Labor Market Power and Wage Rigidity in New Keynesian Business Cycles*

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November 23, 2026

Abstract

We extend the canonical New Keynesian model with rigid wages to allow for constrained-efficient variable-pay contracts, and provide a neutrality result: labor market power is irrelevant for the dynamics of hours worked and inflation. Base pay allocates workers across firms, while variable pay allocates hours within a match and in response to aggregate shocks. Market power affects the former, but not the latter. Under the usual restriction of flat-wage contracts, the effect of market power on business-cycle dynamics depends on whether hours are supply-determined or demand-determined. We use these insights to reinterpret several results from the literature.

Keywords: Monopsony, wage rigidity, hours worked, New Keynesian, business cycles
JEL Codes: E12, E31, E32, E52

*We are grateful for insightful comments by Gregor Jarosch and participants in various seminars and conferences. Funding from Vetenskapsrådet [grant number 2026-01565], Norges Forskningsråd [grant number 354541] Riksbankens Jubileumsfond Program [grant number M23-0019] and Handelsbanken Research Foundations [grant number P26-0081] is gratefully acknowledged.

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1 Introduction

Modern business-cycle models emphasize the importance of nominal rigidities for aggregate fluctuations. While early New Keynesian work emphasized sticky prices, the last two decades have made clear that wage rigidities are at least as important quantitatively (Christiano, Eichenbaum and Evans, 2005). More recently, heterogeneous-agent New Keynesian (HANK) models have sharpened the case: wage rigidity restores monetary transmission in environments where sticky prices alone can leave aggregate output essentially insulated from policy (Broer, Hansen, Krusell and Öberg, 2020), and it reconciles high marginal propensities to consume with near-zero marginal propensities to earn without implying implausibly large fiscal multipliers (Auclert, Bardóczy and Rognlie, 2023). Reflecting these developments, canonical HANK frameworks now often take wage rigidities as the sole nominal friction (Auclert, Rognlie and Straub, 2025).

Wage rigidity is intimately connected to labor market power and to whether hours worked are determined by "aggregate demand" or "aggregate supply." In the canonical New Keynesian model of wage rigidity (Erceg, Henderson and Levin, 2000, hereafter EHL), workers have market power and firms choose hours worked ex post, generating demand-driven variation in output and inflation. Through the lens of this framework, wage-markup shocks are a major driver of aggregate fluctuations (Smets and Wouters, 2007; Galí, Smets and Wouters, 2012). In contrast, following the growing evidence of firm market power, a recent literature embeds monopsonistic labor markets into business-cycle models (e.g., Bredemeier, Jansen and Winkler, 2026; Alpanda and Zubairy, 2021; Dennery, 2020; Bardóczy, Bornstein and Salgado, 2026; Kurozumi, Sugioka and Van Zandweghe, 2025). Yet the way wage rigidities are introduced differs in a subtle but consequential respect from EHL by inverting the setup, with firms setting wages and workers choosing hours worked. As a consequence, hours are supply-determined in the short run in this recent literature.

We disentangle the interaction of rigid wages and labor market power in shaping business-cycle dynamics. To do so, we extend the canonical New Keynesian model with rigid wages to allow for variable-pay contracts in which firms have the right to manage hours ex post, in line with the prevalence of demand-driven variation in short-run hours among the employed (Ganong, Noel, Patterson, Vavra and Weinberg, 2026). In the baseline model, firms, rather than workers, have labor market power and we impose no restrictions on the wage contracts, following Broer, Harmenberg, Krusell and Öberg (2023). We then vary the market power structure and restrict the contract space, spanning the specifications considered in the aforementioned literature, to uncover their implications for business-cycle dynamics.

In the baseline setting, the optimal contract offered by the firm has two separate components with different allocative properties. The marginal-wage component allocates hours within an ongoing match and is chosen to compensate the worker for the disutility of an additional hour of work. With complete markets and small aggregate shocks, the contract is constrained efficient in the sense that the marginal-wage schedule maximizes a joint surplus for the worker and the firm. The allocative properties of the contract are thus unaffected by labor market power. Given the marginal-wage schedule, the base-pay component is set to induce workers to accept employment at

the firm, and thus allocates workers across firms at the time of hiring. While firm market power affects total worker compensation, it does not affect the within-match allocative marginal wage, which, in a full-employment labor market, is the relevant statistic for the business-cycle dynamics of output and inflation. In our model, firm market power is thus *neutral* for the business-cycle dynamics of quantities and allocative prices, while it does affect the dynamics of measured average wages.

Comparing our baseline model and this neutrality result with alternative specifications allows us to unpack the results in the literature. If workers rather than firms have market power, the neutrality result carries over: with unrestricted contracts, worker market power is equally irrelevant for the dynamics of quantities. Only if the contract space is restricted to a single hourly wage does market power, whether held by firms or by workers, affect the equilibrium dynamics of quantities. With a flat hourly wage, the restricted model is isomorphic to the canonical EHL model, and the degree of market power now matters. Here, a single hourly wage does two jobs: it allocates workers across firms at hiring, and it allocates hours within a match in response to shocks. In the flat-wage EHL model, shocks to market power cause fluctuations in output, and such shocks worsen the trade-off between stabilizing inflation and output (Justiniano, Primiceri and Tambalotti, 2013). Moreover, when estimating this model, fluctuations in measured wages that are not tied to changes in quantities may be attributed to measurement error. From the perspective of our variable-pay baseline model, shocks to market power are neither allocative for cyclical hours worked nor inflation, but do affect fluctuations in base pay, and thus average hourly wages.

If we instead invert our setup, so that workers rather than firms choose hours ex post, while keeping contracts unrestricted, monopsony power remains irrelevant, whereas the slope of the wage Phillips curve is flipped. When the price level rises and real wages fall, workers want to work less and hours fall, generating a negative correlation between inflation and hours in response to demand shocks. In the special case of a flat hourly wage, the model becomes isomorphic to Dennery (2020), and the degree of market power now matters again. Variants of this model are a baseline for much of the recent monopsony literature. In this case, the wage Phillips curve becomes an aggregate labor-demand curve (Kurozumi and Van Zandweghe, 2026), declining firm market power increases the potency of monetary policy (Bardóczy et al., 2026), and countercyclical firm market power amplifies fiscal multipliers while wage rigidity dampens them (Bredemeier et al., 2026). These results follow from the combination of supply-determined hours with a restricted contract space, not from firm market power in itself.

Our model provides a tractable framework for the applied literature on rigid wage setting, labor market power, and business-cycle dynamics. It combines the desirable features of the monopsony literature with those of the EHL literature: firms have market power and hours worked are demand-determined, both in line with the evidence. The second feature is especially consequential in frameworks with rich household heterogeneity. First, as Broer et al. (2020) point out, because profits and capital income are highly concentrated, a HANK model with workers on their labor-supply curve has difficulty generating any response of hours and output to monetary shocks. Second,

as Auclert et al. (2023) show, supply-determined models suffer from a trilemma: they cannot jointly match the marginal propensity to consume, the marginal propensity to earn, and the fiscal multiplier.

Our analysis also connects to the older theoretical literature on market power and nominal rigidities. Since Mankiw (1985), Akerlof and Yellen (1985), and Blanchard and Kiyotaki (1987), nominal rigidities have often been embedded in environments with monopolistic competition, in which market power gives agents meaningful price-setting or wage-setting problems. The EHL model follows this logic on the labor side: workers are monopolistic suppliers of differentiated labor services and set rigid nominal wages, while firms choose hours worked. The recent monopsony literature inverts this setup, with firms posting wages as differentiated employers and workers choosing hours worked. Although it is a natural starting point to have one side choose prices and the other choose quantities, our analysis shows that this is not a logical necessity.

