Labour Market Power and Aggregate Productivity

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Table of contents

Introduction

Motivation

1. Firm size is crucial for technology adoption
    - Intangibles offer major productivity gains, but require sunk costs
    - Often too high for small businesses [Survey ISTAT]
2. Average firm size is directly affected by the entrepreneurship rate
    - Consider a <labour vs entrepreneurship> occupational choice
    - Entrepreneurship $\uparrow \Rightarrow$ More firms, fewer workers $\Rightarrow$ Average size $\downarrow$

Hypothesis

— How does labour market power factor in?

- Under monopsony power, wages lie below the competitive level
- Lower wages $\Rightarrow$ Entrepreneurship becomes more accessible

$\rightarrow$ Monopsony leads to the (excess) entry of low-ability entrepreneurs

- Too many firms, lacking the necessary scale for technology adoption

Approach

Q: *Can labour market power have substantial effects on aggregate productivity?*

— Theory: GE model of entrepreneurship, with monopsony & two technologies

— Validation: Test of 10 theoretical predictions using Italian microdata

— Quantification: Calibration exercise to estimate aggregate losses

Summary

— Analytical proof of three channels of productivity losses:

- (i) Misallocation, (ii) Excess entry, (iii) Limited technology diffusion

— Across provinces, moving from low to high markdowns ($\equiv MRPL/w$):

- Misallocation $\uparrow$ Entrepreneurship $\uparrow$ Firm size $\downarrow$ Intangibles $\downarrow$ Productivity $\downarrow$

— Compared to a competitive benchmark, productivity falls by 21%

- Excess entry $>>$ Limited tech diffusion $>>$ Misallocation

Literature

— Labour market power and misallocation

Berger et al., 2022; Bachmann et al., 2022; Armangué-J. et al., 2024

\+ *Contribution*: Distortions in the occupational choice & technology adoption

— Entry cutoff and aggregate productivity

Melitz, 2003; Syverson, 2004; Guner et al., 2008; Garicano et al., 2014

\+ *Contribution*: New perspective, based on labour market power

— Managerial quality and IT adoption

Bloom et al., 2012; Schivardi & Schmitz, 2017

\+ *Contribution* LMP reduces the average quality of active entrepreneurs

Theory

Environment

— Tractable model of entrepreneurship in GE, with three key ingredients:

1. Occupational choice by agents i, with ability $\mu_i \sim$ Pareto(α)
   Lucas, 1978

2. Labour market power, arising from idiosyncratic taste $\tilde{\varepsilon}_{ik} \sim$ Fréchet $(\frac{1}{\theta})$
   Card, 2018

3. Technological upgrade $(t_k = 1 + \gamma)$ by paying a fixed cost $(f_k = \tau \bar{w})$
   Bustos, 2011

Competition

— Product differentiation $\Rightarrow$ Monopolistic competition

- Consumer's problem: $\text{Max}_{c_{ik}} \left(\frac{1}{E^{\frac{1}{\sigma}}} \int_{k \in \mathcal{E}} c_{ik}^{\frac{\sigma-1}{\sigma}} dk \right)^{\frac{\sigma}{\sigma-1}}$
- Product demand elasticity: $\left| \frac{\partial y_k}{\partial p_k} \frac{p_k}{y_k} \right| = \sigma$

— Job differentiation $\Rightarrow$ Monopsonistic competition

- Worker's problem: $\text{Max}_k \, w_k \tilde{\varepsilon}_{ik}$
- Labour supply elasticity: $\frac{\partial l_k}{\partial w_k} \frac{w_k}{l_k} = \frac{1}{\theta}$

Firms

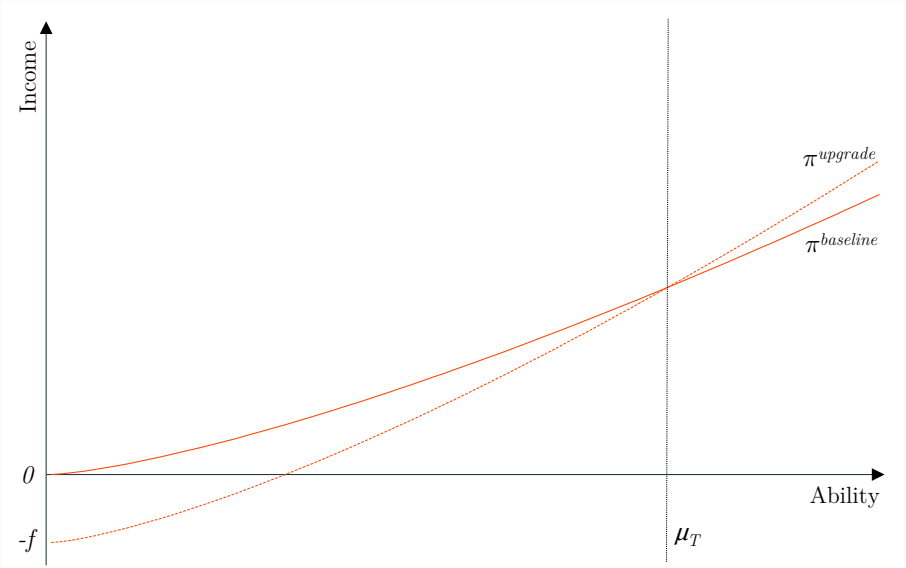
— Production function: $y_k = a_k l_k = \mu_k t_k l_k$

