Union and Firm Labor Market Power[*]

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Abstract

Can union and firm labor market power counteract each other? We answer this by building a general equilibrium, multi-sector right-to-manage bargaining model incorporating firm labor market power. Heterogeneous firms and unions bargain bilaterally in local labor markets, determining firm-specific rent-sharing that affects labor allocation. Using administrative data from French manufacturing firms to estimate key elasticities, we find that without unions, output and social welfare would respectively decline by 0.67 and 2.76 percent, as unions partially offset the negative labor allocation effects of oligopsonistic power.

JEL Codes: J2, J42, J51

Keywords: Labor markets, Wage setting, Misallocation, Monopsony, Unions

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There is growing evidence, especially for the United States, that links lower wages to labor market concentration.[1] Indeed, if this concentration reflects monopsony power in the labor market, standard theory predicts that firms pay workers less than their marginal revenue product of labor. On the other hand, if labor market institutions enable workers to organize, bargaining can mitigate firms' labor market power.

In this paper, we study the interaction between union and firm labor market power and quantify their effects on output and welfare in the French manufacturing sector. The French case stands out over other developed countries, especially with respect to the U.S., for having regulations that significantly empower workers over employers. We therefore provide a theoretical framework that incorporates both, employer and union labor market power.

The paper's main contribution is to build, identify, and estimate a general equilibrium model where heterogeneous union-employer pairs bargain bilaterally. Firms face upward-sloping labor supplies that allow them to capture rents, while unions can redistribute them through bargaining. A key element is that union-firm pairs compete for labor within their local labor market, so their bargaining outcome affects other competing union-firm pairs.

Central to our paper is how unions affect rent-sharing and labor reallocation. Without unions, firms pocket their rents and hire too few workers. While subsidies can encourage hiring, unions achieve it differently: by sharing rents with workers. Differences in rent-sharing drive labor reallocation across firms: if unions redistribute more from productive firms, they reallocate toward them increasing aggregate productivity by undoing part of the misallocation from firms' labor market power; if unions redistribute more from less productive firms, they worsen labor market power's negative effects on output.

Our main quantitative result is that unions mitigate the negative effects of firms' market power. We find that in the absence of unions and holding the total labor supply constant, output and social welfare decrease respectively by 0.67% and 2.76%. While the effect on output and social welfare is small, unions have a meaningful distributional role. Without unions, the labor share would be 13.9 percentage points smaller and average wages 28% smaller. This translates into workers' welfare losses of more than 30%.

After briefly presenting the French institutional setting, we present the model. Bargaining

[1] See Benmelech et al. (2018), Schubert et al. (2024), Azar et al. (2020), Berger et al. (2022), Jarosch et al. (2024), among others.

follows the right-to-manage approach, where employers make hiring decisions in a second stage given the bargained wage. A novel feature is that the employer faces an endogenous labor supply constraint: employment must not exceed the labor supplied to the employer. This setup yields an employment allocation that is either labor supply or labor demand constrained. If the bargained wage is below the marginal revenue product of labor, employment will be labor supply constrained. On the contrary, when the bargained wage is above the market clearing wage for the employer, employment is labor demand constrained. This leads to labor rationing and unemployment in equilibrium. Our model nests as special cases both the monopoly union model of Dunlop (1944) or a model with oligopsonistic competition as Berger, Herkenhoff, and Mongey (2022) (BHM henceforth).

We show that under a general class of utilitarian union objectives and elastic labor demands, expected wages and utility are decreasing in bargained wages when the employer is labor demand constrained. As a result, it is in the interest of *both* the union and the firm to bargain wages that are at most equal to the competitive wage along the labor supply. This wage-setting process leads to a wedge between the equilibrium bargained wage and the marginal revenue product of labor that is weakly below one. Differences in labor wedges across firms distort relative wages and create resource misallocation.

The model captures that union and firm labor market power constitute countervailing forces. The wedge is a function of an endogenous markdown—due to oligopsony power—and an endogenous bargaining share, which reflects the union market power. The bargaining share determines the union's rent-sharing ability, counteracting the firm's market power.

We show how to aggregate the model and obtain closed-form expressions for the sector-level variables, along proving uniqueness and existence of the general equilibrium. In an extension, we consider alternative misaligned union objectives on insiders that may lead to wages above the competitive ones that cause labor rationing. We show that, with or without rationing, the model is block-recursive as the local labor market equilibria are invariant to aggregates.

After the model setup, we discuss how to identify and estimate the model parameters. We have two types of parameters: the ones related to the labor supply and bargaining, and the ones related to production. Labor supplies depend on two key parameters related to the heterogeneity of workers' preferences, the *local* and *across-market* elasticities of substitution. These two elasticities jointly determine the extent of employers' labor market power on the labor supply.

The main challenge is to separately identify the union bargaining powers from the local and across-market elasticities of substitution. We propose a strategy to estimate these elasticities that is independent from the underlying wage setting process. We first estimate the across-market elasticity of substitution and the inverse labor demand elasticity using employers that are alone in their local labor markets. Their local labor market equilibrium is a standard system of labor supply and demand equations, that suffers from simultaneity bias. Rather than instrumenting, we adapt the identification through heteroskedasticity of Rigobon (2003) which allows to recover the structural parameters by imposing restrictions on the covariance matrix of structural shocks.

We then estimate the local elasticities of substitution using the firm's labor supply. We use firm-level revenue productivities to instrument for wages. We include market-year fixed effects to control for all the strategic interactions, avoiding biased estimates from SUTVA violations (Berger, Herkenhoff, and Mongey, 2022). We finally identify the union bargaining powers by matching observed sector-level labor shares.

Our counterfactual analyses suggest that employer labor market power is stronger than that of unions. Increasing bargaining powers with the baseline union objectives without rationing, brings wages closer to the competitive ones improving aggregate productivity, output and workers' welfare. We then explore alternative misaligned union objectives that may lead to rationing. Increasing union bargaining powers may push wages above competitive levels and generate unemployment. We find that increasing them to one under these misaligned objectives yields an unemployment rate of 11.5% and decreases output by 7%.

Finally, we consider an alternative institutional setting where an aggregate union and an employer association set wage floors at the sector level. We assume unconstrained firms in this framework choose wages oligopsonistically. High wage floors at the sector create rationing in firms with low productivity and decrease their expected wages. Wages increase for firms that are constrained by the wage floors on the labor supply, shifting resources from productive unconstrained firms to them. In contrast, firms that are rationing partially free up labor supply and may induce reallocation toward more productive firms, even though they leave part of their labor supply idle. We find that the negative effects prevail as sector wage floors reduce output.

Literature. This paper speaks to several strands of the literature. First, we contribute to the literature on employer labor market power. We depart from papers studying monopsony power (e.g. Manning, 2011; Card et al., 2018; Yeh et al., 2022) and oligopsony power (Berger, Herkenhoff, and Mongey, 2022) by including wage bargaining between union-employers.[2] Different from BHM, employment in our framework is endogenously labor supply or labor demand constrained. Bachmann et al. (2022), MacKenzie (2021) and Trottner (2023) have focused on misallocation effects of monopsony power. We contribute to this literature by including unions and studying their counterbalancing effect to the labor market power of firms.

Second, we contribute to the literature studying unions at the firm level.[3] Our paper is related to Lagos (2024) who studies worker amenity and wage compensation under bargaining, and to Hosken et al. (2023) who considers a model of worker-employer bargaining with output market power to evaluate the effects of mergers. The implications of labor market power for mergers and acquisitions have recently received more attention in policy circles (Berger et al., 2025a), as well as the role of unions in counteracting it (Posner, 2024). We provide a framework for studying the labor market implications of mergers when unions are present.

Some papers have focused on the role of unions on reducing wage inequality (e.g. DiNardo et al., 1995; Farber et al., 2021). Recently, Beauregard et al. (2025) not only discuss the effect of unions on firm pay dispersion but also show that the union pay premium is partly explained by a rent extraction component that is present in our framework.

Relatedly, there is growing empirical evidence on the ability of unions on weakening the effects of labor market concentration.[4] These findings are in line with our structural model and we find that allowing for collective bargaining is key to match certain empirical regularities. We furthermore provide a framework to evaluate their aggregate implications.

Our paper is also related to the literature on rent-sharing. When a firm is labor supply constrained, wages in our model resemble those in frameworks with firm-level upward sloping labor supplies (Card et al., 2018; Lamadon et al., 2022), incumbent workers retention consid-

[2]Recent papers studying monopsony or oligopsony power in neoclassical labor markets include Lamadon et al. (2022), Deb et al. (2022), Deb et al. (2024), Amodio and De Roux (2024), Amodio et al. (2024), Jha and Rodriguez-Lopez (2021), and Felix (2021) among others. These are complementary to Jarosch et al. (2024) and Datta (2021) as they consider search frameworks.

[3]Bhuller et al. (2022) and Jäger et al. (2024) provide recent surveys on collective bargaining.

[4]Marinescu et al. (2021) in France, Benmelech et al. (2018) in the U.S. and, Dodini et al. (2021) and Dodini et al. (2024) in Norway.

erations (Kline et al., 2019), or union bargaining with exogenous outside options (Abowd and Lemieux, 1993). Our model can generate endogenous rent-sharing expressions that depend on labor supply shares, bargaining powers, and outside options.

Finally, we contribute to the industrial organization literature on bilateral vertical supply relationships with bargaining. Avignon et al. (2024) and Demirer and Rubens (2025) also have frameworks where bargaining allocations are endogenously either supply or demand constrained.[5] We contribute to these papers by developing a quantitative general equilibrium model with many heterogeneous union-employer pairs and studying the effect of bargaining on labor reallocation. We also show that, when unions care about employment rationing and labor demands are elastic, employment is always labor supply constrained.

Outline. The paper is organized as follows. Section 1 summarizes the French institutional setting. Section 2 presents the model. Section 3 introduces the data. Section 4 discusses the identification and estimation. Section 5 presents the counterfactuals and Section 6 concludes. Additional derivations are in the Online Appendix and the Supplemental Material.

1 Institutional background

The institutional framework of the French labor market is characterized by legal requirements that give unions an important role even in medium sized firms. The French labor market is known to be one where unions are relevant players, though trade union affiliation in France is among the lowest of all the OECD countries. The unionization rate in France was 9% in 2014, slightly below the U.S. (10.7%) and well below Germany (17.7%) or Norway (49.7%).[6]

Low affiliation rates do not translate into low collective bargaining coverage for the French case. Collective bargaining agreements extend almost automatically to all the workers, unionized or not. For example, if an agreement is reached that pertains a certain occupation in a firm, all the workers with that occupation are covered. The French institutional framework implies that coverage of collective agreements in 2014 was as high as 98.5% despite the low union affiliation rates. This is in contrast to the U.S. collective bargaining agreements that only apply to

[5] Alviarez et al. (2023) consider bargaining in a vertical supply relationship but assume demand always binds. Their characterization of the markup is very similar to our wedge when the allocation is labor supply constrained.

[6] See Table D.6 in Online Appendix D.6 for a comparison with more countries.

union members and therefore coverage is very similar to the unionization rate.

Collective bargaining occurs at multiple levels. Firms and unions can negotiate at aggregate levels (industry, occupation, region) and at economic units (group, firm, plant), so multiple collective agreements can coexist at a given establishment. Before 2009, the five historically representative unions had automatic bargaining rights without needing to prove local support. Any of the five unions could designate a delegate to negotiate with the firm.[7] In 2010, 92% of mono-establishment firms that had a specific collective bargaining agreement negotiated it at the firm level. Of the multi-establishment firms with specific agreements, 45% negotiated at least partially at the establishment level (Naouas and Romans, 2014, p. 7).

The French institutional framework naturally supports bargaining at the establishment-occupation level through the organization of worker representation elections. Elections for worker representatives are organized at the establishment level, with employees divided into professional categories or "electoral colleges" based on their occupations (Askenazy and Breda, 2022). These colleges typically group workers into broad categories: workers and employees (first college), supervisors and technicians (second college), and managers and executives (third college). Each electoral college elects its own representatives, who then negotiate on behalf of their specific occupational group. This structure means that bargaining outcomes can vary across occupational categories within the same establishment.

