Equilibrium Effects of the Minimum Wage: The Role of Product Market Power

Salvatore Lo Bello [*] Lorenzo Pesaresi [**]

[*]Bank of Italy[1]

[**]University of Zürich

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[1]The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Bank of Italy.

Motivation

- Minimum Wage (MW) prominent labor market policy.
- Traditional view: contrasts in-work poverty ($w \uparrow$) but increases unemployment ($u \uparrow$). [Brown et al. (1982); Neumark and Wascher (1992)]

  Theory: perfectly competitive labor market.
- Current consensus: boosts low wages ($w \uparrow$) with muted employment effects ($\bar{u}$). [Card and Krueger (1994); Cengiz et al. (2019)]

  Theory: labor market power.
- New empirical evidence: induces sizable price effects ($p \uparrow$). [Allegretto and Reich (2018); Link (2019); Harasztosi and Lindner (2019)]

  Theory: ?

Research Question

What is the role of product mkt power in the equilibrium effects of MW?

This Paper in a Nutshell

1. Add strategic pricing to std monopsony model $\Longrightarrow$ **novel concentration channel** of the MW:

   MW $\uparrow \xrightarrow{\text{reallocation}}$ mkt share of large firms $\uparrow \xrightarrow{\text{concentration}}$ markup $\uparrow$

   $\Longrightarrow$ Ambiguous labor share response to the MW: monopsony power $\downarrow$ but monopoly power $\uparrow$.

   $\Longrightarrow$ Restraining effect on Y and w: monopoly power $\uparrow$ $\Longrightarrow$ labor demand $\downarrow$.

2. Construct a quantitative model w/ **endogenous markups and markdowns**.
   - Two-sided heterogeneity.
   - Frictional labor mkt (wage posting) + oligopolistic product mkt.

3. Use the estimated model to simulate the effects of MW reforms $\rightarrow$ **prod mkt power affects aggregate and distributional impact**.

Preview of Quantitative Results

- **Hump-shaped response of the labor share.** labor share
  - Small MW: reduction in monopsony power dominates $\Longrightarrow$ labor share $\uparrow$.
  - Large MW: increase in monopoly power dominates $\Longrightarrow$ labor share $\downarrow$.
- MW=15^{th} perc. $\Longrightarrow$ wage gains (**+9%**), modest unemployment surge (**+1pp**) but GDP rise (**+4%**), driven by **sizable productivity gains** from workers' reallocation.
  - Larger welfare gains for low-skill workers (**+15%**).
- Factoring in **product market power is key** for a correct evaluation of MW reforms.
  1. Crucial for quantifying the aggregate impact: **GDP rises twice as much w/o prod mkt power.**
  2. Necessary for studying the distributional impact: **monotonic labor share response w/o endogenous markups.**

Related Literature

- **Structural Models of the Equilibrium Effects of the MW**

  Engbom and Moser (2021), Berger et al. (2022), Drechsel-Grau (2021), Hurst et al. (2022), Ahlfeldt et al. (2022)

  Contribution: Show the importance of product market power and endogenous markup response for the aggregate and distributional impact of the MW.

- **Wage Posting Models**

  Burdett and Mortensen (1998), Bontemps et al. (1999, 2000), van den Berg and Ridder (1998), Manning (2003), Bilal and Lhuillier (2021), Engbom and Moser (2021), Flinn and Mullins (2021)

  Contribution: Highlight the role of product market power for the equilibrium wage distribution.

- **Oligopolistic Competition in Sectoral Markets**

  Atkeson and Burstein (2008), Grassi (2017), Burstein et al. (2021), De Loecker et al. (2021), Edmond et al. (2015, 2018), Deb et al. (2020), MacKenzie (2020)

  Contribution: Discipline firms' labor market power by empirical wage distributions and worker transitions $\rightarrow$ markdowns separately identified from markups.

Stylized Model

A simple monopsony model w/o product market power

- Simple economy: 1 labor - 1 product market.

Perfectly competitive product market

- Continuum of firms w/ het. productivity $z \in [\underline{z}, \bar{z}]$.
- Profit maximization problem:

$$\max_{\ell} \quad \bar{p} z \ell - w(\ell)\ell$$
$$\text{s.t.} \quad w(\ell) = \ell^{\frac{1}{\eta}}$$

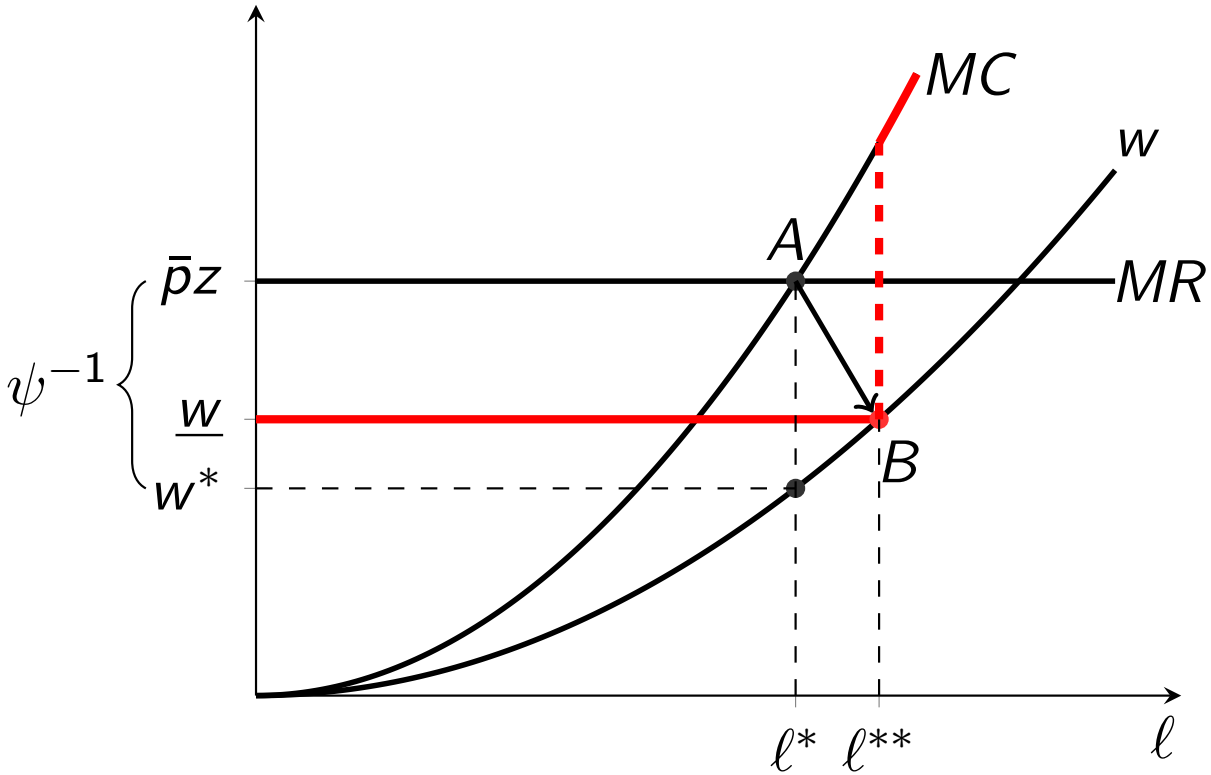
  where η is the elasticity of labor supply.
- The FOC implies:

$$w^*(z) = \underbrace{\frac{\eta}{1+\eta}}_{\psi} \bar{p} z \implies LS^*(z) = \frac{w^*(z)}{\bar{p} z} = \psi$$

  where ψ is the equilibrium markdown, constant across firms.

A simple monopsony model w/o product market power

- MW ↑ $\Longrightarrow$ exit ($z < \underline{w}/\bar{p}$) + monopsony power of low prod firms ↓.



Proposition 1.

The introduction of a binding MW causes the aggregate labor share to increase: $\bar{LS}^{**}_{MW} > \bar{LS}^{*}$.

A simple monopsony model w/ product market power

Imperfectly competitive product market

- $N < \infty$ firms w/ het. productivity $z \in [\underline{z}, \bar{z}]$.
- Profit maximization problem:

$$\max_{\ell} \; p(\ell) z \ell - w(\ell)\ell - \kappa$$

$$\text{s.t.} \; p(\ell) = \left(\frac{z\ell}{Y}\right)^{-\frac{1}{\epsilon(N)}}$$

$$w(\ell) = \ell^{\frac{1}{\eta}}$$

  where $\epsilon(N)$ is the elasticity of demand, with $\epsilon_N > 0$.

- Demand elasticity is a positive function of number of firms.

  Intuition: $N \downarrow \implies$ Market shares $\uparrow \implies$ Demand elasticity $\downarrow$.

A simple monopsony model w/ product market power

- The FOC implies

$$w^*(z) = \underbrace{\frac{\epsilon(N)-1}{\epsilon(N)}}_{\mu(N)^{-1}} \underbrace{\frac{\eta}{1+\eta}}_{\psi} p^*(z)z \implies LS^*(z) = \frac{\psi}{\mu(N)}$$

  where $\mu(N)$ is the equilibrium markup, constant across firms.

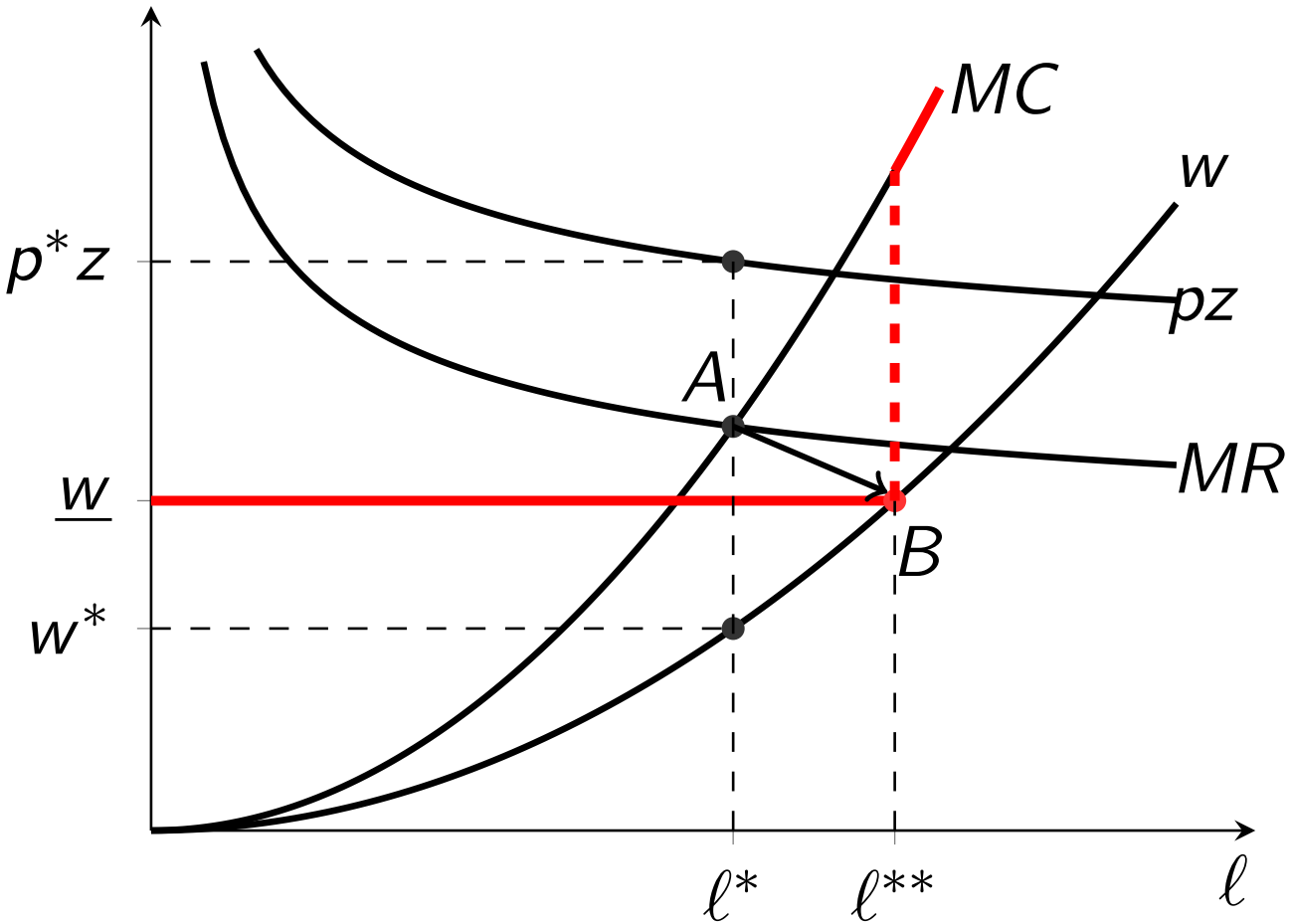
- In this economy there is a **double wedge** between wage w^* and rev productivity p^*z.

  $\implies$ Firms make profits both on the output and the input market.

- **Labor share depends on both markup and markdown**.

A simple monopsony model w/ product market power

MW $\uparrow \implies$ exit ($\Pi^{**}_{MW}(z) < 0$) + monopsony power of low prod firms $\downarrow$.



A simple monopsony model w/ product market power

- But that's not it... some firms have left the market:

$$N' < N \implies \epsilon(N') < \epsilon(N)$$

- Hence, all firms increase their markups:

$$\mu(N') > \mu(N)$$

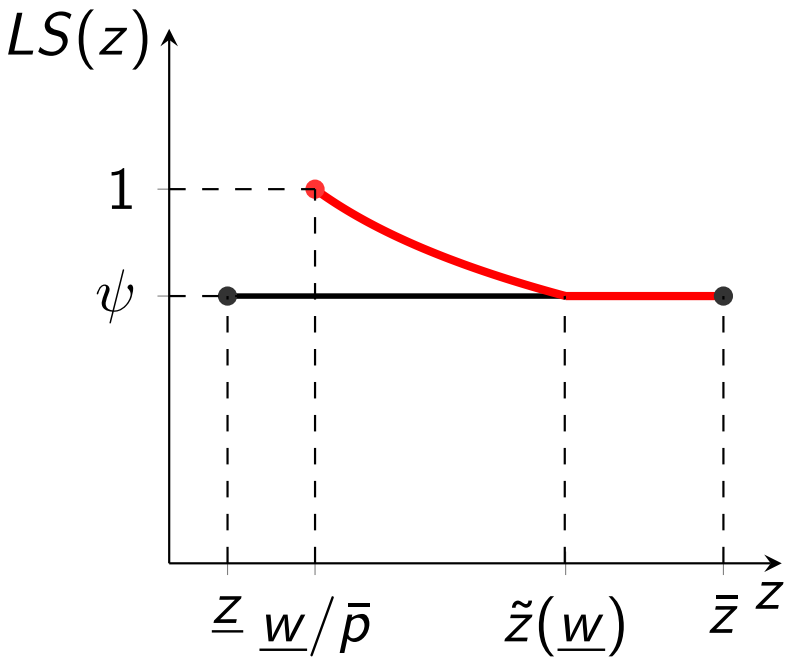
- What happens to the labor share, then? It depends on whether monopsony $\downarrow$ or monopoly $\uparrow$ dominates.

Proposition 2.