- Output = Ability x Technology x Labour

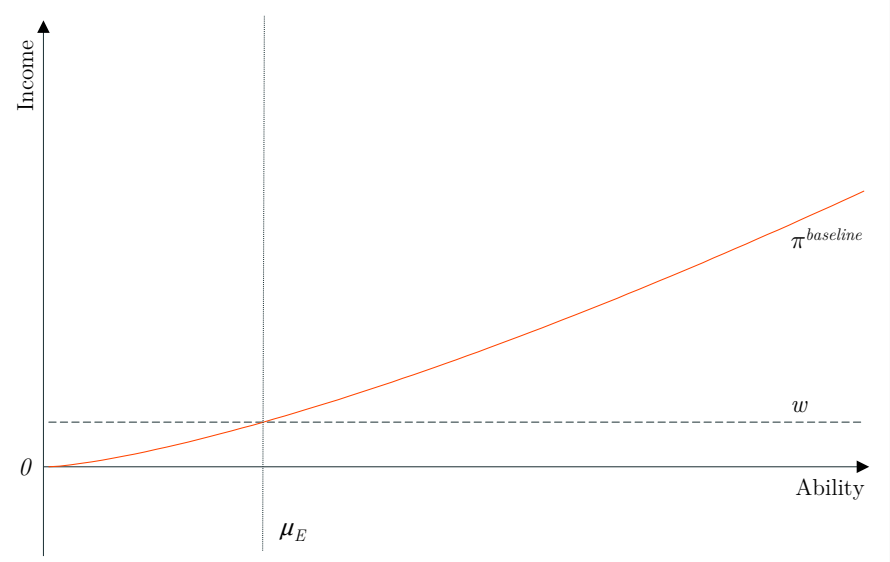
— Firms set prices & wages internalising the (finite) elasticities

- Firm's problem: $\text{Max}_{l_k}\ p_k a_k l_k - w_k l_k - f_k$
- FOC: $MRPL_k = p_k a_k \frac{\sigma-1}{\sigma} = w_k(1+\theta)$
- Labour, output, wages, profits: all grow in a_k

Technology choice



Entry choice

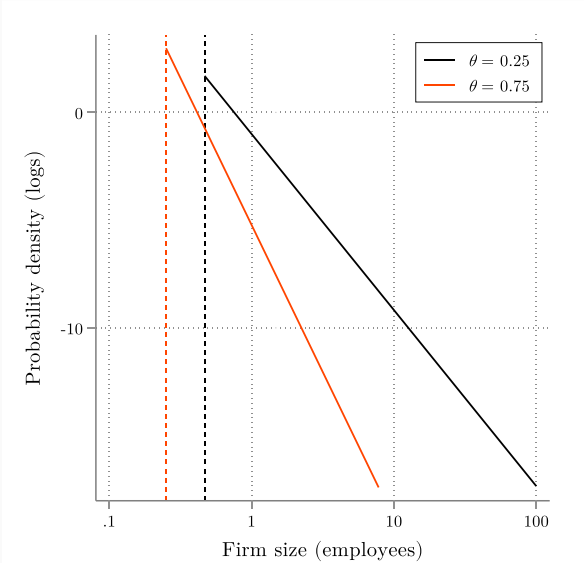


Theoretical results: Size distribution

— How does labour market power affect the size distribution?

1. It reallocates workers towards smaller firms
   - $l_k > l_j \Rightarrow \frac{\partial(l_k/l_j)}{\partial\theta} < 0$
2. It induces excess entry, reducing average firm size
   - $\frac{\partial E}{\partial\theta} > 0$
   - $\frac{\partial L^P}{\partial\theta} < 0$

Theoretical results: Size distribution



Theoretical results: Productivity (1/3)

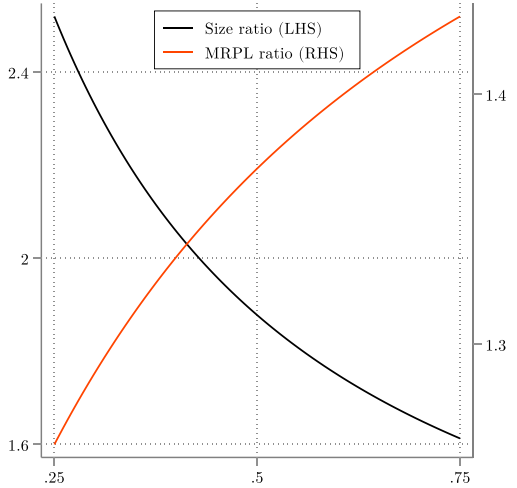
— How does labour market power affect aggregate productivity?

