Costs of Adjustment and Firms' Responsiveness: Evidence from a Labour Market Reform

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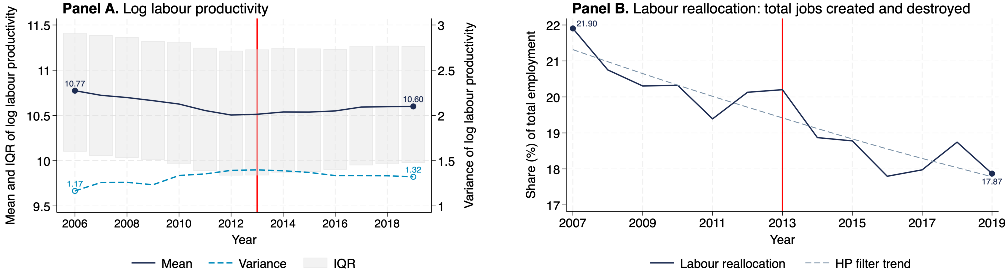
- Slowing growth and flat productivity have been ailing most European economies since the start of the century.
- **Increasing labour market flexbility** is often prescribed as an effective policy to lift productivity.
  - $\rightarrow$ Reduced costs of adjustment enhance the employment responsiveness of firms to profitability shocks.
  - $\rightarrow$ This greater responsiveness speeds up job reallocation in the economy and raises productivity.
- This reasoning underlay the labour market reforms in Portugal, Spain, Italy and Greece during the European sovereign debt crisis (2010-2015).

- This paper focuses on the insights of the Portuguese reform:
  - → By 2008 its labour market ranked as **the most stringent** across OECD countries.
  - → The reform (2011-2013) reduced and capped severance payments, set up dismissal funds, and added a new reason to justify fair dismissals $\implies$ Stringency was effectively reduced. EPL
  - → And yet, **productivity remained stubbornly flat**.



Why did this happen? Is productivity immune to changes in labour adjustment costs?

Data: panel of Portuguese non-financial firms (*BPLIM*) b/w 2006-2019

→ A revenue function estimation exercise retrieves the unobserved profitability shocks to firms.

→ The reform is associated w/ **increasing responsiveness**: employment policy function, extensive and intensive margins of employment adjustment.

→ That exercise also documents **rising product market power** through **greater markups**.

Theory: estimated structural model of dynamic labour demand by heterogeneous firms

→ A more flexible labour market and the increase in markups have a **quantitatively offsetting effect on the variance of productivity**.

Business dynamism, firms' responsiveness, and market power

[Decker et al. (2016), De Loecker & Eeckhout (2018), Decker et al. (2020), De Loecker et al. (2020), Cooper et al. (2024a), Cooper et al. (2024b), Biondi et al. (2024)]

$\rightarrow$ Labour market flexibility raises responsiveness but cannot boost productivity in the presence of rising market power.

Dynamic labour demand choices of heterogeneous firms

[Hamermesh (1989), Bentolila & Bertola (1990), Caballero et al. (1997), Hopenhayn & Rogerson (1993), Varejão & Portugal (2007), Cooper et al. (2015)]

$\rightarrow$ Piecewise adjustment cost function embeds main features of the Portuguese labour market.

Effects of a labour market reform

[Autor et al. (2007), OECD (2014), Cingano et al. (2016), Pinelli et al. (2017), Caggese et al. (2022), OECD (2017), Cooper et al. (2018)]

$\rightarrow$ The distribution of labour produtivity remained unaltered due to rising market power.

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Did employment responsiveness change?

- Firms produce according to a **CRS technology** and face a **downward sloping demand curve**.
- The resulting **revenue function** is given by $R(A_{i,t}, n_{i,t}, h_{i,t}) \equiv A_{i,t} \cdot (n_{i,t}\, h_{i,t})^{\alpha}$. Details
- TFPR is a **gaussian AR(1) process**: $A_{i,t} = \xi_{i,t} \cdot A^{\rho}_{i,t-1}$, w/ innovations $\log(\xi_{i,t}) \overset{iid}{\sim} \mathcal{N}(0, \sigma^2)$.
- Applying logs and **quasi first-differencing**:

$$\log(R_{i,t}) = \rho \log(R_{i,t-1}) + \alpha\big(\log(n_{i,t}) + \log(h_{i,t})\big) - \alpha\rho\big(\log(n_{i,t-1}) + \log(h_{i,t-1})\big) + \log(\xi_{i,t})$$

- Estimation recovers the parameters and the series of profitability innovations. Data

  → **OLS**: omitted variable bias, $\log(n_{i,t}) \not\perp \log(\xi_{i,t})$.

  → **GMM-IV**: lagged labour usage and wages are $\perp$ to $\log(\xi_{i,t})$, and $\not\perp$ to current employment.

	Full sample: 2006-2019	Pre-reform: 2006-2013	Post-reform: 2014-2019
Curvature, α	0.526^{***}	0.563^{***}	0.442^{***}
	(0.005)	(0.015)	(0.017)
Serial correlation, ρ	0.880^{***}	0.878^{***}	0.901^{***}
	(0.003)	(0.004)	(0.008)
Std deviation, σ	0.601^{***}	0.601^{***}	0.594^{***}
	(0.005)	(0.015)	(0.017)
Observations	2 612 592	1 377 835	1 043 986

Notes: Parameters α and ρ are estimated directly from equation (1). The corresponding standard errors are clustered at the industry level. The series of profitability innovations are then generated with the parameterised revenue function. The estimator of σ is the standard deviation of that data series. The variance of this estimator is obtained by sampling with replacement 100 000 observations 100 times.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Sectors decomposition

Did employment responsiveness change? — Decompose change in the curvature, α

- The curvature is a composite parameter, $\alpha \equiv \frac{\zeta\varepsilon}{1-\varepsilon(1-\zeta)}$, where:
  - $\rightarrow$ The output elasticity of labour, ζ, matches the labour share under CRS.
  - $\rightarrow$ Price elasticity of demand, $\nu \equiv |(1-\varepsilon)^{-1}|$, embeds the markup and can then be inferred.