2 Baseline model

The model combines a monopsonistic labor market, as in Card, Cardoso, Heining and Kline (2018), with the wage-contract rigidity in Broer et al. (2023).

Workers have idiosyncratic tastes across firms, giving rise to monopsony power in the labor market. Each period, a fraction of workers are exogenously separated from their firms. Separated workers choose which new firm to work for as a function of the wage contracts offered by firms and their idiosyncratic tastes. Firms post nominally rigid wage contracts, which map hours worked into nominal wage payments. Once a match is formed, the firm unilaterally chooses hours worked. In anticipation of firms' "right to manage," equilibrium contracts are convex, reflecting the disutility of work for workers. The contracts are such that, in steady state, firms fully internalize workers' marginal utility cost of working an additional hour and implement the first best.

2.1 Setting

Time is infinite and discrete, $t = 0, 1, 2, \ldots$. The economy consists of a unit-mass continuum of workers indexed by $i \in [0, 1]$ and a continuum of firms indexed by $j \in [0, 1]$. Workers belong to a representative household that enables full consumption insurance. We consider a closed economy without capital, so aggregate consumption equals aggregate output, $C_t = Y_t$. For simplicity, while wage contracts are nominally rigid, goods prices are flexible.[1]

Aggregate states. The aggregate states are productivity A_t, the price level P_t, and aggregate output Y_t. Throughout this paper we study a *perfect-foresight path* with respect to aggregate variables: from time $t = 0$ onward, agents know the entire path $\{A_t, P_t, Y_t\}_{t \geq 0}$. The premise of

[1] Bilbiie and Trabandt (2025) show that, with constant returns to scale, the simple New Keynesian model with flexible prices and sticky wages yields the same allocations for output, hours, inflation, and the interest rate as the textbook three-equation model with sticky prices and flexible wages, provided the two Phillips curves have the same slope.

this approach is that aggregate shocks are small relative to idiosyncratic shocks. Due to certainty equivalence, as emphasized by Boppart, Krusell and Mitman (2018) and Auclert, Bardóczy, Rognlie and Straub (2021), the perfect-foresight path is a sufficient statistic for simulating a model with stochastic fluctuations up to a first-order approximation.

Idiosyncratic productivity. Each firm is hit by an idiosyncratic productivity shock $A_{j,t} > 0$ (i.i.d. across j and t, with a smooth non-degenerate distribution on $(0, \infty)$ and finite moments). The idiosyncratic shock $A_{j,t}$ is realized *after* matches are formed in period t (and before hours are chosen), so contracts cannot condition on $A_{j,t}$. Since aggregate states are known, the expectation operator $\mathbb{E}_t$ is with respect to idiosyncratic productivity. Note that a first-order approximation of the model with respect to aggregate variables does not entail any approximation of the dynamics of worker-level outcomes with respect to idiosyncratic shocks.

Labor market timing, contracts, and matching. Each period proceeds as follows:

1. At the start of period t, each worker is separated from their incumbent employer with probability $1 - \theta$. Separated workers draw a vector of idiosyncratic taste shocks $\{\varepsilon_{ij,t}\}_{j\in[0,1]}$ for working at different firms (Type I Extreme Value). The realized $\varepsilon_{ij,t}$ associated with the chosen employer remains fixed for the duration of the match (until the next separation event).

2. Firms post nominal wage contracts. A contract is a schedule $W_{j,t}(\cdot)$ mapping hours into nominal total payments and is taken as given by the firm ex post. Contracts are *Calvo-style vintage contracts*: a worker hired at t is assigned a vintage-t contract, and that contract remains in force (without renegotiation) until the worker separates. Once the worker has entered the contract, the firm has the right to manage hours ex post.

3. Separated workers choose which firm to work for, generating a new hire measure $L_{j,t}$ at each firm.

4. The idiosyncratic shock $A_{j,t}$ is realized. Given contract $W_{j,t-s}(\cdot)$ and $(P_t, A_t, A_{j,t})$, the firm chooses hours for its employed workers.

Production. Production within a match features (weakly) decreasing returns to hours. Firm j employs $\theta^s L_{j,t-s}$ workers who were hired s periods ago. With aggregate productivity A_t and idiosyncratic productivity $A_{j,t}$, firm j produces

$$Y_{j,t} = A_t A_{j,t} \sum_{s=0}^{\infty} \theta^s L_{j,t-s} \, N_{j,t|t-s}^{1-\alpha},$$

where $N_{j,t|t-s}$ denotes hours in period t per worker employed at firm j under a contract of vintage $t-s$, and $\alpha \in [0, 1)$ governs the curvature of output in hours per worker. The case $\alpha = 0$ corresponds to output linear in hours. Because output is additively separable across workers, we can write the

firm's ex-post problem "per match" without loss of generality: the hours choice is separable across workers, so the firm assigns the same hours $N_{j,t|t-s}$ to all workers within a given contract vintage, while aggregation keeps track of cohort sizes $L_{j,t-s}$.

Preferences. The representative household owns all firms and has preferences

$$\sum_{t=0}^{\infty} \beta^t \mathbb{E}_0 \left[\log C_t - \int_0^1 v(N_{i,t})\, di + \int_0^1 \varepsilon_{ij(i),t}\, di \right],$$

where $v(N) = \kappa \frac{N^{1+\psi}}{1+\psi}$, $N_{i,t}$ is hours worked by worker i, employed at firm $j(i)$, and $\varepsilon_{ij(i),t}$ is a match-specific taste shifter.

Let $\lambda_t \equiv 1/C_t$ denote the household's marginal utility of consumption. Because of full consumption insurance, all workers share the same marginal utility of consumption at the contracting stage. The representative household's consumption-saving decision is characterized by the Euler equation

$$\lambda_t = \beta R_t \lambda_{t+1}, \tag{1}$$

where R_t is the gross real interest rate.

2.2 Decision problems

Firms and production. Firms choose how many hours to demand from their workers, given each worker's wage contract. Denote hours in period t for the cohort of workers entering into a contract with firm j at time τ by $N_{j,t|\tau}$. Given $(P_t, A_t, A_{j,t})$ and the vintage-τ wage schedule $W_{j,\tau}(\cdot)$, the firm chooses hours for the vintage-τ cohort, $N_{j,t|\tau}$, to maximize per-worker profits,

$$\max_{N_{j,t|\tau}} \; P_t A_t A_{j,t}\, N_{j,t|\tau}^{1-\alpha} - W_{j,\tau}\Big(N_{j,t|\tau}\Big),$$

implying the (per-worker) labor-demand condition equalizing the marginal rate of transformation with the marginal wage,

$$(1-\alpha) P_t A_t A_{j,t} N_{j,t|\tau}^{-\alpha} = W'_{j,\tau}\Big(N_{j,t|\tau}\Big). \tag{2}$$

Worker choice and new hires. Separated workers' i.i.d. Type I Extreme Value taste shocks $\{\varepsilon_{ij,t}\}_{j\in[0,1]}$ have dispersion δ.[2] Let $\tilde{V}_{ij,t}$ denote the value (in utility units) for the representative household of having worker i choose firm j at time t. Given a vintage-t contract at firm j, hours

[2]With a literal continuum of i.i.d. Type I Extreme Value draws, $\sup_j \varepsilon_{ij,t} = +\infty$ almost surely. We therefore interpret the taste draws as a Poisson point process $\{(j_m, \varepsilon_m)\}$ on $[0,1] \times \mathbb{R}$ with intensity $dj \cdot \delta^{-1} e^{-\varepsilon/\delta}\, d\varepsilon$ (Resnick and Roy, 1991; Dagsvik, 1994).