Legal requirements regarding union representation depend on firm or plant size, creating different thresholds for worker representation. At 11 employees, establishments must organize elections for Staff Delegates (Délégués du Personnel). At 50 employees, establishments must also establish Works Councils (Comité d'Entreprise) with separate elections for each electoral college, creating a more complex system where different occupational groups have distinct representation. As a consequence, establishment-level bargaining is common even at relatively small establishments. In fact, 52% (51%) of establishments with at least 20 employees bargained over wages in 2010 (in 2004) (See Table 1 of Naouas and Romans, 2014) and affects about 70% of wage employment.[8] This share was 61% for firms above 50 employees. In our final sample, manufacturing firms with more than 50 workers—where bargaining is expected to be frequent

[7] This changed with the 2008 reform, which required union delegates to win at least 10% of votes in workplace elections to gain representative status and bargaining rights at the firm level.

[8] The prevalence of wage bargaining was 44% for establishments with 11 employees or more.

and there are mandatory profit-sharing rules (Nimier-David et al., 2023)—constitute 74% of employment and 80% of value added.[9]

We now present a model with both firm labor market power and—in line with the French institutional setting—unions.

2 A Model of Union and Firm Labor Market Power

We first present a general framework of heterogeneous unions and firms in local labor markets. Later, we specify the production side of the economy, the workers' preferences, the unions' objectives, and define the general equilibrium. Since firms can operate across multiple local labor markets, we distinguish between firms and employers, where an employer represents a firm's hiring unit within a specific local labor market. All proofs are in Online Appendix A.

2.1 Heterogeneous unions and employers in a local labor market

Here, we describe an environment where many heterogeneous employers and unions bargain bilaterally within a local labor market. An important feature of our framework is that both unions and employers take into account a labor supply constraint: the number of workers used in production must be less than the number of workers that wish to work with the employer. This contrasts with most of the literature studying unions that: (i) treat both the union and employers as representative, and (ii) ignore endogenous labor supply constraints.

Local labor market and timing. A local labor market m consists of a discrete set of union-employer pairs $\mathcal{I}_m = \{1, \ldots, N_m\}$. Each pair bargains bilaterally while competing for workers with other pairs. If bargaining fails, the employer does not participate in the market, so there is no production and the employment option is not available for workers. After the bargaining stage, workers choose where to supply labor.

Revenue and labor supply constraint. Employer i generates revenue using employment L_i according to the function $F_i(L_i)$, where $F_i'(L_i) > 0$ and $F_i''(L_i) < 0$. Workers employed in i earn

[9] Pecheu (2022) finds that a large proportion of firms do not comply with the mandatory rent-sharing scheme. The Appendix of Caliendo et al. (2015) provides a summary of size related legal requirements in France.

a wage w_i. Denote the endogenous quantity of labor supplied to i as L_i^S. As other pairs compete for labor, a natural constraint emerges: employed labor must not exceed the labor supplied to i. The labor supply constraint for i is:

$$\text{Labor supply constraint:} \quad L_i \leq L_i^S \iff \psi_i \leq 1, \quad \text{where } \psi_i \equiv L_i / L_i^S. \tag{1}$$

Whenever the labor supply constraint (1) is slack, there is labor rationing with the *rationing share* $\psi_i < 1$.[10] When employment is on the labor supply for i, its rationing share is equal to one.

Expected wage and labor supply. If there is rationing in i ($\psi_i < 1$), we assume the employer randomly selects which workers to employ. This means a worker seeking employment at i faces an *expected wage* of $\overline{w}_i = \psi_i w_i$. We assume that workers are risk neutral so the labor supply to employer i depends on its own expected wage ($\overline{w}_i$) and those of other employers in the local market ($\{\overline{w}_j\}_{j \neq i}$). That is, $L_i^S = \ell_i^S \left(\overline{w}_i, \{\overline{w}_j\}_{j \neq i}\right)$, where $\partial \ell_i^S / \partial \overline{w}_i > 0$. We suppress the term $\{\overline{w}_j\}_{j \neq i}$ of the labor supply function from now on for notation simplicity.

Nash-in-Nash. The union-employer negotiated outcome corresponds to the Nash bargaining solution, while each union-employer pair treats the outcomes of other pairs in their local labor market as fixed. This approach represents a Nash equilibrium in Nash bargains, commonly called the "Nash-in-Nash" solution (Horn and Wolinsky, 1988; Collard-Wexler et al., 2019).

Strategy space. We define the strategy space using wages and rationing shares rather than wages and employment levels. This choice helps us avoid a complication: when employment level L_i is used, the employment decision of union-employer pair i affects the labor supply constraints of all other competitors $j \neq i$ in the local labor market. Under the Nash equilibrium assumption, each union-employer pair understands the constraints faced by other pairs and would need to account for all competitors' constraints, which can be cumbersome when there is a large number of pairs.[11] By using rationing shares ψ_i instead of L_i, each union-employer pair

[10] The rationing share is analogous to the hiring probability in Ahlfeldt et al. (2022) induced by an exogenous minimum wage.

[11] Specifically, j's labor supply $\ell_j^S \left(\overline{w}_j, \{\overline{w}_{j'}\}_{j' \neq j}\right)$ depends on i's expected wage $\overline{w}_i = w_i \frac{L_i}{\ell_i^S(\overline{w}_i, \{\overline{w}_{i'}\}_{i' \neq i})}$, meaning L_i would affect j's and all others' labor supply constraints. This problem parallels complications in the analysis of Bertrand-Edgeworth models of oligopolistic competition (Benassy, 1989).

only needs to keep track of their own labor supply constraint $\psi_i \leq 1$, facilitating the analysis.

Right-to-manage model. We model bargaining using a "right-to-manage" approach (Nickell and Andrews, 1983), where employers and unions negotiate first over wages, but employers retain the ability to set the rationing share. After wage bargaining, employers set the rationing share to maximize profits, subject to the labor supply constraint $\psi_i \leq 1$.[12]

2.2 Wage characterization

We begin by defining the two-stage bargaining problem and characterizing the resulting wages, distinguishing between cases where labor demand or labor supply is the binding constraint.

Proposition 1. *Under the right-to-manage framework, the Nash bargaining solution determines wages and rationing shares by solving:*

$$\max_{w_i} \left(G_i(w_i, \psi_i)\right)^{\varphi} \left(F_i(\psi_i \ell_i^S(\psi_i w_i)) - w_i \psi_i \ell_i^S(\psi_i w_i)\right)^{1-\varphi}, \tag{2}$$

$$\text{subject to:} \quad \psi_i \leq 1, \quad \underbrace{\psi_i \ell_i^S(\psi_i w_i) \leq \ell_i^D(w_i)}_{\text{Labor Demand Constraint}}, \quad \text{and} \quad \underbrace{(\psi_i - 1)(\psi_i \ell_i^S(\psi_i w_i) - \ell_i^D(w_i))}_{\text{Complementary Slackness}} = 0.$$

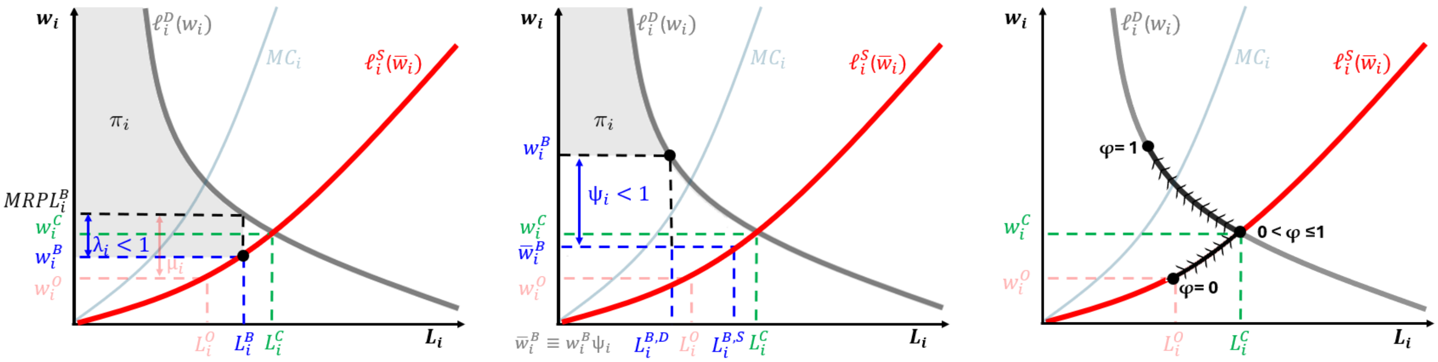
where φ represents the union's bargaining power, $G_i(w_i, \psi_i)$ is the union's objective function, and $\ell_i^D(w_i)$ is the labor demand, obtained by inverting the first order condition $w_i = F_i'(L_i)$.

Let $\xi(y, x) \equiv \frac{\partial y}{\partial x} \frac{x}{y}$ denote the elasticity of y with respect to x. Then, let $\nu_i \equiv \xi(F_i, L_i)$ be the elasticity of the revenue function with respect to employment and $e_i \equiv \xi(\ell_i^S, \overline{w}_i)$ be the the labor supply elasticity. We can characterize the wage of i as follows:

$$w_i = \lambda_i F_i'(L_i), \quad \text{with} \quad \lambda_i = \min\{\widetilde{\lambda}_i, 1\} \quad \text{and} \quad \widetilde{\lambda}_i = \omega_i \frac{1}{\nu_i} + (1 - \omega_i)\mu_i, \tag{3}$$

[12] Most right-to-manage models ignore endogenous workers' labor supply constraints. Exceptions are Lagos (2024) and Demirer and Rubens (2025). Avignon et al. (2024) introduces a buyer-seller framework where they give a microfoundation to determine which party has the right-to-manage (or choose the traded quantity) in equilibrium. In our framework, employers always have the right-to-manage.

Figure 1: Right-to-manage bargaining - Partial equilibrium



(a) On labor supply (b) On labor demand (c) Constraint determination

Notes: Allocations for different models: oligopsony (w_i^O, L_i^O), perfect competition (w_i^C, L_i^C), and bargaining (w_i^B, L_i^B). Panel (a): Bargaining outcome on the labor supply curve. Panel (b): Bargaining outcome on the labor demand curve with rationing $\psi_i < 1$. Panel (c): Equilibrium employment lies between L_i^O and L_i^C when the labor supply is the active constraint, and employment decreases with w_i^B when the labor demand is the active constraint.

where μ_i and ω_i are, respectively, the *markdown* and the *bargaining share*. They are equal to:

$$\mu_i = \frac{e_i}{1+e_i}, \quad \text{and} \quad \omega_i = \frac{\varphi\xi(G_i, w_i)}{\varphi\xi(G_i, w_i) + (1-\varphi)(1+e_i)}. \tag{4}$$

$\widetilde{\lambda}_i$ and the marginal revenue product are computed on the labor supply where $\psi_i = 1$ for employer i. The Supplemental Material contains derivation details.

The wedge $\lambda_i = \min\{\widetilde{\lambda}_i, 1\}$ is a key feature of the right-to-manage model: it cannot exceed one as this would violate the labor demand constraint. When $\lambda_i < 1$, the wage falls below the marginal revenue product of labor, $F_i'(L_i)$, and λ_i is a weighted average of a markdown μ_i and a markup— as ν_i is generally less than one.[13] Then $\lambda_i \geq \mu_i$ and the wage is greater than in the oligopsony case where $\lambda_i = \mu_i$.

The bargaining share ω_i measures the extent of union market power and rent redistribution on the labor supply. It increases with φ and the elasticity of the objective function to the wage $\xi(G_i, w_i)$. When the exogenous union bargaining power φ is zero, we have that $\omega_i = 0$ and $\lambda_i = \mu_i$, and our model reduces to oligopsonistic competition. If $\varphi = 1$, then $\omega_i = 1$ and we have the monopoly union model of Dunlop (1944).

[13]If there are positive profits when the employer pays the marginal revenue product of labor, then $\nu_i < 1$. To see this, if $w_i = F_i'(L_i)$, then profits are $F_i(L_i) - F_i'(L_i)L_i = F_i(L_i)(1-\nu_i)$. If these are positive, then $\nu_i < 1$.

Equation (3) characterizes the wage for both possible cases depending on which constraint binds, as illustrated in Figure 1. First, when the labor supply constraint binds, there is no rationing ($\psi_i = 1$), as in Figure 1a where employer i's employment lies along its labor supply curve. The labor wedge equals $\lambda_i < 1$ and the wage and employment fall between oligopsonistic and competitive levels.