Evidence

	Pre-reform: 2006-2013	**Post-reform: 2014-2019**
Curvature, α	0.563	0.442
Output elasticity of labour, ζ	0.285	0.316
Implied elasticity of demand, $\nu \equiv \lvert(1-\varepsilon)^{-1}\rvert$	5.527	3.511
Implied markup, $\mu \equiv \varepsilon^{-1}$	1.221	1.398
Counterfactual α: constant labour elasticity		-5.734%
Counterfactual α: constant markup		$+33.05\%$

Notes: The curvature of the revenue function corresponds to $\alpha \equiv \frac{\zeta\varepsilon}{1-\varepsilon(1-\zeta)}$. The labour share of a firm is computed as the ratio between the wage bill (including social security contributions) and its revenues. The output elasticity of labour, ζ, is obtained by taking the unweighted mean of (1% winsorized) firm-level values and then the time-series average across the corresponding time window. The number of observations in each time window is the same as reported in Table 1.

Markups

Did employment responsiveness change? — Taking stock

- Fall in α mirrors a **more inelastic demand schedule** and **rising market power**:
- But did the post-reform also coincide w/ increasing employment responsiveness?

$$\textbf{Responsiveness} \equiv \partial \log(n_{i,t}) / \partial \log(\xi_{i,t})$$

- As the exogenous innovations are uncovered, it is possible to estimate:
  1. **Employment policy function**: $n_{i,t} \equiv \varphi(n_{i,t-1}, \xi_{i,t})$.
  2. **Extensive margin of employment adjustment**: probability of adjustment over the distribution of $\xi_{i,t}$.
  3. **Intensive margin of employment adjustment**: conditional on adjustment, size of that adjustment over the distribution of $\xi_{i,t}$.
  4. **Exit responsiveness**: probability of exiting over the distribution of $\xi_{i,t}$.

Did employment responsiveness change? — Estimated policy function

- A log linear approximation of the **employment policy function** is:

$$\log(n_{i,t}) = \lambda_1 \cdot \log(n_{i,t-1}) + \lambda_2 \cdot \log(\xi_{i,t}) + \epsilon_{i,t}$$

	Full sample: 2006-2019	Pre-reform: 2006-2013	Post-reform: 2014-2019
Serial correlation, λ_1	0.953***	0.949***	0.960***
	(0.005)	(0.006)	(0.004)
Responsiveness, λ_2	0.035***	0.028***	0.051***
	(0.008)	(0.008)	(0.010)
Industry & Year FE	Yes	Yes	Yes
R^2	0.959	0.958	0.959
Observations	3 308 659	1 709 959	1 350 617

Notes: Standard errors are clustered at the industry level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Robustness Inaction

Did employment responsiveness change? — Summary of results

- **Rising covariance** $\Longrightarrow$ employment decisions are tied more closely to profitability circumstances.
- **Convex adjustment hazard** and **concave hiring rule** also exhibit that increasing responsiveness.
- But **responsiveness of exit decisions** become largely unchanged.

		Pre-reform: 2006-2013	**Post-reform: 2014-2019**
Covariance b/w employment and TFPR		0.64	0.81
+1 std. deviation TFPR shock	↑ Prob. of adjustment (pp)	0.91	1.90
	↑ Size of adjustment (pp)	2.28	5.59
	↓ Prob. of exit (pp)	4.53	4.27
−1 std. deviation TFPR shock	↑ Prob. of adjustment (pp)	1.34	0.32
	↓ Size of adjustment (pp)	3.64	6.73

Responsiveness regressions

Did employment responsiveness change? — Yes, but...

As expected, the labour market reform...

→ Effectively **slashed labour adjustment costs** borne by Portuguese firms.

→ **Raised employment responsiveness** to profitability shocks.

Contrary to what was expected, the labour market reform...

→ Coincided w/ a period of **increasing product market power** through **greater markups**.

→ Ultimately **failed to boost productivity** and alter its distribution.

Enhanced responsiveness and **rising market power** have disparate effects on labour allocation.

→ Is it possible to separately identify their effects on the **variance of labour productivity**?

→ A **structural model** provides the counterfactuals to study why productivity remained unaltered.

The model

- Heterogeneous firms make dynamic labour demand decisions w/ entry and exit.

  [Hopenhayn & Rogerson (1993)]

- Firms draw a Markov profitability level $A \in \mathcal{A}$ and know their **inherited stock of workers**, n_{-1}

- W/ this joint knowledge they decide whether **to produce** or **to permanently exit** the economy:

$$V(A, n_{-1}) = \max \left\{ \underbrace{V^i(A, n_{-1})}_{\text{Incumbents}}, \underbrace{V^o(n_{-1})}_{\text{Exiters}} \right\}$$

- Incumbents choose labour usage (n and h) **to be employed immediately**.

$$V^i(A, n_{-1}) = \max_{n \geq 0,\, h \geq 0} \left\{ R(A, n, h) - \omega(n, h) - c - C(n_{-1}, n) + \beta \int_{A' \in \mathcal{A}} V(A', n) \cdot \mathrm{d}\Pi(A'|A) \right\}$$

- Exiters just have to bear the cost of shutting down: **pay severance to employees** who are let go.

- Revenue function and profitability process are parameterised w/ **initial GMM-IV estimates**.
- The remaining vector of parameters, $\Theta \in \mathbb{R}^7$, is estimated via **simulated method of moments**.
- Moments from before and after the labour reform identify the main parameters of interest.