1. It reallocates workers towards smaller firms

   $\Rightarrow$ Corollary: it reduces allocative efficiency

   - $MRPL_k > MRPL_j \Rightarrow \frac{\partial\left(l_k/l_j\right)}{\partial\theta} < 0$

Theoretical results: Productivity (1/3)



Theoretical results: Productivity (2/3)

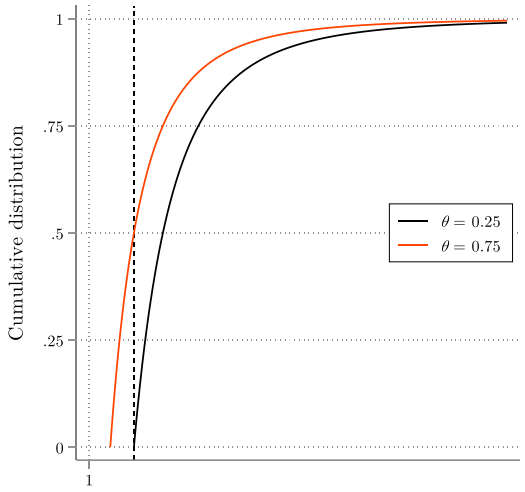
— How does labour market power affect aggregate productivity?

2. It induces excess entry, reducing average firm size

   $\Rightarrow$ Corollary: it shifts the ability distribution towards the left

   - $\theta > \theta' \Rightarrow \Phi\left(\mu|_{\mu>\mu_E(\theta)}\right) > \Phi\left(\mu|_{\mu>\mu_E(\theta')}\right)$

Theoretical results: Productivity (2/3)



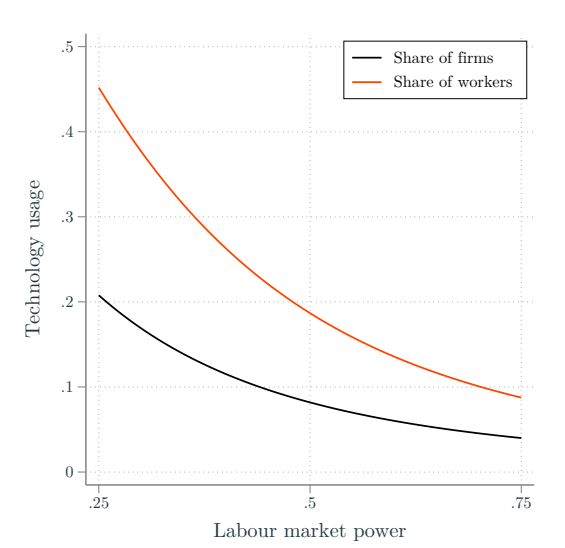
Theoretical results: Productivity (3/3)

— How does labour market power affect aggregate productivity?

3. It limits technology diffusion across firms and workers

- Share of firms: $\frac{\partial\left(\frac{1-\Phi(\mu_T)}{1-\Phi(\mu_E)}\right)}{\partial\theta} < 0$
- Share of workers: $\frac{\partial\left(\frac{\int_{\mu_T}^{\infty} l(\mu)\phi(\mu)d\mu}{L^P}\right)}{\partial\theta} < 0$

Theoretical results: Productivity (3/3)



Validation

Strategy

1. Estimation of labour market power $\hat{\theta}_{Kt}$ across Italian provinces K
    - Measured as the average firm-level wage markdown $\hat{\chi}_{kt}$:
        - $1 + \hat{\theta}_{Kt} = \frac{1}{E_{Kt}} \sum_{k \in K} \hat{\chi}_{kt}$
        - $\hat{\chi}_{kt} \equiv \frac{\hat{MRPL}_{kt}}{w_{kt}} = (\hat{\varepsilon}^{r,l}_{kt})(\frac{r_{kt}}{w_{kt} l_{kt}})$
2. Do more monopsonistic areas show the predicted outcomes?
    - 10 testable predictions from the Theory

Data

— Data on Italian firms from the CompNet database

- Micro-aggregation of financial statements
- Including percentiles, dispersion measures, parametric indicators, etc.

— Info on IT diffusion from other sources

- Software adoption by size class from ISTAT survey data
- Software expenditure from EUKLEMS-INTANProd

Revenue function estimation

— Translog specification in capital, labour, and materials

- $r_{kt}^{ln} = \beta^{\kappa}\kappa_{kt}^{ln} + \beta^{l}l_{kt}^{ln} + \beta^{m}m_{kt}^{ln} + [interactions] + \omega_{kt} + \epsilon_{kt}$

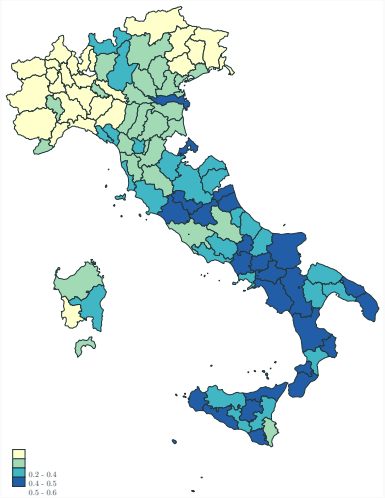
— Firm-specific elasticities, industry-specific parameters