Second, when $\widetilde{\lambda}_i > 1$ along the labor supply, the wedge λ_i equals one. The employer rations employment ($\psi_i < 1$) to remain on the labor demand curve (MRPL) with a wage exceeding the market clearing one. This corresponds to Figure 1b. Due to rationing, the expected wage $\overline{w}_i^B$ falls below the wage w_i^B. From the rationing share definition, when $\psi_i = L_i/L_i^S < 1$, the employer leaves some labor supply unemployed. This slack equals the difference $L_i^{B,S} - L_i^{B,D}$.

Finally, Figure 1c shows that employment is labor supply constrained for low values of φ, with oligopsony at one extreme ($\varphi = 0$). As φ increases, employment and wages rise along the labor supply curve until reaching the labor demand curve. Beyond this point, further increases in φ make the labor demand the binding constraint, potentially increasing wages while decreasing employment. However, as we show below, further increases in φ may have no effect, with wages and employment corresponding to the intersection of labor supply and demand.

Local labor market equilibrium. Given labor supply functions $\ell_i^S(\cdot)$, revenue functions $F_i(\cdot)$, and union objective functions $G_i(\cdot)$, a local labor market equilibrium is a set of wages $\{w_i\}$ and rationing shares $\{\psi_i\}$, so that each union-employer pair solve its problem defined by (2), taking as given other pairs' wages and rationing shares.

2.3 Production and workers' preferences

Here we specify the production side of the economy and worker preferences that we use to define the general equilibrium for generic union objectives.

Multiple sectors. The economy consists of a discrete set of sectors $\mathcal{B} = \{1, \ldots, B\}$. Each local labor market m belongs to a sector b. We define the set of all labor markets within b as $\mathcal{M}_b$, and the set of all markets as $\mathcal{M} = \bigcup_{b \in \mathcal{B}} \mathcal{M}_b$. Employers, denoted by $i \in \mathcal{I}$, have sector-specific output elasticities, and unions have sector-specific bargaining powers φ_b.

Production. The final consumption good Y, our numeraire, is produced using sector-specific outputs Y_b. These sector outputs aggregate intermediate goods from individual employers within each sector. The production structure is:

$$Y = \prod_{b \in \mathcal{B}} Y_b^{\theta_b}, \quad Y_b = \sum_{i \in b} y_i, \quad \text{and} \quad y_i = \widetilde{A}_i K_i^{\alpha_b} L_i^{\beta_b}, \tag{5}$$

where $\sum_b \theta_b = 1$. K_i, and L_i are capital and labor used by employer i while α_b and β_b are respectively the output elasticities of capital and labor.

All output markets are competitive. The price of sector b output is P_b, and profit maximization yields the demand for sectoral good Y_b:

$$P_b Y_b = \theta_b Y. \tag{6}$$

Employers rent sector-specific capital from foreign suppliers, who charge sector-specific exogenous rental rates of capital R_b. After choosing capital, employers generate revenue using labor: $F_i(L_i) = P_b y_i - R_b K_i$. Capital demand and revenue functions are:

$$R_b K_i = \alpha_b P_b y_i, \quad F_i(L_i) = (1-\alpha_b) P_b^{\frac{1}{1-\alpha_b}} A_i L_i^{\frac{\beta_b}{1-\alpha_b}}, \quad A_i \equiv \widetilde{A}_i^{\frac{1}{1-\alpha_b}} \left(\frac{\alpha_b}{R_b}\right)^{\frac{\alpha_b}{1-\alpha_b}}, \tag{7}$$

where A_i is a transformed productivity after substituting capital demand.

Workers' problem. A measure L^S of risk-neutral workers choose where to supply labor based on wages and rationing shares. If rationed, a worker gets zero income. The expected indirect utility of a worker ι employed with employer i in market m and sector b is:

$$\mathcal{U}_i(\iota) = \psi_i w_i z_i(\iota) u_m(\iota) = \overline{w}_i z_i(\iota) u_m(\iota),$$

where $z_i(\iota)$ and $u_m(\iota)$ are idiosyncratic taste shocks with cumulative distribution functions $\mathcal{F}_{z,i}$ and $\mathcal{F}_u$. The first shock, $z_i(\iota)$ is employer-specific, while the second applies to all employers within local labor market m.

We assume these taste shocks are drawn from independent Fréchet distributions: $\mathcal{F}_{z,i}(z) = e^{-T_i z^{-\varepsilon_b}}$, $T_i > 0$, $\varepsilon_b > 1$ and $\mathcal{F}_u(u) = e^{-u^{-\eta}}$, $\eta > 0$. The parameter T_i determines the average utility from working with employer i. The shape parameters ε_b and η control the dispersion of the taste shocks. We call ε_b and η the *local* and *across* labor market elasticities of substitution.

Workers make their choices in two steps: first, they choose a local labor market after observing local labor market shocks u_m. Second, after choosing a market, they observe employer-specific shocks and choose the employer that maximizes their expected utility. Employer i's labor supply L_i^S equals the unconditional probability of supplying labor to i, s_i, multiplied by the total measure of workers L^S:

$$L_i^S = s_i \times L^S = \frac{T_i \overline{w}_i^{\varepsilon_b}}{\Phi_m} \times \frac{\Phi_m^{\eta/\varepsilon_b} \Gamma_b^{\eta}}{\Phi} \times L^S = s_{i|m} \times s_m \times L^S, \tag{8}$$

where $s_{i|m}$ is employer i's labor supply share within market m, and s_m is market m's labor supply share. Φ_m and Φ are local market m and economy-wide aggregates defined as:

$$\Phi_m \equiv \sum_{i' \in \mathcal{I}_m} T_{i'} \overline{w}_{i'}^{\varepsilon_b}, \quad \Phi_b \equiv \sum_{m' \in \mathcal{M}_{b'}} \Phi_{m'}^{\eta/\varepsilon_b}, \quad \Phi \equiv \sum_{b \in \mathcal{B}} \Phi_b \Gamma_b^{\eta}, \tag{9}$$

where Γ_b are sector-specific constants.

Labor supply elasticity. Given the labor supply function in (8), we can characterize the labor supply elasticity $\xi(\ell_i^S, \overline{w}_i)$, which we denote e_i. Assuming employers and unions take the economy-wide aggregate Φ as given, we get:

$$e_i = \varepsilon_b \left(1 - s_{i|m}\right) + \eta \, s_{i|m}. \tag{10}$$

When substitution is easier within than across local labor markets, i.e. when $\varepsilon_b > \eta$, the labor supply elasticity e_i decreases with the labor supply share $s_{i|m}$.

Workers' welfare. Worker's welfare is proportional to workers' average utility conditional on choices. We define total worker welfare as $\mathcal{W} = \Phi^{1/\eta}$, where Φ is defined in (9). The Supplemental Material shows this measure can also be derived as the utility of a representative worker.[14]

[14] The characterization using the representative worker is useful if the conditions for the existence of the expectation of the Fréchet shocks does not hold, i.e. when $\eta < 1$.

General equilibrium. Given union objective functions $G_i(w_i, \psi_i)$, a general equilibrium consists of wages $\{w_i\}$, rationing shares $\{\psi_i\}$, labor supplies $\{L_i^S\}$, employment $\{L_i\}$, capital $\{K_i\}$, revenue functions $\{F_i(L_i)\}$, sector prices $\{P_b\}$, employer outputs $\{y_i\}$, sector outputs $\{Y_b\}$, and economy-wide output Y such that equations (5)-(8) are satisfied and all local labor markets are in equilibrium.

2.4 Aggregation

Here we show how to aggregate and rewrite the model at the sector b level with the labor supply shares, wedges, and rationing shares from the solution of the local labor markets. This aggregate model is, in turn, enough to solve for sector prices in closed-form. To do that we rely on the following assumption that yields a constant labor demand elasticity across sectors.

Assumption 1. *The output elasticities satisfy* $\frac{\beta_b}{1-\alpha_b} = 1-\delta$, *where* $\delta \in [0,1]$ *for all* $b \in \mathcal{B}$.

This assumption implies that the revenue elasticity of labor ν_i of Section 2.1 is equal to $1-\delta$ and equation (3) becomes:

$$w_i = \beta_b \lambda_i P_b^{\frac{1}{1-\alpha_b}} A_i L_i^{-\delta}. \tag{11}$$

The following proposition shows how to aggregate the model at the sector level.

Proposition 2 (Aggregation at the Sector Level)**.** *Given labor supply shares, wedges, and rationing shares, the output and labor supply at the sector level are functions of sectoral measures of productivities, labor wedges, and misallocation, as well as the vector of sector prices* $\{P_b\}_{b\in\mathcal{B}}$*:*

$$\textbf{\textit{Productivities:}}\ A_m = \sum_{i\in\mathcal{I}_m} A_i \tilde{s}_{i|m}^{1-\delta}, \qquad A_b = \sum_{m\in\mathcal{M}_b} A_m \tilde{s}_{m|b}^{1-\delta},$$

$$\textbf{\textit{Labor wedges:}}\ \lambda_m = \sum_{i\in\mathcal{I}_m} \lambda_i \frac{A_i \psi_i^{1-\delta}}{A_m \Omega_m} s_{i|m}^{1-\delta}, \qquad \lambda_b = \sum_{m\in\mathcal{M}_b} \lambda_m \frac{A_m \Omega_m}{A_b \Omega_b} s_{m|b}^{1-\delta},$$

$$\textbf{\textit{Misallocation:}}\ \Omega_m = \sum_{i\in\mathcal{I}_m} \frac{A_i \psi_i^{1-\delta}}{A_m} s_{i|m}^{1-\delta}, \qquad \Omega_b = \sum_{m\in\mathcal{M}_b} \Omega_m \frac{A_m}{A_b} s_{m|b}^{1-\delta},$$

where $\tilde{s}_{i|m}$ *and* $\tilde{s}_{m|b}$ *are the employer and local labor market employment shares that would arise if all had* $\lambda_i = \psi_i = 1\, \forall i \in \mathcal{I}$. *Let* $\mathbf{s}_b \equiv \{s_{i|m}\}_{i\in\mathcal{I}_b}$ *and* $\mathbf{\Psi}_b \equiv \{\psi_i\}_{i\in\mathcal{I}_b}$ *be the vectors containing all the labor* *supply and rationing shares of all the employers in sector b. Then, sector level measures A_b, λ_b and Ω_b and prices $\{P_b\}_{b\in\mathcal{B}}$ are enough to characterize labor supply and output at the sector level:*

$$L_b^S = \frac{\Phi_b\left(P_b, \mathbf{s}_b, \mathbf{\Psi}_b\right)\Gamma_b^{\eta}}{\sum_{b'\in\mathcal{B}}\Phi_{b'}\left(P_{b'}, \mathbf{s}_{b'}, \mathbf{\Psi}_{b'}\right)\Gamma_{b'}^{\eta}} L^S, \quad Y_b = P_b^{\frac{\alpha_b}{1-\alpha_b}}\Omega_b A_b L_b^{S\,1-\delta}.$$

Given the labor supply and rationing shares, we only need to solve for the sector prices P_b. The following proposition characterizes their solution.

Proposition 3 (Characterization Sector Prices)**.** *Let* $\mathbf{P} = \{P_b\}_{b\in\mathcal{B}}$ *be the vector of sector prices. In equilibrium,* $\mathbf{P}$ *solves*

$$P_b^{\frac{1}{1-\alpha_b}} A_b\Omega_b L_b^S(\mathbf{P})^{1-\delta} = \theta_b \prod_{b'\in\mathcal{B}}\left[P_{b'}^{\frac{\alpha_{b'}}{1-\alpha_{b'}}} A_{b'}\Omega_b L_{b'}^S(\mathbf{P})^{1-\delta}\right]^{\theta_{b'}}, \quad \text{for each } b\in\mathcal{B}. \tag{12}$$

The next proposition establishes the existence and uniqueness of the sector prices solution.

Proposition 4 (Existence and Uniqueness of Sector Prices)**.** *There exists a unique vector of prices* $\mathbf{P}$ *that solves the system formed by* (12) *and it has a closed-form expression.*

These results already hint at the solution algorithm: guess a vector of prices $\mathbf{P}$, then solve for the local labor markets, aggregate, solve again for $\mathbf{P}$, and update the solution. However, as long as the local labor markets are independent of aggregates, we only need to solve the price vector $\mathbf{P}$ once. This is the case with our baseline union objective, which we specify later.

2.5 Conditions for no rationing

In this section, we establish the conditions that lead to a no-rationing equilibrium.