		Responsiveness				Distributions		Exit	Distance
		ϱ_{An}	λ_1	θ_2	ψ_2	$\sqrt{\Sigma_{\overline{r}}}$	$\overline{n}$	$\overline{x}$	$F(\hat{\Theta})$
2006-2013	*Data*	0.64	0.95	−0.02	−0.08	1.14	1.24	8.16	
	Model	0.58	0.83	−0.02	−0.07	1.77	1.17	6.03	0.41
2014-2019	*Data*	0.81	0.96	−0.02	−0.07	1.16	1.14	6.44	
	Model	0.67	0.83	−0.02	−0.08	1.59	1.16	6.19	0.21

Notes: Targeted moments are the covariance between the log level of TFPR and log employment ϱ_{An}, the serial correlation of log employment λ_1 in (2), the concavity of the hiring rule θ_2 in (3), the exit responsiveness coefficient ψ_2 in (5), the standard deviation of log labour productivity $\sqrt{\Sigma_{\overline{r}}}$, the mean of log employment $\overline{n}$, and the mean of the exit rate $\overline{x}$. The measure of distance between data and simulated moments defined in (10) is $F(\hat{\Theta})$.

Local elasticities

- Cost of sacking one employee: **from 78% to only 54% of the average revenue** of the economy.
- But the unit cost of hiring remained largely unchanged: **b/w 31% and 34%**.

	Labour adjustment costs				Wage function		Fixed cost
	γ_f	Γ_f	γ_h	Γ_h	η	w_0	c
2006-2013	0.23	0.55	0.18	0.13	4.25	1.25	0.04
2014-2019	0.19	0.35	0.27	0.07	4.16	0.73	0.06

Notes: All labour adjustment costs parameters and the fixed cost of operation are expressed as a share of the average revenue of the simulated economy. The economy is simulated at a quarterly frequency and aggregated to match the annual moments of the data. The quarterly discount factor is set to $\beta = 0.99$, and the hourly rate w_1 is calibrated such that the steady-state value of hours per worker replicates the observed yearly average.

Optimal weighting matrix

Quantitative analysis

- The variance of labour productivity has remained mostly flat, while the pace of job reallocation maintained its declining trend.
- A more flexible labour market enhanced firms' employment responsiveness, but product market power also rose.
- **Can the muted response of productivity be explained by the interaction b/w these two channels?** The model can answer this.
  - → Counterfactuals: what would have happened to the variance of productivity if either of those channels had been absent?
  - → Variance decomposition: which economic forces drive that dispersion?

Quantitative analysis — Counterfactual exercises

		Targeted moments		Distance
		ϱ_{An}	$\sqrt{\Sigma_{\overline{r}}}$	$F(\hat{\Theta})$
2006-2013	*Data*	0.64	1.14	
	Model	0.58	1.77	0.41
2014-2019	*Data*	0.81	1.16	
	Model	0.67	1.59	0.21
	Counterfactual, $C(n_{-1}, n)$	0.31	1.76	1.53
	Counterfactual, *free adjustments*	2.79	1.03	19.08
	Counterfactual, α	0.24	1.36	8.95

Notes: In **Counterfactual,** $C(n_{-1}, n)$ only the four adjustment cost parameters ($\gamma_f, \Gamma_f, \gamma_h$, and Γ_h) are kept at their 2006-2013 levels. All other parameters take their 2014-2019 values.

In **Counterfactual,** *free adjustments* all four adjustment costs parameters ($\gamma_f, \Gamma_f, \gamma_h$, and Γ_h) are set to zero. All other parameters take their 2014-2019 values.

In **Counterfactual,** α only the curvature of the revenue function (α) is kept at its 2006-2013 levels. All other parameters take their 2014-2019 values.

Partial estimation

- The variance of productivity is linked to the measure of misallocation of Hsieh and Klenow (2009): the cross-sectional variance of TFPR, Σ_A.
- That variance is an explicit function of α and the VCov matrix of employment, hours, and TFPR.

$$\mathrm{Var}\big(\log(R) - \log(n)\big)^{-1} \times \mathbf{tr}\left(\begin{bmatrix} 1 & 2(\alpha-1) \\ 0 & (\alpha-1)^2 \end{bmatrix} \cdot \begin{bmatrix} \Sigma_A & \varrho_{An} \\ \varrho_{An} & \Sigma_n \end{bmatrix}\right) \approx 0.96$$

- The decomposition embeds the effects of the labour market reform and the rise in market power.
- How did each of those impact the variance decomposition?

		Variance	Elements of variance decomposition			Share of variance
		$\Sigma_{\bar{r}}$	Σ_A	$(\alpha-1)^2\,\Sigma_n$	$2(\alpha-1)\,\varrho_{An}$	
2006-2013	*Data*	1.31	1.60	0.23	−0.56	0.96
	Model	3.14	1.15	1.37	−0.51	0.64
2014-2019	*Data*	1.35	1.82	0.37	−0.90	0.96
	Model	2.53	1.34	1.17	−0.74	0.70
	Counterfactual, $C(n_{-1}, n)$	3.09	1.35	1.27	−0.34	0.74
	Counterfactual, $R(\cdot)$	1.86	1.58	0.04	−0.21	0.76

Notes: The first column displays the variance of log labour productivity, $\Sigma_{\bar{r}}$. The following three columns show the elements which are part of the variance decomposition: the variance of log profitability, Σ_A, the weighted variance of log employment, $(\alpha-1)^2\Sigma_n$, and the weighted covariance between log profitability and log employment, $2(\alpha-1)\varrho_{An}$. The last column reports the sum of the three preceeding elements divided by the variance of log labour productivity.