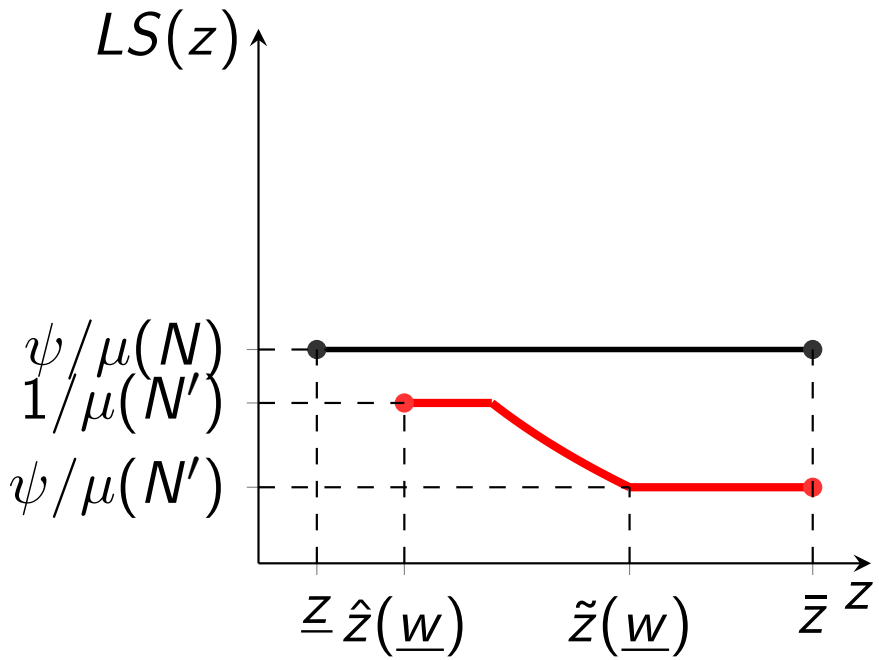
The introduction of a sufficiently large MW, i.e., such that $\mu(N') > \mu(N)/\psi$, causes the labor share to decrease: $\bar{LS}^{**}_{MW} < \bar{LS}^{*}$.

Summing up

a) No product market power



b) Product market power



Takeaway: with product market power, the labor share may *shrink* in response to MW reforms $\Longrightarrow$ MW can backfire!

Quantitative Model

Model – Highlights

- **Goal**: Quantify the markup vs markdown response to the MW.
- **How**: Novel structural model w/ frictional labor markets (Engbom and Moser (2021)) and oligopolistically- competitive product markets (Atkeson and Burstein (2008)).
- SaM frictions + wage posting $\rightarrow$ varying elasticity of labor supply $\rightarrow$ **endogenous and heterogeneous markdowns**.
  - Source of monopsony power: matching frictions (geographical distance, incomplete info).
- Oligopolistic competition $\rightarrow$ varying elasticity of demand $\rightarrow$ **endogenous and heterogeneous markups**.
  - Source of monopoly power: consumers' preferences + granularity.

Model – Environment

- Segmented labor markets by worker ability a. Workers
  - Matching frictions: job finding rate $\lambda(\theta)$, job separation rate δ, OTJ search intensity s, vacancy posting costs $c(v)$.
  - Wage posting: employment wage dist $G(w)$, wage offer dist $F(w)$.
- Sectoral product markets with $N_k < \infty$ firms. Consumers
  - Elasticity of subst across sectors $\rho > 1$.
  - Elasticity of subst within sectors $\sigma > \rho$.
- For tractability, each firm is assigned to one product and one labor market.

Model – Firm's Problem

- A firm w/ productivity z hiring workers of ability a and competing in product market k solves:

$$\max_{w \geq \underline{w}/a, v, \ell} \quad p(\ell) \underbrace{az\ell}_{=y(\ell)} - awl - c(v) - \kappa$$

$$\text{s.t.} \qquad \ell(w, v) = \frac{v}{V} \frac{\lambda(\theta)\left(u + seG(w)\right)}{\delta + s\lambda(\theta)\left(1 - F(w)\right)} \qquad \text{(Labor Supply)}$$

Derivation

$$p(\ell) = y(\ell)^{-\frac{1}{\sigma}} Y_k\left(\ell\right)^{\frac{1}{\sigma} - \frac{1}{\rho}} Y^{\frac{1}{\rho}} \qquad \text{(Inverse Demand)}$$

$$Y_k(\ell) = \left[y(\ell)^{\frac{\sigma-1}{\sigma}} + \sum_{i \neq 1}^{N_k} y_{ki}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \qquad \text{(Sectoral Output)}$$

Model – Firm's PMP – Cont'd

$$\text{FOC/w: } \ell(w,v) = \left[(1+\epsilon^{p,\ell})p\left(\ell(w,v)\right)z - w\right]\frac{\partial \ell(w,v)}{\partial w}.$$

- Can rewrite FOC/w as **optimal pricing rule**:

$$p\left(\ell(w,v)\right) = \underbrace{\frac{1}{1+\epsilon^{p,\ell}}}_{Markup \equiv \mu(\ell)} \underbrace{\frac{\epsilon^{\ell,w}+1}{\epsilon^{\ell,w}}}_{Markdown \equiv \Psi(\ell)^{-1}} \frac{w}{z}.$$

Markdown Solution System Graph

Model – Equilibrium Characterization

- Markup and markdown are equilibrium outcomes:

$$\mu(z) = \frac{\sigma}{(\sigma-1)\left[1 - \frac{\sigma/\rho - 1}{\sigma - 1} s(z)\right]} > 1.$$

$$\psi(z) = \left(1 + \frac{1}{2f\left(w(z)\right)w}\left[\left(1 - F\left(w(z)\right)\right) + \frac{\delta}{s\lambda(\theta)}\right]\right)^{-1} < 1.$$

- Firm's total market power summarized by its **Market Power Index**:

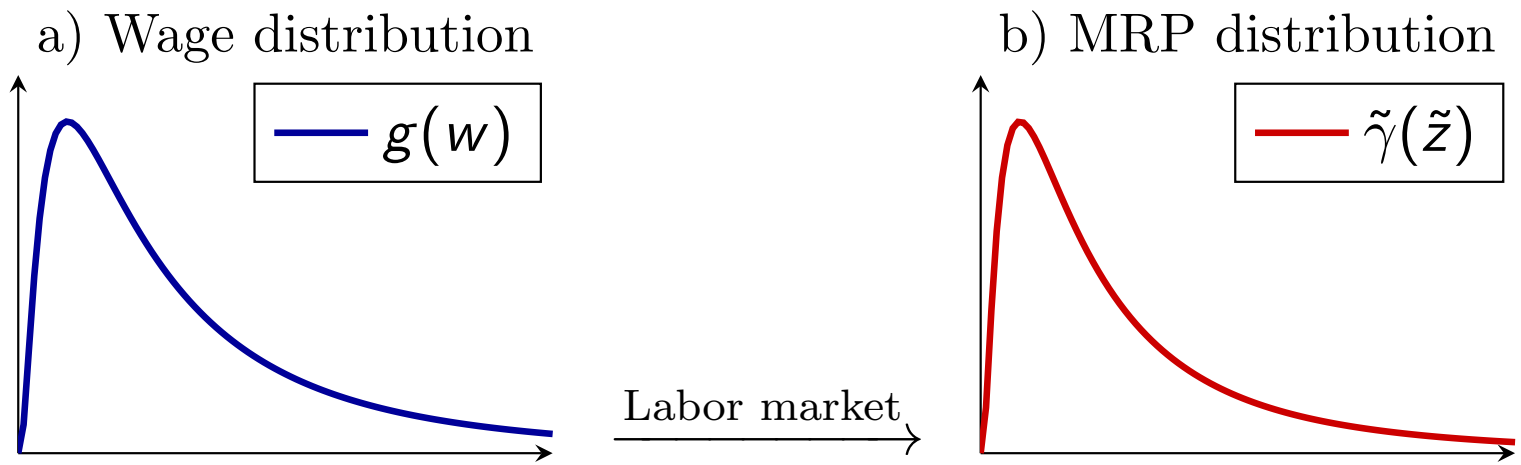
$$\mathcal{M}(z) = \frac{\mu(z)}{\psi(z)} > 1.$$

$\Longrightarrow$ Both product market power ($\mu > 1$) and labor market power ($\Psi < 1$) restrain optimal firm size (double wedge).

Quantitative Analysis

Estimation Strategy

- Estimate the model on Italian data, targeting empirical moments for the period 2016-18.
- Link worker ability types to **AKM worker fixed effects** ($J = 10$) and replicate actual workers' transitions (Engbom and Moser (2021)).
- For each worker type, two-step estimation of industry-specific (1-digit) firms' physical prod dist's (Bontemps et al. (2000)):



details on estimation

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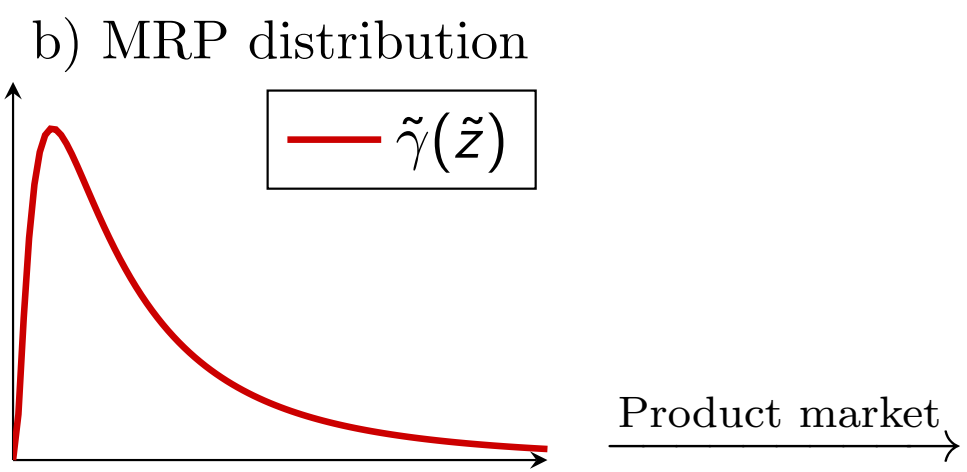


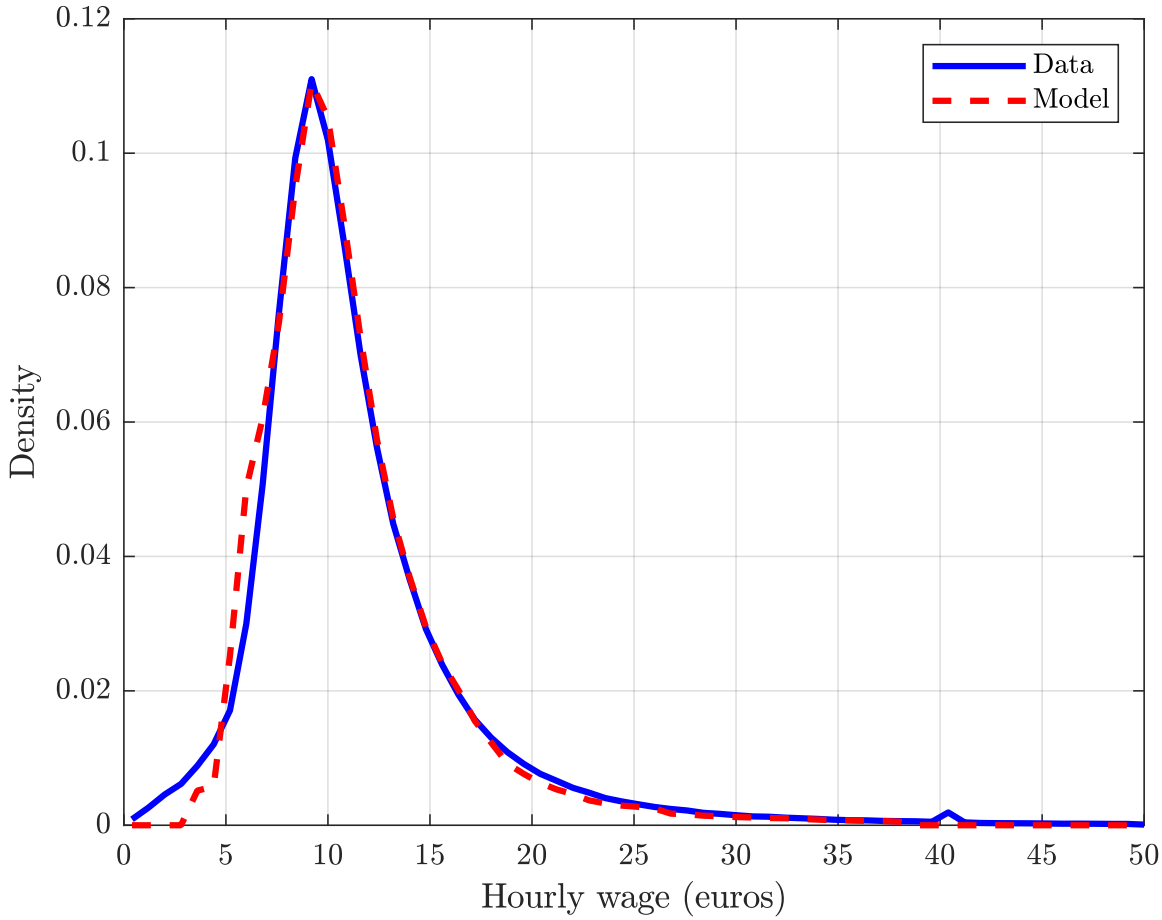
details on estimation

Estimation Strategy – Cont'd

- Structural estimation allows **separately identifying markups and markdowns**:
  - Observed wage dist's + observed workers' transitions $\Longrightarrow$ markdowns.
  - Inferred MRP dist's + observed market structure of 4-digit sectors $\Longrightarrow$ markups.

Equilibrium eq's Calibration Table market power dist

Model Fit – Wage Distribution

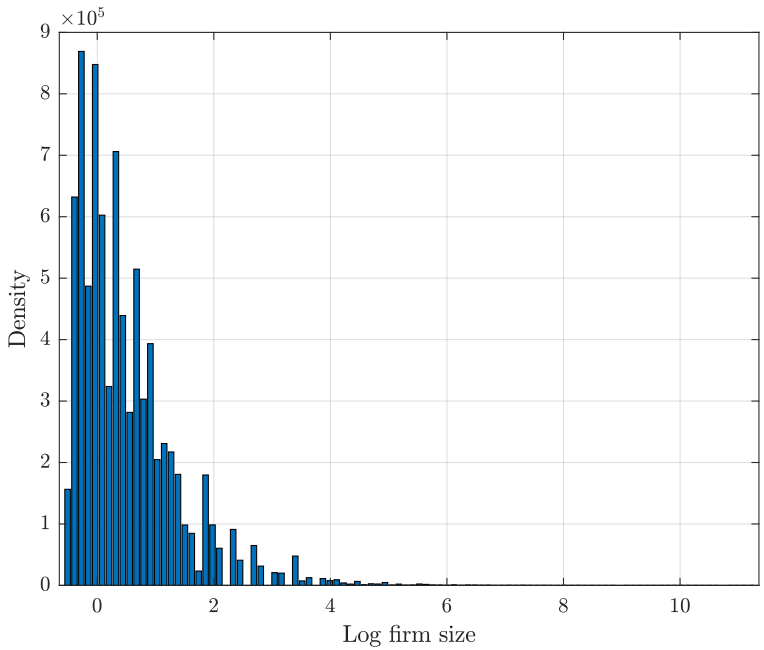


Source: INPS data (2016-2018) and model.

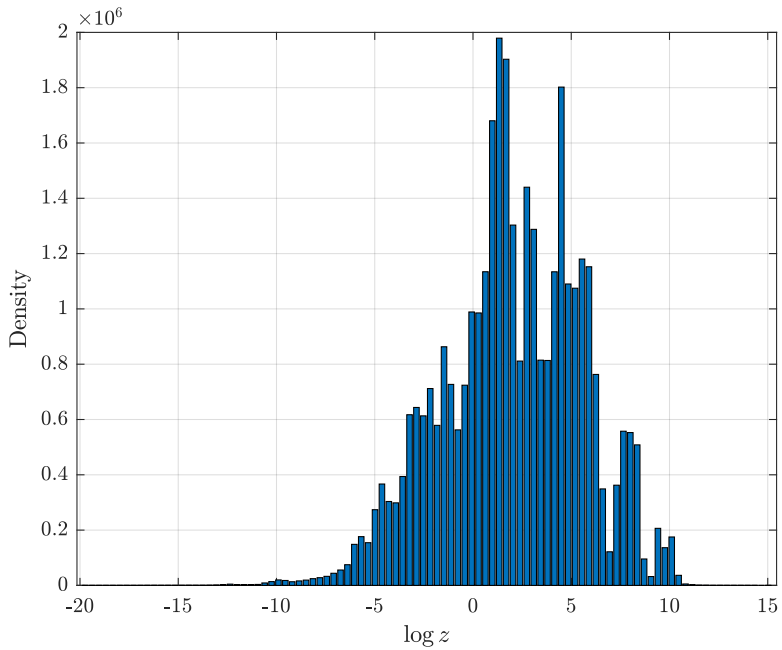
- Model replicates almost exactly the empirical wage dist.