Proposition 5. *Assume the union's objective function can be rewritten as* $\widetilde{G}_i(\overline{w}_i, \psi_i)$ *with* $\partial\widetilde{G}_i/\partial\overline{w}_i \geq 0$ *and* $\partial\widetilde{G}_i/\partial\psi_i \geq 0$*, and the labor demand elasticity* $-\xi(\ell_i^D, w_i) > 1$*. Then,* $\psi_i = 1$ *for all i.*

The assumptions regarding the union's objective function are quite general. Examples that satisfy these conditions for union objectives include the wage bill $w_i L_i$, the expected wage $\psi_i w_i$, and total utility in the framework we present below.[15]

[15] Another example of a union objective function that would satisfy the conditions of Proposition 5 is a Cobb-Douglas specification $w_i^{\varrho_w} L_i^{\varrho_L}$ with $\varrho_w < \varrho_L$ similar to Dodini et al. (2024). All of the listed examples work with or without an exogenous (from union i's perspective) outside option.

The condition on having an elastic labor demand is satisfied in environments with homogeneous revenue functions of degree less than 1.[16] This means that, when the labor demand is binding, wage increases reduce employment sharply, lowering both ψ_i *and* the expected wage. Then, on the demand curve, the interests of the unions and employers align: both prefer to reduce wages—unions to increase *expected* wages, employers to increase profits.

2.6 Rent-sharing

Union market power, captured by ω_i, determines how employers share rents with workers. To understand this rent-sharing, we decompose the wage bill into its different sources when union objectives lead to no rationing. Using the wage expression (3), the wage bill decomposes as:

$$w_i L_i = \underbrace{\nu_i F_i(L_i)}_{w_i L_i \text{ if } w_i = F_i'(L_i)} - \underbrace{(1-\mu_i)\nu_i F_i(L_i)}_{\text{Oligopsonistic Rents}} + \underbrace{\omega_i \overbrace{\left[\underbrace{(1-\nu_i)F_i(L_i)}_{\text{Rents if } w_i = F_i'(L_i)} + \underbrace{(1-\mu_i)\nu_i F_i(L_i)}_{\text{Oligopsonistic Rents}} \right]}^{\text{Total Rents}}}_{\text{Bargaining gains}}. \tag{13}$$

The first term represents the wage bill when firms pay wages equal to the marginal revenue product of labor $F_i'(L_i)$—that is, when employers take wages as given and there is no bargaining. The second term captures the employer's oligopsonistic rents. The third term shows the union's bargaining gains—the fraction of total rents captured through negotiation. These total rents include both oligopsonistic rents and additional rents that arise when the revenue function is concave. These last rents are present even when employers pay the marginal revenue product of labor $F_i'(L_i)$.

The union has a higher ω_i and more market power when it has a higher exogenous bargaining power φ. But φ is not the only source of market power. Intuitively, a union has more market power when its outside option is higher, as the next proposition shows.

Proposition 6. *Let $G_i(w_i, \psi_i) \equiv G_{i,1}(w_i, \psi_i) - G_{i,0}$, with $G_{i,1}(w_i, \psi_i) \geq G_{i,0}$. Then, ω_i is increasing in $G_{i,0}$.*

[16]Examples include perfect competition in the output market with Cobb-Douglas production under decreasing returns, and monopolistic competition with constant or decreasing returns.

Heterogeneous union outside options therefore affect rent-sharing and, ultimately, employment allocation.

Reduced-form bargaining. The bargaining share ω_i determines rent-sharing and generally differs from bargaining power φ. They are equal only when the union's objective function is the wage bill with no outside option. Appendix B shows that condition (13) can be derived from a *reduced-form* bargaining problem where union surplus is excess wage bill over oligopsony, employer surplus is profits, and bargaining powers equal bargaining shares. This reduced-form relates to other frameworks that consider bargaining with exogenous bargaining powers and outside options. However, since bargaining shares are in general endogenous, counterfactuals treating them as exogenous bargaining power parameters are incorrect unless $\omega_i = \varphi$.

2.7 Baseline union objectives

We follow the literature and assume unions are utilitarian and do not know which workers might be rationed (McDonald and Solow, 1981; Manning, 1987). A key distinction in our framework is that workers are heterogeneous and value employment with different employers differently. Unions maximize the total utility of workers *conditional* on their choice of local labor market m. Unions also understand that if bargaining fails and no employment option is offered at i, workers can still find employment elsewhere in the local labor market.

Given the distribution of taste shocks, the union bargaining with employer i has the following objective function inclusive of the outside option:

$$G_i(w_i, \psi_i) = \left[\left(\sum_{j \in \mathcal{I}_m} T_j \left(\psi_j w_j\right)^{\varepsilon_b} \right)^{\frac{1}{\varepsilon_b}} - \left(\sum_{j \neq i} T_j \left(\psi_j w_j\right)^{\varepsilon_b} \right)^{\frac{1}{\varepsilon_b}} \right] L_i^S. \tag{14}$$

The first term in brackets equals Φ_m^{1/ε_b} and represents the average utility of workers who choose to supply labor to market m.[17] The second term, denoted $\Phi_{m,-i}^{1/\varepsilon_b}$, is the average utility for a worker in local labor market m if i is not available as an employment option.[18]

[17] With extreme value shocks, this conditional expectation equals the unconditional expected utility of working in market m.

[18] This outside option resembles the worker outside option in Jarosch et al. (2024)'s framework with search frictions, where, if bargaining fails, an employer removes all job postings.

The function $G_i(w_i, \psi_i)$ satisfies the conditions of Proposition 5, so there is no rationing and $\psi_i = 1$. This would also be true if the union maximized wage-bill or average utility with a similar outside option.[19] In a later counterfactual, we consider a "misaligned" utility function that can generate rationing in equilibrium.

Recall that the bargaining shares ω_i summarize the union market power in the absence of rationing. They increase with the elasticity of the objective function with respect to the wage:

$$\xi(G_i, w_i) = s_{i|m} \times \frac{1}{1 - \left(1 - s_{i|m}\right)^{1/\varepsilon_b}} + e_i. \tag{15}$$

This expression contains three components. The first term shows that increasing the wage by one percent raises the average utility Φ_m^{1/ε_b} by $s_{i|m}$ percent—a measure of workplace attractiveness. Why is that? In models with extreme value shocks, expected utilities conditional on a choice are equalized. Attractive workplaces would have more workers and carry more weight in the average utility, so increasing their wage has a larger effect.

The second term, the fraction, relates to the outside option $\Phi_{m,-i}^{1/\varepsilon_b}$. This term decreases with $s_{i|m}$, meaning more attractive workplaces give unions lower outside options. This is intuitive: a very attractive employer has a high $s_{i|m}$, indicating other local labor market employment options are relatively bad. This reduces union's market power. In contrast, unions bargaining with small, unattractive employers have stronger outside options since alternatives are relatively better. The third term is the labor supply elasticity, which appears because the union cares about total utility.

2.8 Solving the model

Solving the model amounts to finding employer wages, sector prices, and employment allocations. We show that the baseline model can be solved in two steps. First, we solve for the labor supply shares of all local labor markets, which are independent of sector or economy-wide aggregates. Thus, the model inherits the block-recursivity of Berger et al. (2022). Second, once labor supply shares are determined, we aggregate and solve for sector prices as explained in Section 2.4. The following proposition establishes the block-recursivity.

[19] The case with average utility and outside option would be $G_i(w_i, \psi_i) = \Phi_m^{1/\varepsilon_b} - \Phi_{m,-i}^{1/\varepsilon_b}$.

Proposition 7 (Block-Recursivity). *Recall $\lambda_i = \min\{\widetilde{\lambda}_i, 1\}$. Each local labor market equilibrium is independent of aggregate variables and is characterized by the following N_m equations:*

$$s_{i|m} = \frac{\left(T_i^{\frac{1}{\varepsilon_b}} A_i \lambda_i\right)^{\frac{\varepsilon_b}{1+\varepsilon_b \delta}}}{\sum_{j \in \mathcal{I}_m} \left(T_j^{\frac{1}{\varepsilon_b}} A_j \lambda_j\right)^{\frac{\varepsilon_b}{1+\varepsilon_b \delta}}}, \quad \widetilde{\lambda}_i = (1-\omega_i)\frac{e_i}{e_i+1} + \omega_i \frac{1}{1-\delta}, \tag{16}$$

for all i in market m, and where e_i is given by (10)*, and ω_i is given by* (4) *and* (15)*.*

The model with no rationing is block-recursive because the wedge is only a function of labor supply shares.[20] This feature is preserved for objective functions that lead to rationing if the rationing shares are also independent of market aggregates. We consider this case in a counterfactual in Section 5.

We can now establish the existence and uniqueness of the local labor market equilibrium.

Proposition 8 (Existence and Uniqueness of Local Equilibrium). *If $\widetilde{\lambda}_i$ is decreasing in $s_{i|m}$ for all $i \in \mathcal{I}_m$ and $\eta < \varepsilon_b$ for all $b \in \mathcal{B}$, then there exist unique vectors of labor supply shares $\{s_{i|m}\}_{i \in \mathcal{I}_m}$, that solve the system* (16)*.*

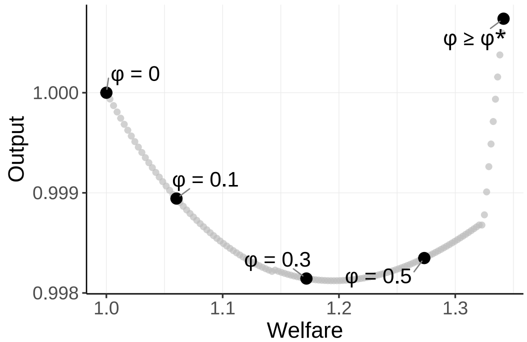
A corollary is that if the conditions for Propositions 4 and 8 hold, there exists a unique no-rationing general equilibrium.

2.9 Employment reallocation and productivity effects of unions

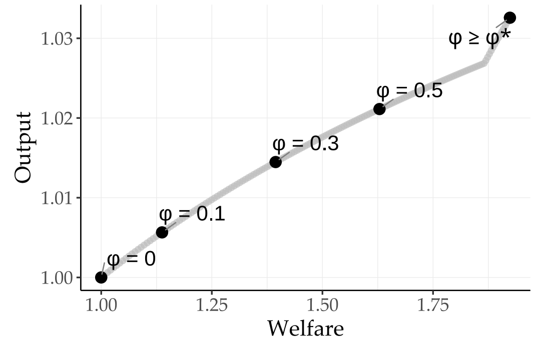
Bargaining redistributes rents and increases worker wages. This redistribution depends on two factors: bargaining shares ω_i and total available rents. When unions affect relative wages, they change labor allocation across employers and impact total productivity. If more productive employers generate larger rents and unions bargaining with these employers have greater market power (higher ω_i), productivity should rise as productive employers attract more labor. While productive employers likely generate more rents, it's unclear whether unions bargaining with them necessarily have more market power—especially if unions at smaller, less productive employers enjoy better outside options.

[20] This also holds for other union objective functions like the wage bill.

Figure 2: Output vs workers' welfare for different φ's



(a) Negative output effects



(b) Positive outcome effects

Notes: Scatter plots of total output and total workers' welfare for different values of φ normalized to the oligopsony case, i.e. $\varphi = 0$. Local labor market with two employers, 1 and 2, where $A_1 = 2 \times A_2$, $T_1 = T_2$. Two parameterizations. Common parameters: $\alpha = 0$, $\beta = 0.9$. Left: $\varepsilon = 3$, and $\eta = 2.9$. Right: $\varepsilon = 2$, and $\eta = 0.5$.

A simple example with two identical markets illustrates the ambiguous effect of bargaining on productivity. Each market has two employers, where employer 1 has twice the productivity of employer 2. Production only uses labor ($\alpha = 0$) with normalized total labor of 1. Figures 2a and 2b show workers' welfare and total output for different union bargaining powers (φ). The figures differ in the within and across elastictities of substitution. They show two contrasting outcomes: Figure 2a shows that increasing union bargaining power can decrease output despite improving welfare, while Figure 2b shows that both output and welfare increase with φ. Unions' productivity effect is therefore theoretically ambiguous.

Each figure shows a kink when increasing φ. This corresponds to the case where employer 2, with low productivity, hits the labor demand constraint so $\widetilde{\lambda}_2 > 1$ and $\lambda_2 = \min\{\widetilde{\lambda}_2, 1\} = 1$; further increases in φ leave λ_2 unchanged. Both employers hit this threshold when $\varphi = \varphi^*$, which we define below.