in future periods are determined by Equation (2) and we can write

$$\begin{aligned}\tilde{V}_{ij,t} &\equiv \sum_{s=0}^{\infty}(\beta\theta)^s\mathbb{E}_t\left[\lambda_{t+s}\frac{W_{j,t}(N_{j,t+s|t})}{P_{t+s}} - v(N_{j,t+s|t}) + \varepsilon_{ij,t}\right] \\ &= V_{j,t} + \frac{\varepsilon_{ij,t}}{1-\beta\theta},\end{aligned}$$

where $V_{j,t}$ collects the part of match utility that does not depend on $\varepsilon_{ij,t}$,

$$V_{j,t} = \sum_{s=0}^{\infty}(\beta\theta)^s\mathbb{E}_t\left[\lambda_{t+s}\frac{W_{j,t}(N_{j,t+s|t})}{P_{t+s}} - v(N_{j,t+s|t})\right]. \tag{3}$$

The Type I Extreme Value shocks yield a logit structure, so the measure of new hires at firm j is

$$L_{j,t} = (1-\theta)\frac{\exp\big((1-\beta\theta)V_{j,t}/\delta\big)}{\int_0^1 \exp\big((1-\beta\theta)V_{k,t}/\delta\big)\,dk}. \tag{4}$$

The contract-posting problem (vintage t): setup. Firm j chooses to post the vintage-t wage schedule $W_{j,t}(\cdot)$ to maximize the expected present value of profits from the cohort it hires at time t, discounted in utility units by $\beta^s\lambda_{t+s}$ and accounting for survival probability θ^s:

$$\max_{W_{j,t}(\cdot),\,V_{j,t},\,L_{j,t},\,\{N_{j,t+s|t}\}_{s\geq 0}} \sum_{s=0}^{\infty}(\beta\theta)^s\lambda_{t+s}\,L_{j,t}\mathbb{E}_t\left[A_{t+s}A_{j,t+s}N_{j,t+s|t}^{1-\alpha} - \frac{W_{j,t}(N_{j,t+s|t})}{P_{t+s}}\right] \tag{5}$$

subject to the worker value definition, Equation (3), worker choice, Equation (4), and ex-post firm optimality for each future date $t+s$,

$$(1-\alpha)P_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t}^{-\alpha} = W'_{j,t}(N_{j,t+s|t}). \tag{6}$$

Define the surplus of a vintage-t match at firm j as

$$S_{j,t} \equiv \sum_{s=0}^{\infty}(\beta\theta)^s\mathbb{E}_t\left[\lambda_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t}^{1-\alpha} - v(N_{j,t+s|t})\right]. \tag{7}$$

Substituting Equation (3) into the objective and rewriting in terms of surplus $S_{j,t}$, we can fully

state the firm's problem as

$$\begin{aligned}
&\max_{W_{j,t}(\cdot),V_{j,t},L_{j,t},\{N_{j,t+s|t}\}_{s\geq 0},S_{j,t}} L_{j,t}(S_{j,t}-V_{j,t})\\
\text{s.t.}\quad & L_{j,t}=(1-\theta)\frac{\exp\big((1-\beta\theta)V_{j,t}/\delta\big)}{\int_0^1\exp\big((1-\beta\theta)V_{k,t}/\delta\big)\,dk},\\
& V_{j,t}=\sum_{s=0}^{\infty}(\beta\theta)^s\mathbb{E}_t\left[\lambda_{t+s}\frac{W_{j,t}(N_{j,t+s|t})}{P_{t+s}}-v(N_{j,t+s|t})\right],\\
& S_{j,t}=\sum_{s=0}^{\infty}(\beta\theta)^s\mathbb{E}_t\left[\lambda_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t}^{1-\alpha}-v(N_{j,t+s|t})\right],\\
& W'_{j,t}(N_{j,t+s|t})=(1-\alpha)P_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t}^{-\alpha}.
\end{aligned}$$

Separation of extensive and intensive margins. The terms of the contract stipulate only that payments are a function of hours worked; no other restrictions are imposed. We can therefore write the wage contract $W_{j,t}(N)$ in terms of a base-pay component $W_{j,t}(0)$ and a variable component that integrates the marginal-wage schedule, $W_{j,t}(N)=W_{j,t}(0)+\int_0^N W'_{j,t}(n)\,dn$. Since hours worked $N_{j,t+s|t}$ are determined by the marginal-wage schedule through $W'_{j,t}(N_{j,t+s|t})=(1-\alpha)P_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t}^{-\alpha}$, surplus $S_{j,t}$ is independent of base pay $W_{j,t}(0)$. Further, by changing base pay while keeping the marginal-wage schedule fixed, it is possible to obtain any $V_{j,t}$.

The maximization problem can therefore be separated into an intensive-margin problem and an extensive-margin problem, where the intensive margin is allocated through the marginal-wage schedule $W'_{j,t}(\cdot)$, and the extensive-margin sorting of workers to firms is allocated through base pay $W_{j,t}(0)$. The intensive-margin problem is the subproblem of maximizing surplus for an existing match,

$$\begin{aligned}
&\max_{W'_{j,t}(\cdot),\{N_{j,t+s|t}\}_{s\geq 0},S_{j,t}} S_{j,t} \qquad (8)\\
\text{s.t.}\quad & S_{j,t}=\sum_{s=0}^{\infty}(\beta\theta)^s\mathbb{E}_t\left[\lambda_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t}^{1-\alpha}-v(N_{j,t+s|t})\right],\\
& W'_{j,t}(N_{j,t+s|t})=(1-\alpha)P_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t}^{-\alpha}.
\end{aligned}$$

This problem determines the marginal-wage schedule $W'_{j,t}(\cdot)$ and within-match hours worked $N_{j,t+s|t}$.

The extensive-margin problem takes the maximal surplus $S_{j,t}$ as given when optimizing hiring,

$$\begin{aligned}
&\max_{V_{j,t},L_{j,t}} L_{j,t}(S_{j,t}-V_{j,t}) \qquad (9)\\
\text{s.t.}\quad & L_{j,t}=(1-\theta)\frac{\exp\big((1-\beta\theta)V_{j,t}/\delta\big)}{\int_0^1\exp\big((1-\beta\theta)V_{k,t}/\delta\big)\,dk},\\
& S_{j,t}=\sum_{s=0}^{\infty}(\beta\theta)^s\mathbb{E}_t\left[\lambda_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t}^{1-\alpha}-v(N_{j,t+s|t})\right].
\end{aligned}$$

This problem determines total worker value $V_{j,t}$ and firm-level hires $L_{j,t}$. The level of base pay is determined residually by $V_{j,t} = \sum_{s=0}^{\infty}(\beta\theta)^s \mathbb{E}_t\big[\lambda_{t+s}\frac{W_{j,t}(N_{j,t+s|t})}{P_{t+s}} - v(N_{j,t+s|t})\big]$. Taking the first-order conditions with respect to $L_{j,t}$ and $V_{j,t}$ in the extensive-margin subproblem yields that the firm receives a constant amount $\delta/(1-\beta\theta)$ of surplus per worker, and the worker receives

$$V_{j,t} = S_{j,t} - \frac{\delta}{1-\beta\theta}. \tag{10}$$

The parameter δ, which governs how the surplus is split, is the measure of monopsony power in the model—a higher value corresponds to a greater degree of monopsony—and equals the steady-state profit share in the economy.