Estimated Model – Firm Size and Productivity Distribution

a) Firm size



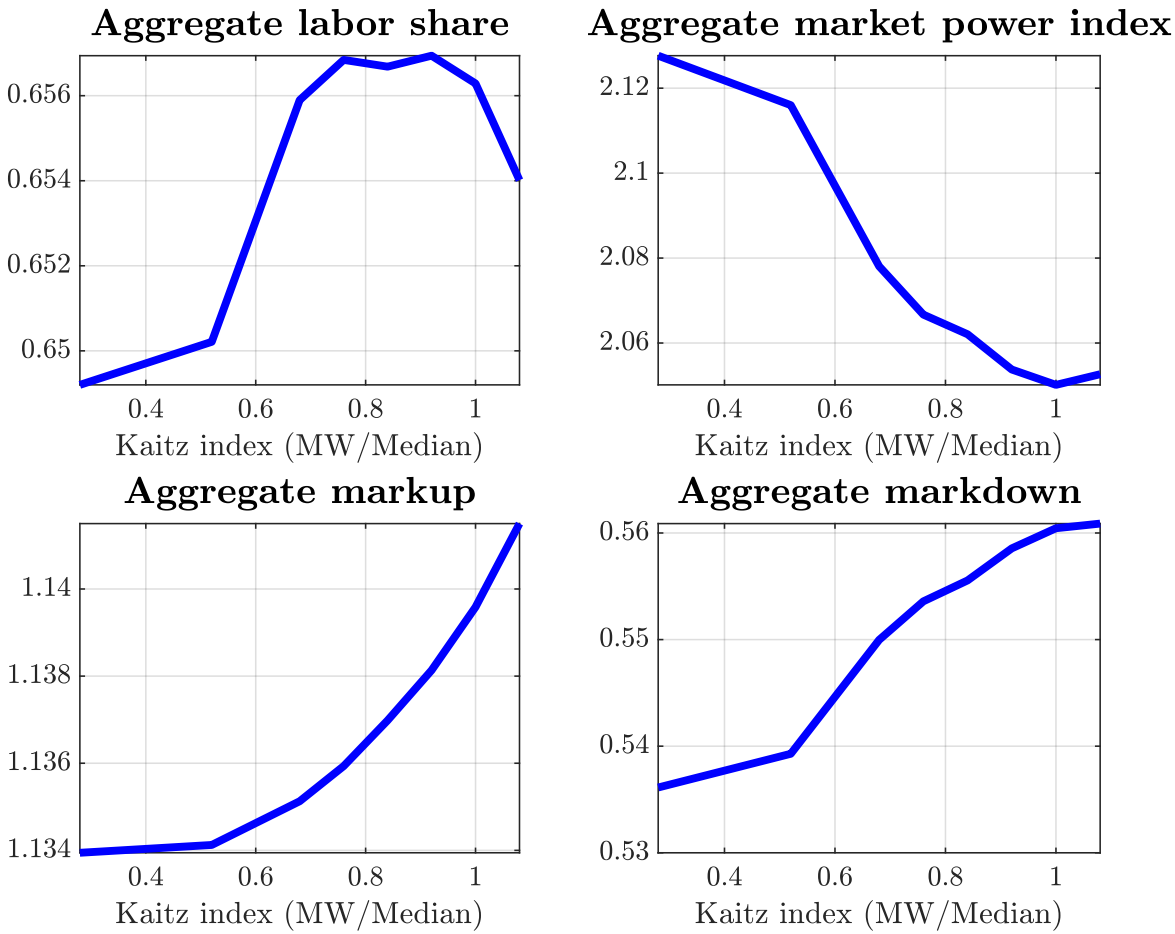
b) Physical productivity



- Right-skewed firm size dist, $\sim$ log-normal physical prod dist.

Labor Market Policies

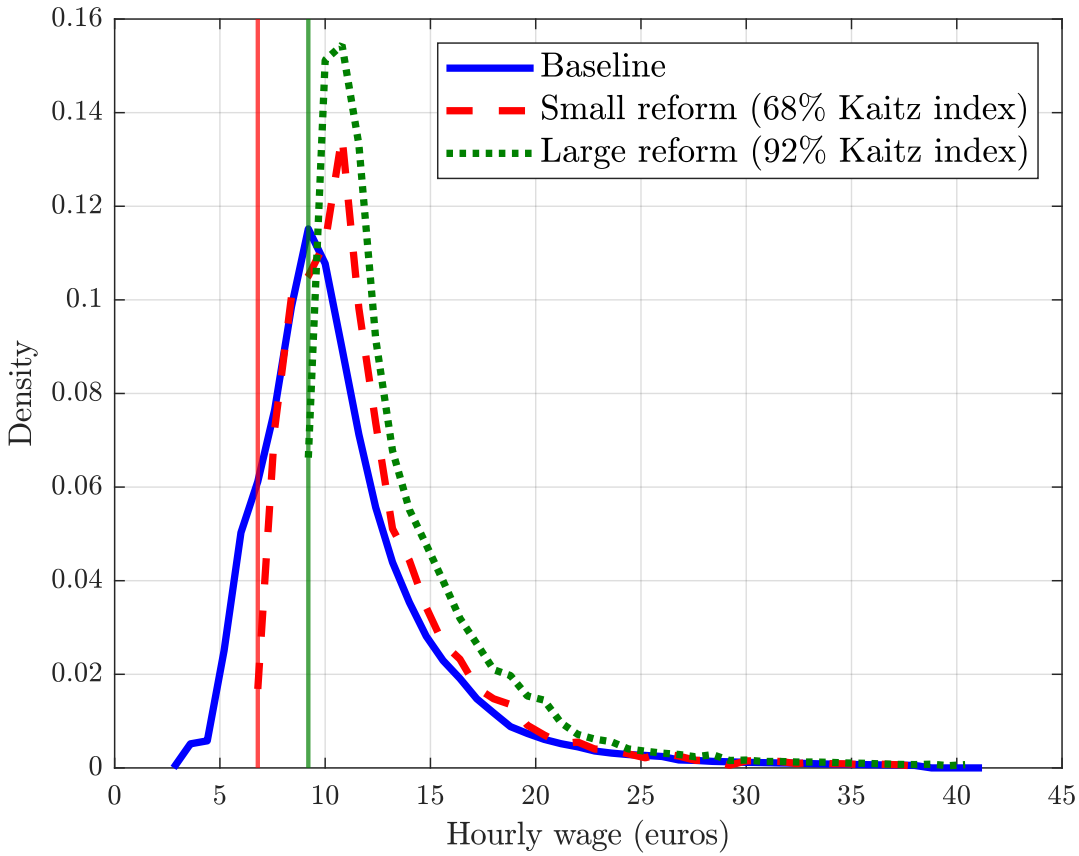
Counterfactuals – Labor Share & Market Power



- Hump-shaped labor share response mirroring U-shaped MPI.
- $\Delta\psi$ dominates $\Delta\mu$ for low-to-middle MWs, opposite for large MWs.

impact of markups factor shares

Counterfactuals – Wage Distribution



Takeaway: Wage dist shifts rightward w/ higher MW due to pay rises (bottom half) and selection into higher-paying firms. CDF percentiles

Counterfactuals – Equilibrium Effects

Variable	Baseline	Small reform (68% Kaitz index)	Large reform (92% Kaitz index)
Panel a. Aggregate statistics			
GDP	**1.000**	**1.044**	**1.110**
Unemployment rate	**0.108**	**0.118**	**0.135**
Output per worker	1.000	1.042	1.118
Avg hourly wage (€)	11.032	12.032	13.500
Variance log wage	**0.132**	**0.091**	**0.074**
Avg firm size	4.051	4.076	4.189
Panel b. Distributional Statistics			
Labor share	**0.649**	**0.656**	**0.657**
Profit share	0.351	0.344	0.343
Profit share (product market)	**0.163**	**0.163**	**0.164**
Profit share (labor market)	0.180	0.174	0.171

Source: Model. *Note*: the variables *GDP* and *Output per worker* are normalized to 1 in the Baseline.

Takeaway: MW ↑ → employment ↓ but GDP ↑ since productivity ↑; avg wage ↑ and wage inequality ↓; labor share ↑ since profits from lab mkt ↓ but profits from prod mkt ↑.

Counterfactuals – Equilibrium Effects

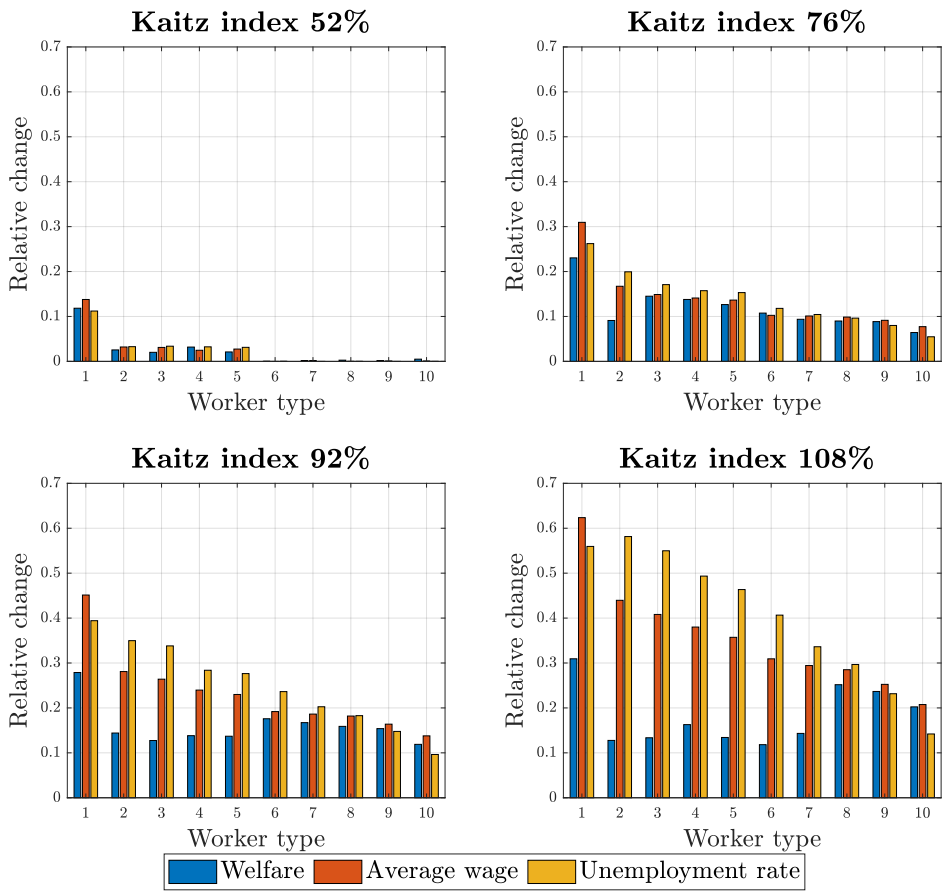
Variable	Baseline	Small reform (68% Kaitz index)	Large reform (92% Kaitz index)
Panel c. Market power statistics			
Average markup	1.134	1.135	1.138
Average markdown	0.536	0.550	0.559
Average mpi	**2.128**	**2.078**	**2.054**
Misalloc index (mpi std dev)	**0.547**	**0.530**	**0.507**
Panel d. Labor market transitions			
Job-finding rate	0.207	0.185	0.157
Job-to-job flow rate	0.013	0.013	0.012
Job-separation rate	0.025	0.025	0.025

Source: Model.

Takeaway: MW ↑ → avg MPI (aggregate distorsion) ↓ and MPI dispersion (misallocation) ↓.

Market Power Response Beh vs Comp

Counterfactuals – Distributional Impact



Takeaway: Wage gains and unemployment surge decrease w/ worker type; U-shaped welfare gains from large MWs (profits ↑).

profit dist

The Role of Product Market Power

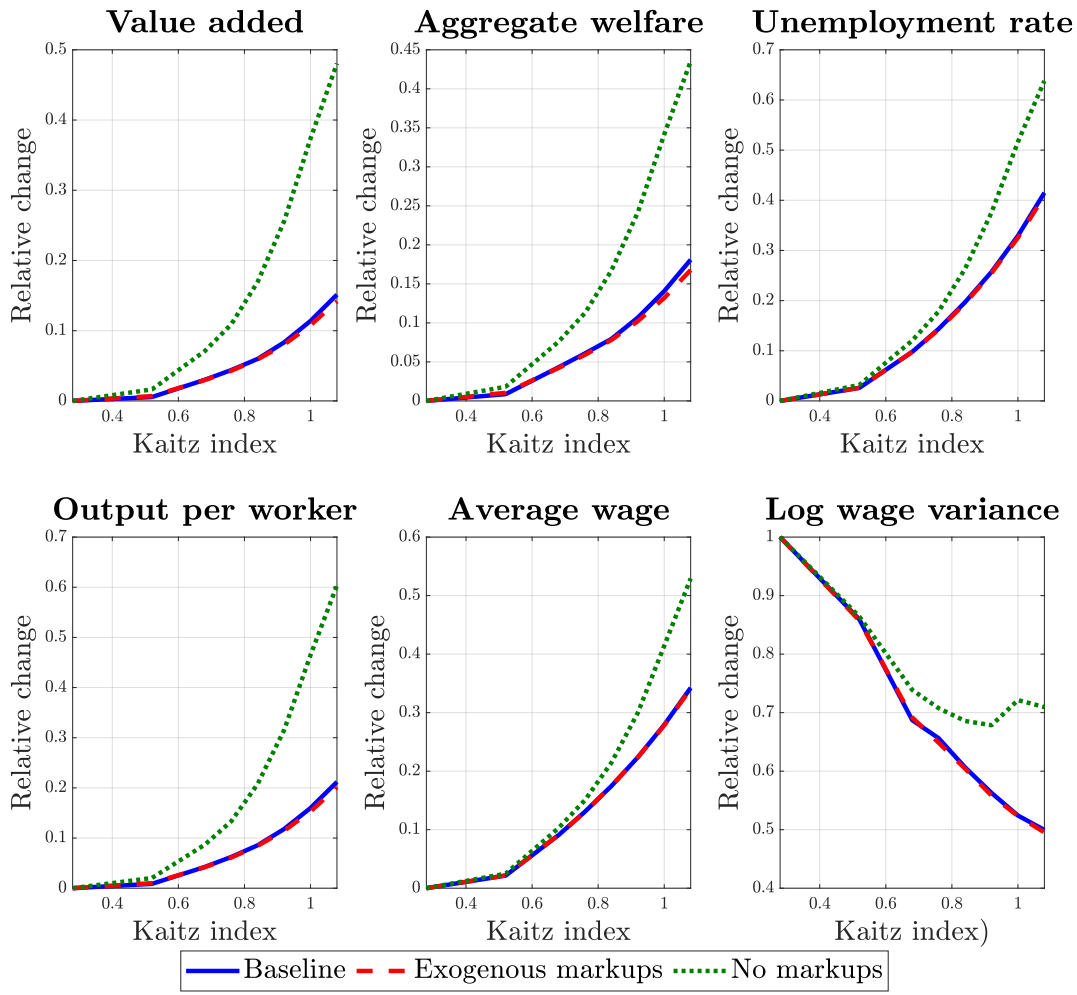
- **Goal**: Isolate the role of prod mkt power in the equilibrium effects of the MW.
- **How**: Replicate the same experiments in 2 alternative environments:
  1. *What if there was no prod mkt power at all?*

     Markupless economy: perfect competition on the prod mkt → no markups, identical prices. Markupless Economy Markupless vs Baseline
  2. *What if markups were constant?*

     MP economy: monopolistic competition in sectoral mkts → identical markups. MP Economy MP vs Baseline