Maximum effective bargaining power. Setting $\varphi = 1$ equalizes wedges, making wages equal to $MRPL_i$ and reaching the competitive allocation. However, this allocation can be reached at a lower union bargaining power, φ^*, where the labor demand and labor supply constraints become binding for all employers. The *maximum effective bargaining power* where labor demand

and supply bind for all employers in sector b is:

$$\varphi_b^* = \underset{\varphi_b}{\text{argmin}} \left\{ \widetilde{\lambda}_i(\varphi_b) : \widetilde{\lambda}_i \geq 1 \text{ for all } i \in \mathcal{I}_b \right\}.$$

3 Data

Most of our analysis relies on the *FICUS* dataset for the years 1994-2007 with firm-level fiscal records consisting of balance sheet information including wage bill, capital stock, number of employees and value added.[21] This dataset includes all French firms, except for the smallest ones declaring at the micro-BIC regime and some agricultural firms. We also use *CASD Postes*, an employer-employee dataset with the universe of salaried employees with firm and establishment identifiers. We recover the location, occupation classification, wages and employment that are necessary to distinguish across different establishment-occupations of a given firm.

Local labor market and employer definition. In our empirical application, we define local labor markets as commuting zone-occupation-industry combinations. Operational workers working in the food industry in Lourdes, close to the Pyrenees, are one example of a local labor market. We use the most aggregated 1-digit occupation classification, aligning with union electoral college categories, and 3-digit industry codes. Sectors are 2-digit industry classifications. An employer represents an establishment-occupation combination within a commuting zone.[22]

Summary statistics. The median occupation at a given establishment has 2 employees. We categorize manufacturing firms into 97 different 3-digit industries, which are distributed across 364 different commuting zones. The average 3-digit industry labor share is 52% and the share of capital is 26%.[23] Taking those averages, the profit share would be around 22%.

On average, there are 57,900 local labor markets per year. Our sample consists of approximately 4 million establishment-occupation-year observations that belong to around 1.25 million firms. Details about sample selection and summary statistics are in the Supplemental Material.

[21] Industry classification changes between 1993 and 2003 are consistent at the 3-digit level but not after 2007.
[22] We aggregate establishment-occupations of the same firm within a commuting zone in defining employer i.
[23] We follow Barkai (2020) to compute the capital share.

The median local labor market is small and has only 2 establishments and 10 employees. This is a consequence of the handful of manufacturing firms that are present in the countryside demanding certain occupations. The median local labor market is concentrated with a Herfindahl-Hirschman Index (HHI henceforth) of 0.68.[24] High median local labor market concentrations do not imply that most of the workers are in highly concentrated environments but rather that there are few markets with low concentration levels and high employment.

4 Identification and estimation

We follow a sequential four-step strategy to identify and estimate parameters, assuming no rationing. First, we identify parameters constant across sectors—the inverse elasticity of labor demand δ and across-market elasticity of substitution η—adapting the identification-through-heteroskedasticity from Rigobon (2003). Second, we identify local elasticities $\{\varepsilon_b\}_{b=1}^{B}$ by instrumenting wages in labor supply. Third, we calibrate the remaining parameters—the output elasticities $\{\alpha_b\}_{b=1}^{B}$, union bargaining powers $\{\varphi_b\}_{b=1}^{B}$, and final good elasticities $\{\theta_b\}_{b=1}^{B}$—to match industry-specific capital, labor, and expenditure shares. Fourth, we identify amenities and revenue productivities using observed employment and wages.

4.1 Common parameters across sectors: η and δ

We identify the common parameters η and δ using employers that operate alone in their local markets ($s_{i|m} = 1$), which we refer to as full monopsonists. These employers compete for workers only across local markets, making the across-market elasticity η the single relevant parameter governing their labor supply. After demeaning at the sector level, the log inverse labor demand and supply of full monopsonists are:

$$\ln w_i = -\delta \ln L_i + \ln A_i, \tag{17}$$

$$\ln L_i = \eta \ln w_i + \ln \widetilde{T}_i, \tag{18}$$

where $\widetilde{T}_i = T_i^{\eta/\varepsilon_b}$. This system suffers from simultaneity bias.

[24] The median HHI is very similar (0.69) if we consider wage bill shares $s^w_{i|m}$.

We estimate δ and η using *identification-through-heteroskedasticity* (Rigobon, 2003). For our context, this method offers a key advantage: it does not depend on the specific wage-setting process. Unlike instrumental variables approaches, which require context-specific justification that may vary with different wage-setting processes, our identification strategy remains valid across model variants with different union objective functions, or in an oligopsonistic setting without unions. While less common than instrumental variables, identification through heteroskedasticity has been widely applied in diverse contexts.[25]

The method builds on the insight that constraints on second order moments of structural errors (here $\ln A_i$ and $\ln \widetilde{T}_i$) restrict the admissible solutions of the structural parameters (here δ and η). For example, Leamer (1981) shows that imposing zero covariance on the errors constrains the coefficients to lie on a hyperbola in the (δ, η) plane.

The basic implementation of identification through heteroskedasticity uses variation in second order moments across two regimes to pin down the solution. Using the errors' zero covariance assumption, each regime generates one hyperbola in the (δ, η) plane based on its observed price-quantity covariance structure. When structural error variances shift between regimes while δ and η remain constant, we get two distinct hyperbolas. The intersection of these two hyperbolas identifies the structural parameters.[26]

We can recast the covariance assumptions of the basic implementation above as a GMM application where the two moment conditions are $\mathbb{E}\left(\ln A_{i,1} \ln \widetilde{T}_{i,1}\right) = 0$ and $\mathbb{E}\left(\ln A_{i,2} \ln \widetilde{T}_{i,2}\right) = 0$, i.e., zero covariance of structural errors in both regimes. The term *heteroskedasticity* refers to the rank condition that ensures error variances shift non-proportionally across regimes, giving the variation needed for identification.

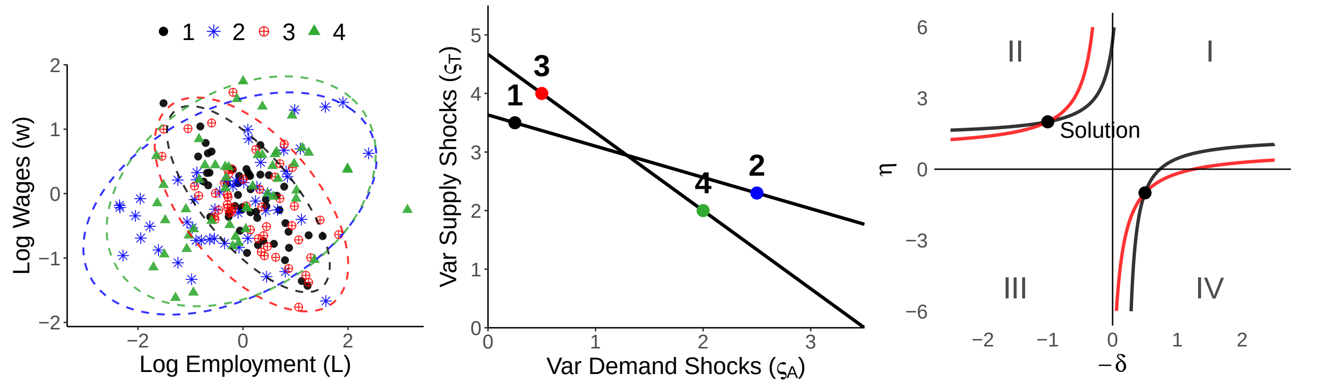
We relax the zero covariance restriction by using four regimes instead of two. The regimes correspond to our four occupational categories: top management, clerical, supervisor, and operational. The following assumption imposes the necessary moment conditions.

Assumption 2. *Let* $\ln A_{i,o}$ *and* $\ln \widetilde{T}_{i,o}$ *be the structural errors for occupation* $o \in \{1, 2, 3, 4\}$*, where*

[25] Some examples include: Rigobon (2003), Rigobon and Sack (2004) and Nakamura and Steinsson (2018) for finance and monetary policy; in trade, the classic reference is Feenstra (1994), with extensions by Broda and Weinstein (2006) and a modern treatment by Grant and Soderbery (2024); for development, Rigobon and Rodrik (2005); and for IO, MacKay and Miller (2025). Lewbel (2012) provides a more formal treatment of the method.

[26] This approach can be traced back to Leontief (1929); see p. 321 in Leamer (1981).

Figure 3: Identification through heteroskedasticity



(a) Wage-employment clouds (b) Rank condition (c) Moment conditions

Notes: Panel (a): wage-employment data for four occupational groups. Ellipses represent 95% confidence regions. Panel (b): occupations in the variance space $(\varsigma_A, \varsigma_T)$, where axes represent demand and supply shock variances. Panel (c): shows the parameter space where each covariance restriction generates a hyperbola in the $(-\delta, \eta)$ plane.

$o = 1$ *denotes top management,* $o = 2$ *clerical,* $o = 3$ *supervisor, and* $o = 4$ *operational. Then,*

$$\mathbb{E}\left(\ln A_{i,1} \ln \widetilde{T}_{i,1}\right) = \mathbb{E}\left(\ln A_{i,2} \ln \widetilde{T}_{i,2}\right) \quad \textit{and} \quad \mathbb{E}\left(\ln A_{i,3} \ln \widetilde{T}_{i,3}\right) = \mathbb{E}\left(\ln A_{i,4} \ln \widetilde{T}_{i,4}\right).$$

This assumption requires that the covariance between demand and supply shocks is the same within white collar (1,2) and blue collar (3,4) occupations, but allows it to differ between these pairs. For example, if high-productivity employers also offer attractive amenities that appeal similarly to both top management and clerical workers, then demand and supply shocks would be positively correlated in the same way for both white collar occupations.

The following proposition presents the rank condition for identification. The proof is in Appendix C.1.

Proposition 9. *Let Assumption 2 hold. Also, denote* $\varsigma_{A,o}$ *and* $\varsigma_{T,o}$ *as the variances for* $\ln A_{i,o}$ *and* $\ln \widetilde{T}_{i,o}$*, respectively. Then, if*

$$\frac{\varsigma_{T,1} - \varsigma_{T,2}}{\varsigma_{A,1} - \varsigma_{A,2}} \neq \frac{\varsigma_{T,3} - \varsigma_{T,4}}{\varsigma_{A,3} - \varsigma_{A,4}} \tag{19}$$

the system formed by (17)-(18) is identified up to two solutions. Furthermore, if the two solutions yield different signs for $-\delta$ *and* η*, the constraints* $\delta > 0$ *and* $\eta > 0$ *identify the unique relevant solution.*

To build intuition, Figure 3 illustrates the identification logic in three panels. Panel (a) shows an example of some wage-employment data across the four occupational groups. The heteroskedasticity across these regimes provides the variation for identification.

Panel (b) translates this heteroskedasticity into the variance space. Each occupation generates a point in the $(\varsigma_A, \varsigma_T)$ plane, where the axes represent the variances of demand and supply shocks respectively. The rank condition (19) requires that the slope connecting white collar occupations (1,2) differs from the slope connecting blue collar occupations (3,4)—ensuring the two lines are not parallel.

Panel (c) shows how the moment conditions translate into the parameter space. Each covariance restriction generates a hyperbola in the $(-\delta, \eta)$ plane. The intersections of these two hyperbolas yield two candidate solutions, corresponding to the two possible ways to assign demand and supply labels to the structural equations. Economic theory selects the solution in quadrant II, where $-\delta < 0$ and $\eta > 0$.

4.2 Local elasticities of substitution ε_b

We identify local elasticities of substitution ε_b using variation within a local labor market and an instrumental variables approach. The employer's labor supply (8) in logs is:

$$\ln(L_{it}^S) = \varepsilon_b \ln(w_{it}) + f_{mt} + \ln(T_{it}), \tag{20}$$

where f_{mt} is a local labor market-year fixed effect which absorbs endogenous local labor market aggregates. BHM note that strategic interaction effects manifest via these market aggregates and can change across equilibria, potentially biasing the estimator by violating the stable unit of treatment value assumption (SUTVA). The fixed effects control for these market changes. See Online Appendix C.2 for a detailed discussion.

Wages are correlated with T_{it}, so we instrument for them using a proxy $\widehat{Z}_j$ of firm revenue productivity:

$$\widehat{Z}_j = \frac{P_b Y_j}{\sum_{i \in j} L_i^{1-\delta}},$$

where $P_b Y_j$ is firm j's value added, and where we use the previously identified δ.