2.3 Equilibrium conditions

Since all firms are ex ante identical, $S_{j,t} = S_t$ and $W_{j,t} = W_t$ are equal across firms. As a consequence, $V_{j,t} = V_t$ and $L_{j,t} = (1-\theta)$ are also equal across firms. The resource constraint is that aggregate consumption equals aggregate output,

$$C_t = Y_t. \tag{11}$$

The model is closed with a policy rule for the nominal interest rate. The gross real interest rate is given by

$$R_t = \frac{\exp(i_t)}{\Pi_{t+1}}, \tag{12}$$

where i_t is the nominal interest rate and $\Pi_t \equiv P_t/P_{t-1}$ is gross price inflation. Monetary policy is set with a Taylor rule putting weight ϕ_π on inflation Π_t,

$$\exp(i_t) = \frac{(\Pi_t)^{\phi_\pi}}{\beta}\exp(\epsilon_t^{\text{mp}}), \tag{13}$$

where

$$\epsilon_t^{\text{mp}} = \rho_{\text{mp}}\epsilon_{t-1}^{\text{mp}}, \qquad t \geq 1, \tag{14}$$

with persistence ρ_{mp}, and ϵ_0^{mp} exogenously given.

2.4 Log-linearized equilibrium

Steady state and notation. We log-linearize around a deterministic steady state with constant aggregate productivity $\bar{A}$, price level $\bar{P}$, and marginal utility $\bar{\lambda}$, assuming the economy is in steady state prior to $t = 0$ and restricting attention to bounded paths. For any aggregate variable X_t, define its log deviation $\hat{x}_t \equiv \log(X_t/\bar{X})$. Let goods-price inflation be $\pi_t \equiv \log(P_t/P_{t-1})$.

A first-order approximation to the optimal contract $W_t(\cdot)$. The optimal contract solves the contracting problem given by Equation (8). Absent the constraint, the first best implements $(1-\alpha)\lambda_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t}^{-\alpha} = v'(N_{j,t+s|t})$. In a steady state with constant aggregates $(\bar{A}, \bar{P}, \bar{\lambda})$, this is implemented by setting $W'(N) = \frac{\bar{P}}{\bar{\lambda}}v'(N)$ so that real marginal pay equals the marginal rate of substitution. This wage contract makes the firm internalize the worker's disutility cost when assigning hours.

The first-order perturbation of this problem, with respect to aggregate shocks, is characterized in Broer et al. (2023), Equation (13). It results in an optimal marginal-wage schedule given by

$$W_t'(N) = \exp(\hat{\xi}_t)\frac{\bar{P}}{\bar{\lambda}}v'(N),$$

where the shifter of the marginal-wage schedule is given by

$$\hat{\xi}_t = (1-\beta\theta)\left[\sum_{s=0}^{\infty}(\beta\theta)^s(\hat{p}_{t+s} - \hat{\lambda}_{t+s})\right],$$

i.e., the average price of consumption utility for the duration of the contract.

In steady state, workers' marginal utility λ_t and the price level P_t are constant. Therefore $\exp(\hat{\xi}_t) = 1$, and firms offer wage contracts in which the marginal-wage schedule is set equal to the marginal rate of substitution (MRS). By Equation (2), firms select hours so that the marginal wage equals the marginal rate of transformation (MRT). The allocation thus equates the MRS with the MRT and the contract is efficient: absent aggregate shocks, a social planner would implement the same hours response as the decentralized market in response to idiosyncratic shocks. Note that full insurance is key to this result: the MRS varies across workers only because of variation in the disutility of work. Away from the steady state, the optimal contract can no longer implement the first best. Instead, the best it can do is to target the first-best optimality condition *on average* over the expected contract duration.

Within-vintage labor demand. For a cohort of workers with contract vintage $t-s$, average hours in period t, $\hat{n}_{t|t-s}$, satisfy the log-linear version of Equation (2),[3]

$$\hat{p}_t + \hat{a}_t - \alpha\,\hat{n}_{t|t-s} = \hat{\xi}_{t-s} + \psi\,\hat{n}_{t|t-s}. \tag{15}$$

Aggregation across vintages. At time t, a share $(1-\theta)\theta^s$ of workers are in vintage $t-s$. Define the intensive-margin *allocative nominal wage* as the cross-vintage average of contract marginal-wage

[3]Hours worked in a given match j of vintage $t-s$ are, relative to steady state with the same realization of the idiosyncratic shock, exactly given by $(\psi+\alpha)\hat{n}_{j,t|t-s} = \hat{p}_t + \hat{a}_t - \hat{\xi}_{t-s}$. Invoking the law of large numbers, $\hat{n}_{t|t-s} = \mathbb{E}_t\hat{n}_{j,t|t-s} = (\hat{p}_t + \hat{a}_t - \hat{\xi}_{t-s})/(\psi+\alpha)$.

shifters:

$$\hat{w}_t^{\text{all}} \equiv (1-\theta)\sum_{s=0}^{\infty}\theta^s\hat{\xi}_{t-s}, \qquad \hat{\omega}_t^{\text{all}} \equiv \hat{w}_t^{\text{all}} - \hat{p}_t. \tag{16}$$

Let aggregate hours be $\hat{n}_t \equiv (1-\theta)\sum_{s=0}^{\infty}\theta^s\hat{n}_{t|t-s}$. Aggregating Equation (15) across vintages yields

$$\hat{a}_t = \hat{\omega}_t^{\text{all}} + (\psi+\alpha)\,\hat{n}_t. \tag{17}$$

Wage Phillips curve and accounting identity. Let *allocative wage inflation* be $\pi_t^{\text{all}} \equiv \hat{w}_t^{\text{all}} - \hat{w}_{t-1}^{\text{all}}$. As in Broer et al. (2023), the Calvo structure implies a forward-looking Phillips curve in the allocative wage:

$$\pi_t^{\text{all}} = \beta\pi_{t+1}^{\text{all}} - \gamma\left(\hat{\omega}_t^{\text{all}} + \hat{\lambda}_t\right), \qquad \gamma \equiv \frac{(1-\theta)(1-\beta\theta)}{\theta}. \tag{18}$$

Finally, the allocative real wage evolves according to the accounting identity

$$\hat{\omega}_t^{\text{all}} = \hat{\omega}_{t-1}^{\text{all}} + \pi_t^{\text{all}} - \pi_t. \tag{19}$$

2.5 General equilibrium dynamics

The model is summarized by six equations in six endogenous variables. Using $\hat{\lambda}_t = -\hat{c}_t = -\hat{y}_t$, we obtain the allocative wage dynamics:

$$\pi_t^{\text{all}} = \beta\pi_{t+1}^{\text{all}} - \gamma\left(\hat{\omega}_t^{\text{all}} - \hat{y}_t\right), \tag{20}$$

$$\hat{\omega}_t^{\text{all}} = \hat{\omega}_{t-1}^{\text{all}} + \pi_t^{\text{all}} - \pi_t. \tag{21}$$

Labor demand is given by

$$\hat{a}_t = \hat{\omega}_t^{\text{all}} + (\psi+\alpha)\,\hat{n}_t, \tag{22}$$

and aggregate output is given by

$$\hat{y}_t = \hat{a}_t + (1-\alpha)\hat{n}_t. \tag{23}$$

The household's Euler equation, together with market clearing, yields a standard dynamic IS curve,

$$\hat{y}_t = \hat{y}_{t+1} - (i_t - \pi_{t+1} - \rho), \tag{24}$$

where $\rho \equiv -\log\beta$. The monetary policy rule yields

$$i_t = \rho + \phi_\pi\pi_t + \epsilon_t^{\text{mp}}. \tag{25}$$

Our main result is that, in this model, hours worked and output are determined independently of the degree of monopsony power (as captured by the parameter δ).