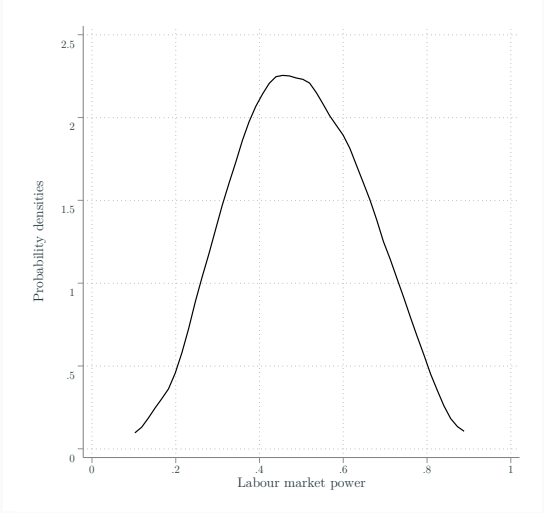
- $\varepsilon_{kt}^{r,l} \equiv \frac{\partial r_{kt}^{ln}}{\partial l_{kt}^{ln}} = \beta^{L} + \left[2\beta^{l^2}l_{kt}^{ln} + \beta^{\kappa l}\kappa_{kt}^{ln} + \beta^{lm}m_{kt}^{ln}\right]$

— To deal with endogeneity: control function approach (Ackerberg et al., 2015)

- Key difference: ω_{kt} includes both productivity and demand shocks

Labour market power: Estimates



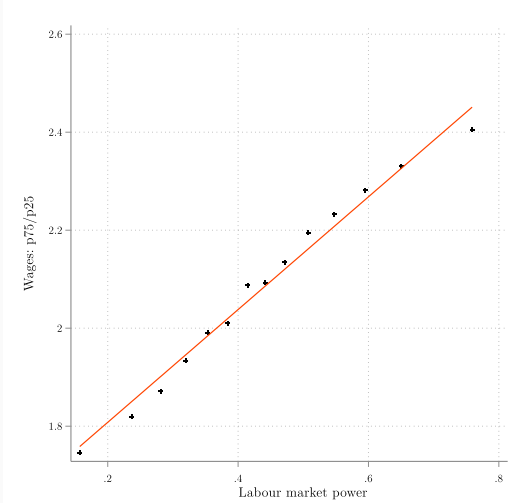


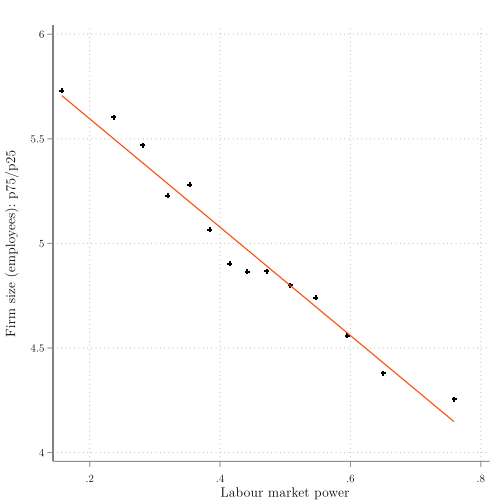
Theoretical predictions

— *Moving from less to more monopsonistic labour markets:*

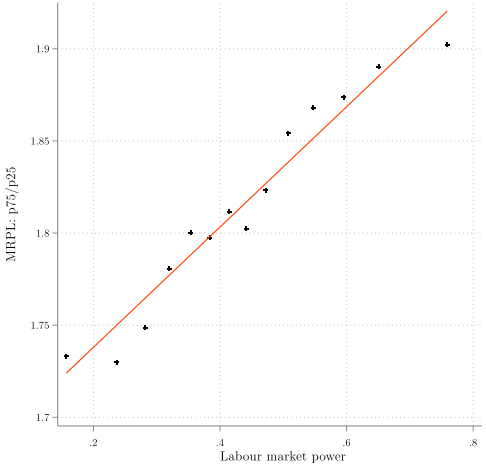
1. Wage dispersion ↑
2. Size dispersion ↓
3. MRPL dispersion ↑
4. TFPR dispersion ↑
5. Average wage ↓
6. Entrepreneurship ↑
7. Average firm size ↓
8. Average productivity ↓
9. IT diffusion ↓
10. Aggregate productivity ↓

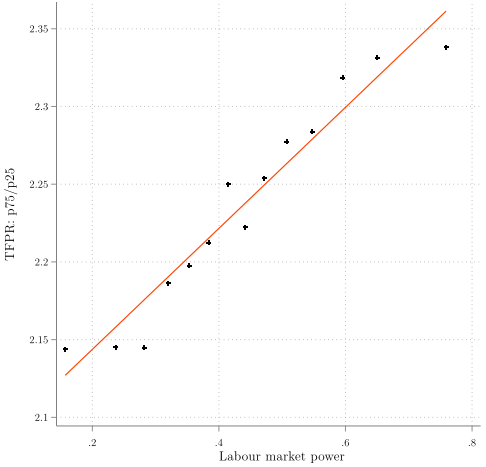
Empirical results: (1) Wage dispersion and (2) Size dispersion