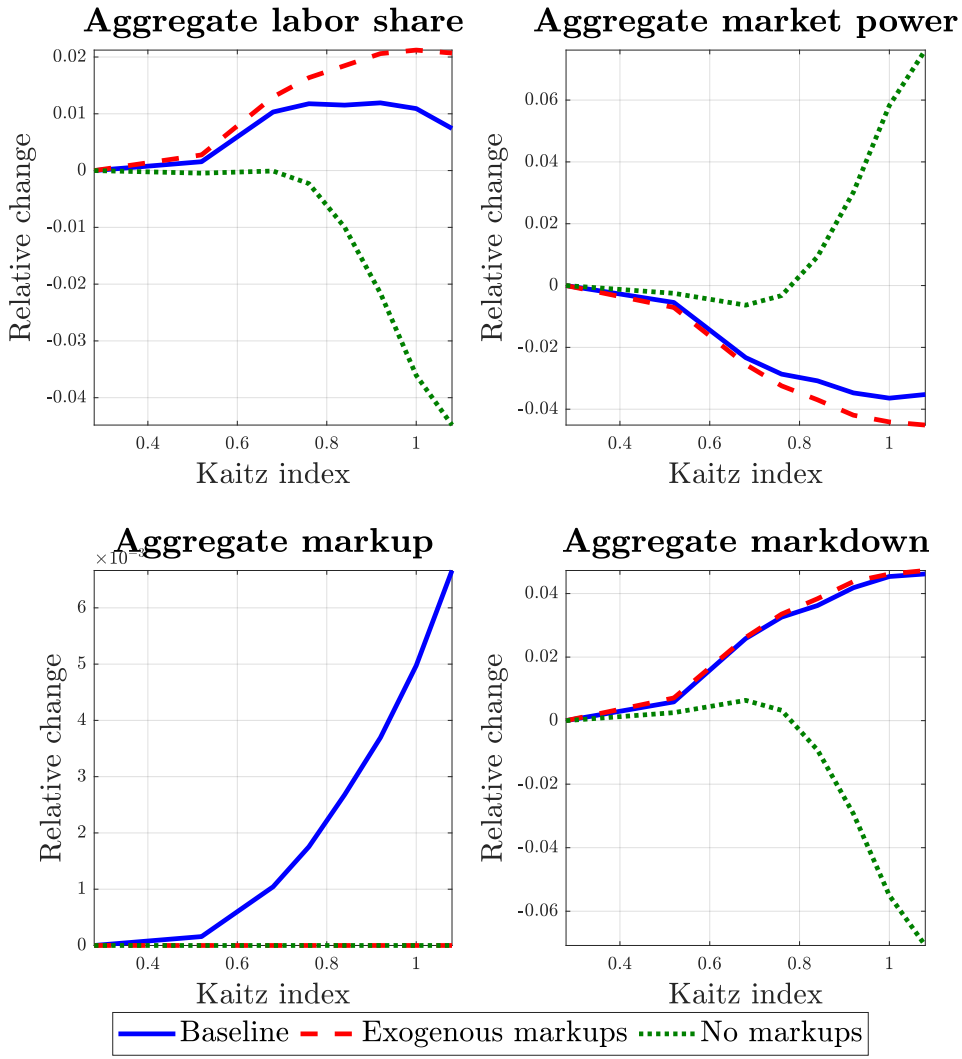
Exit Decisions

The Role of Product Market Power – Aggregates



Takeaway: No prod mkt power → largely overstate unemp surge +50% and GDP rise (+200%) (excessive reallocation).

The Role of Product Market Power – Distribution



Takeaway: Identical markups → monotonic labor share response.

Distr imp

Conclusions

- Characterize theoretically a **novel concentration channel** of the MW.

  $\rightarrow$ Response of the labor share is qualitatively ambiguous: monopsony power $\downarrow$ but monopoly power $\uparrow$.

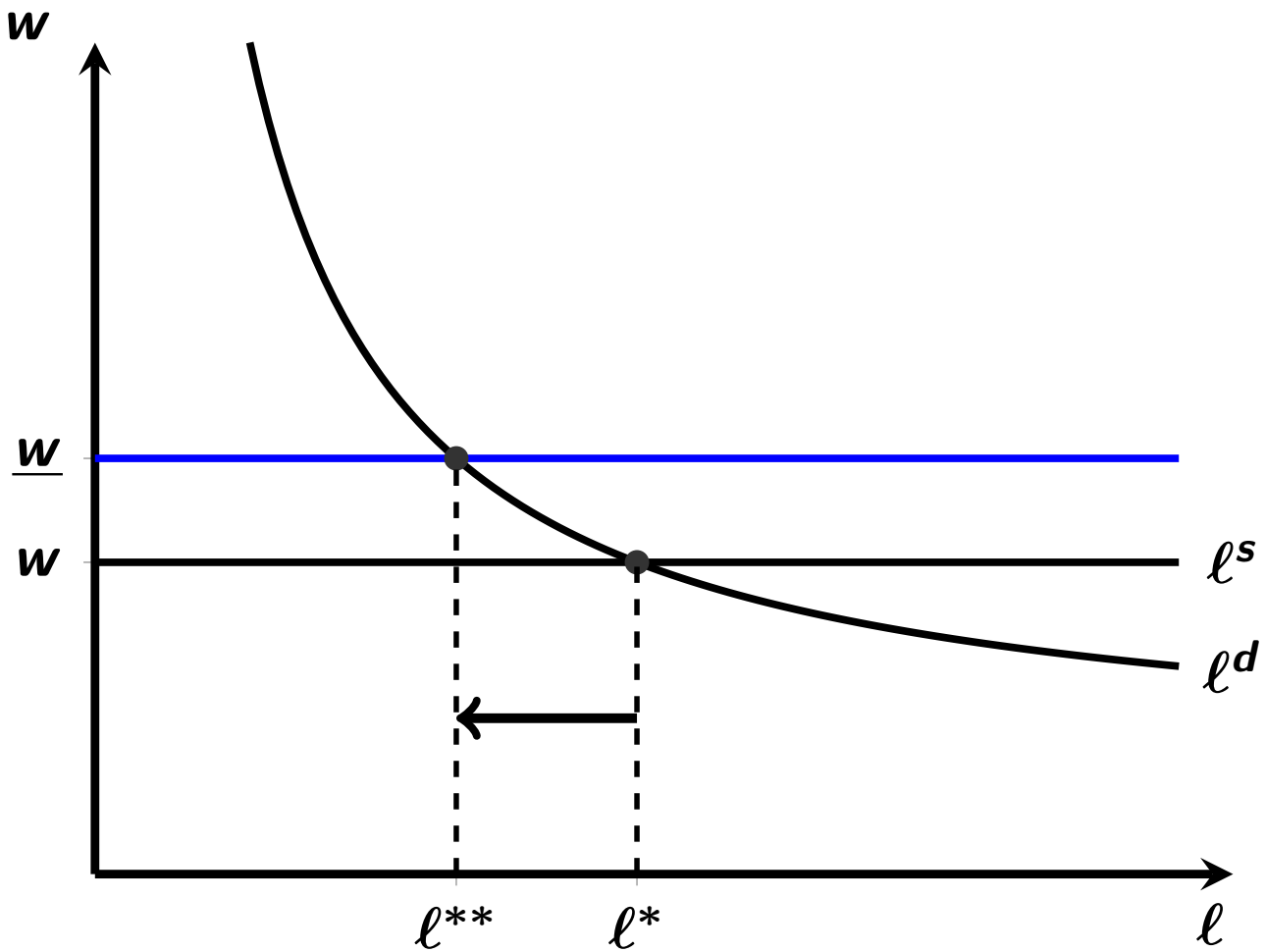
- Estimate a structural model to quantify both forces.

- Find hump-shaped response of the labor share $\Longrightarrow$ concentration channel increasingly relevant as MW gets higher.

- Neglecting prod mkt power leads to overestimate reallocation gains $\rightarrow$ **prod mkt power key for aggregate impact** of medium-to-large MW.

- Ignoring endogenous markups leads to underestimate the surge in profits from higher concentration $\rightarrow$ **strategic pricing crucial for distributional impact**.

Appendix – Perfectly Competitive Labor Market



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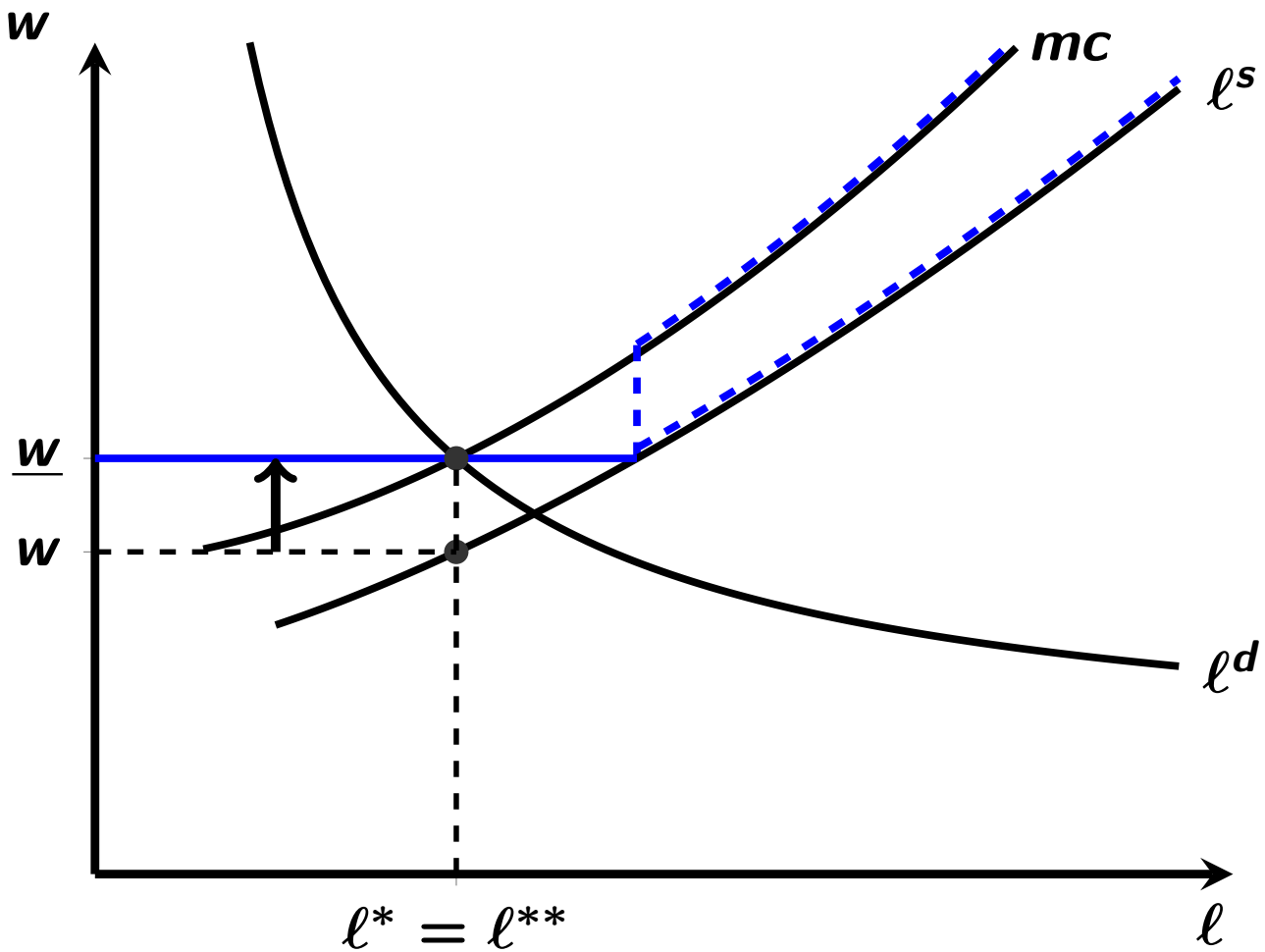
Appendix – Labor Market Power



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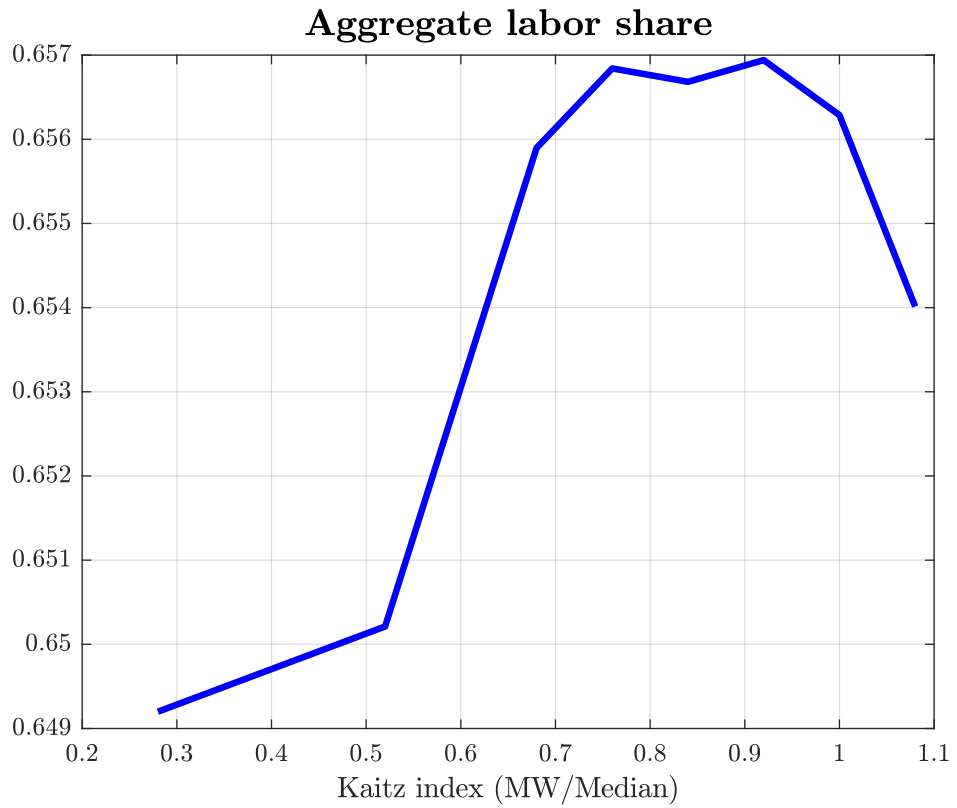
Appendix – Labor Share Response



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Model – Consumer's Problem

- Hand-to-Mouth consumers with risk-neutral intertemporal preferences and nested CES static preferences over sectoral goods:

$$\max_{c_{ik}} C = \left(\int_0^1 C_k^{\frac{\rho-1}{\rho}} \, dk \right)^{\frac{\rho}{\rho-1}}$$

$$\text{s.t.} \quad C_k = \left(\sum_{i=1}^{N_k} c_{ik}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

$$\int_0^1 \sum_{i=1}^{N_k} p_{ik} c_{ik} \, dk \leq PI$$

  where $\rho > 1$ and $\sigma > \rho$

- Preference-based sectoral oligopolistic competition

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Model – Worker's Problem

- Workers can be either employed or unemployed in a labor market j

Value of Unemp: $$rU = a_j b_j + \lambda(\theta) \int_{\underline{w}}^{\bar{w}} [W(w) - U] \, dF_j(w)$$

Value of Emp: $$rW(w) = a_j w_j + \Pi_j + s_j \lambda(\theta_j) \int_{w}^{\bar{w}} [W(w') - W(w)] \, dF_j(w') + \delta_j (U - W(w))$$

where $r > 0$ is the instantaneous interest rate, b flow value of leisure, $\lambda(\theta)$ job finding rate, $s \in (0, 1)$ OTJ search efficiency, δ job separation rate, and $F(w)$ the (endogenous) wage offer distribution

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Appendix – Steady-State Labor Supply Curve

LOM firm-level employment

$$\dot{\ell}(t) = -\left[\delta + s\lambda\left(\theta(t)\right)\left(1 - F(w(t))\right]\ell(t) + q\left(\theta(t)\right)\left[\frac{u(t)}{S(t)} + \frac{se(t)}{S(t)}G\left(w(t)\right)\right]v(t)$$

Steady-state conditions

$$\begin{cases} G_j(w) = \dfrac{\lambda(\theta_j)F_j(w)}{\delta_j + s_j\lambda(\theta_j)(1 - F_j(w))} \\ u_j = \dfrac{\delta}{\delta + \lambda(\theta)} \\ \dot{\ell}(t) = 0 \implies \ell = \dfrac{v}{V_j}\dfrac{\lambda(\theta_j)\left(u_j + s_j e_j G_j(w)\right)}{\delta_j + s_j\lambda(\theta_j)\left(1 - F_j(w)\right)} = \dfrac{\delta\lambda(\theta)}{\theta\left[\delta + s\lambda(\theta)\left(1 - F(w)\right)\right]^2}v \end{cases}$$

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Appendix – Labor Market Equilibrium

Define the MRP as $\tilde{z} \equiv \frac{p}{\mu} z$.