Proposition 1 (Irrelevance of monopsony for allocative equilibrium dynamics)**.** *Fix the exogenous processes* $\{\hat{a}_t, \epsilon_t^{\text{mp}}\}_{t\geq 0}$ *and policy parameters. Consider an equilibrium path for* $(\pi_t^{\text{all}}, \hat{\omega}_t^{\text{all}}, \pi_t, \hat{y}_t, \hat{n}_t, i_t)$ *satisfying Equations* (20)–(25)*. Then the equilibrium dynamics of these variables are independent of the monopsony parameter* δ*.*

Proof. The closed system (20)–(25) contains no occurrence of δ. Therefore, any equilibrium (and, under standard determinacy conditions, the unique equilibrium) for $(\pi_t^{\text{all}}, \hat{\omega}_t^{\text{all}}, \pi_t, \hat{y}_t, \hat{n}_t, i_t)$ is invariant to δ. □

The result is a direct implication of allowing the contract to separate the extensive-margin allocation of workers to firms from the intensive-margin allocation of hours worked within a match, as seen in the decision problems given by Equation (8) and Equation (9). Surplus maximization entails a marginal-wage schedule that aligns with the worker's MRS, independent of the degree of monopsony.

Monopsony does, however, matter for the dynamics of labor compensation. A higher degree of monopsony implies that the base pay of workers is lower, while the variable-pay component, which depends on hours worked, is unaffected. In Supplemental Appendix A.2 we derive the equilibrium dynamics of labor compensation. Varying market power changes the relative importance of base pay versus variable pay, and it changes the dynamics of base pay.

The results in this section can be generalized along several dimensions. For example, sticky prices in a retail goods sector can be added without affecting the irrelevance result. As long as monetary policy in Equation (13) does not put explicit weight on labor compensation (with dynamics that depend on market power), the irrelevance result is unaffected. Similarly, the consumption dynamics given by Equation (1) can include habits as in Fuhrer (2000) or other features. Finally, the market-clearing condition in Equation (11) could be replaced by a small open economy extension as in Galí and Monacelli (2005).

3 Analysis

To understand when and how labor market power matters for aggregate dynamics, we compare four versions of our model: (I) our baseline model; (II) our model with the contract restricted to a flat hourly wage; (III) our model with worker rather than firm market power; and (IV) our model in which the worker rather than the firm has the right to manage hours.[4]

[4]In a different setting, Jarosch, Pilossoph and Swaminathan (2026) study flat-wage contracts, varying the bargaining strength of workers and firms. Our Model II and the flat-wage version of Model III are dynamic counterparts of their static model framework.

3.1 Four versions of the labor market

The four versions differ along three dimensions. First, who has market power when contract terms are set: the firm, as in Models I, II, and IV, or the worker, as in Model III. Second, how restricted the contracts are, that is, whether a single price has to allocate both workers across employers and hours within the match. Third, who has the right to manage hours ex post: the firm, in which case hours are demand-determined, or the worker, in which case hours are supply-determined.

With a flat hourly wage, Model III is isomorphic to the standard New Keynesian model with rigid wages and worker market power of EHL, and Model IV is isomorphic to the New Keynesian model with rigid wages and firm market power of Dennery (2020). All versions share the household, technology, nominal friction, policy rule, and shocks of Section 2. In terms of equilibrium dynamics of hours worked and inflation, the models differ only in their wage Phillips curve and wage-accounting equation.

The Supplemental Appendix contains full specifications and derivations. For any variable x_t, $\Delta x_t \equiv x_t - x_{t-1}$.

(I) Firm market power with demand-determined hours (baseline). The aggregate dynamics of our baseline model are given by Equations (20)–(25). They reduce to the following wage Phillips curve and wage-accounting equation:

$$\pi_t^{\text{all}} = \beta \pi_{t+1}^{\text{all}} + \gamma \frac{1+\psi}{1-\alpha}(\hat{y}_t - \hat{a}_t), \tag{NKWPC I}$$

$$\pi_t = \pi_t^{\text{all}} + \frac{\psi+\alpha}{1-\alpha}\Delta\hat{y}_t - \frac{1+\psi}{1-\alpha}\Delta\hat{a}_t. \tag{WA I}$$

The wage Phillips curve describes the dynamics of allocative marginal-wage inflation, π_t^{all}, and the wage-accounting equation maps it into price inflation. The key observation is that the firm market power parameter δ affects neither the slope of the wage Phillips curve nor, therefore, the dynamics of output and inflation.

(II) Firm market power with flat-wage contracts and demand-determined hours. Consider the same model as our baseline, with $\alpha > 0$, but with the contract restricted to a flat hourly wage with no base pay, $W_t(N) = W_t^* N$.[5] A single price now serves two purposes. When a firm resets the wage, it trades off attracting more hires, through a higher value of the job to the worker, against fewer hours worked per worker, since a higher hourly wage also lowers hours within the match. The equilibrium of the flat-wage model reduces to

$$\pi_t^w = \beta \pi_{t+1}^w + \gamma^{\text{II}} \frac{1+\psi}{1-\alpha}(\hat{y}_t - \hat{a}_t), \tag{NKWPC II}$$

$$\pi_t = \pi_t^w + \frac{\alpha}{1-\alpha}\Delta\hat{y}_t - \frac{1}{1-\alpha}\Delta\hat{a}_t, \tag{WA II}$$

[5] With a flat wage, equilibrium necessitates downward-sloping labor demand, which is why we require $\alpha > 0$.

where $\gamma^{\text{II}} \equiv \gamma \frac{\alpha(1-\alpha+\delta)}{(\psi+\alpha)(1-\alpha)+\delta(1+\psi)}$. Here π_t^w denotes hourly-wage inflation.

This wage Phillips curve and the accompanying wage-accounting equation have exactly the same form as in the canonical EHL model of wage rigidity used in the applied New Keynesian literature, despite coming from a model with monopsony in the labor market. The models are isomorphic if the elasticity of substitution between varieties of labor in the EHL model is set to $\varepsilon_w = \frac{\psi(1-\alpha)+\delta(1+\psi-\alpha)}{\psi\alpha(1-\alpha+\delta)}$. Model II thus provides an alternative microfoundation for the EHL model, in a framework characterized by the empirically relevant feature of monopsony rather than monopoly in the labor market. Greater firm market power δ flattens the wage Phillips curve.

(III) Worker market power with demand-determined hours. Consider the same model as our baseline, but with firms, instead of workers, drawing idiosyncratic taste shocks over workers, which gives workers market power over firms. The contract space is unchanged, and the firm still has the right to manage hours ex post. The contracting problem separates exactly as in the baseline. Model III therefore has the same wage Phillips curve, with $\gamma^{\text{III}} = \gamma$, and wage-accounting equation as the baseline, Equations (NKWPC I) and (WA I). Changes in worker market power move only base pay and leave the dynamics of output, hours, and inflation unaffected.