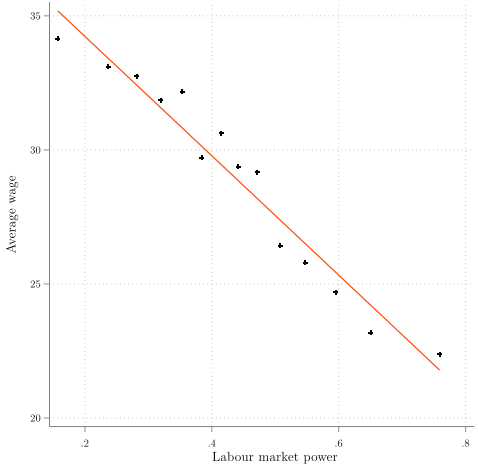


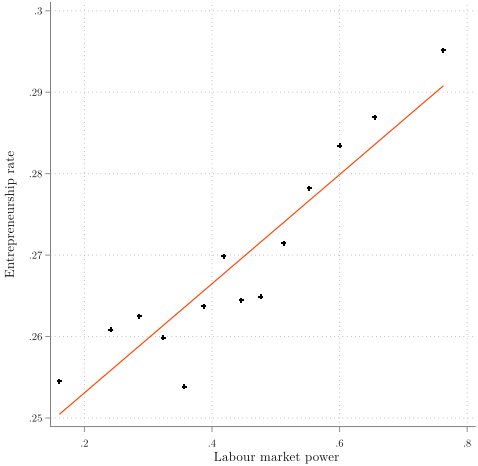
Empirical results: (3) MRPL dispersion and (4) TFPR dispersion



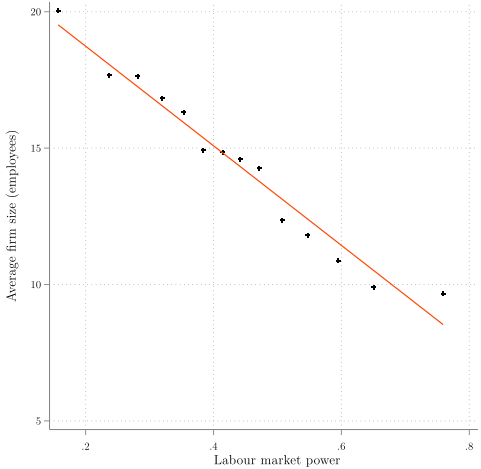


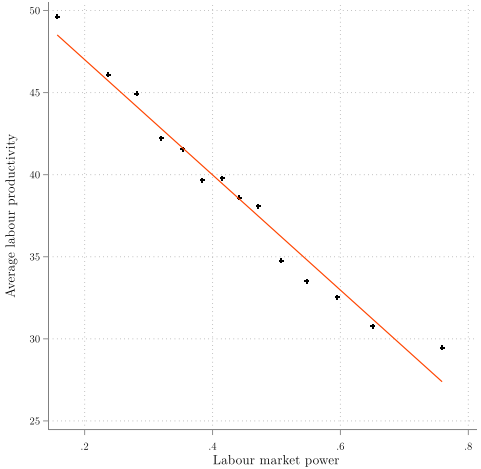
Empirical results: (5) Average wage and (6) Entrepreneurship



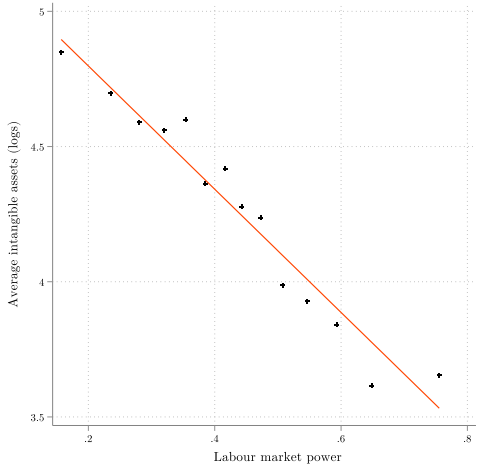


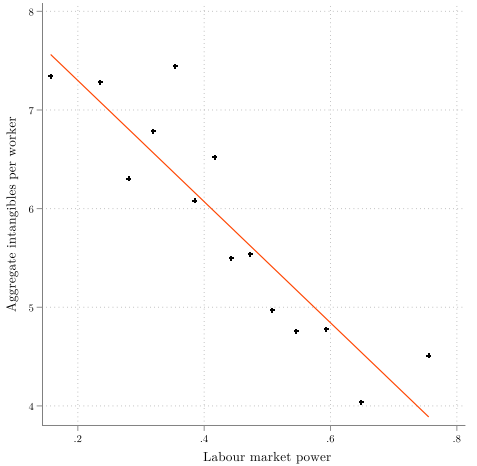
Empirical results: (7) Average size and (8) Average productivity