In **Counterfactual,** $C(n_{-1}, n)$ only the four adjustment cost parameters (γ_f, Γ_f, γ_h, and Γ_h) are kept at their 2006-2013 levels. All other parameters take their 2014-2019 values. In **Counterfactual,** $R(\cdot)$ all elements of the revenue function (α, ρ, and σ) are kept at their 2006-2013 levels. All other parameters take their 2014-2019 values.

Conclusion

A reform in Portugal added flexibility to the labour market but it did not boost productivity.

This paper studies why it happened.

- As predicted, the labour market reform enhanced the employment responsiveness of firms.
- But it also coincided w/ a period of rising product market power.
- Together, they exert a quantitatively offsetting effect on the dispersion of labour productivity.

The paper provides meaningful implications for policy:

- Greater markups is a documented trend in developed economies (De Loecker & Eeckhout (2018)).
- Easier labour adjustments are not sufficient; productivity also responds to stronger competitive pressures.

THANK YOU!

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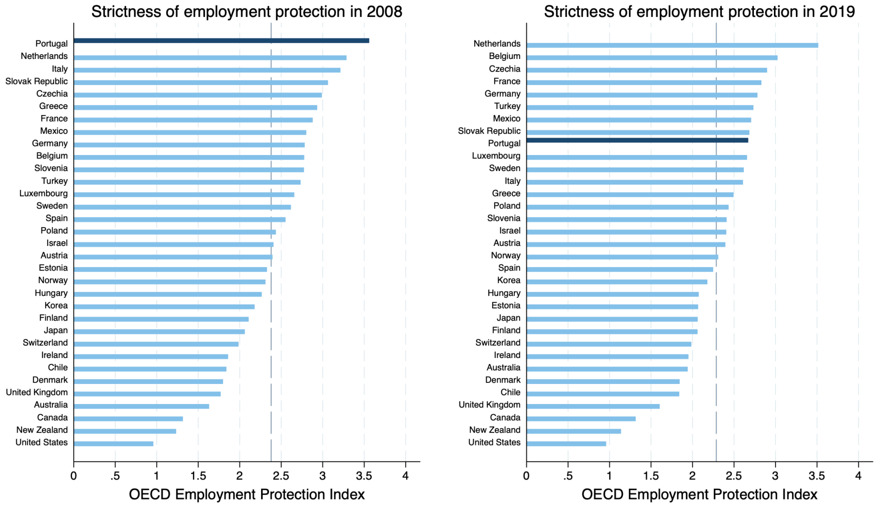
Appendix: OECD Employment Protection Legislation Index



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Appendix: Revenue function derivation

- Firms have a **CB production technology** w/ CRS: $y = z \cdot (nh)^{\zeta} \cdot k^{1-\zeta}$, w/ $\zeta \in (0,1)$.
- Their **demand price schedule** is $p(y) = (\theta/y)^{1/\nu}$, where θ is a stochastic demand shifter.
- **Assumption**: both productivity z and demand θ are lognormal, Markovian processes.
- The **revenue function net of capital payments** is as follows:

$$R(\cdot) = \max_k \left\{ p(y) \cdot y - rk \right\} = \max_k \left\{ \theta^{\frac{1}{\nu}} \cdot \left(z \cdot (nh)^{\zeta} \cdot k^{1-\zeta} \right)^{\frac{\nu-1}{\nu}} - rk \right\}$$

$$= \underbrace{(1-\varepsilon(1-\zeta)) \left(\frac{\varepsilon(1-\zeta)}{r} \right)^{\frac{\varepsilon(1-\zeta)}{1-\varepsilon(1-\zeta)}} \cdot z^{\frac{\varepsilon}{1-\varepsilon(1-\zeta)}} \cdot \theta^{\frac{1-\varepsilon}{1-\varepsilon(1-\zeta)}}}_{\equiv A(z,\theta;r)} \cdot \underbrace{(nh)^{\frac{\zeta\varepsilon}{1-\varepsilon(1-\zeta)}}}_{\equiv (nh)^{\alpha}}$$

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Appendix: Portuguese firm-level data

- Balance sheet and income statement items for the near universe of non-financial Portuguese firms.
- Data provided by the Bank of Portugal (*BPLIM*) for the period b/w 2006 and 2019.

		Full sample: 2006-2019	**Pre-reform: 2006-2013**	**Post-reform: 2014-2019**
Observations		3 983 356	2 182 179	1 801 177
Nr. unique firms		616 441	445 447	435 628
Employees	Mean	9.41	9.56	9.22
	p25	1.00	2.00	1.00
	p50	3.00	3.00	3.00
	p75	6.00	6.00	6.00
Log revenue pw	Mean	10.60	10.63	10.57
	Std. deviation	1.15	1.14	1.16
Exit rate (%)	Mean	7.42	8.16	6.44

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Appendix: Sectoral decomposition of the economy

2-digit industry	**Employment share (%)**	**Pre-reform: 2006-2013**	**Post-reform: 2014-2019**
Manufacturing	24.30	0.653***	0.495***
		(0.017)	(0.020)
Wholesale and retail trade	21.93	0.648***	0.467***
		(0.012)	(0.012)
Construction	10.90	0.969***	0.706***
		(0.018)	(0.026)
Administrative and supportive services	10.40	0.611***	0.474***
		(0.028)	(0.028)
Accommodation and food services	7.97	1.090***	0.767***
		(0.022)	(0.021)

Notes: Parameter α is estimated directly from equation (1). The corresponding standard errors are robust. The number of observations for the full period, pre-reform, and post-reform are respectively as follows: *Manufacturing* has 480 369, 204 430, and 141 962; *Wholesale and retail trade* has 1 124 121, 404 030, and 288 223; *Construction* has 444 120, 178 376, and 110 635; *Administrative and supportive services* has 135 198, 41 684, and 35 069; and *Accommodation and food services* has 386 467, 136 391, and 113 758. The employment share corresponds to the average throughout the 2006-2019 period.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

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Appendix: Constant returns to scale

- Santos et al. (2022, EJ) estimate sector-specific production functions for Portuguese manufacturing firms.
- The existence of CRS technology is not a far-fetched premise:
  - → The sum of the coefficients in a CB specification ranges b/w 0.68 and 1.10.
  - → The null hypothesis that the sum equals 1 is not rejected at 10% in half of the industries.
  - → That figure is greater w/ a translog specification: 14/18 industries exhibit CRS.