Equilibrium System of Differential Equations:

$$\begin{cases} h'(\tilde{z}) = \frac{M}{V}\tilde{\gamma}(\tilde{z}) \left(\frac{[\tilde{z} - w(\tilde{z})]}{\bar{c}} \frac{\delta\lambda(\theta)}{\theta\left[\delta + s\lambda(\theta)\left(1 - h(\tilde{z})\right)\right]^2} \right)^{\frac{1}{\eta}} \\ w'(\tilde{z}) = [\tilde{z} - w(\tilde{z})] \frac{2s\lambda(\theta)h'(\tilde{z})}{\delta + s\lambda(\theta)\left(1 - h(\tilde{z})\right)} \end{cases}$$

Boundary conditions:

$$\lim_{\tilde{z} \to \underline{\tilde{z}}(a)} h(\tilde{z}|a) = 0$$

$$\lim_{\tilde{z} \to \underline{\tilde{z}}(a)} w(\tilde{z}|a) = \max\left\{ R(a), \frac{w^{min}}{a} \right\}$$

FOCs Estimation

Appendix – Firm's PMP

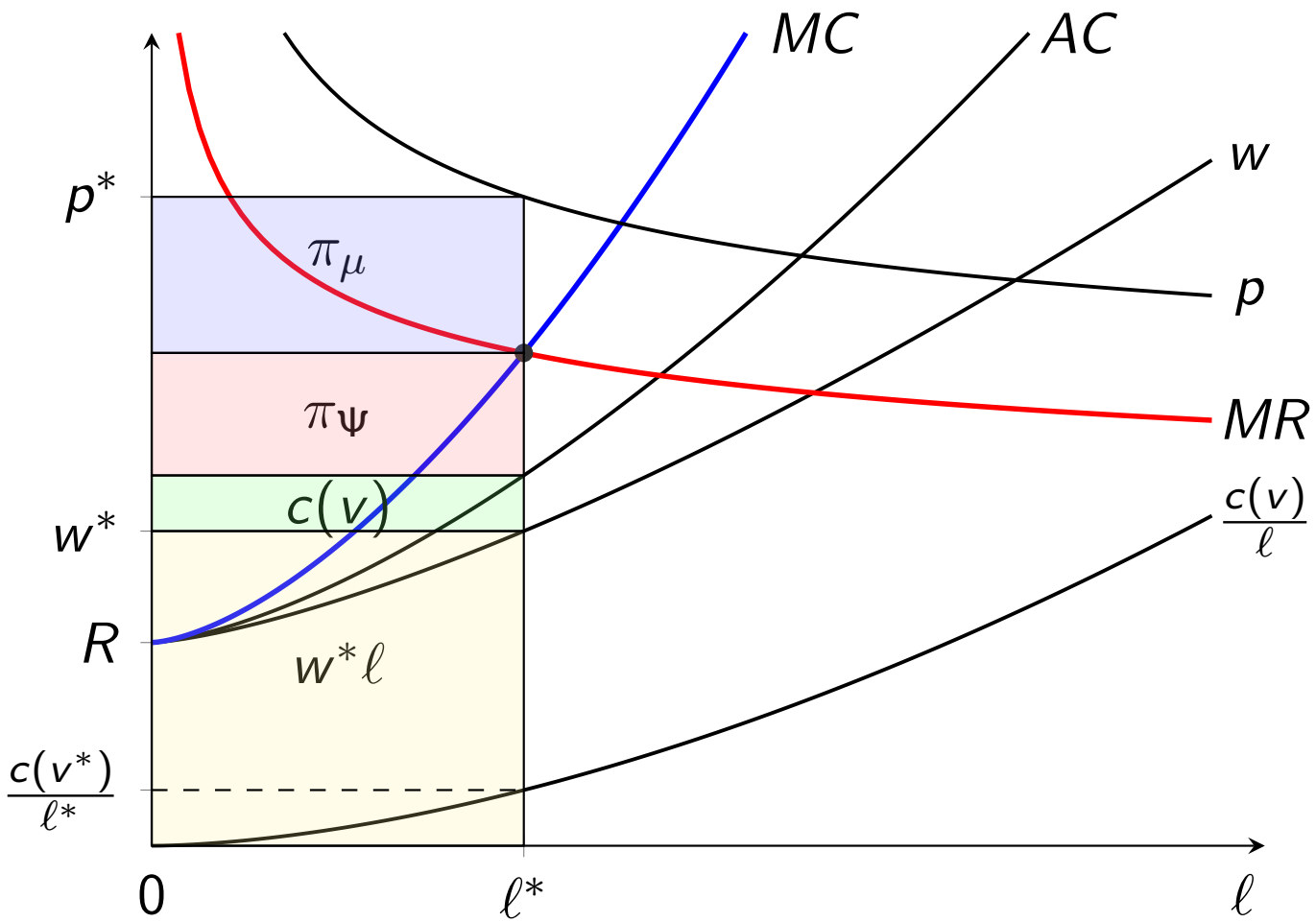

Figure: Static PMP with no MW.

FOCs Market power Product market power

Model – Equilibrium Characterization

Equilibrium Definition

- In equilibrium, firms are indifferent between adjusting their size through vacancy (*visibility channel*) or wage policy (*wage channel*)

$$\frac{\bar{c}_j v_{jk}(z)^{\eta}}{\partial \ell_{jk}(z)/\partial v_{jk}(z)} = \frac{\ell_{jk}(z)}{\partial \ell_{jk}(z)/\partial w_{jk}(z)} \implies \epsilon_{jk}^{\ell,w}(z) = \frac{w_{jk}(z)\ell_{jk}(z)}{(1+\eta)c_j\left(v_{jk}(z)\right)}$$

$\implies$ **Elasticity of labor supply implied by labor market policies**

- Firms are granular in their product market $\rightarrow$ strategic choice of equilibrium size (*Cournot* game)

$$\epsilon_{jk}^{p,\ell}(z) = -\frac{1}{\rho}s_{jk}(z) - \frac{1}{\sigma}\left(1 - s_{jk}(z)\right)$$

where $s_{jk}(z) = \frac{p_{jk}(z)y_{jk}(z)}{\sum_{i=1}^{N_k} p_{jki}y_{jki}}$

$\implies$ **Elasticity of inverse demand depends on firm's market share**

Appendix – Equilibrium Definition

Definition

A steady-state equilibrium of our model economy consists of:

- A set of reservation wages $\{\underline{w}_j^{R,U}, \underline{w}_j^{R,E}\}$ for both unemployed and employed workers, that solve the workers' problems;
- Consumption policy functions $\{c_{ikj}\}$ for the employed, that solve the consumers' problem;
- A set of wage, vacancy posting and price setting policies $\{w_{j,k}(z), v_{j,k}(z), p_{j,k}(z)\}$ that solve the firms' problem;
- A set of thresholds $\left\{\underline{z}_{j,k}\right\}$ that determine the marginal firm of each submarket (j,k);
- Measures $\{G_j(w), e_j, u_j, V_j\}$ and matching rates $\{\lambda(\theta_j), q(\theta_j)\}$ that are consistent with firms' optimization, with the laws of motion in steady-state and with the matching technology;
- Goods market clearing conditions ensuring that quantities demanded and produced of each good coincide:

$$c_{ik} = \int_j e_j L_j \int_{\underline{w}_j}^{\bar{w}_j} c_{ik}(w, \Pi_j)\, dG_j(w)\, dj = y_{ik} - \bar{c}_j \frac{{v_{ik}}^{1+\eta}}{1+\eta} - \kappa_k \quad \forall\ i = 1, \ldots, N_k,\ \forall k.$$

where $L_j = L(a_j) = \omega(a)|_{a=a_j} L$.

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Appendix – Markdown Derivation

$$
\begin{aligned}
mc(\ell) &= w(\ell) + w'(\ell)\ell + c'\left(v(\ell)\right) v'(\ell) \\
&= w(\ell)(1 + \epsilon_{w,\ell}) + \frac{cv(\ell)^{1+\eta}}{\ell(w,v)}\epsilon_{v,\ell} \\
&= w(\ell)\left(1 + \epsilon_{w,\ell} + \frac{\epsilon_{v,\ell}}{\epsilon_{\ell,w}}\right) \\
&= w(\ell)\left(1 + \frac{\epsilon_{w,\ell}\ \epsilon_{\ell,w} + \epsilon_{v,\ell}}{\epsilon_{\ell,w}}\right) \\
\implies \Psi(\ell) &= \frac{\epsilon_{\ell,w}}{\epsilon_{\ell,w}(1 + \epsilon_{w,\ell}) + \epsilon_{v,\ell}}
\end{aligned}
$$

where $\dfrac{cv(\ell)^{1+\eta}}{\ell(w,v)} = \dfrac{\ell(w,v)}{\partial\ell(w,v)/\partial w} = \dfrac{w(\ell)}{\epsilon_{\ell,w}}$ (interior optimum)

$$\ell = \ell(w,v) \implies \epsilon_{w,\ell}\ \epsilon_{\ell,w} + \epsilon_{v,\ell} = 1$$

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Appendix – Calibration

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Parameter	Description	Value	Target/Source	Data	Model
		Panel a. Externally set parameters			
Matching function					
χ	TFP parameter	1.000	Normalization	-	-
ξ	Elast. to search effort	0.500	Petrongolo and Pissarides (2001)	-	-
Household preferences					
r	Discount rate	0.004	Annualized interest rate of 4 percent	-	-
Other parameters					
J	Number of labor markets	10	Deciles of AKM worker fixed effects	-	-
K	Number of product markets	8211	One firm in MRP level w/ lowest density	-	-
		Panel b. Directly inferred structural and auxiliary parameters			
Labor market parameters					
M	Firm-to-worker population ratio	0.238	Average firm size	4.200	4.051
$\{\Pi_j\}$	Share of aggregate profits		Distribution of non-labor income	Π	
$\{\delta_j\}$	Separation rates	Values	EN rate		
$\{s_j\}$	On-the-job search intensity	Values	Job-to-job transition rate		
Productivity distributions and product markets					
$\{\tilde{\Gamma}_{j,k}\}$	Firm MRP distributions		Wage distributions		
$\{N_k\}$	Number of competing firms		Distribution of market structures, 4-digit Ateco		

Appendix – Calibration – Cont'd

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Parameter	Description	Value	Target/Source	Data	Model
		Panel c. Internally estimated parameters			
Search costs and labor market parameters					
$\{\bar{c}_j\}$	Vacancy posting cost (scale)	Values	Unemployment rate	0.108	0.108
η	Vacancy posting cost (elasticity)	0.530	Share of employment in firms 50+	0.372	0.358
$\{b_j\}$	Flow value of leisure	Values	Smallest observed wage		
$\{\kappa_j\}$	Overhead costs		Smallest operating profits		
$\{a_j\}$	Worker ability	-	Relative worker-firm AKM variance	0.886	0.883
Demand elasticity and firms' assignment					
ρ	Elast. of subst. across sectors	1.420	Weighted CR4	0.250	0.235
σ	Elast. of subst. within sectors	10.634	Profit-to-labor share ratio	0.539	0.554
Θ	Sampling function (scale)	-	Standard deviation log value added	1.490	1.437

Source: Model, INPS, Istat, Eurostat and SHIW data. *Note*: Labor market transition estimates and wage distributions are drawn from INPS matched employer-employee data (2016-2018). Statistics on average firm size and the share of employment in large firms are taken from Eurostat data. Finally, statistics on the number of firms in 4-digit Ateco sectors are drawn from the Structural Business Statistics dataset of Istat (2019).

Appendix – Estimation Strategy

Three-step estimation of industry-specific (1-digit) firm productivity dist's:

1. Structurally estimate the MRP ($\tilde{z}$) distributions by **inverting observed wage distributions** by worker type (Bontemps et al. (2000)):

$$\tilde{z}(w; G(w)) = w + \frac{u + s(1-u)G(w)}{2s(1-u)g(w)}\Delta w \implies \tilde{z} \sim \tilde{H}(\tilde{z})$$

2. Each firm is assigned (i) a MRP drawn from the distribution $H(\tilde{z})$ and (ii) a product market according to the empirical distribution of market structures across 4-digit sectors Market structure distribution

3. Solve for the equilibrium market shares in each sectoral market to back out firms' *physical* productivity z:

$$\begin{cases} z(\tilde{z}, s) = \mu(s)\dfrac{\tilde{z}}{p} \\ p = y(z, \tilde{z})^{-\frac{1}{\sigma}} Y_k(z, \tilde{z})^{\frac{1}{\sigma}-\frac{1}{\rho}} Y^{\frac{1}{\rho}} \end{cases} \implies z_k(\tilde{z})$$

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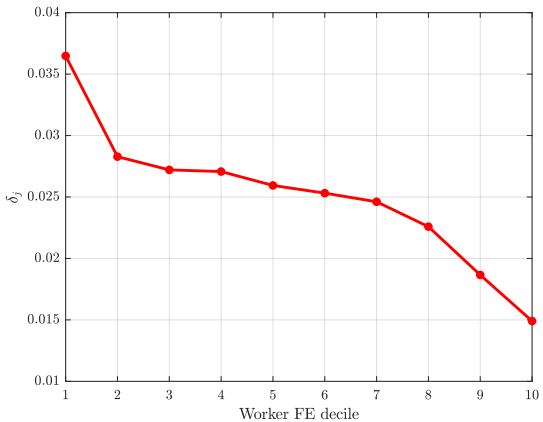
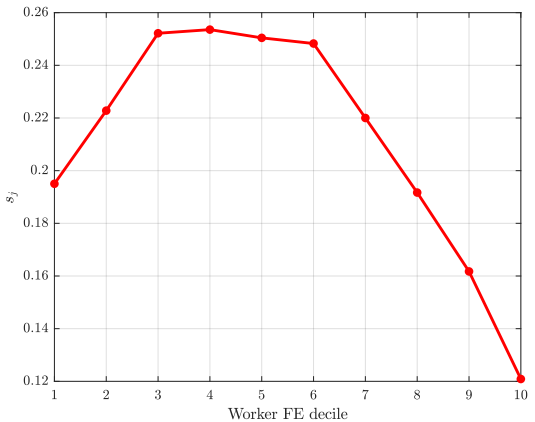
Appendix – Labor Market Statistics by Worker Type

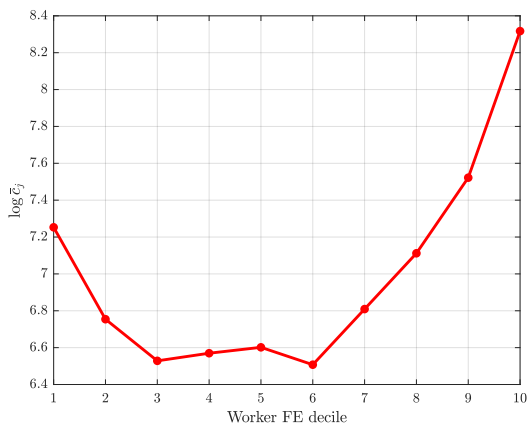
δ_j



s_j



$\bar{c}_j$



b_j

Source: Model.