In the more restrictive case of flat-wage contracts (with $\alpha > 0$), the equilibrium reduces to Equations (NKWPC II) and (WA II), with γ^{II} replaced by $\gamma^{\text{III}'}$ given by

$$\gamma^{\text{III}'} \equiv \gamma \frac{\alpha}{\psi+\alpha}\left(1 + \frac{\alpha(1-\alpha)\delta}{\alpha^2(1-\alpha)+(1+\psi)\delta(\alpha+\delta)}\right),$$

which depends on worker market power non-monotonically through δ. This wage Phillips curve and the accompanying wage-accounting equation have exactly the same form as in the canonical EHL model of wage rigidity used in the applied New Keynesian literature, although the EHL model generates market power through a CES aggregator rather than through Type I Extreme Value taste shocks. The two are isomorphic if the elasticity of substitution in the EHL model is set to $\varepsilon_w = \frac{1}{\alpha} - \frac{(1-\alpha)(\psi+\alpha)\,\delta}{\psi[\alpha^2(1-\alpha)+\alpha(2+\psi-\alpha)\delta+(1+\psi)\delta^2]}$, provided this ε_w exceeds one.

(IV) Firm market power with supply-determined hours. Finally, consider the baseline model, but assume that workers, instead of firms, have the right to manage hours following a shock. To keep the setup symmetric with the baseline, idiosyncratic shocks hit the worker's disutility of work, rather than the firm's productivity, and are observed by the worker when choosing hours. Again, the contracting problem separates, so that δ affects only base pay. Whereas the marginal pay in the optimal contract in Model I is given by the marginal disutility of work, in Model IV the optimal contract instead traces out the marginal product of labor so marginal pay is decreasing in hours supplied for $\alpha > 0$.

The equilibrium reduces to

$$\pi_t^{\text{all}} = \beta\pi_{t+1}^{\text{all}} - \gamma\frac{1+\psi}{1-\alpha}(\hat{y}_t - \hat{a}_t), \tag{NKWPC IV}$$

$$\pi_t = \pi_t^{\text{all}} - \frac{1+\psi}{1-\alpha}\Delta\hat{y}_t + \frac{\psi+\alpha}{1-\alpha}\Delta\hat{a}_t. \tag{WA IV}$$

The wage Phillips curve is the exact mirror image of the one in our baseline: it has the same slope, $\gamma^{\text{IV}} = \gamma$, but the opposite sign. In the more restrictive case of flat-wage contracts, the equilibrium reduces to

$$\pi_t^w = \beta\pi_{t+1}^w - \gamma^{\text{IV}'}\frac{1+\psi}{1-\alpha}(\hat{y}_t - \hat{a}_t), \tag{NKWPC IV$'$}$$

$$\pi_t = \pi_t^w - \frac{1+\psi-\alpha}{1-\alpha}\Delta\hat{y}_t + \frac{\psi}{1-\alpha}\Delta\hat{a}_t, \tag{WA IV$'$}$$

where

$$\gamma^{\text{IV}'} \equiv \gamma\psi\,\frac{(1+\psi)\text{LS}^2 - 2(1-\alpha)\text{LS} + (1-\alpha)}{(1+\psi)^2\text{LS}^2 - (1-\alpha)(2+3\psi+\alpha)\text{LS} + (1+\psi)(1-\alpha)},$$

which depends non-monotonically on firm market power through the steady-state labor share LS, which is decreasing in δ.

This wage Phillips curve and the accompanying wage-accounting equation have exactly the same form as in Dennery (2020).[6] Dennery (2020) introduces a monopsony counterpart of EHL, with firm market power and supply-determined hours worked, and in which market power stems from workers' CES love-for-variety preferences. Variants of this setup with flat wages and supply-determined hours are considered by Alpanda and Zubairy (2021), Kurozumi and Van Zandweghe (2026), Kurozumi et al. (2025), Bardóczy et al. (2026), and Bredemeier et al. (2026); we return to the latter two in Subsection 3.3.

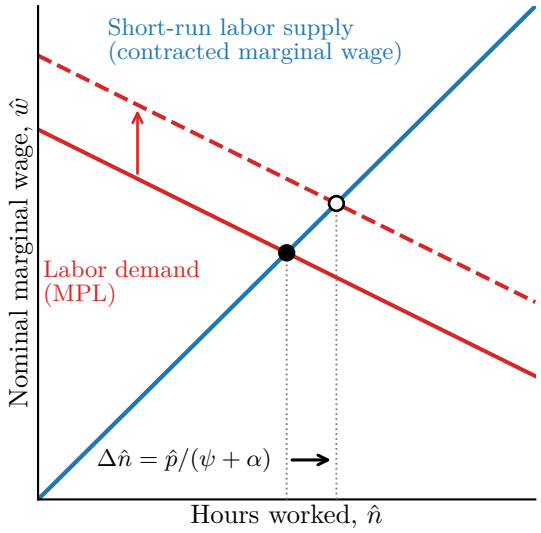
3.2 When and how does market power matter?

To understand why the aggregate wage Phillips curves differ across the four models, Figure 1 displays the log-linear equilibrium of each labor market under full rigidity, $\theta \to 1$, and shows how that equilibrium shifts after an increase in the price level, holding $\hat{\lambda}_t = \hat{a}_t = 0$ fixed. In nominal terms, labor demand is $\hat{w}_t = \hat{p}_t + \hat{a}_t - \alpha\hat{n}_t$ and the household's marginal rate of substitution is $\hat{w}_t = \hat{p}_t + \psi\hat{n}_t - \hat{\lambda}_t$, where $\hat{w}_t$ denotes the log deviation of the *marginal* wage relative to steady state.

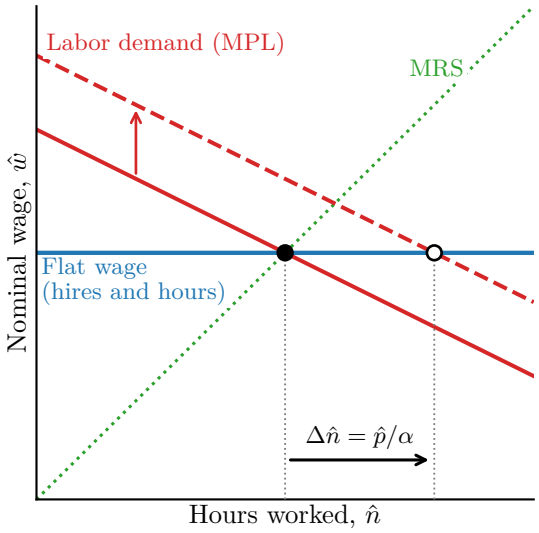
Starting with our model, the contract places no restriction on how wage payments depend on hours. As a result, firms offer constrained-efficient contracts, with a nominal marginal-wage schedule that slopes up with the worker's marginal disutility of work. This schedule is the short-

[6] For $\alpha > 0$, the flat-wage version of Model IV and Dennery (2020)'s model are isomorphic when the slope $\gamma/(1+\alpha\varepsilon_f)$ in the Dennery model equals $\gamma^{\text{IV}'}$, where ε_f is the love-for-variety elasticity of substitution between working for different employers, provided the implied ε_f is positive.

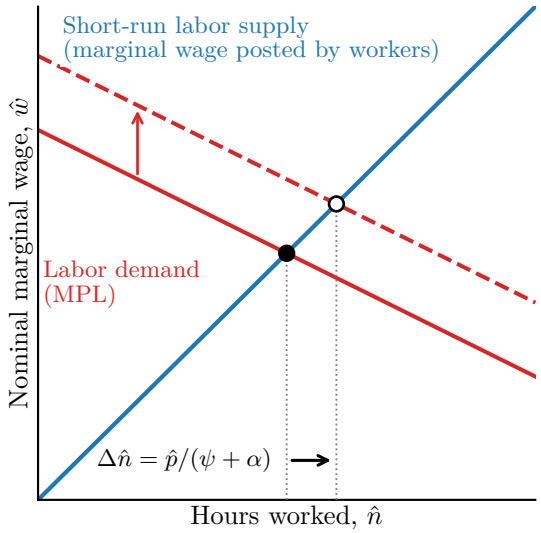
Figure 1: The labor market under full rigidity: response to a price-level shock.



