W}_{f,t}|}{N_{f,t}}$$

$$Disp^{jt}_{f,t} = \frac{1}{J}\sum_{j=1}^{J}\sqrt{\frac{1}{N_j}\sum_{i=1}^{N_j}(w_i - \bar{w}_j)^2}$$

$|\mathcal{W}_{f,t}|$: Number of unique pay points

$N_{f,t}$: Number of workers in firm f

Machin and Datta (2024)

J : Number of job-titles

N_j : Workers in job-title j

w_i : Wage of worker i

$\bar{w}_j$: Average wage in job-title j

Giupponi and Machin (2022)

PayPoints Dispersion

Within-Firm Organization and Spillovers: Estimation and Results

Recall Testable Implications

TI.1 - Spillovers arise from a **binding** minimum wage

→ Otherwise, no firm-level adjustments

TI.2 - Spillovers depend on the **internal organization of firms**

→ Firms with **rigid** hierarchies **react more**

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TI.1 - Binding MW and Spillovers: Estimation

Difference-in-Differences on Spillover Workers

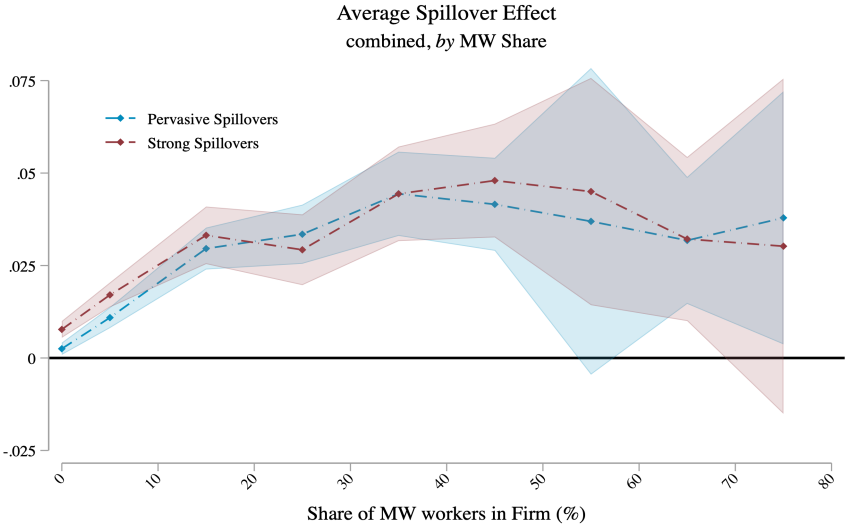
$$\Delta w_{it} = \alpha + \beta_1 MWBind_{f,t-1} + \boldsymbol{\tau} MW_t \times MWBind_{f,t-1} + X'\Gamma + \delta_t + \eta_c + \epsilon_i t$$

$\boldsymbol{MWBind \in \{MWShare, MWEmployer\}}$ firm-level measures of minimum wage bite

$\boldsymbol{MWShare_{f,t-1}}$ share of the workforce of firm f with $w_{t-1} < mw_t$

$\boldsymbol{MWEmployer = 1}$ if firm f has in $t-1$ at least on worker for whom mw_t is binding

TI.1 - Spillovers by MWShares



TI.2 - Compensation Policy and Spillovers: Estimation

Difference-in-Differences on Spillover Workers

$$\Delta w_{it} = \alpha + \beta_1 Rig_{f,t-1} + \tau Rig_{f,t-1} \times MW_t + X'\Gamma + \delta_t + \eta_c + \epsilon_i t$$

$\boldsymbol{Rig_{f,t-1} \in \{-PayPoints^{pw}, -Disp^{jt/qual}\}}$ firm-level measures of pay structure rigidity

$\boldsymbol{PayPoints^{pw}_{f,t-1}}$ measures unique pay points per worker

$\boldsymbol{Disp^{jt}_{f,t-1}}$ is the weighted average SD of pay by job title

Binary versions take value **1 for top quintile**

Higher values of $\boldsymbol{Rig_{f,t-1}}$ mean more rigid compensation policies and well-defined hierarchies

TI.2 - Stronger spillovers with rigid compensation policy

	PayPoints		AvgDisp JT	
	Pervasive	Strong	Pervasive	Strong
	(1)	(2)	(3)	(4)
MW_t	0.0218***	0.0260***	0.0122***	0.0147***
	(0.002)	(0.002)	(0.001)	(0.001)
Rig	-0.0192***	-0.0214***	-0.0062***	-0.0053***
	(0.003)	(0.003)	(0.000)	(0.001)
Rig × MW$_t$	**0.0197*****	**0.0155*****	**0.0011****	**0.0018*****
	(0.004)	(0.004)	(0.000)	(0.001)
P25 → P75 Rigidity				
Δ Wage Growth	**0.0050**	**0.0050**	**0.0008**	**0.0016**
Δ Spillover Effect	**49.9%**	**30.6%**	**7.2%**	**8.8%**
Bin Fixed Effects	Yes	Yes	Yes	Yes
Hike Fixed Effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Obs	339 421	151 421	288 018	129 749

Discussion

→ The **minimum wage** causes **far-reaching and strong spillover** effects

→ **Organization** of firms **shapes** the **propagation** of labor-cost **shocks**
  → Implications for a **broad set of shocks** that impacts relative pay