While Assumption 2 allows correlation between structural shocks T_{it} and A_{it} *across* markets, the fixed effect f_{mt} absorbs any such cross-market correlation.[27] The instrument remains valid provided shocks are uncorrelated within markets. Nonetheless, we use a lagged instrument instead of a contemporaneous one to minimize potential endogeneity concerns.

This firm-specific instrument approach resembles the internal instruments of Lamadon et al. (2022). Deb et al. (2024) follow a similar procedure to ours. They use BHM's labor demand-shifting instrument—state-level corporate tax changes—to estimate local elasticities of substitution while controlling for market aggregates via fixed effects. We employ the same approach but with firm-specific productivity instruments.

So far our identification strategy remains independent of wage-setting assumptions.

4.3 Output elasticities α_b, θ_b, and bargaining powers φ_b

We follow Barkai (2020) to construct the sector rental rates per year $\{R_{bt}\}_{b=1}^{B}$. We identify α_b to match the average capital share: $\mathbb{E}_t\left[\frac{R_{bt}K_{bt}}{P_{bt}Y_{bt}}\middle|b\right] = \alpha_b$. Using the assumption $\frac{\beta_b}{1-\alpha_b} = 1-\delta$, we back out the output elasticities of labor.

We identify the final good output elasticities for every year $\{\theta_b\}_{b\in\mathcal{B}}$ such that industry expenditure shares equal industry value added shares in the data.

We pin down the union bargaining powers using sector labor shares. Given wages and employment data, sector labor share increases in φ_b.[28] We set φ_b to match average sector labor shares across years.

4.4 Identification of amenities, revenue productivities, and counterfactuals

Amenities and revenue productivities are identified to match observed wages and employment in equilibrium. Under no rationing, using the revenue function (7), the wage (11) becomes:

$$w_i = \beta_b \lambda_i Z_i L_i^{-\delta}, \tag{21}$$

[27] Recall that Assumption 2 applies only to markets that have only one employer.

[28] The labor share for sector b is $LS_b(\varphi_b) = \beta_b \sum_{i\in\mathcal{I}_b} w_i L_i \left(\sum_{i\in\mathcal{I}_b} w_i L_i/\lambda_i\right)^{-1}$.

where $Z_i = P_b^{1/1-\alpha_b} A_i$ is the revenue productivity that combines employer's physical productivity A_i and sector price P_b. With all parameters identified and λ_i determined by observed employment shares, we back out Z_i from (21) using observed wages and employment. Online Appendix C.3 shows how we recover amenities T_i to match employment using the labor supply.

We compute counterfactuals relative to the baseline using exact-hat algebra (Costinot and Rodríguez-Clare, 2014). Since the local equilibrium characterization is invariant to multiplicative market-wide constants, we can fully characterize counterfactual equilibria using revenue productivities Z_i without worrying about the baseline sector prices P_b.

To see this, denote counterfactual variables with primes (e.g., P_b') and relative changes with hats (e.g., $\widehat{P}_b = P_b'/P_b$). Counterfactual revenue productivity becomes:

$$Z_i' = P_b'^{1/1-\alpha_b} A_i = \widehat{P}_b^{1/1-\alpha_b} Z_i.$$

This allows us computing counterfactual equilibria relative to the baseline using revenue productivities Z_i as fundamentals. See Online Appendix C.4 for details.

4.5 Estimation results

Table 1 shows the estimation results of the main parameters. The most important parameters of the estimation are the elasticities of substitution and the union bargaining powers.

The estimated across local labor market elasticity is $\widehat{\eta} = 0.33$ and the sector specific local labor market labor supply elasticities $\widehat{\varepsilon}_b$ range from a little greater than 1.00 to 3.46. With the across local labor market elasticity being lower than the within ones ($\widehat{\eta} < \widehat{\varepsilon}_b \quad \forall b$), workers are more elastic within than across local labor markets. Thus, the markdown μ_i decreases with labor supply shares $s_{i|m}$. We verified numerically λ_i is also decreasing in $s_{i|m}$.

Our across local labor market labor supply elasticity is slightly below the estimate by Berger et al. (2022) (Table 3) for the U.S. All of our sector specific within local labor market elasticities lie below their estimate of 10.85. This might be a consequence of the lower job-to-job transition rates that characterize the French labor market.[29]

According to our estimates, (i) the employment-weighted average bargaining power of

[29] See Jolivet et al. (2006) for a comparison of French mobility against the U.S.

Table 1: Main Estimates

Parameter	Description	Estimate	Identification
η	Across labor market elasticity	0.332	Heteroskedasticity
δ	1 - Returns to scale	0.028	Heteroskedasticity
$\{\varepsilon_b\}$	Within labor market elasticity	1.000-3.455	Labor supply
$\{\beta_b\}$	Output elasticity labor	0.563-0.864	Capital share and δ
$\{\varphi_b\}$	Union bargaining	0.081-0.679	Sector labor share

Notes: Main estimates that are complemented with additional sector estimates in Table S8.1. *Parameter* and *Description* define the parameters and briefly describe them; *Estimate*: shows point estimates of η and δ and the range of estimates for sector b parameters; *Identification*: describes shortly the identification strategy.

French manufacturing is 0.37, with a simple average of 0.40; and (ii) bargaining power varies substantially across industries, ranging from 0.08 for *Chemical* to 0.68 for *Transport*.

Our estimates for manufacturing bargaining powers in France are consistent with previous studies. Using a framework with search frictions and on-the-job search, Cahuc et al. (2006) estimate a bargaining power of 0.35 for top management workers, which is similar to the average of our estimates. Additionally, recent estimates for different manufacturing industries in France by Mengano (2022) are also in line with the middle range of our estimates.[30]

The estimated inverse labor demand elasticity is $\widehat{\delta} = 0.03$. This parameter is related to the average returns to scale of the production function and determines the markup on (3) as $\nu_i = 1 - \delta$. Combining δ and the estimated capital elasticities per sector $\{\alpha_b\}_{b\in\mathcal{B}}$ allow us to recover the values for the output elasticities with respect to labor as $\beta_b = (1-\alpha_b)(1-\delta)$. These elasticities go from 0.56 for *Transport* to the 0.86 for *Clothing* and *Textile*. We present the estimates for all the parameters in the Supplemental Material.

Relation to other estimates. We estimate local and across-market elasticities of substitution, which bound the elasticity of the labor supply. Therefore, our paper contributes to micro estimates of firm labor supply elasticities. Staiger et al. (2010), Falch (2010), Berger et al. (2022) and Datta (2021) use quasi-experimental variation on wages to estimate the firm labor supply elasticities that go from 0.1 (Staiger et al., 2010) to 10.8 (Berger et al., 2022). Both our local and across market elasticities of substitution lie in that range. Dube et al. (2020) and Datta (2021) estimate

[30] See Tables A.2. and A.3. in the Appendix of his paper and Table S8.1 in our Supplemental Material.

a labor supply elasticity to firm-level wage policies ranging between 3 and 5 while, Azar et al. (2022) estimate market elasticities of 0.5 and firm elasticities of 5 which are very close to our estimated elasticities of substitution. Lastly, the median estimate in the meta-analysis of Sokolova and Sorensen (2021) and the estimates in Webber (2015) are close to 1, which is in between our estimates for the across-market and local elasticities of substitution.

4.6 Estimation fit

We validate the model by comparing the model's reduced-form relationship between labor shares and labor market concentration at the 3-digit industry level to the data. Using 3-digit industry labor shares from data and two models, with and without unions, we estimate:

$$\ln\left(LS_{h,t}\right) = f_{b,t} + \vartheta \log\left(HHI_{h,t}\right) + \epsilon_{h,t},$$

where $LS_{h,t}$ is the labor share for 3-digit industry h in year t, $f_{b,t}$ are 2-digit sector-year fixed effects, and $HHI_{h,t}$ is the average Herfindahl-Hirschman Index across local labor markets within h.[31] Labor shares vary between data and model versions while HHI_{ht} values are the same since model employment equals data employment. All estimates are significant at the 1% level.

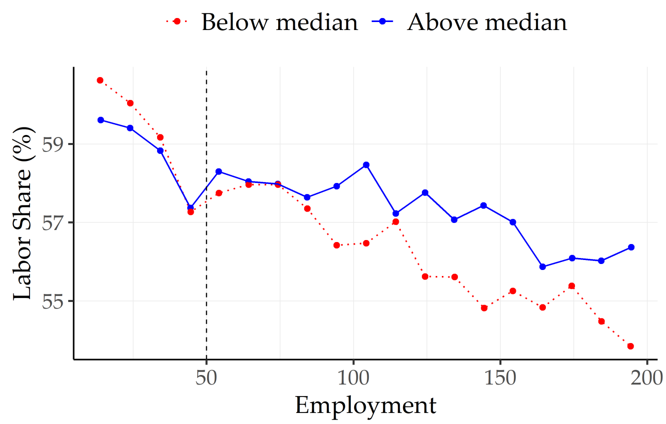
The data regression yields $\widehat{\vartheta} = -0.058$, showing a negative labor share-concentration relationship. The oligopsony model produces $\widehat{\vartheta} = -0.447$, about eight times larger than in data. Our baseline model with unions yields $\widehat{\vartheta} = -0.203$, half the oligopsony magnitude. Employer market power is essential to explain the negative labor share-concentration correlation, while unions moderate this relationship.

The Online Appendix also shows that the model fits well non-targeted labor shares at the 3-digit industry level and the evolution of total value added.

Are the bargaining power estimates informative? As explained before, we target sector labor shares to estimate union bargaining powers, a natural choice given our model's direct mapping between these and labor shares. But do these estimates reflect actual union bargaining power?

[31] The HHI at market m and year t is: $HHI_{m,t} = \sum_{i \in \mathcal{I}_{m,t}} s^2_{i|m,t}$ where $s_{i|m,t}$ are observed employment shares. The 3-digit industry concentration is: $HHI_{h,t} = \frac{1}{|\mathcal{M}_{h,t}|} \sum_{m \in \mathcal{M}_{h,t}} HHI_{m,t} \frac{L_{m,t}}{L_{h,t}}$, where $|\mathcal{M}_{h,t}|$ is the number of markets that belong to h in year t, and $L_{m,t}$ and $L_{h,t}$ are respectively local labor market and 3-digit industry employment.

Figure 4: Labor share and size



Notes: Size gradient of the firm labor share across different firm employment bins. Firms with below (above) median union bargaining powers are in red dashed (blue solid) lines.

To check this, we first examine the correlation with average firm size. As explained in Section 1, union duties relate to employment size, so sectors with larger employers should have more powerful unions. The correlation between our bargaining power estimates and average firm size is 26.3%. Importantly, nothing in our model mechanically generates positive correlation between labor shares and size. In fact, the model predicts the opposite since larger employers should have lower labor shares when $\widetilde{\lambda}_i$ decreases with labor supply shares.

Second, bargaining powers are not merely capturing size composition differences across sectors. Recall that legal duties regarding union representation tighten significantly at the 50-employee threshold. Figure 4 shows binned scatter plots relating labor shares to employment size for sectors above and below median bargaining power estimates. Both plots show declining labor shares with size, consistent with Autor et al. (2020) for the US. However, the trends flatten and even reverse around the 50-employee threshold, with much more pronounced flattening for high-bargaining-power sectors. This pattern is not mechanical since in our estimation we target sector labor shares, not changes in the labor share-employment slope. Therefore, we are confident that our parameters are informative of actual bargaining power.[32]

[32]Additionally, Pecheu (2022) shows that rent-sharing schemes increase with firm size, though his analysis is not sector-disaggregated; see Figure 1 in his paper.

5 Counterfactuals

In this section we evaluate the output and welfare effects of the labor wedges coming from labor market power and we quantify how firm and union labor market power counteract each other. We perform counterfactuals for 2007, the last year of our sample. In all counterfactuals, workers' preferences remain unchanged, with the same distribution of idiosyncratic taste shocks.

5.1 The effects of two-sided labor market power

Table 2 presents the results of various counterfactual scenarios assuming free mobility of workers. The first column displays the labor shares in the baseline and each counterfactual scenario. The subsequent columns show the percentage gains compared to the baseline, with column 2 representing output gains. Eliminating unions in the oligopsonistic competition counterfactual reduces output by 0.67%, implying that union market power attenuates labor market distortions in the model. In the oligopsonistic scenario, large and productive employers constrain more their hiring, leading to more labor misallocation and an output reduction.