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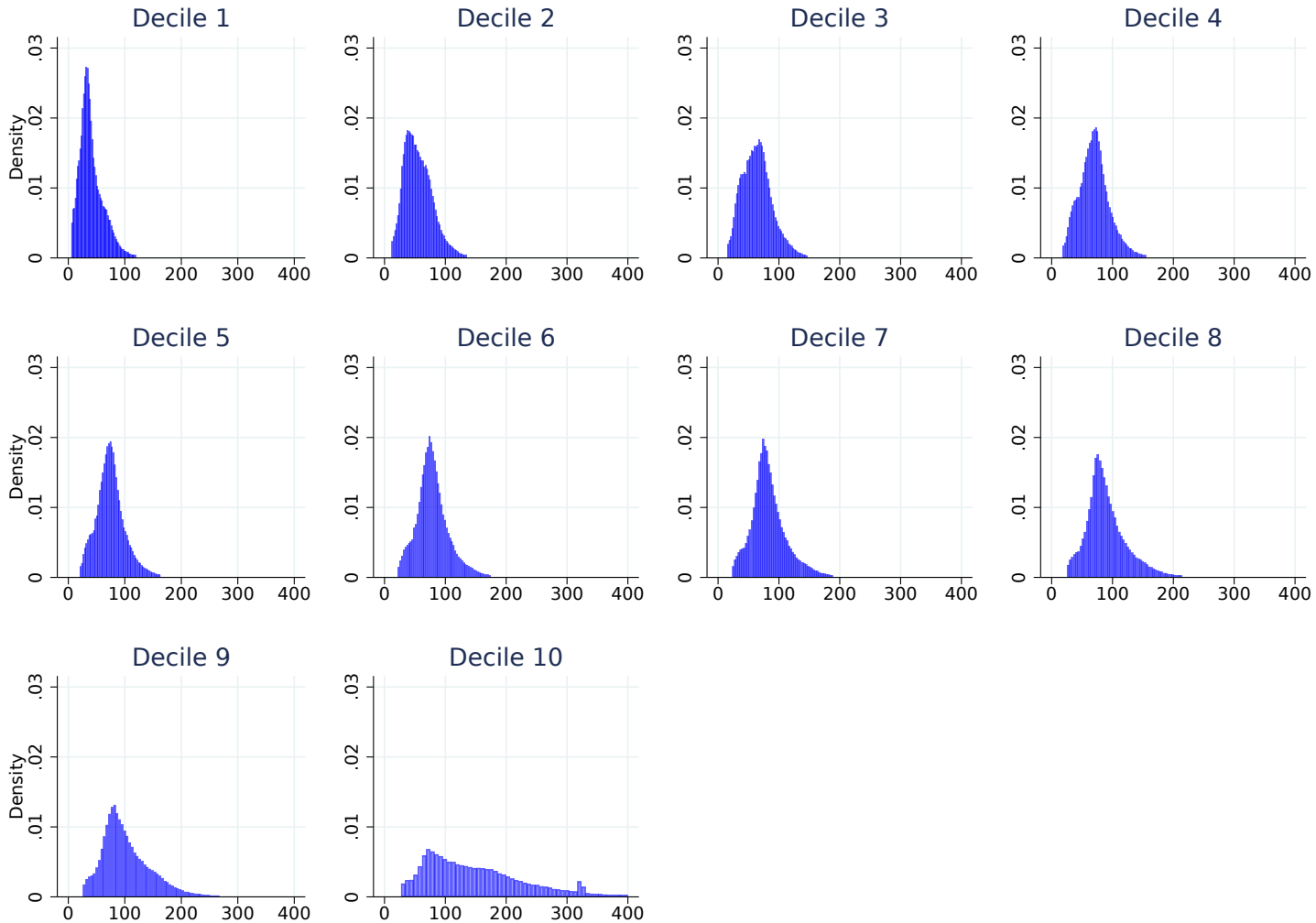
Appendix – Wage Distribution by Worker Type



Source: INPS matched employer-employee data (2016-2018).

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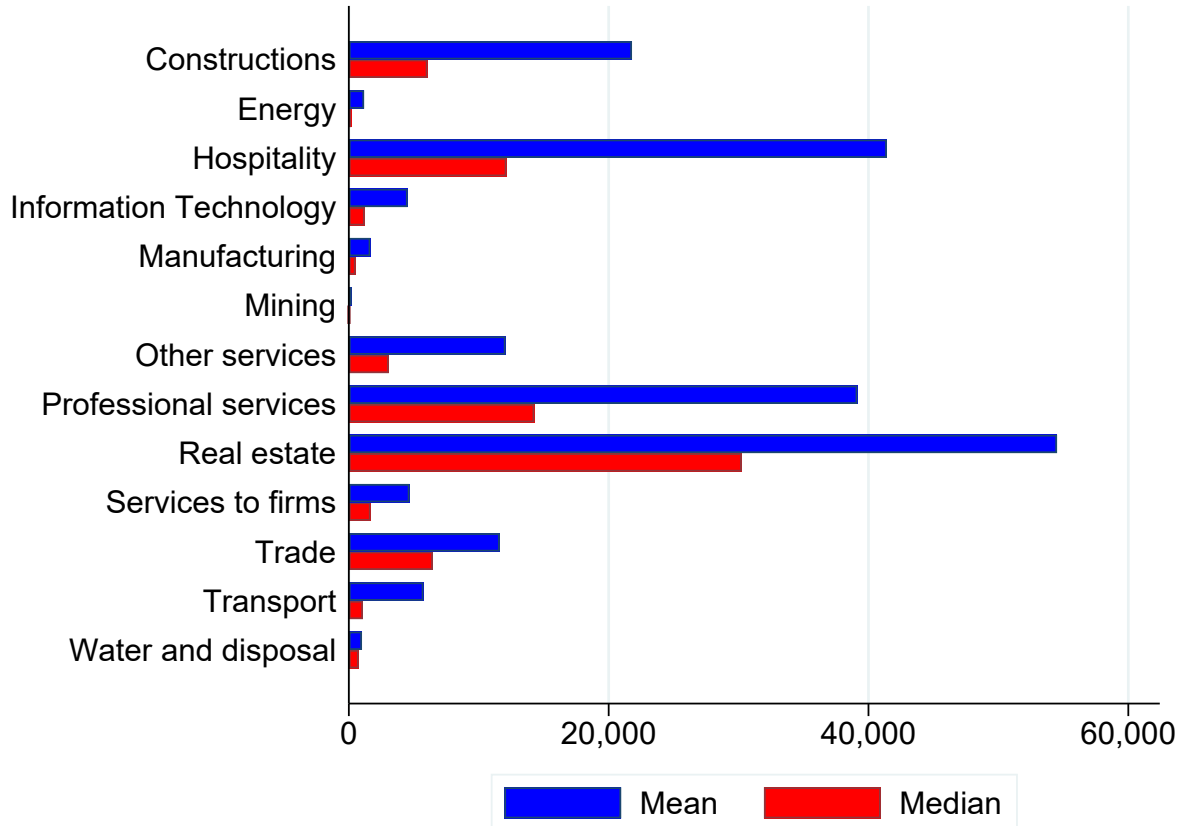
Appendix – Distribution of Market Structure by Industry

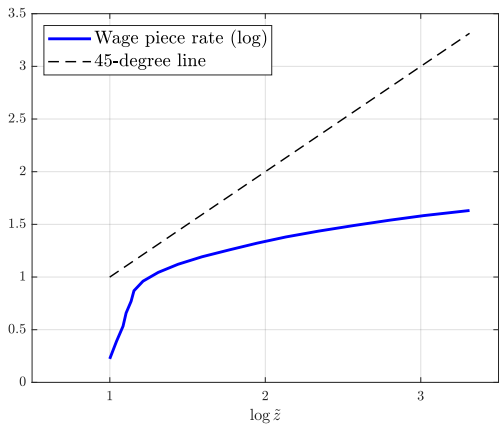


Source: Structural Business Statistics (Istat), 2019. *Note*: Sectors are defined according to the 4-digit Ateco classification.

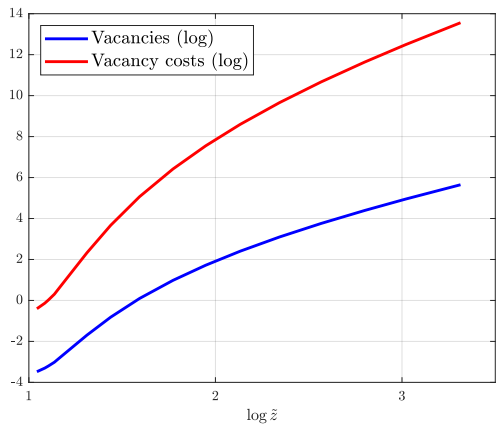
Estimation Calibration

Appendix – Labor Market Policy Functions

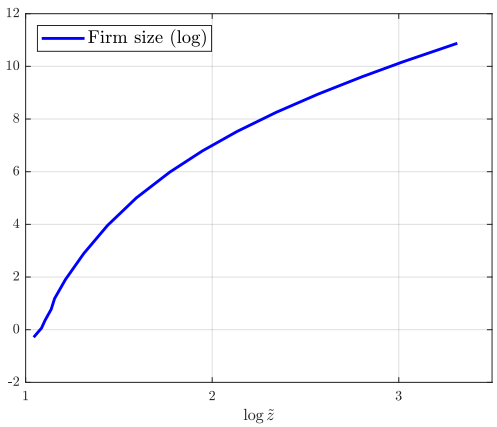
a) Wage piece rate



b) Vacancy posting



c) Equilibrium size



Source: Model. *Note*: the charts show the firms' policy functions in the 5^{th} decile labor market.

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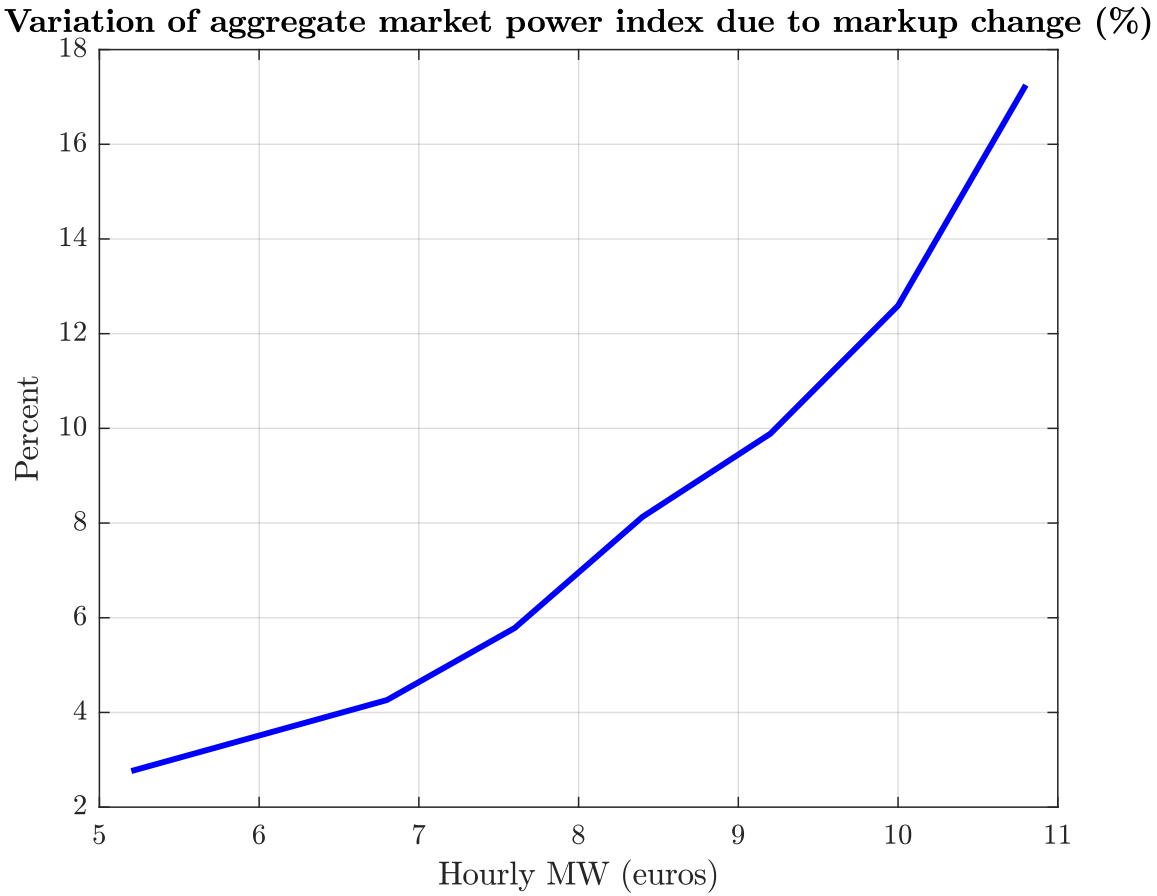
Appendix – Markup Share in MPI variation



Source: Model.

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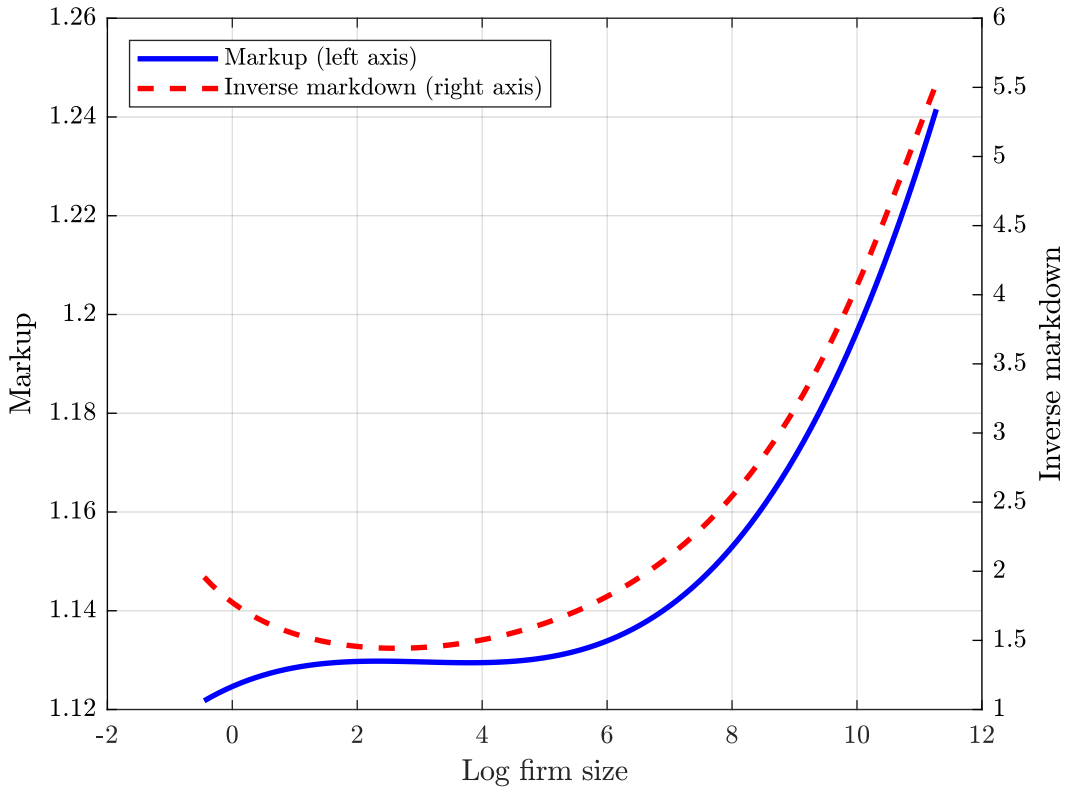
Appendix – Markups vs Markdowns



Source: Model. *Note*: the lines represent the average markup and inverse markdown for different levels of firm size.