→ In line with theory, **rigid** organizations **enhance spillovers**
  → Particularly when they are more exposed to the *mw*
  → **Policy:** A role for collective bargaining to help propagate MW
  → **Policy:** Particularly **important** in contexts where **low-wages persist**

→ Robustness checks show results are not driven by alternative explanations
  → Sectoral or exposure-related reactions to the policy
  → Worker composition
  → Supervisory chains of command Forsythe (2023)
  → Collective bargaining

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MW Spillovers: Bin distribution pre 2014

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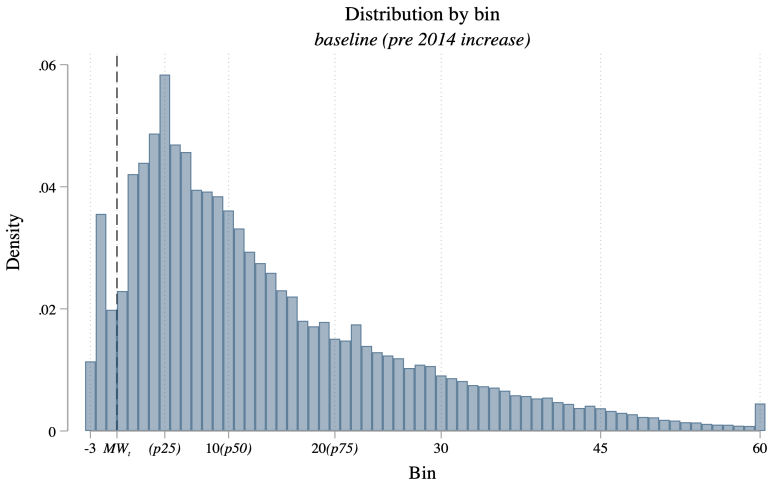

MW Spillovers: Bin distribution pre 2016

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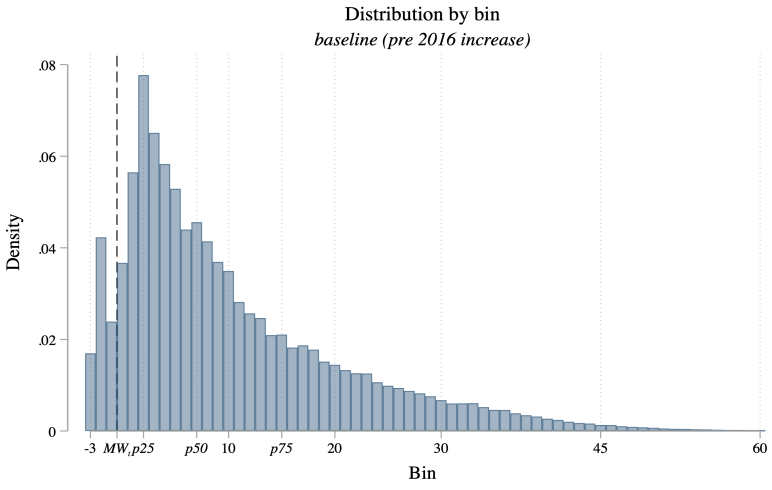

Difference-in-Differences and Pre-Post

	DiD - Pervasive			DiD - Strong			Pre - Post, Combined	
	Combined	2014 Hike	2016 Hike	Combined	2014 Hike	2016 Hike	Pervasive	Strong
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$MWHike \times Spillover$	0.0072***	0.0074***	0.0074***	0.0115***	0.0124***	0.0125***	-	-
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		
$MWHike$	0.0001	-0.0007	0.0007	0.000	0.0016*	0.0011**	0.0074***	0.0134***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Dep. Var mean *pre-hike, spillover*	0.025	0.023	0.027	0.028	0.026	0.030	0.025	0.029
Bin Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hike Fixed Effects	Yes	-	-	Yes	-	-	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1 175 112	548 593	626 519	1 175 112	548 593	626 519	578 085	269 601

Results: 2014 Hike

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Results: 2016 Hike

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PayPoints per Worker Pre-Hike

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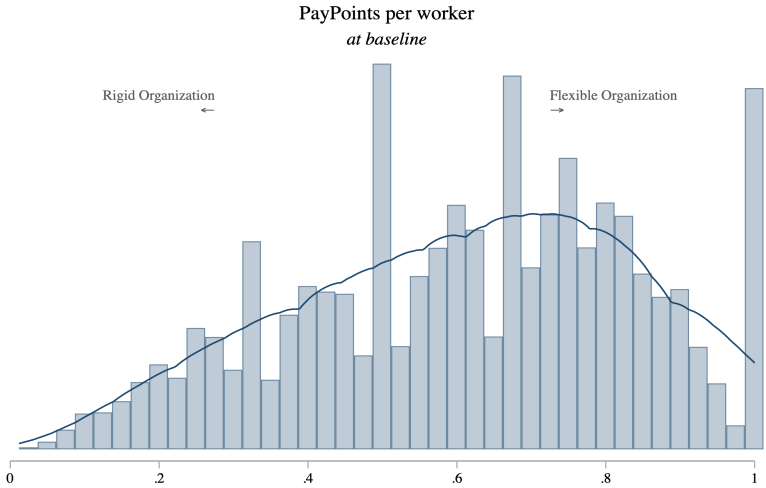

Average Job Title Wage Dispersion Pre-Hike

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