In the second counterfactual, *No wedges*, we eliminate labor wedges setting wages equal to the marginal revenue products of labor. This corresponds to a case where employers are wage takers, which can also be achieved if $\varphi_b = 1$ for all b. In that case, aggregate output increases by 1.65%. We explore the role of unions as substitutes of competition in the *Monopsony* counterfactual—a limiting case when labor supply shares tend to zero, and there is no bargaining. Surprisingly, this counterfactual yields the highest output gains of 1.86%, but the workers' welfare falls. In this counterfactual, labor wedges are constant within sectors but still distort sectoral labor supply. When more productive sectors have higher elasticities ε_b, labor reallocates toward them relative to an equilibrium without wedges, increasing total output.

Workers' welfare and the aggregate labor share capture the distributional effects. Using the demand of the final good producer (6), the aggregate labor share is: $LS = \sum_{b \in \mathcal{B}} \beta_b \lambda_b \theta_b$. Column 1 of Table 2 shows that removing unions decreases the labor share by 13.9 percentage points, from 50.38% in the baseline to 36.48% in *Oligopsony*. The labor share rises to 73.33% in the counterfactual without labor wedges.

Table 2: Counterfactuals: Output and Welfare

		Gains (%)		
	Labor share (%)	ΔY	Δ Wage	Δ Welfare (L)
Baseline $\lambda(\mu, \varphi_b)$	50.38	-	-	-
Counterfactuals				
Oligopsony $\lambda(\mu, 0) = \mu_i$	36.48	-0.67	-28.07	-30.32
No wedges $\lambda(1, 0) = 1$	73.33	1.65	47.96	44.32
Monopsony $\lambda(\mu, 0) = \frac{\varepsilon_b}{\varepsilon_b+1}$	47.79	1.86	-3.36	-7.42

Notes: $\Delta x \equiv (x' - x)/x$. Results in percentages. *Labor share*: aggregate labor share. The last three columns are changes relative to the baseline. ΔY: aggregate output, Δ *Wage*: aggregate wage (employment weighted average). Δ *Welfare (L)*: workers' welfare. *Oligopsony*: counterfactual without unions $\lambda_i = \mu_i$; *No wedges*: wedge equal to one (perfect competition); *Monopsony*: monopsonistic competition (infinitesimal firms) without unions.

There are two reasons why the labor share changes are large relative to output gains except in the *Monopsony* counterfactual: (i) baseline labor wedges are compressed by the unions, so they have limited heterogeneity and have limited room for output gains or losses; and (ii) the baseline model features a high aggregate profit share of 25%, where most of the profits come from employers labor market power rents, so there is a high potential for redistribution.[33] Removing the labor wedges shifts the profit previously earned by the employers to the workers.

Columns 3 and 4 of Table 2 show average wage and welfare gains relative to the baseline. In *Oligopsony*, the average wage and workers' welfare are reduced respectively by 28% and 30%. In contrast, in the case with no labor wedges, average wages and workers' welfare increase respectively by 48% and 44%. The welfare changes exceed the output ones due to the redistribution of rents and changes in non-wage amenities from the labor reallocation.

In the Supplemental Material, we present the same exercises for a model where the union objective function is the total wage bill with zero outside option. Results are very similar.

5.2 Welfare decomposition

Workers' welfare. We decompose workers' welfare gains into labor reallocation and rent-sharing components. Let $\mathcal{W}_c$ be workers' aggregate welfare in equilibrium c and $\overline{\mathcal{W}}$ their wel-

[33]The profit share equals $\sum_b \theta_b \beta_b \delta (1-\delta)^{-1}$ if employers payed workers their $MRPL$. As δ is close to zero, this implies that most of the profits in the baseline equilibrium come from employers labor market power.

Table 3: Counterfactuals: Welfare Decomposition

		Share $\Delta\mathcal{W}_c$			Share $\Delta\mathcal{S}_c$	
	$\Delta\mathcal{W}_c$ (%)	Reallocation	Rent-sharing	$\Delta\mathcal{S}_c$ (%)	AE	RE
Unions	43.51	72.93	27.07	2.84	78.97	21.03
No wedges	107.11	50.96	49.04	3.02	88.61	11.39
Monopsony	32.87	78.35	21.65	1.83	109.29	-9.29

Notes: Oligopsony as reference. $\Delta\mathcal{W}_c$: workers' welfare gains; *Reallocation* and *Rent-sharing* share of welfare gains in (22). $\Delta\mathcal{S}_c$: social welfare gains; *AE* and *RE* share of $\Delta\mathcal{S}_c$ from efficiency and redistribution in (23). *Unions*: baseline with bargaining; *No wedges*: wedges equal to one; *Monopsony*: infinitesimal firms without unions.

fare under the reference of oligopsony. For any equilibrium c, we find a proportional labor income tax τ_c^* that leaves employers with the same income as in the oligopsony case after transferring the tax revenue.[34] Importantly, τ_c^* is the same for all employers, so it does not affect the workers' labor supply decision. Recall that workers' welfare is $\mathcal{W} = \Phi^{1/\eta}$, which is homogeneous of degree 1 in wages, so a common and proportional tax can be factored out. Then, workers' welfare relative to oligopsony can be decomposed as:

$$\frac{\mathcal{W}_c - \overline{\mathcal{W}}}{\overline{\mathcal{W}}} = \underbrace{(1-\tau_c^*)\frac{\mathcal{W}_c - \overline{\mathcal{W}}}{\overline{\mathcal{W}}}}_{\text{Reallocation}} + \underbrace{\tau_c^*\frac{\mathcal{W}_c - \overline{\mathcal{W}}}{\overline{\mathcal{W}}}}_{\text{Rent-sharing}}. \tag{22}$$

The first term, *Reallocation*, captures welfare gains due to changes in labor reallocation. These gains can come from higher output as labor shifts to more productive employers, or from better amenities as workers sort into more attractive firms. The term *Rent-sharing* quantifies welfare changes coming purely from redistribution of rents from employers to workers. $(1-\tau_c^*)$ and τ_c^* represent, respectively, the share of welfare changes explained by reallocation and rent-sharing.

Table 3 presents the welfare decomposition in the baseline with unions and counterfactuals. The first column shows workers' welfare relative to oligopsony.[35] When unions are present (*Unions*), workers' welfare increases by 44%, with 73% of those gains corresponding to *Reallocation* and 27% to *Rent-sharing*. In contrast, the welfare gains in the *No wedges* case (107%) come roughly evenly split at 50% for both components.

[34]The tax rate is: $\tau_c^* = \frac{\Pi_O - \Pi_c}{WB_c}$, where WB_c is the aggregate wage bill in counterfactual c, and Π_c and Π_O are the profits in counterfactual c and oligopsony.

[35]Results differ from those in Table 2 as we are taking the oligopsony counterfactual as reference.

Why the difference? Unions redistribute more rents from large employers, which have high productivity, high amenities, or both. This compresses the distribution of wedges across firms, reducing misallocation. The compression from *Unions* to *No wedges* (that can be attained with $\varphi_b = 1$) is smaller than from oligopsony to the baseline. Therefore, rent-sharing becomes more important for workers' welfare gains.

Social welfare. Our economy has workers and employers (whose utility equals profits). Let C be total consumption, σ workers' consumption share, and N an employment index summarizing workers' utility from employment distribution *net* of consumption. Social welfare $\mathcal{S}(\sigma, C, N)$ equals the sum of workers and employers utilities in consumption-equivalent terms.[36] Denoting counterfactuals with primes (σ') and reference with bars ($\overline{\sigma}$), normalized social welfare is $\mathcal{S}_\Gamma = \mathcal{S}(\sigma, C, N)/\Gamma$ with $\Gamma = \mathcal{S}(\overline{\sigma}, \overline{C}, \overline{N})$. Welfare gains decompose as:

$$\underbrace{\mathcal{S}_\Gamma(\sigma', C', N') - \mathcal{S}_\Gamma(\overline{\sigma}, \overline{C}, \overline{N})}_{\text{Social welfare gains}} = \underbrace{\frac{1}{\Gamma}\left[\mathcal{S}(\overline{\sigma}, C', N') - \mathcal{S}(\overline{\sigma}, \overline{C}, \overline{N})\right]}_{\text{Aggregate Efficiency (AE)}} + \underbrace{\frac{1}{\Gamma}\left[\mathcal{S}(\sigma', C', N') - \mathcal{S}(\overline{\sigma}, C', N')\right]}_{\text{Redistribution (RE)}}. \tag{23}$$

As Berger et al. (2025b) put it, *AE* measures gains from increasing the size of the "economic pie," while RE measures gains from shifting resources, or consumption in our case.

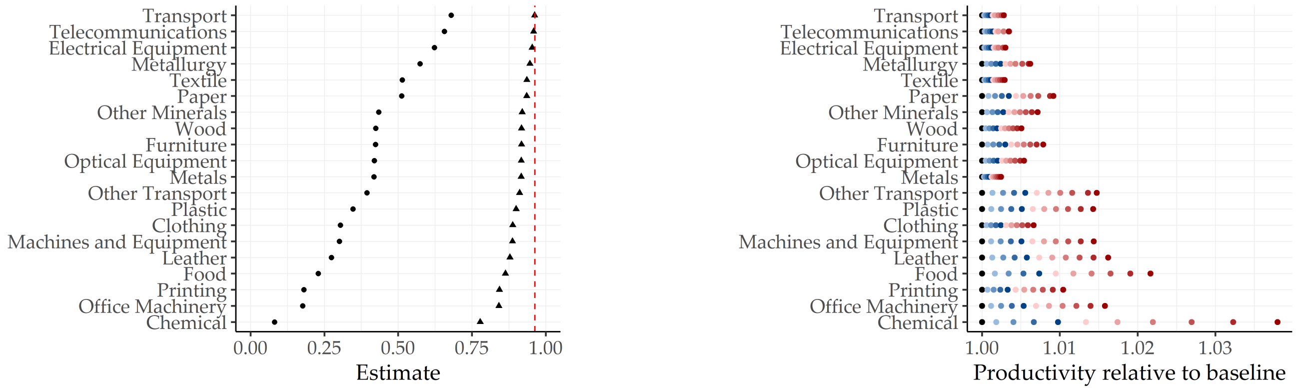
The last three columns of Table 3 present the gains and the decomposition. The *Unions* baseline allocation captures 94% of social welfare gains from *No wedges*. These numbers imply social welfare would decrease by 2.76% without unions. Most gains come from *AE*, with unions achieving $\frac{2.84 \times 0.79}{3.02 \times 0.89} = 83\%$ of the *AE* gains in the *No wedges* case. Despite small output responses, this occurs because workers derive utility from both consumption and taste shocks. Unions also shift labor toward attractive employers in terms of amenities.

5.3 Increasing union bargaining powers

We now explore the effects of exogenous increases of union bargaining powers. Starting from the baseline equilibrium, we increase the bargaining powers by defining them as $\widetilde{\varphi}_b = \varphi_b^{1-\kappa}$, where $\kappa \in [0, 1]$.

[36]The Supplemental Material contains the derivations.

Figure 5: Increasing Union Bargaining Powers



(a) Union bargaining power

(b) Aggregate productivity effects of κ

Notes: Panel (a): Estimated union bargaining powers (dots) per sector, bargaining powers when $\widetilde{\varphi}_b = \varphi_b^{1-\kappa}$ with $\kappa = 0.9$ (triangles) and a vertical line with the maximum effective bargaining power φ^*. Panel (b): Sector productivity for different κ, where blue (red) denotes low (high) values of κ.

Figure 5a shows the estimated union bargaining power by sector alongside a vertical line representing the maximum effective bargaining power φ^*.[37] Given no rationing under the baseline union objective, the gap between estimated bargaining power and φ^*, combined with the baseline distribution of λ_i's in each sector, determines the potential output gains from increasing union bargaining powers.

Figure 5b confirms that the sectors at the bottom—with estimated union bargaining powers that are far from φ^*—experience overall the highest productivity improvements from reallocation in the sector. Nevertheless, those gains are not simply the flip figure of the distance between φ_b and φ^* as sectors may have a high baseline λ_b due to having low concentration among employers. Online Appendix D.1 shows the output effects per sector of increasing the union bargaining powers. The Supplemental Material presents workers' welfare effects.