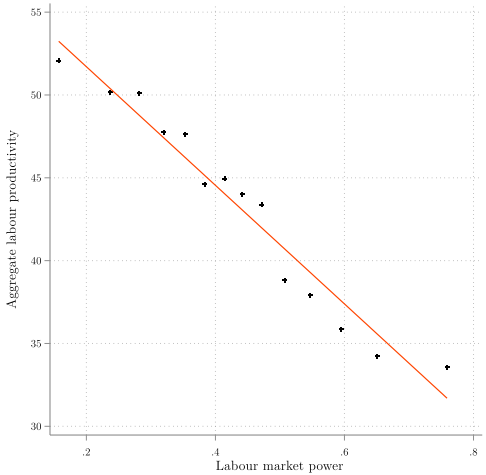


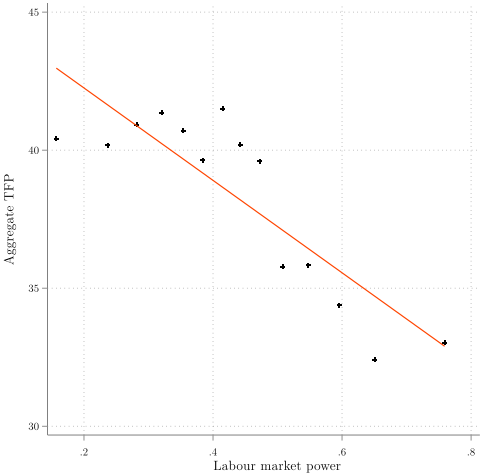
Empirical results: (9) Intangibles





Empirical results: (10) Aggregate productivity



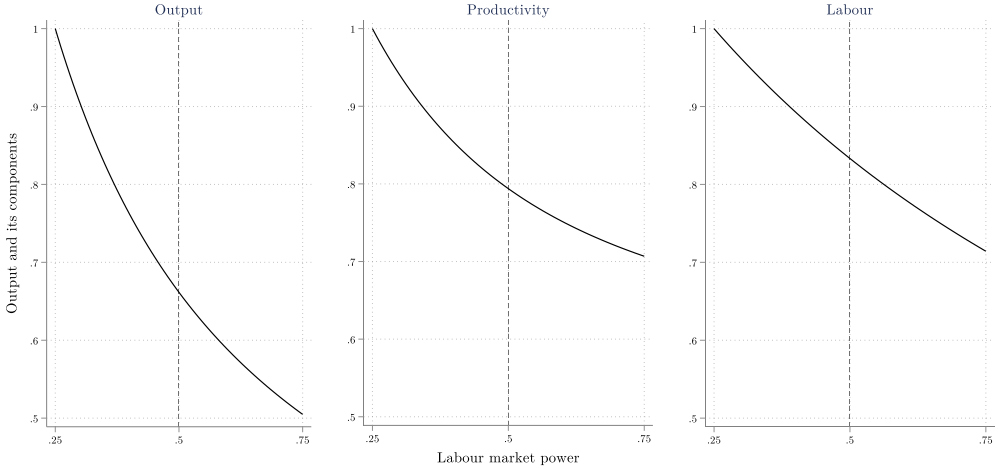


Quantification

Calibration

Calibration	Parameter	Description	Value	Target	Source
External	θ	Job differentiation	0.61	Average wage markdown	CompNet
External	σ	Product substitutability	3.5	Average price markup	Literature
Internal	α	Pareto shape parameter of the ability distribution	3.4	Aggregate profit share	EU Klems
Internal	τ	Cost of technology adoption in labour units	0.89	Aggregate ratio of software to labour expenditure	IntanProd
Internal	γ	Growth in firm productivity upon technology adoption	0.23	Share of firms adopting software	ISTAT

Quantification results: Aggregate losses



Decomposing aggregate productivity

— Aggregate productivity, $A \equiv \frac{Y}{L^P}$, can be composed in:

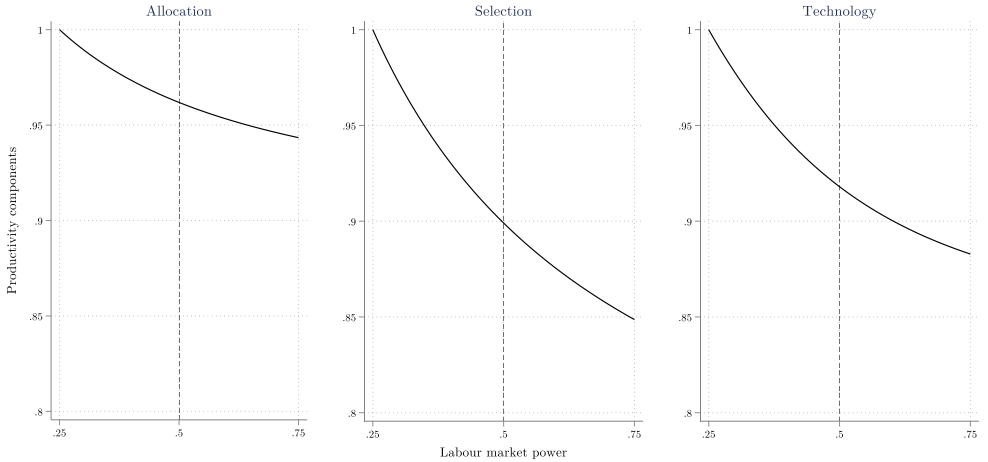
- Management: $M \equiv A|_{\gamma=0}$
- Technology: $T \equiv \frac{A}{A|_{\gamma=0}}$