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Appendix: Firm-level markups

- Firms use **intermediate materials** to produce output and generate revenue. Assumptions:
  - → The demand for intermediate materials is **strictly monotone** in unobserved productivity.
  - → Intermediate materials is a static and frictionless input.
- Under those assumptions, **product markups** can be recovered by $\mu_{i,t} = \beta^m_{i,t} / s^m_{i,t}$.
  - → The revenue elasticity of materials, $\beta^m_{i,t}$, is estimated as in Ackerberg et al. (2015).
  - → The revenue share of intermediate materials, $s^m_{i,t}$ is directly observed in the data.

	Mean	Std. deviation	p25	p50	p75	Observations
2006-2013	2.58	3.89	0.87	1.21	2.05	1 627 782
2014-2019	2.73	4.17	0.98	1.28	2.04	1 255 966

Notes: The firm-level markup is computed as $\mu_{i,x,t} = \beta^m_{x,t} / s^m_{i,x,t}$, where $\beta^m_{x,t}$ is the revenue elasticity of materials in a 2-digit sector x, and $s^m_{i,x,t}$ is the corresponding revenue share of a firm i in that sector. Both the revenue share of materials and the markup have been winsorized at the 5% tails.

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Appendix: Alternative DGP — Additional employment lags

$$\log(n_{i,t}) = \tilde{\lambda}_1 \cdot \log(n_{i,t-1}) + \tilde{\lambda}_2 \cdot \log(n_{i,t-2}) + \tilde{\lambda}_3 \cdot \log(\xi_{i,t}) + \epsilon_{i,t}$$

	Full sample: 2006-2019	**Pre-reform: 2006-2013**	**Post-reform: 2014-2019**
Serial correlation order 1, $\tilde{\lambda}_1$	0.913***	0.911***	0.913***
	(0.012)	(0.012)	(0.012)
Serial correlation order 2, $\tilde{\lambda}_2$	0.056***	0.053***	0.062***
	(0.011)	(0.011)	(0.011)
Responsiveness, $\tilde{\lambda}_3$	0.017**	0.008	0.034***
	(0.008)	(0.007)	(0.008)
Industry & Year FE	Yes	Yes	Yes
R^2	0.966	0.966	0.967
Observations	2 761 799	1 325 349	985 817

Notes: Standard errors are clustered at the industry level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

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Appendix: Alternative DGP — Relax fully flexible capital

$$\log(n_{i,t}) = \hat{\lambda}_1 \cdot \log(n_{i,t-1}) + \hat{\lambda}_2 \cdot \log(k_{i,t-1}) + \hat{\lambda}_3 \cdot \log(\hat{\xi}_{i,t}) + \epsilon_{i,t}$$

	Full sample: 2006-2019	**Pre-reform: 2006-2013**	**Post-reform: 2014-2019**
Lag employment, $\hat{\lambda}_1$	0.942^{***}	0.935^{***}	0.951^{***}
	(0.005)	(0.006)	(0.004)
Lag capital, $\hat{\lambda}_2$	0.013^{***}	0.015^{***}	0.011^{***}
	(0.002)	(0.002)	(0.002)
Responsiveness, $\hat{\lambda}_3$	0.050	0.074	0.126^{***}
	(0.061)	(0.053)	(0.031)
Industry & Year FE	Yes	Yes	Yes
R^2	0.971	0.969	0.973
Observations	2 082 050	1 148 154	781 895

Notes: Standard errors are clustered at the industry level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

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Appendix: Alternative DGP — Quadratic component

$$\log(n_{i,t}) = \check{\lambda}_1 \cdot \log(n_{i,t-1}) + \check{\lambda}_2 \cdot \log(\xi_{i,t}) + \check{\lambda}_3 \cdot \log(\xi_{i,t})^2 + \epsilon_{i,t}$$

	Full sample: 2006-2019	**Pre-reform: 2006-2013**	**Post-reform: 2014-2019**
Serial correlation, $\check{\lambda}_1$	0.984***	0.975***	0.995***
	(0.003)	(0.004)	(0.002)
Responsiveness, $\check{\lambda}_2$	0.030***	0.023***	0.048***
	(0.008)	(0.008)	(0.010)
Quadratic, $\check{\lambda}_3$	−0.003**	−0.006***	0.002
	(0.001)	(0.001)	(0.001)
Industry & Year FE	Yes	Yes	Yes
R^2	0.958	0.958	0.959
Observations	3 308 659	1 709 959	1 350 617

Notes: Standard errors are clustered at the industry level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

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Appendix: Alternative DGP — Sign dependence

$$\log(n_{i,t}) = \check{\lambda}_1 \cdot \log(n_{i,t-1}) + \check{\lambda}_2 \cdot \log(\xi_{i,t}) + \check{\lambda}_3 \cdot \mathbb{I}\big(\log(\xi_{i,t}) < 0\big) + \epsilon_{i,t}$$