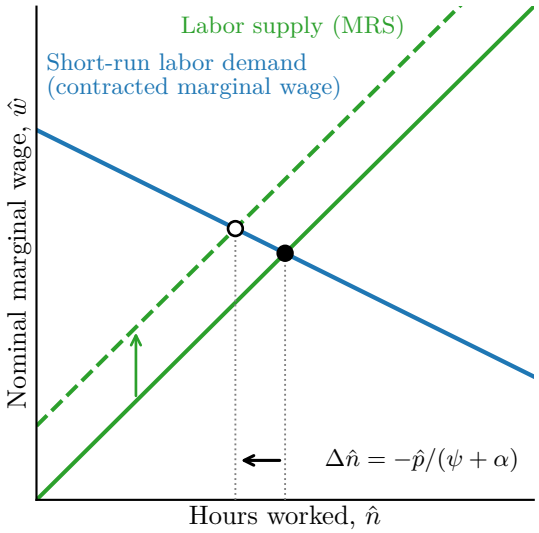
(I) Firm market power with unrestricted contracts and demand-determined hours (baseline).



(II) Firm market power with flat-wage contracts and demand-determined hours.



(III) Worker market power with unrestricted contracts and demand-determined hours.



(IV) Firm market power with unrestricted contracts and supply-determined hours.

run labor-supply curve with slope ψ, and it is fixed for the duration of the contract. Labor demand slopes down, with slope $-\alpha$. A surprise increase in the price level lowers the real marginal wage and therefore shifts nominal labor demand up. Because the contract is rigid, the supply curve does not move, and by Equation (15) hours rise by $\hat{n}_t = \hat{p}_t/(\psi + \alpha)$. Hours worked and the price level are therefore positively correlated, consistent with Equation (NKWPC I).

Comparing the baseline model with the flat-wage model, Panels I and II, isolates the role of the

contract terms. In the baseline model, there are two prices for two allocative margins: the level of base pay allocates workers to firms, and the marginal wage allocates hours within the match. In the flat-wage model, a single price, the hourly wage, serves both purposes. As a consequence, the dynamics of hours worked now depend on the degree of firm market power. Moreover, the allocative price of hours, the hourly wage, is now decoupled from the worker's marginal rate of substitution, and the labor-supply curve in Panel II is a flat line. Hours therefore respond more strongly to a positive price-level shock.

Comparing Panels I and III isolates the effect of changing who has market power. With unrestricted contracts and firm-managed hours, the labor market looks the same whether the contract is posted by the firm or by the worker: Models I and III have the same marginal-wage schedule, i.e., short-run labor-supply curve, and the firm chooses hours along its labor-demand curve. Market power, whoever holds it, determines only the division of the match surplus, and is inconsequential for hours worked and inflation. Only with a flat wage does market power matter for allocations. The flat-wage version of Model III then looks like Panel II.

Finally, comparing Panels I and IV isolates who has the right to manage hours. In Model IV, the contracted marginal-wage schedule tracks the firm's marginal product of labor and is fixed for the duration of the contract, so it is the short-run labor-demand curve. A surprise increase in the price level lowers the real marginal wage and therefore shifts the worker's nominal marginal rate of substitution up. The worker chooses fewer hours, $\hat{n}_t = -\hat{p}_t/(\psi + \alpha)$, and the firm must accept those hours. The allocation is "inverted": hours fall by exactly as much as they rise in our baseline, and the wage Phillips curve (NKWPC IV) has the same slope as Equation (NKWPC I) but the opposite sign. With a flat wage, as in Dennery (2020), hours fall by $\hat{p}_t/\psi$ instead.

With rigid wages, the sign of the wage Phillips curve depends not on the allocation of market power when contract terms are set, but on who has the right to manage hours ex post. If the firm does, hours are demand-determined, real wages and hours are negatively correlated, and the wage Phillips curve has the standard sign. If workers do, hours are supply-determined, real wages and hours are positively correlated, and the wage Phillips curve is flipped. With unrestricted contracts, market power is irrelevant for allocations, whether it is held by firms or by workers, and regardless of who manages hours. Market power influences the slope of the wage Phillips curve only when the contract terms are restricted so that they cannot provide two separate allocative prices. In that case, the markdown or markup determines both how workers are allocated to firms and how hours respond to shocks within the match.

3.3 Implications for the literature

By decoupling market power from supply- or demand-determined hours, our results help interpret several findings in the literature on the role of market power for aggregate dynamics.

First, Dennery (2020) points out that the inverted EHL setup flips the slope of the Phillips curve, so that interest-rate cuts are contractionary and monetary tightening raises output. Den-

nery's insights follow directly from comparing the wage Phillips curves of Models I and IV, Equations (NKWPC I) and (NKWPC IV), which differ only in who has the right to manage hours: with supply-determined hours, the wage Phillips curve has the "wrong" sign, and inflation and hours are, in general, negatively correlated in response to demand shocks. As Model IV shows, this is a consequence not of firms, rather than workers, having market power at the contracting stage, but of workers, rather than firms, having the right to manage hours ex post.

Second, Bardóczy et al. (2026) use a firm monopsony model following the setup of Berger, Herkenhoff and Mongey (2022), with rigid wage setting as in Dennery (2020). They also assume rigid prices, which they calibrate to be more rigid than wages, so that interest-rate cuts are still expansionary. Their key prediction is that firms with more monopsony power pass less of a monetary expansion through to nominal wages, and this partial pass-through dampens the response of employment and output. In Model IV, where workers manage hours but contracts are unrestricted, monopsony power is irrelevant for the response of hours and output. In Model II, where firms manage hours and contracts are restricted to a flat wage, market power matters for allocations, but the effect goes the other way: a fall in monopsony power implies a *steeper* wage Phillips curve and a smaller response of output to monetary policy. The result of Bardóczy et al. (2026) thus relies on coupling firm market power with supply-determined hours and flat-wage contracts.

Third, Bredemeier et al. (2026) embed the same logit employer-choice structure as ours into a New Keynesian model with flat wages and supply-determined hours to study fiscal policy. In response to government spending, a higher marginal utility of consumption makes workers more sensitive to pay relative to non-wage job amenities, employer market power falls, wages rise, and workers supply more hours, amplifying the fiscal multiplier. When they add nominal wage rigidity, they find that sticky wages dampen fiscal expansions in contrast with EHL and attribute the difference to firm wage setting. Both results rely on coupling firm market power with supply-determined hours and flat-wage contracts. In Model I with government spending, a fiscal expansion reduces firm rents and raises base pay, but the allocative marginal wage—and hence hours and output—is unaffected by monopsony power, as in Proposition 1. In Model II, where firms manage hours under flat wages, falling monopsony power pushes hourly wages up and therefore *reduces* hours demanded, reversing the countercyclical-monopsony channel from amplification to dampening. Further, with demand-determined hours, nominal wage rigidity amplifies rather than dampens fiscal expansions, just as in EHL.

Finally, because measured compensation in our model includes non-allocative components, average wages are not the allocative price of labor, and fluctuations in market power move measured wages without moving allocations. An econometrician estimating an EHL model on such data would attribute these movements to measurement error in wages, whereas from the perspective of our model they may also reflect shocks to market power. The distinction matters: Justiniano et al. (2013) show that whether monetary policy faces a meaningful trade-off between stabilizing inflation and output hinges on whether exogenous movements in workers' market power are a major driver of fluctuations. Similarly, labor-wedge decompositions that use average compensation to measure

the price of labor, and thereby assume that wages are allocative (Galí, Gertler and López-Salido, 2007), will include non-allocative movements in base pay.