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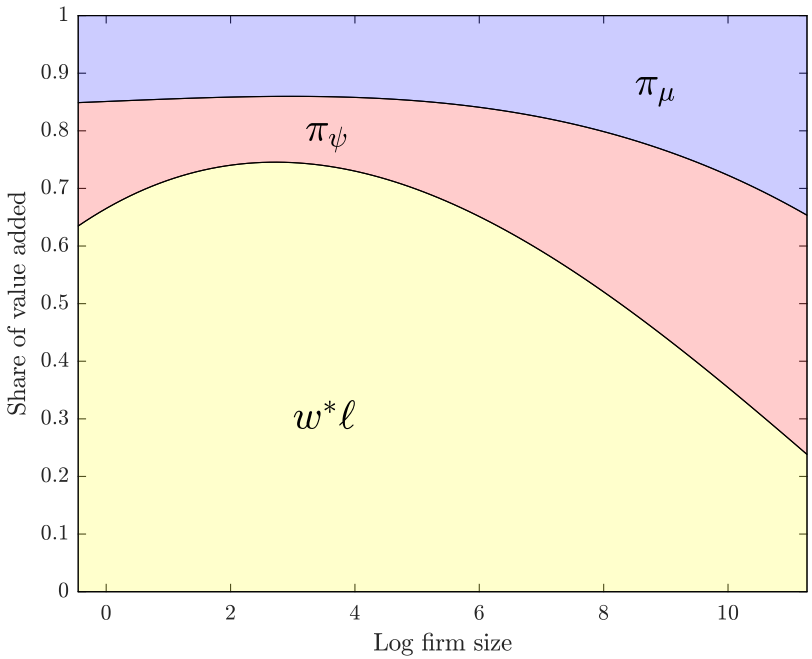
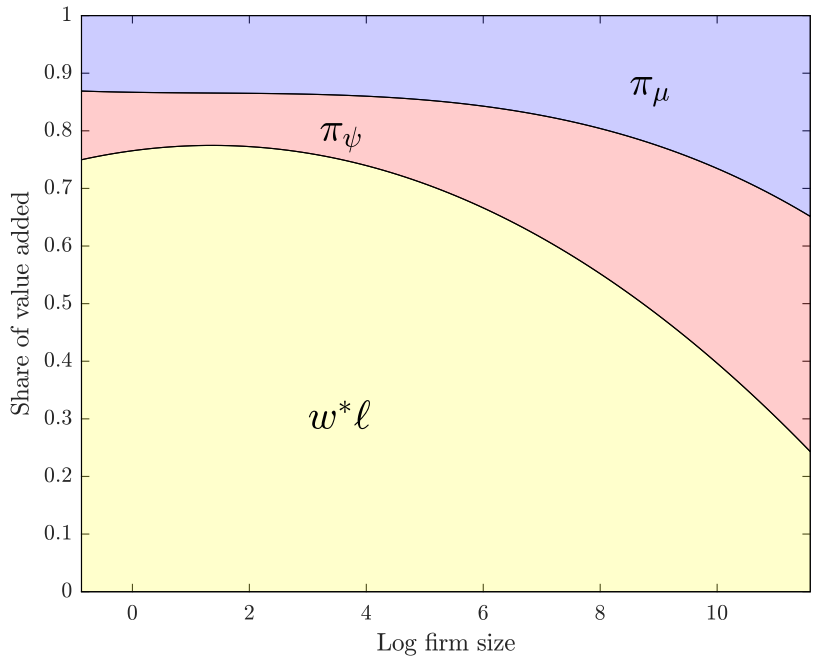
Appendix – Factor Shares Response

a) Baseline equilibrium



b) After the reform



Source: Model.

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Appendix – Market Power Response

- In our model, market power reduces GDP for two reasons:
  1. aggregate market power distortion $\iff \mathbb{E}[\mathcal{M}] > 1$
  2. misallocation of labor $\iff \mathbb{V}[\mathcal{M}] > 0$ (Hsieh and Klenow (2009))
- As long as $\mathbb{V}[\mathcal{M}] > 0$, labor is paid differently across firms:

$$\frac{w}{p} = \underbrace{\frac{\Psi}{\mu}}_{1/\mathcal{M}} z$$

- Small-to-medium MWs: $\mathbb{E}[\mathcal{M}] \downarrow$ and $\mathbb{V}[\mathcal{M}] \downarrow$
- Large MWs: $\mathbb{E}[\mathcal{M}] \uparrow$ but $\mathbb{V}[\mathcal{M}] \downarrow$

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Appendix – Behavioral vs Compositional Effects

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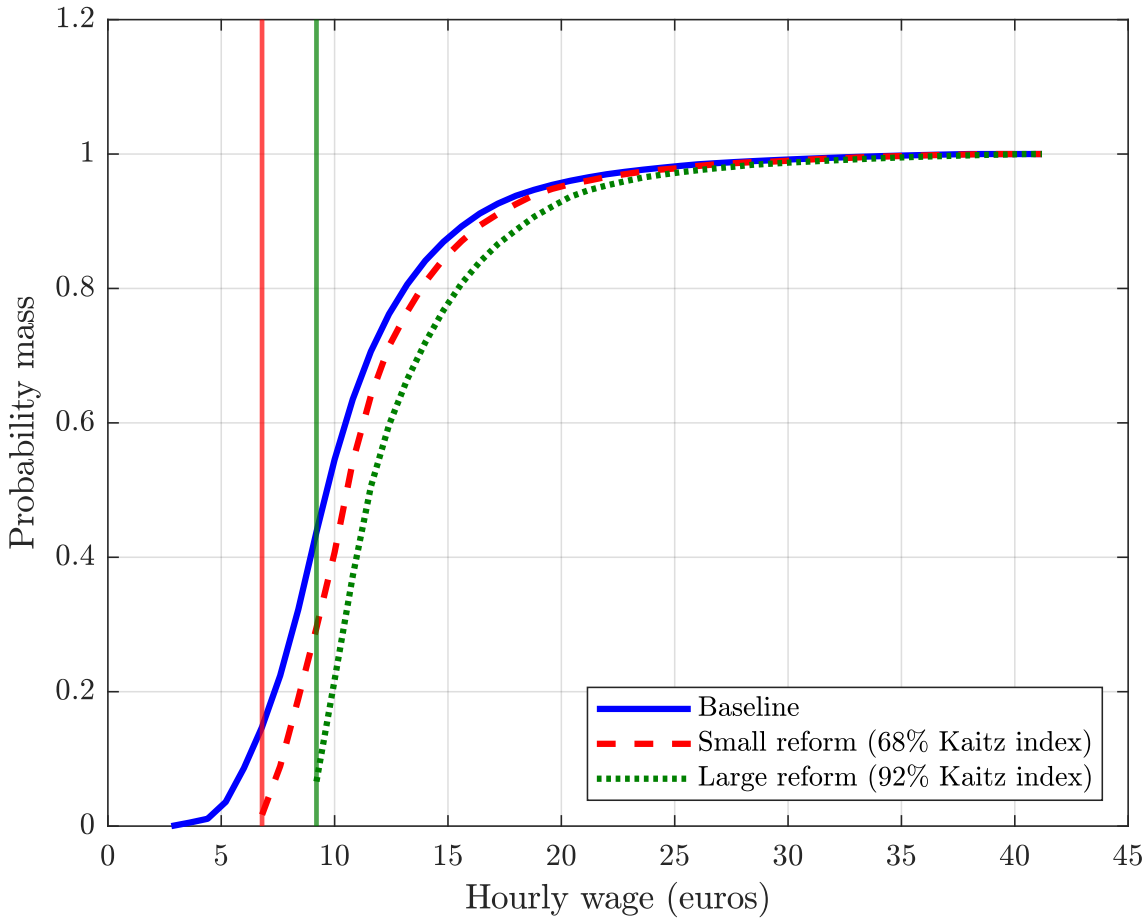
Variable	Overall change (log points)	Due to policy change (perc.)	Due to reallocation (perc.)
Panel a. Small reform (.68 Kaitz index)			
Average wage	10.610	64.5 %	35.5 %
Average firm size	-10.626	116.2 %	-16.2 %
Average vacancies	-22.387	103.4 %	-3.4 %
Log wage variance	-37.509	82.6 %	17.4 %
Labor share	1.298	221.8 %	-121.8 %
Average markup	0.101	33.3 %	66.7 %
Average markdown	3.077	165.3 %	-65.3 %
Average market power index	-2.976	169.8 %	-69.8 %
Panel b. Large reform (.92 Kaitz index)			
Average wage	22.732	58.4 %	41.6 %
Average firm size	-27.471	124.5 %	-24.5 %
Average vacancies	-57.411	104.1 %	-4.1 %
Log wage variance	-57.481	81.1 %	18.9 %
Labor share	1.607	398.5 %	-298.5 %
Average markup	0.358	32.2 %	67.8 %
Average markdown	5.007	224.3 %	-124.3 %
Average market power index	-4.649	239.0 %	-139.0 %

Appendix – Wage CDF



Source: Model.

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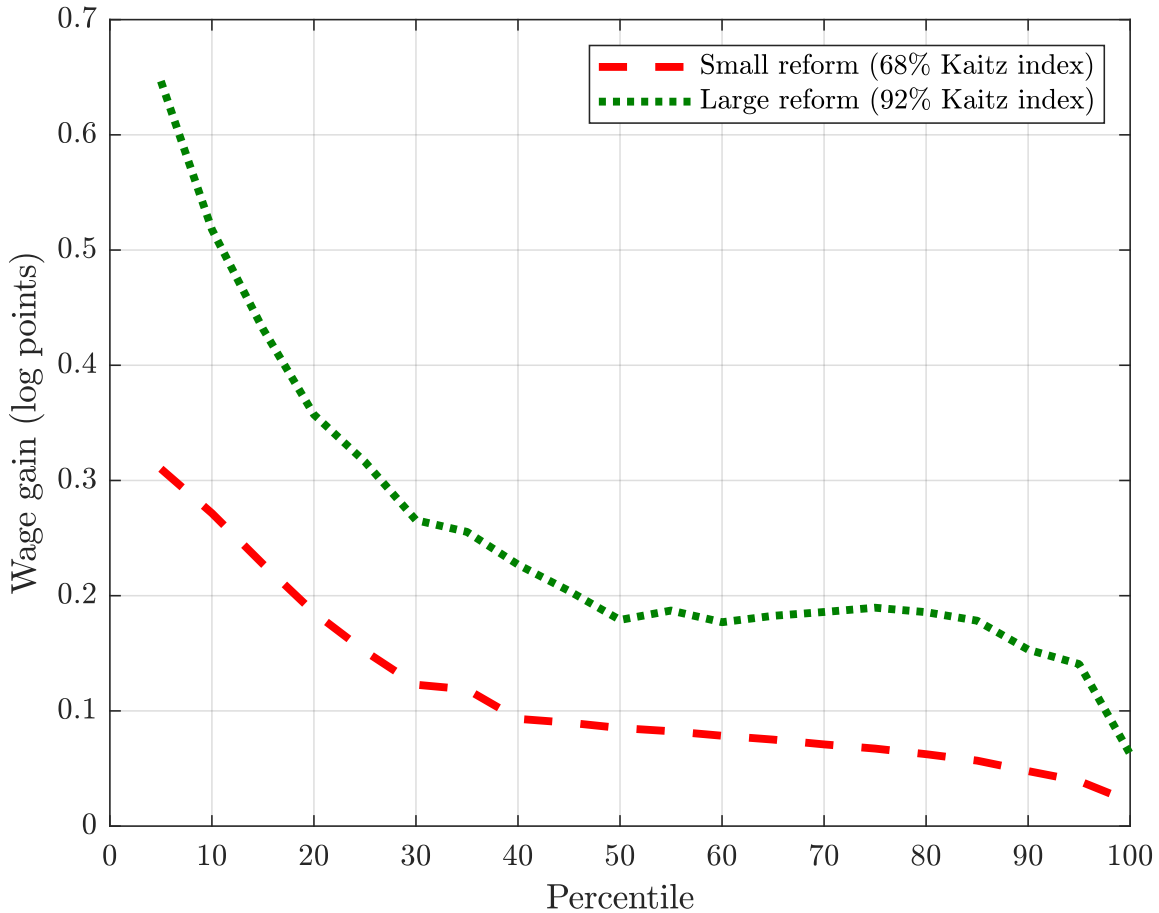
Appendix – Wage Gains by Percentile



Source: Model.

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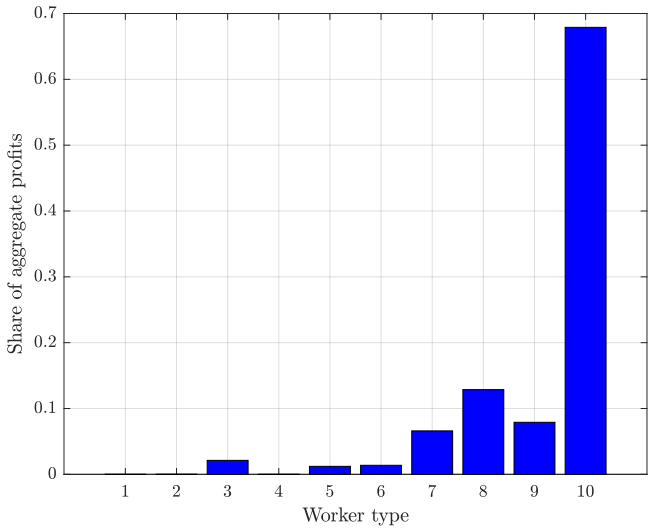
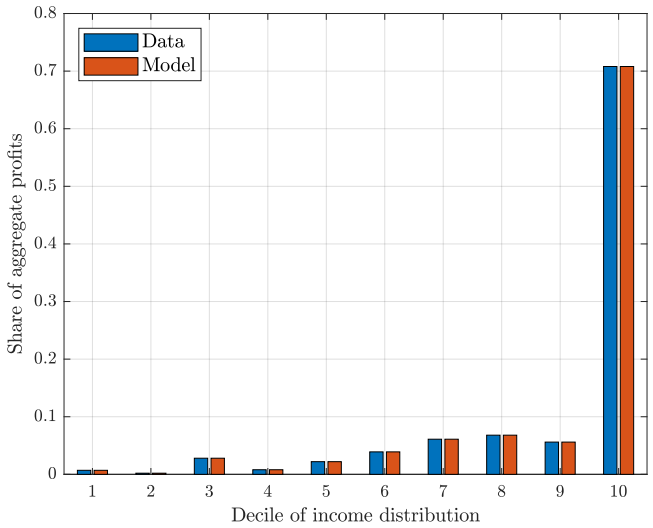
Appendix – Distribution of Profits

a) Across worker types (Π_j)



b) Along the inc dist (model vs. data)



Source: Model. *Note*: panel a plots the estimates of the shares of aggregate profits accruing to each worker type; panel b plots the shares of aggregate profits accruing to each income decile (targets of the estimation), in the data and in the model.