	Full sample: 2006-2019	**Pre-reform: 2006-2013**	**Post-reform: 2014-2019**
Serial correlation, $\check{\lambda}_1$	0.955^{***}	0.951^{***}	0.961^{***}
	(0.005)	(0.006)	(0.005)
Responsiveness, $\check{\lambda}_2$	0.048^{***}	0.045^{***}	0.061^{***}
	(0.007)	(0.007)	(0.010)
Bad news, $\check{\lambda}_3$	0.028^{***}	0.035^{***}	0.021^{**}
	(0.009)	(0.011)	(0.009)
Industry & Year FE	Yes	Yes	Yes
R^2	0.959	0.958	0.959
Observations	3 308 659	1 709 959	1 350 617

Notes: Standard errors are clustered at the industry level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

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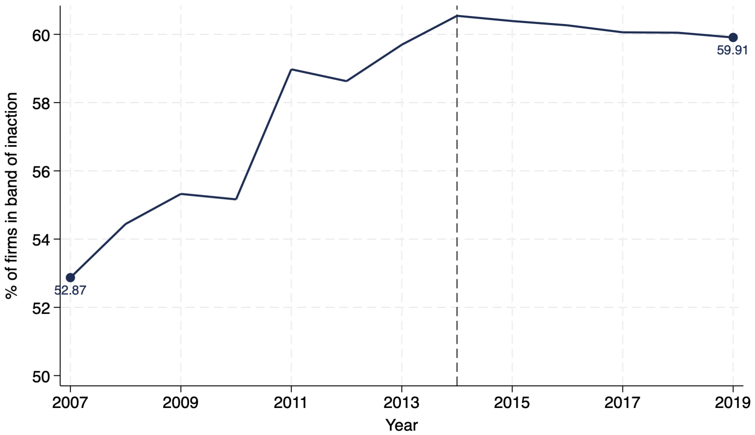
Appendix: Employment inaction in the Portuguese economy



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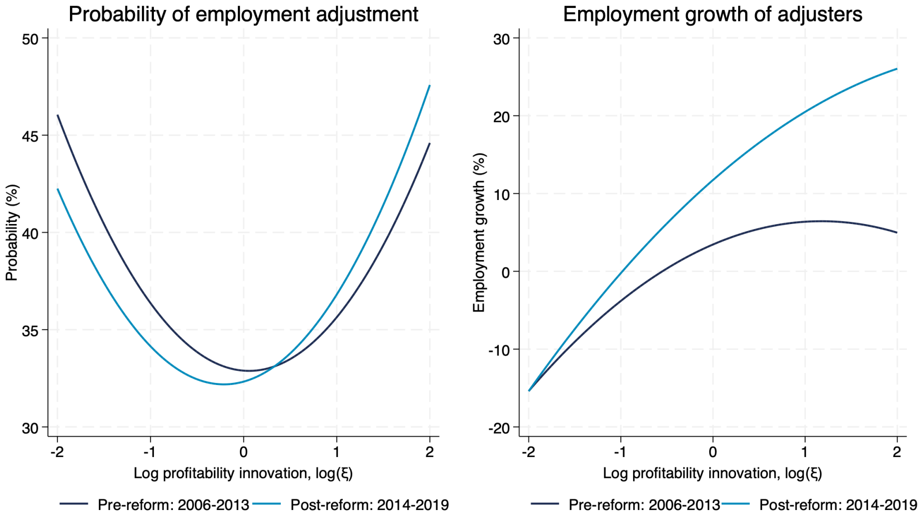
Appendix: Responsiveness regressions



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Apendix: Responsiveness regression at the extensive margin

- A firm **within the band of inaction** has employment growth $\in [-2.5\%, 2.5\%] \implies \mathbb{1}_{i,t} = 0$.

$$\mathbb{1}_{i,t} = \delta_1 \cdot \log(\xi_{i,t}) + \delta_2 \cdot \log(\xi_{i,t})^2 + \delta_3 \cdot \log(n_{i,t}) + \epsilon_{i,t}$$

	Full sample: 2006-2019	**Pre-reform: 2006-2013**	**Post-reform: 2014-2019**
Linear, δ_1	0.015^{***}	0.014^{***}	0.021^{***}
	(0.003)	(0.003)	(0.003)
Quadratic, δ_2	0.012^{***}	0.012^{***}	0.012^{***}
	(0.003)	(0.003)	(0.003)
Lag employment, δ_3	0.176^{***}	0.175^{***}	0.178^{***}
	(0.009)	(0.010)	(0.009)
Positive response	1.143 p.p.	0.907 p.p.	1.903 p.p.
Negative response	−1.074 p.p.	−1.342 p.p.	−0.320 p.p.
Different responses?	Yes***	Yes***	Yes***
Industry & Year FE	Yes	Yes	Yes
Observations	3 308 659	1 709 959	1 350 617
R^2	0.168	0.165	0.172

Notes: Standard errors are clustered at the industry level. *Positive response* and *Negative response* evaluate the percentage point change in the probability of employment adjustment following a positive and negative one-standard deviation shock to profitability, respectively. The row *Different responses?* indicates if those responses are statistically different at various levels of significance.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

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Appendix: Responsiveness regression at the intensive margin

$$\varkappa_{i,t\{\mathbb{1}_{i,t}=1\}} = \theta_0 + \theta_1 \cdot \log(\xi_{i,t}) + \theta_2 \cdot \log(\xi_{i,t})^2 + \theta_3 \cdot \log(n_{i,t-1}) + \epsilon_{i,t}$$