— Management, M, can be composed in:

- Selection: $\bar{M} = \text{mean}\left(\mu_j|_{\gamma=0}\right) = \left(\frac{\alpha}{\alpha-1}\right)\left(\mu_E|_{\gamma=0}\right)$
- Allocation: $\Omega \equiv \frac{M}{\bar{M}}$

$\Rightarrow$ Productivity = Allocation x Selection x Technology

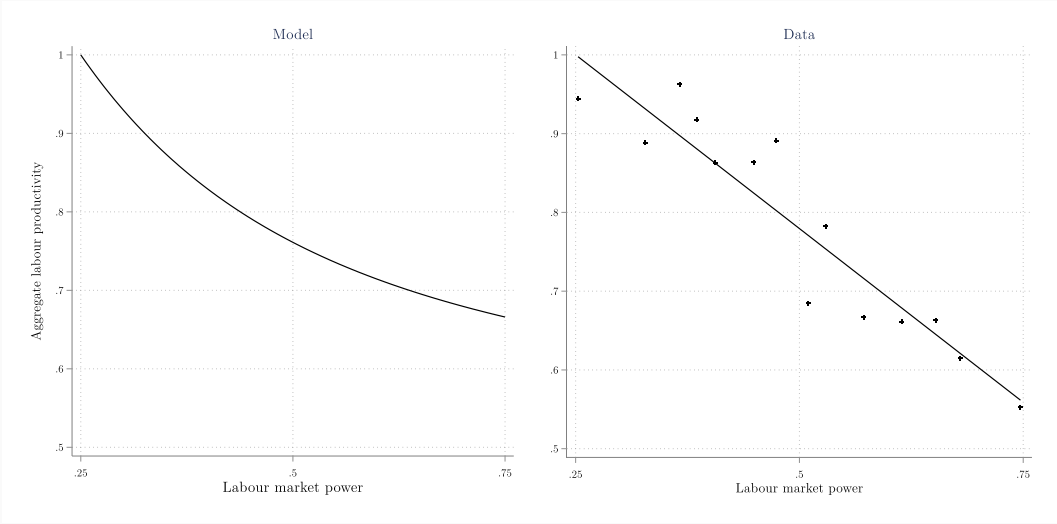
Quantification results: Channels



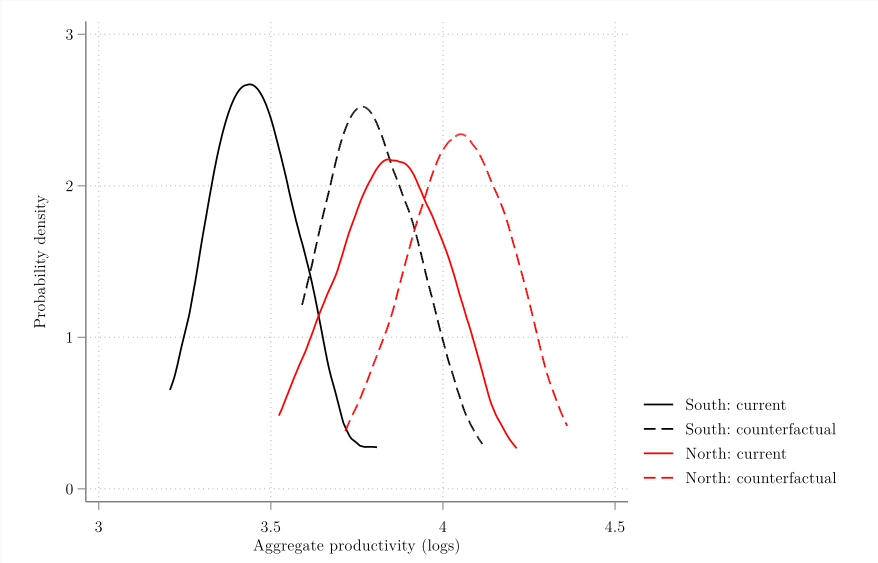
Quantification results: Summary

Variable	Definition	Competitive benchmark	Typical labour market	Highest monopsony
θ	Labour market power	0.25	0.5	0.75
Y	Aggregate output	1	0.66	0.5
A	Aggregate productivity	1	0.79	0.71
L^P	Aggregate production labour	1	0.83	0.72
Ω	Allocation term	1	0.96	0.94
$\bar{M}$	Selection term	1	0.9	0.85
T	Technology term	1	0.92	0.88