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Appendix – MW in PE: Unconstrained Firms

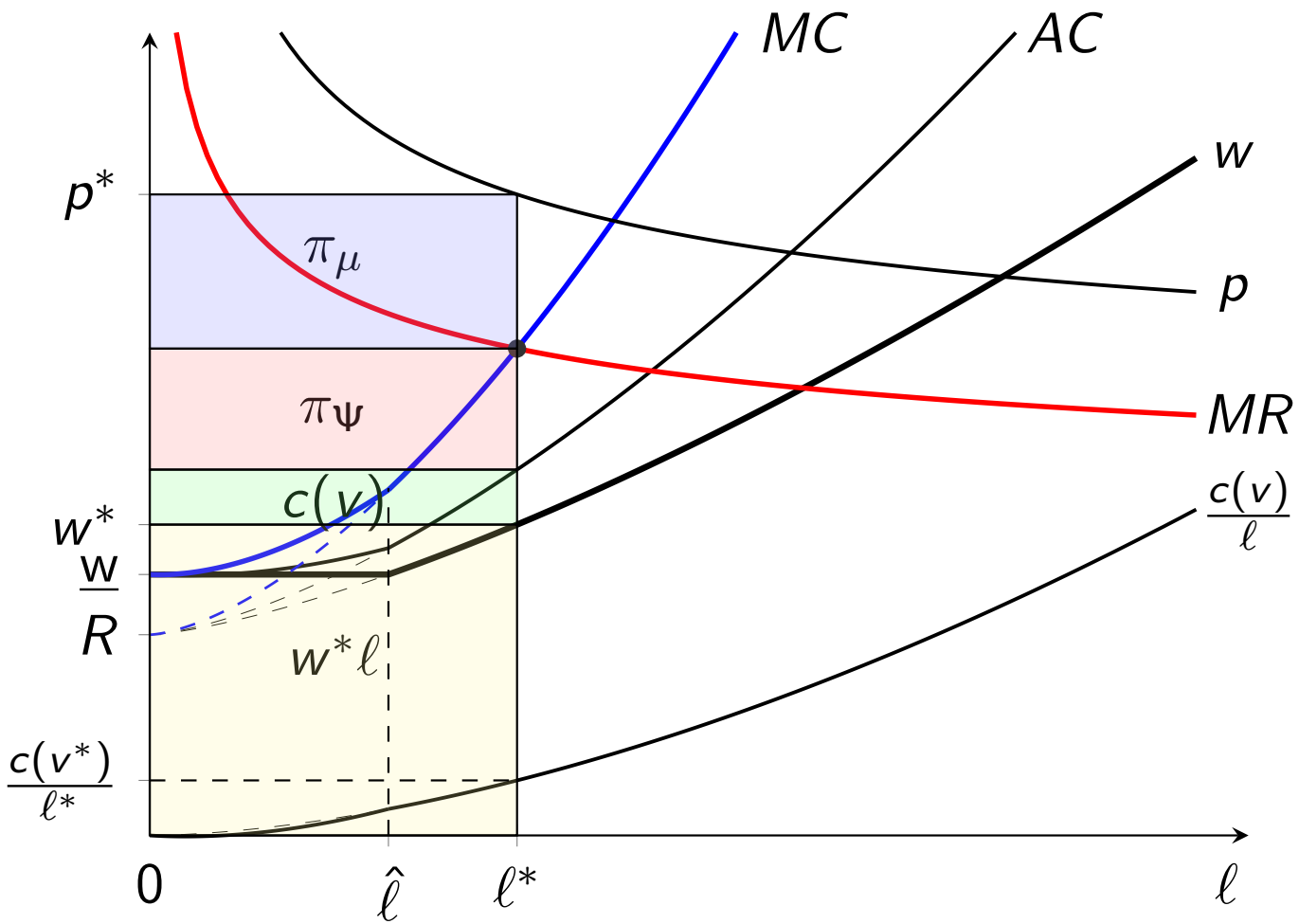

Figure: Non-binding MW.

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Appendix – MW in PE: Constrained Firms

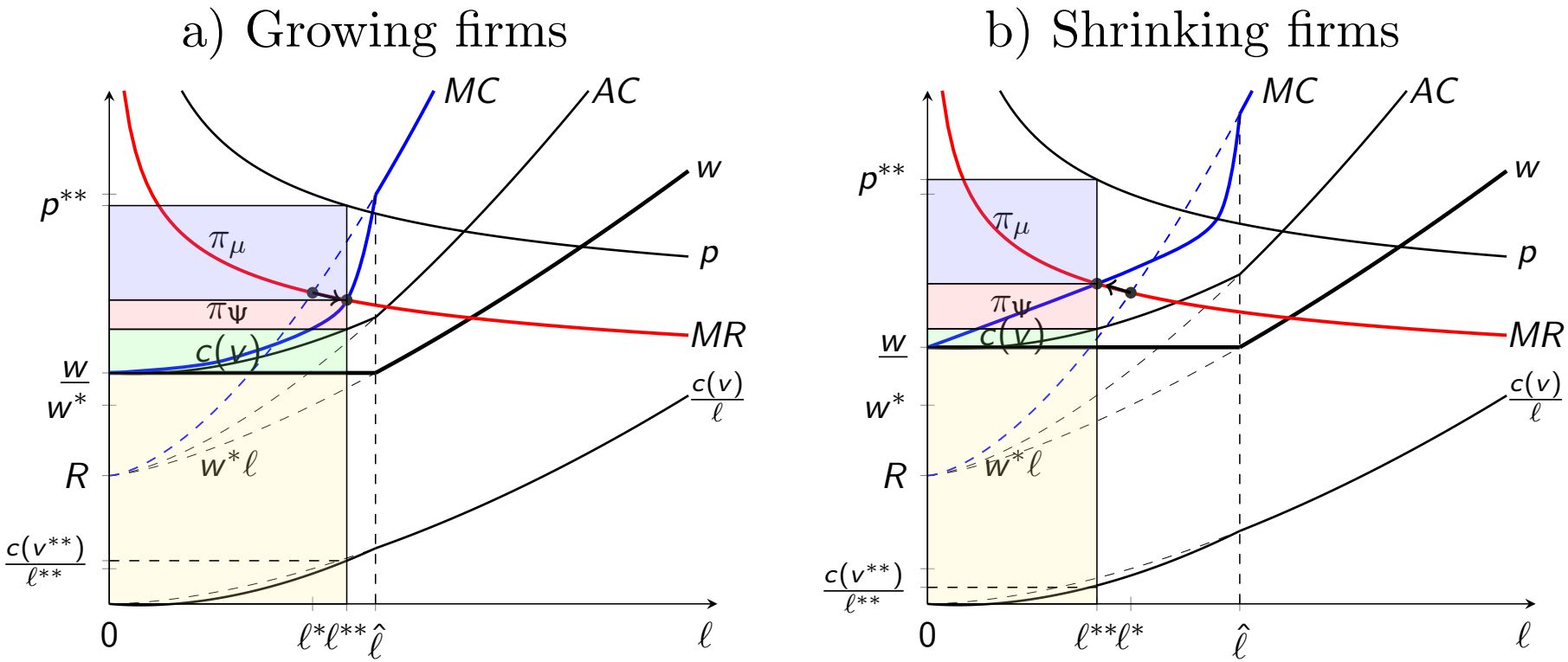

Figure: Binding MW.

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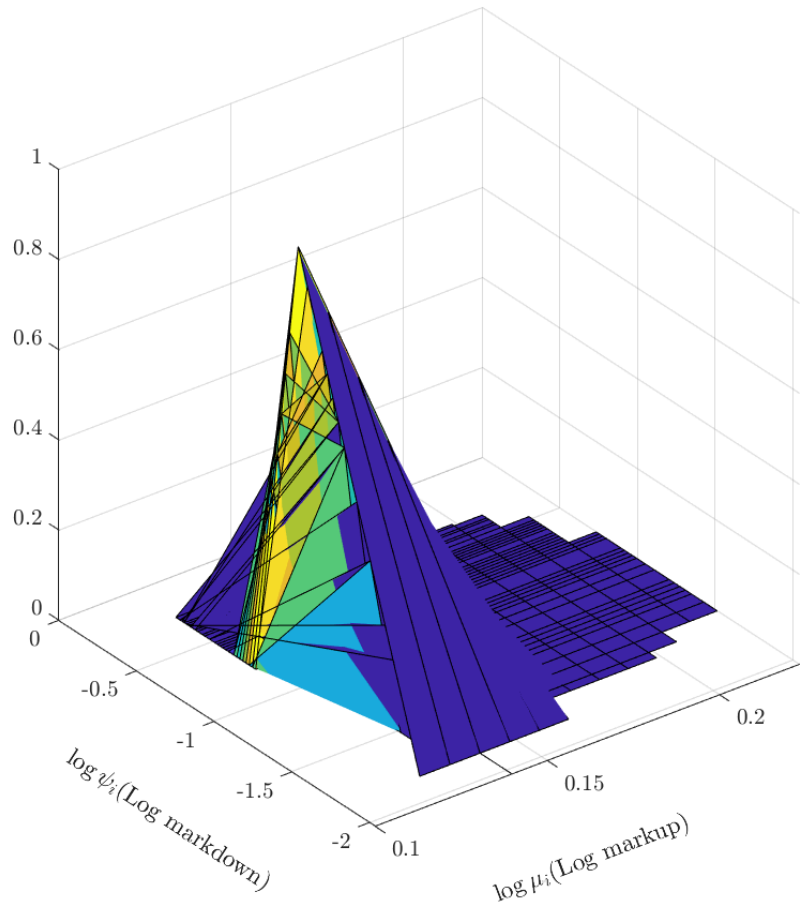
Appendix – Exit Response after MW Reform



Source: Model.

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Appendix – Baseline vs *Markupless* Economy

Variable	Baseline Economy		*Markupless* Economy	
	Status quo	*Large reform*	*Status quo*	*Large reform*
GDP	1.000	1.110	1.000	1.246
Unemployment rate	0.108	0.135	0.108	0.148
Avg firm size	4.051	4.189	4.051	6.776
Avg wage	11.032	13.498	11.032	14.337
Labor share	0.650	0.657	0.777	0.760
Avg mpi	2.127	2.054	1.865	1.922

Source: Model.

Takeaway: Product market power reins in reallocation and spillover effects and drives the distributional impact of high MWs

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Appendix – Baseline vs *MP* Economy

Variable	Baseline Economy		*MP* Economy	
	Status quo	*Large reform*	*Status quo*	*Large reform*
GDP	1.000	1.110	1.000	1.105
Unemployment rate	0.108	0.135	0.108	0.135
Avg firm size	4.051	4.189	4.051	4.190
Avg wage	11.032	13.500	11.032	13.498
Labor share	0.650	0.657	0.650	0.663
Avg mpi	2.127	2.054	2.127	2.038

Source: Model.

Takeaway: Endogenous markups do not affect aggregate variables significantly, but influence the dynamics of factor shares

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Appendix – *Markupless* Economy

Variable	Baseline	Small reform (68% Kaitz index)	Large reform (92% Kaitz index)
Panel a. Aggregate statistics			
GDP	1.000	1.078	1.246
Unemployment rate	0.108	0.120	0.148
Output per worker	1.000	1.087	1.315
Avg hourly wage (€)	11.032	12.165	14.337
Variance log wage	0.132	0.098	0.090
Avg firm size	4.051	4.422	6.776
Panel b. Distributional Statistics			
Labor share	0.777	0.777	0.760
Profit share	0.223	0.223	0.240
Profit share (product market)	0.000	0.000	0.000
Profit share (labor market)	0.223	0.223	0.240

Source: Model. *Note*: the variables *GDP* and *Output per worker* are normalized to 1 in the Baseline.

Product Market Power Baseline Model

Appendix – *Markupless* Economy – Cont'd

Variable	Baseline	Small reform (68% Kaitz index)	Large reform (92% Kaitz index)
Panel c. Market power statistics			
Average markup	1.000	1.000	1.000
Average markdown	0.536	0.540	0.520
Average mpi	1.865	1.853	1.922
Misalloc index (mpi std dev)	0.463	0.462	0.453
Panel d. Labor market transitions			
Job-finding rate	0.207	0.181	0.141
Job-to-job flow rate	0.013	0.012	0.010
Job-separation rate	0.025	0.025	0.025

Source: Model.

Product Market Power Baseline Model

Appendix – MP Economy

Variable	Baseline	Small reform (68% Kaitz index)	Large reform (92% Kaitz index)
Panel a. Aggregate statistics			
GDP	1.000	1.044	1.105
Unemployment rate	0.108	0.118	0.135
Output per worker	1.000	1.042	1.114
Avg hourly wage (€)	11.032	12.035	13.498
Variance log wage	0.132	0.091	0.074
Avg firm size	4.051	4.082	4.190
Panel b. Distributional Statistics			
Labor share	0.650	0.658	0.663
Profit share	0.350	0.342	0.337
Profit share (product market)	0.170	0.168	0.166
Profit share (labor market)	0.180	0.174	0.171

Source: Model. *Note*: the variables *GDP* and *Output per worker* are normalized to 1 in the Baseline.

Product Market Power Baseline Model

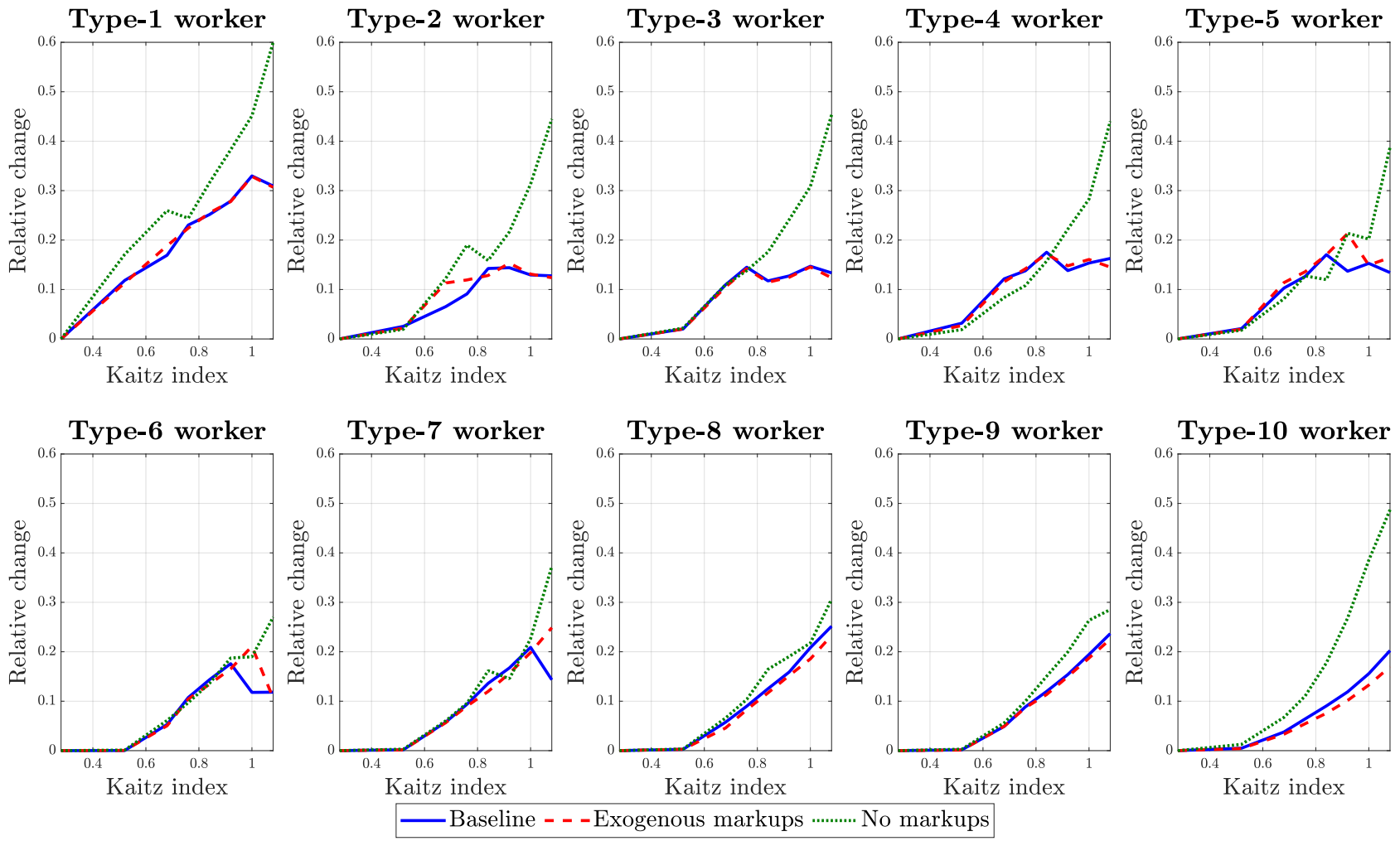
Appendix – MP Economy – Cont'd

Variable	Baseline	Small reform (68% Kaitz index)	Large reform (92% Kaitz index)
Panel c. Market power statistics			
Average markup	1.140	1.140	1.140
Average markdown	0.536	0.550	0.560
Average mpi	2.127	2.073	2.038
Misalloc index (mpi std dev)	0.528	0.511	0.486
Panel d. Labor market transitions			
Job-finding rate	0.207	0.185	0.158
Job-to-job flow rate	0.013	0.013	0.012
Job-separation rate	0.025	0.025	0.025

Source: Model.

Product Market Power Baseline Model

Appendix – Distributional Impact Across Economies



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