	Full sample: 2006-2019	**Pre-reform: 2006-2013**	**Post-reform: 2014-2019**
Intercept, θ_0	0.250^{***}	0.268^{***}	0.235^{***}
	(0.024)	(0.026)	(0.012)
Linear, θ_1	0.065^{***}	0.048^{***}	0.104^{***}
	(0.013)	(0.012)	(0.015)
Quadratic, θ_2	-0.020^{***}	-0.020^{***}	-0.017^{***}
	(0.001)	(0.001)	(0.001)
Lag employment, θ_3	-0.104^{***}	-0.097^{***}	-0.111^{***}
	(0.011)	(0.011)	(0.011)
Positive response	3.249 p.p.	2.278 p.p.	5.592 p.p.
Negative response	−4.710 p.p.	−3.844 p.p.	−6.725 p.p.
Different responses?	Yes***	Yes***	Yes***
Industry & Year FE	Yes	Yes	Yes
Observations	1 380 478	744 067	538 526
R^2	0.075	0.065	0.080

Notes: Standard errors are clustered at the industry level. *Positive response* and *Negative response* evaluate the percentage point change in the employment growth following a positive and negative one-standard deviation shock to profitability, respectively. The row *Different responses?* indicates if those responses are statistically different at various levels of significance.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

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Appendix: Responsiveness regression at the intensive margin

$$\varkappa_{i,t\{\mathbb{1}_{i,t}=1\}} = \check{\theta}_0 + \check{\theta}_1 \cdot \log(\xi_{i,t}) + \check{\theta}_2 \cdot \mathbb{I}\big(\log(\xi_{i,t}) < 0\big) + \check{\theta}_3 \cdot \log(n_{i,t-1}) + \epsilon_{i,t}$$

	Full sample: 2006-2019	**Pre-reform: 2006-2013**	**Post-reform: 2014-2019**
Intercept, $\tilde{\theta}_0$	0.206^{***}	0.218^{***}	0.201^{***}
	(0.026)	(0.029)	(0.015)
Linear responsiveness, $\tilde{\theta}_1$	0.093^{***}	0.081^{***}	0.123^{***}
	(0.012)	(0.012)	(0.014)
Bad news, $\tilde{\theta}_2$	0.056^{**}	0.068^{***}	0.039^{**}
	(0.021)	(0.023)	(0.017)
Lag employment, $\tilde{\theta}_3$	-0.098^{***}	-0.089^{***}	-0.106^{***}
	(0.010)	(0.010)	(0.011)
Positive response	5.593 p.p.	4.892 p.p.	7.329 p.p.
Negative response	−8.982.593 p.p.	−8.981 p.p.	−9.631 p.p.
Different responses?	Yes***	Yes***	Yes**
Industry & Year FE	Yes	Yes	Yes
Observations	1 380 478	744 067	538 526
R^2	0.116	0.123	0.108

Notes: Standard errors are clustered at the industry level. *Positive response* and *Negative response* evaluate the percentage point change in the employment growth following a positive and negative one-standard deviation shock to profitability, respectively. The row *Different responses?* indicates if those responses are statistically different at various levels of significance.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

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Appendix: Responsiveness of exit decisions to profitability

- Let $\chi_{i,t} = 1$ denote a firm which exits the economy at the beginning of period t.

$$\chi_{i,t} = \psi_1 \cdot \log(n_{i,t-1}) + \psi_2 \cdot \log(\xi_{i,t-1}) + \epsilon_{i,t}$$

	Full sample: 2006-2019	**Pre-reform: 2006-2013**	**Post-reform: 2014-2019**
Lag employment, ψ_1	-0.026^{***}	-0.028^{***}	-0.023^{***}
	(0.004)	(0.004)	(0.004)
Responsiveness, ψ_2	-0.073^{***}	-0.075^{***}	-0.072^{***}
	(0.010)	(0.010)	(0.010)
Industry & Year FE	Yes	Yes	Yes
Observations	3 308 659	1 709 959	1 350 617
R^2	0.116	0.125	0.106

Notes: Standard errors are clustered at the industry level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Appendix: The formal problem of the incumbents

$$V^i(A, n_{-1}) = \max_{n\geq 0,\, h\geq 0} \left\{ R(A, n, h) - \omega(n, h) - c - C(n_{-1}, n) + \beta \int_{A' \in \mathcal{A}} V(A', n) \cdot \mathrm{d}G(A'|A) \right\}$$

- Reduced form **revenue function** as before: $R(A, n, h) \equiv A \cdot (nh)^{\alpha}$, w/ curvature $\alpha \in (0, 1)$;
- Constant elasticity **wage function**: $\omega(n, h) \equiv n \cdot \left(w_0 + w_1 h^{\eta}\right)$ w/ $\eta \geq 1$;
- **Fixed cost of operation**: $c > 0$;
- Asymmetric **labour adjustment cost function** w/ fixed and linear components:

$$C(n_{-1}, n) \equiv \begin{cases} \Gamma_f + \gamma_f \cdot (n_{-1} - n) & \text{if } n_{-1} > n \\ 0 & \text{if } n_{-1} = n \\ \Gamma_h + \gamma_h \cdot (n - n_{-1}) & \text{if } n_{-1} < n \end{cases}$$

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Appendix: Entering and exiting the economy

- Firms which want to exit need only to **pay severance** to all employees who are let go:

$$V^o(n_{-1}) = -\gamma_f \times n_{-1}$$

- For each exiter $\exists$ a potential entrant w/ a signal $\tilde{A}$ drawn from the stationary distribution.

- Those firms enter the **following period** w/ the **lowest level of employment**, $\underline{n}$, if:

$$\int_{A' \in \mathcal{A}} V(A', \underline{n}) \cdot \mathrm{d}G(A'|\tilde{A}) \geq 0$$

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Appendix: Stationary equilibrium of the economy

- A stationary equilibrium corresponds to a steady-state distribution over (A, n).
- That distribution must exist and is defined by the following elements:
  - $\rightarrow$ The profitability conditional CDF, $\Pi(\cdot|A)$;
  - $\rightarrow$ The employment policy function, $n \equiv \varphi(A, n_{-1})$;
  - $\rightarrow$ The exit policy function, $\chi(A, n_{-1})$;
  - $\rightarrow$ The entrance policy function, $\psi(\tilde{A})$.