Model vs Data



Geographical disparities



Conclusion

Conclusion

— New theory of monopsony as a key source of productivity losses

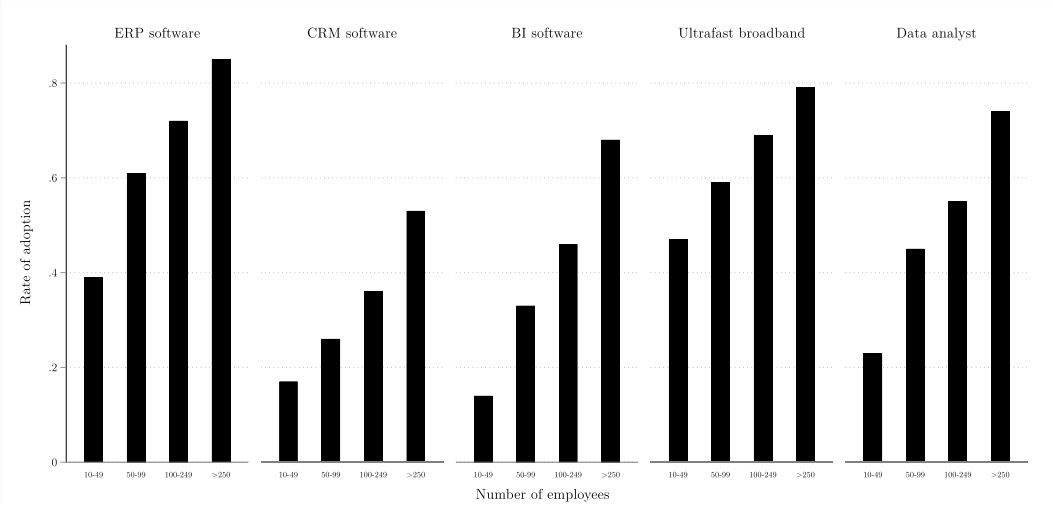
- Substantial distortions in the size distribution and technology diffusion
- Powerful explanation for cross-market differentials in productivity

— New evidence on labour market power across Italian provinces

- Wages systematically below the MRPL, especially in the South
- LMP associated with lower wages, smaller firms, and reduced productivity

Appendix

Technology adoption by size class



First set of predictions

	(1) Wages: P75/P25 (logs)	(2) Employment: P75/P25 (logs)	(3) MRPL: P75/P25 (logs)	(4) TFPR: P75/P25 (logs)
LMP	0.355^{**}	-0.257^{*}	0.113^{**}	0.113^{*}
	(0.161)	(0.143)	(0.0401)	(0.0554)
South (dummy)	0.00378	-0.0902^{**}	0.0313^{***}	0.0174
	(0.0292)	(0.0301)	(0.00849)	(0.0120)
City (dummy)	0.0128	0.0226	0.0198^{*}	0.0299^{**}
	(0.0159)	(0.0292)	(0.00948)	(0.0134)
Observations	1,436	1,436	1,436	1,436

Second set of predictions

	(5) Average wage (logs)	(6) Entrepreneurship rate (logs)	(7) Average firm size (logs)	(8) Average labour productivity (logs)
LMP	-0.548^{***}	0.394^{**}	-0.948^{***}	-0.497^{***}
	(0.0911)	(0.164)	(0.215)	(0.162)
South (dummy)	-0.235^{***}	-0.00458	-0.317^{***}	-0.205^{***}
	(0.0248)	(0.0358)	(0.0559)	(0.0295)
City (dummy)	0.0596^{*}	-0.103^{***}	0.129^{**}	0.0462^{**}
	(0.0300)	(0.0234)	(0.0480)	(0.0195)
Observations	1,436	1,370	1,436	1,436

Third set of predictions

	(9) Average intangible assets (logs)	(10) Intangibles per worker (logs)	(11) Aggregate labour productivity (logs)	(12) Aggregate TFP (logs)
LMP	-0.232^{***}	-0.286	-0.537^{***}	-0.304
	(0.0737)	(0.219)	(0.110)	(0.218)
South (dummy)	-0.202^{***}	-0.149^{**}	-0.254^{***}	-0.259^{***}
	(0.0228)	(0.071)	(0.0335)	(0.0479)
City (dummy)	0.141^{***}	-0.027	0.0222	0.177^{***}
	(0.0226)	(0.0719)	(0.0210)	(0.0354)
Observations	1,376	1,436	1,436	1,433

Quantification: Productivity loss, robustness

Baseline	Loss	Lower value	Loss	Higher value	Loss
$\sigma = 3.5$	21%	$\sigma = 3$	15%	$\sigma = 4$	26%
$\alpha = 3.4$	21%	$\alpha = 2.9$	26%	$\alpha = 3.9$	17%
$\tau = 0.89$	21%	$\tau = 0.3$	14%	$\tau = 1.48$	26%
$\gamma = 0.23$	21%	$\gamma = 0$	19%	$\gamma = 0.46$	19%