The main takeaways of the counterfactuals so far are: (i) unions not only redistribute a significant portion of total output towards workers, but also increase the economy's overall efficiency compared to the case with only oligopsony; and (ii) unions attain most of the social welfare gains from removing labor wedges. Bargaining allows for a differential redistribution of rents that leads to the compression of labor wedges that induce labor reallocation towards

[37]Since all sectors have at least one employer with $s_{i|m} = 1$, we get a constant, $\varphi^* = \frac{1-\delta}{1+\eta\delta} = 0.962$.

more productive or attractive employers. The mechanism suggests that rent-sharing rules such as the one explained in Nimier-David et al. (2023) may have positive efficiency effects through an improved allocation of labor across firms.

So far, we have considered counterfactuals with our baseline union objective function, which generates no rationing. Below, we explore the possibility of having unemployment when unions become powerful.

5.4 Misaligned unions' objectives and unemployment

Our baseline union objective guarantees that there will be no rationing in equilibrium. Here we explore a situation where unions have misaligned objectives on insiders. We call these objectives "misaligned" as the union cares about total utility *conditional* on being employed in i. Their objective is:

$$G_i^M(w_i, \psi_i) = \left[\left(\sum_{j \in \mathcal{I}_m} T_j \left(\psi_j w_j \right)^{\varepsilon_b} \right)^{\frac{1}{\varepsilon_b}} \psi_i^{-1} - \left(\sum_{j \neq i} T_j \left(\psi_j w_j \right)^{\varepsilon_b} \right)^{\frac{1}{\varepsilon_b}} \right] \psi_i L_i^S. \tag{24}$$

$G_i^M(w_i, \psi_i)$ does not satisfy the conditions of Proposition 5, therefore an equilibrium with rationing, where there will be unemployment, cannot be ruled out.[38]

In the Supplemental Material, we show that the optimal rationing share is $\psi_i = \min\{\widetilde{\psi}_i, 1\}$, where:

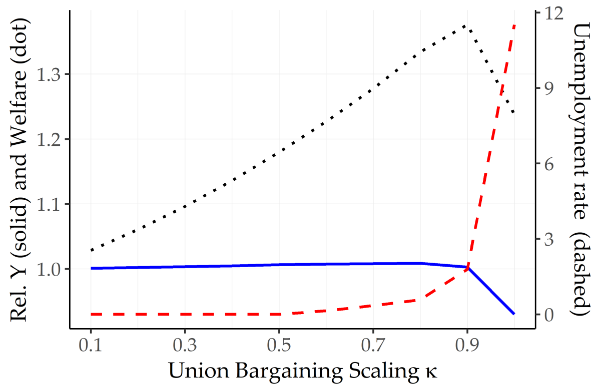
$$\widetilde{\psi}_i = \frac{1}{(1 - s_{i|m})^{1/\varepsilon_b}} \left[\omega_\psi (1 - \delta) \frac{s_{i|m} + e_i}{1 + e_i} + (1 - \omega_\psi) \right], \quad \text{and} \quad \omega_\psi = \frac{\varphi_b}{\varphi_b + (1 - \varphi_b)(1 - \delta)}.$$

The $\min\{\cdot\}$ operator reflects the possibility of a binding labor supply constraint. As $\widetilde{\psi}_i$ depends only on labor supply shares $s_{i|m}$, the model remains block-recursive.

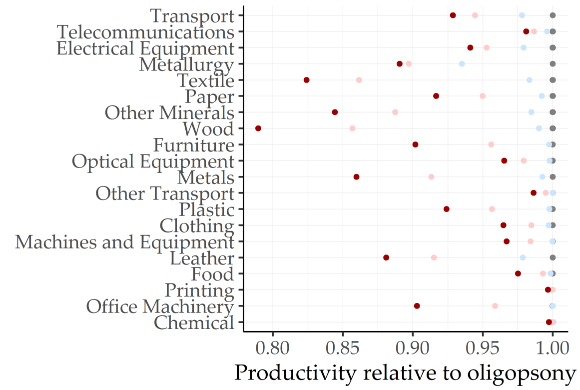
After determining whether employer i is labor demand or supply constrained, we solve for local equilibrium using expected wages. Multiplying the rationing share ψ_i on both sides of

[38] Objective (24) is equal to the baseline one (14) when there is no rationing in i ($\psi_i = 1$). If the misaligned objectives were the true ones, here we quantify the excess rationing caused by increasing the bargaining powers.

Figure 6: Counterfactuals: Misaligned Objectives and Sector Wage Floors



(a) Increased union bargaining power



(b) Sector wage floor: Productivity

Notes: Panel (a): Increasing union bargaining powers $\varphi_b^{1-\kappa}$ for different $\kappa \in [0, 1]$ with misaligned objectives. Output (blue solid), workers' welfare (black dotted) and unemployment (red dashed). Panel (b): Sector productivity for different wage floors. Gray (dark red) is oligopsony without wage floors ($\underline{w}_b$ at sector's 10th percentile).

equation (11) and using $L_i = \psi_i L_i^S$ we get:

$$\overline{w}_i = \beta_b \lambda_i P_b^{\frac{1}{1-\alpha_b}} \left(A_i \psi_i^{1-\delta} \right) L_i^{S^{-\delta}},$$

The expression above synthesizes the solution of problem (2) and comprises the two cases of Figures 1a and 1b. When $\psi_i < 1$, the labor demand constraint is active and $\lambda_i = 1$; when the labor supply constraint is active, $\lambda_i \leq 1$ and $\psi_i = 1$. After finding λ_i and ψ_i, we can solve for the expected wages. Once labor supply and rationing shares are determined, the local labor market follows (16) with $A_i \psi_i^{1-\delta}$. Aggregation follows Section 2.4.[39]

Increasing union bargaining powers: Misaligned objectives. We replicate the increase of union bargaining powers from Section 5.3 now with misaligned objectives on insiders. In the case of rationing, there will be unemployment. Figure 6a presents output (blue solid), welfare (black dotted) and unemployment (red dashed) effects.[40] The Figure shows that if union bargaining powers increase with κ until 0.9, output is slightly higher but there are sizable workers' welfare gains relative to the baseline. This is the case even if the unemployment rate amounts

[39]This characterization resembles Berger et al. (2025b)'s use of *shadow wages*.
[40]Results are complemented with Table S9.3 in the Supplemental Material.

to 1.79%. On the contrary, when $\kappa = 1$ all the sector union bargaining powers are set to one which leads to a sharp rise of the unemployment rate to 11.52%. This slack labor supply leads to 7% output losses relative to the baseline and to lower workers' welfare than with $\kappa = 0.9$.[41]

5.5 Sector wage floors

In this section we consider a different wage setting arrangement where a sector union, who cares about their total wage bill, and an employer association, who cares about their total profits, bargain sector wage floors. Here we fix sector b labor supply L_b^S to the baseline and consider a simplified production structure where all firms produce a homogeneous good. These two assumptions make sector b's choice of the sector wage floor $\underline{w}_b$ independent of other sectors' minimum wages $\{\underline{w}_{b'}\}_{b' \in \mathcal{B}}$.[42] This setup is similar to the simplified framework of Hermo (2024), but choosing a sector specific wage floor.

Given $\underline{w}_b$, employer i solves:

$$\max_{w_i, \psi_i} F_i(\psi_i \ell_i^S(\psi_i w_i)) - w_i \psi_i \ell_i^S(\psi_i w_i)$$
$$\text{subject to:} \quad \psi_i \leq 1, \quad \text{and} \quad w_i \geq \underline{w}_b.$$

As in Berger et al. (2025b), the allocation of above's problem can belong to three regions:

- *Region I*: employer unconstrained and the wage is equal to the oligopsony wage ($w_i > \underline{w}_b$).
- *Region II*: employer constrained by the labor supply, so $w_i = \underline{w}_b$ and $\psi_i = 1$.
- *Region III*: employer constrained by the labor labor demand, so $w_i = \underline{w}_b$ and $\psi_i < 1$.

Although employer i's problem is very similar to Berger et al. (2025b), it has two important differences: (i) employers compete à la Bertrand by choosing wages; and (ii) workers who are rationed at i do not find employment somewhere else. Thus, we can have unemployment where the labor supply, a function of expected wages, exceeds labor demand from employer i.

[41] Figure 5a shows that certain sectors like *Transport* and *Telecommunications* reach the maximum effective bargaining power threshold φ_b^* with $\kappa = 0.9$. Beyond φ_b^*, all the employers in b ration under misaligned objectives.

[42] We make these simplifying assumptions for numerical reasons. Introducing a minimum wage breaks the block-recursivity. By using one price and fixing sector labor supplies, we avoid looping over different sector prices and sector labor supply levels, to solve for all wages, rationing shares, and employment levels each time.

Figure 6b summarizes the productivity effects of the sector minimum wages under oligopsony (without sector bargaining) and when we set bargained wages to the sector specific 1st, 5th and 10th percentiles of baseline wages. The sector productivities here account for labor rationing by using $A_i \psi_i^{1-\delta}$. The Figure shows that sector productivity decreases for positive $\underline{w}_b$ and the same is true for sector profits.[43]

If employer j moves from Region I to Region II due to $\underline{w}_b$, it is constrained by the minimum wage but on the labor supply ($\psi_j = 1$). Employer j has now higher expected wage and labor supply share than in oligopsony. This increase comes at the expense of more productive employers, for whom the minimum wage is non-binding, thereby inducing a reallocation toward less productive firms. If employer k moves from Region II to Region III with $\psi_k < 1$ due to a high minimum wage, the rationing decreases its expected wage and will attract fewer workers. This can potentially create positive reallocation effects by pushing some workers to more productive, non-rationing employers. However, some workers would still get rationed, which results in unemployment and a loss of productive capacity. This is reflected in the negative productivity effects of Figure 6b.

This negative productivity effects of the wage floors contrasts with Figure 4C of Berger et al. (2025b), who find that minimum wages can increase productivity in some cases. The discrepancy arises because in our model, workers who supply labor to rationing employers may remain unemployed. In Berger et al. (2025b)'s framework, the representative household internalizes that some employers are labor demand constrained and diverts worker supply to other employers. Therefore, workers who would have gone to unproductive employers—now rationing due to the minimum wage—reallocate to more productive employers, undoing part of the misallocation from employer market power. As mentioned above, our framework allows for partial reallocation of workers to more productive, unconstrained employers. However, in our case, the unemployment effect dominates.[44]

The reallocation patterns with sector wage floors are opposite to our baseline with bargaining at the employer level. In the baseline, as long as more productive employers have more

[43]Table D.5 in Online Appendix D.5 provides additional results.

[44]Lo Bello and Pesaresi (2025) have a model with search frictions to study the employment reallocation and unemployment effects of minimum wages, where increasing them causes the exit of small unproductive firms. Employment reallocates to larger, more productive firms creating a trade-off between reallocation gains and employment losses.

rents, rent-sharing shifts labor supply toward more productive employers and creates output gains relative to oligopsony. In contrast, bargained sector wage floors reallocate labor toward the least productive firms, which increase expected wages if they are supply constrained but potentially create unemployment if they are demand constrained.

Online Appendix D.5 shows that the Nash product always decreases even with small wage floors, driven by profit losses.

5.6 Additional counterfactuals

Online Appendix D provides the details of additional counterfactuals that we summarize here.

Labor mobility. Restricting mobility only within a local labor market would contain output losses from oligopsony as productivity losses are reduced by more than 60%.

Urban-rural wage gap. The urban-rural wage gap is amplified from 34 to 48 percent in the oligopsonistic competition counterfactual, as unions disproportionately boost rural wages. Unions close by almost half the urban-rural wage gap.

Employer exit. Allowing for employer exit when increasing the union bargaining powers yields almost identical output and welfare gains as only few small firms exit.

Endogenous labor force participation. An endogenous labor force participation margin induces higher output responses than when total labor supply is fixed. The counterfactual output change without unions is -1.57% as the total labor supply decreases by 0.93%.

Agglomeration. A model with agglomeration forces amplifies productivity losses from removing unions leading to higher output losses than without agglomeration.

6 Conclusion

Our paper centers on how unions affect labor reallocation. We show that unions can partially undo market power misallocation when redistributing more rents from firms with greater market power, serving as a partial substitute for labor market competition. But our analysis suggests caution: if unions have misaligned objectives and ignore rationing, empowering them can increase unemployment.

From our analysis we find that rent-sharing rules can replicate unions' beneficial labor reallocation aspects. They could even restore efficiency. However, these rules should be tailored to the employers and their implementation is perhaps not realistic. Unions could be a second-best alternative.

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