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Appendix: Local elasticities at the estimated parameters

Moments \ Parameters	γ_f	Γ_f	γ_h	Γ_h	η	w_0	c
ϱ_{An}	-4.75	0.23	1.47	1.85	28.13	10.87	11.06
λ_1	0.27	0.11	-0.59	-0.47	-4.53	-1.67	-2.03
θ_2	28.44	-1.00	17.20	3.18	-37.49	-26.01	-7.71
ψ_2	-2.93	-0.10	4.54	4.97	38.45	13.16	17.77
$\sqrt{\Sigma_{\bar{r}}}$	0.01	0.03	0.94	1.01	5.59	1.28	3.28
$\bar{n}$	2.77	-0.17	-3.54	-2.84	-34.28	-12.72	-13.38
$\bar{x}$	-3.01	-0.00	4.43	4.69	39.34	13.11	17.93

Moments \ Parameters	γ_f	Γ_f	γ_h	Γ_h	η	w_0	c
ϱ_{An}	0.98	-0.69	-1.32	0.78	0.30	0.00	-0.36
λ_1	1.27	-4.40	-0.53	-3.97	-1.14	1.55	2.75
θ_2	0.10	0.02	-0.15	0.00	-0.02	0.06	0.05
ψ_2	0.21	-2.44	-0.96	-0.50	1.15	-1.78	-0.82
$\sqrt{\Sigma_{\bar{r}}}$	-2.42	-6.92	1.01	4.07	2.53	-3.46	-4.76
$\bar{n}$	1.10	1.94	-0.63	-0.61	-0.43	1.06	0.66
$\bar{x}$	0.63	5.07	0.99	-1.63	-2.24	3.38	2.68

Notes: In the *left panel* the element (m, p) of the matrix gives the local elasticity of moment m following a 1% change in parameter p. In the *right panel* element (m, p) of the matrix gives the local elasticity of parameter p following a 1% change in moment m. All these local elasticities are computed when the parameters are identified for the full period of the sample, 2006-2019.

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Appendix: Estimated parameters in a two-stage SMM procedure

- Results are similar when the **optimal weighting matrix** is used in a **two-stage SMM procedure**:
  - → Simulate the baseline economy 1 000 times and store the corresponding moments.
  - → The inverted VCov matrix of those moments are weights in the new iteration of the minimisation.

		Responsiveness				Distributions		Exit	Distance
		ϱ_{An}	λ_1	θ_2	ψ_2	$\sqrt{\Sigma_{\bar{r}}}$	$\overline{n}$	$\overline{x}$	$F(\hat{\Theta}_2)$
2006-2013	*Data*	0.64	0.95	−0.02	−0.08	1.14	1.24	8.16	
	Model	0.59	0.81	−0.02	−0.08	1.80	0.98	6.31	13736.03
2014-2019	*Data*	0.81	0.96	−0.02	−0.07	1.16	1.14	6.44	
	Model	0.57	0.85	−0.01	−0.07	1.59	1.21	5.44	3153.2

Notes: Targeted moments are the covariance between the log level of TFPR and log employment ϱ_{An}, the serial correlation of log employment λ_1 in (2), the concavity of the hiring rule θ_2 in (3), the exit responsiveness coefficient ψ_2 in (5), the standard deviation of log labour productivity $\sqrt{\Sigma_{\bar{r}}}$, the mean of log employment $\overline{n}$, and the mean of the exit rate $\overline{x}$. The measure of distance between data and simulated moments defined in (10) is $F(\hat{\Theta}_2)$.

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Appendix: Estimated parameters in a two-stage SMM procedure

	Labour adjustment costs				Wage function		Fixed cost
	γ_f	Γ_f	γ_h	Γ_h	η	w_0	c
2006-2013	0.27	0.73	0.22	0.13	4.19	1.36	0.04
2014-2019	0.20	0.44	0.29	0.10	4.16	0.73	0.06

Notes: All labour adjustment costs parameters and the fixed cost of operation are expressed as a share of the average revenue of the simulated economy. The point estimates are obtained via a two-stage SMM procedure. The optimal weighting matrix is employed after the economy is simulated 1000 times. All simulations are run at a quarterly frequency and then aggregated to match the annual moments of the data. The quarterly discount factor is set to $\beta = 0.99$, and the hourly rate w_1 is calibrated such that the steady-state value of hours per worker replicates the observed yearly average.

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Appendix: Partial re-estimation of $C(n_{-1}, n)$

- Labour adjustment costs alone exert a significant influence on both *i)* the covariance b/w employment and profitability, and *ii)* the std. deviation of labour productivity.

		Targeted moments				Distance
		ϱ_{An}	λ_1	ψ_2	$\sqrt{\Sigma_{\bar{r}}}$	$F(\hat{\Theta})$
2006-2013	*Data*	0.64	0.95	−0.08	1.14	
	Model	0.58	0.83	−0.07	1.77	0.41
2014-2019	*Data*	0.81	0.96	−0.07	1.16	
	Model	0.67	0.83	−0.08	1.59	0.21
	Partial re-estimation	0.83	0.84	−0.07	1.30	0.03

Notes: In **Partial re-estimation** all but the four adjustment cost parameters are kept at their 2006-2013 levels. These are estimated while targeting the four moments displayed in the table: ϱ_{An}, λ_1, ψ_2, and $\sqrt{\Sigma_{\bar{r}}}$.

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