4 Conclusions

The interaction between firm market power and labor market dynamics has attracted renewed interest. Recent approaches posit that firms derive power from workers' preference for employer variety, while hours worked are freely chosen by workers. We propose an alternative way to incorporate monopsony power into a New Keynesian model. Wage contracts separate the value of a job, which allocates workers across firms, from the marginal-wage schedule, which allocates hours within a match. This separation delivers a monopsony model that is consistent with both wage rigidity and demand-determined hours. Because of demand-determined hours, and in contrast to the recent business-cycle monopsony literature, the model addresses both the Broer et al. (2020) and Auclert et al. (2023) critiques of business-cycle frameworks with flexible labor supply.

The model yields two main lessons. First, monopsony power is irrelevant for the allocative dynamics of output, hours, and inflation in our baseline economy. What matters for those dynamics is the allocative marginal-wage schedule, not the average wage paid to workers. Second, monopsony power matters for compensation. By changing the division of match surplus and the composition of wage payments between base pay and variable pay, firm market power shapes the dynamics of measured real wages, the labor share, and the profit share. In the representative-household environment studied here, these compensation effects do not feed back into aggregate demand. With incomplete markets, however, shifts in the labor share and the distribution of income can affect aggregate demand. Our model thus points to a channel through which firm market power shapes monetary transmission via redistribution rather than via the allocative wage Phillips curve. Exploring this in a HANK model is a promising avenue for future research.

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Supplemental appendix

Section A.1 collects conventions and one aggregation result that are used throughout. Section A.2 completes the analysis of the baseline model, Model I: it derives the reduced form reported in Section 3 and the dynamics of measured compensation. Section A.3 treats Models III and IV, in which contracts remain unrestricted, and states the general irrelevance result. Sections A.4 and A.5 treat flat-wage contracts with demand-determined hours (Model II, the flat-wage version of Model III, and EHL) and with supply-determined hours (the flat-wage version of Model IV and Dennery 2020).

A.1 Preliminaries

Conventions. All models share the household, technology, Calvo separation, and policy rule of Section 2, and are log-linearized around the same kind of steady state, with the notation of Subsection 2.4. The coefficient $\gamma \equiv (1-\theta)(1-\beta\theta)/\theta$ is defined in Equation (18). Since $\lambda_t = 1/C_t$ and $C_t = Y_t$, we have $\lambda_t Y_t = 1$.

In every model, $\hat{\lambda}_t = -\hat{y}_t$ and $\hat{y}_t = \hat{a}_t + (1-\alpha)\hat{n}_t$, so that

$$\hat{\lambda}_t + \hat{a}_t = -(\hat{y}_t - \hat{a}_t), \qquad \hat{n}_t = \frac{\hat{y}_t - \hat{a}_t}{1-\alpha}. \tag{A.1}$$

We refer to the dynamic IS curve and the policy rule, the last two equations of the system (20)–(25), as the demand block. It is common to all models, so each model is summarized by its wage Phillips curve and its wage-accounting equation.

Calvo aggregation. All wage Phillips curves below follow from the same step. Let $\hat{x}_t^*$ be a nominal contract term set at t and fixed until separation, and let $\hat{x}_t \equiv (1-\theta)\sum_{s=0}^{\infty}\theta^s \hat{x}_{t-s}^*$ be its average across vintages. Suppose that

$$\hat{x}_t^* = (1-\beta\theta)\sum_{s=0}^{\infty}(\beta\theta)^s\left(\hat{p}_{t+s} + \hat{z}_{t+s}\right) \tag{A.2}$$

for some real target $\hat{z}_t$. Then $\pi_t^x \equiv \hat{x}_t - \hat{x}_{t-1}$ satisfies

$$\pi_t^x = \beta\pi_{t+1}^x + \gamma\left(\hat{z}_t - (\hat{x}_t - \hat{p}_t)\right). \tag{A.3}$$

To see this, write (A.2) as $\hat{x}_t^* = (1-\beta\theta)(\hat{p}_t + \hat{z}_t) + \beta\theta\hat{x}_{t+1}^*$, substitute $(1-\theta)\hat{x}_t^* = \hat{x}_t - \theta\hat{x}_{t-1} = \theta\pi_t^x + (1-\theta)\hat{x}_t$ at t and $t+1$, and collect terms. In the baseline, $\hat{x}_t^* = \hat{\xi}_t$ and $\hat{z}_t = -\hat{\lambda}_t$, which gives Equation (18).

A.2 The baseline model, Model I

Reduced form. We derive Equations (NKWPC I) and (WA I) from the system (20)–(25). By labor demand, Equation (17), and (A.1),

$$\hat{\omega}_t^{\text{all}} = \hat{a}_t - \frac{\psi + \alpha}{1 - \alpha}(\hat{y}_t - \hat{a}_t), \tag{A.4}$$

so that $\hat{\omega}_t^{\text{all}} - \hat{y}_t = -\frac{1+\psi}{1-\alpha}(\hat{y}_t - \hat{a}_t)$. Substituting into Equation (20) gives the wage Phillips curve (NKWPC I). First-differencing (A.4) and using the accounting identity (19), $\Delta\hat{\omega}_t^{\text{all}} = \pi_t^{\text{all}} - \pi_t$, gives the wage-accounting equation (WA I).

Measured compensation: steady state. The allocative equilibrium is independent of δ, but compensation is not. Integrating the optimal marginal schedule of Subsection 2.4, the vintage-t contract is

$$W_t(N) = W_t^0 + \exp(\hat{\xi}_t)\frac{\bar{P}}{\bar{\lambda}}v(N), \tag{A.5}$$

the sum of base pay $W_t^0 \equiv W_t(0)$ and variable pay. In steady state, hours are efficient for every realization of idiosyncratic productivity, $v'(\bar{N}_j)\bar{N}_j = (1-\alpha)\bar{\lambda}\bar{A}A_j\bar{N}_j^{1-\alpha}$. Taking expectations and using $\bar{\lambda}\bar{Y} = 1$ and $v'(N)N = (1+\psi)v(N)$ gives $\mathbb{E}[v(\bar{N}_j)] = \frac{1-\alpha}{1+\psi}$. Real variable pay is $v(\bar{N}_j)/\bar{\lambda}$, so variable pay is a share $\frac{1-\alpha}{1+\psi}$ of output, and it exactly compensates the worker for the disutility of work. By Equation (3), the worker's value is therefore the present value of base pay, $(1-\beta\theta)\bar{V} = \bar{\lambda}\bar{W}^0/\bar{P}$, and by Equation (7), $(1-\beta\theta)\bar{S} = 1 - \frac{1-\alpha}{1+\psi} = \frac{\psi+\alpha}{1+\psi}$. Since $\bar{V} = \bar{S} - \frac{\delta}{1-\beta\theta}$ by Equation (10), base pay is a share

$$b \equiv \frac{\psi + \alpha}{1 + \psi} - \delta \tag{A.6}$$

of output, which we assume to be positive when we log-linearize. Output is thus divided into

$$1 = \underbrace{\delta}_{\text{profits}} + \underbrace{\frac{\psi + \alpha}{1 + \psi} - \delta}_{\text{base pay}} + \underbrace{\frac{1 - \alpha}{1 + \psi}}_{\text{variable pay}}.$$

For given technology and preferences, more market power lowers the labor share, $1 - \delta$, one for one by reducing base pay. Decreasing returns, $\alpha > 0$, do not by themselves generate profits: the inframarginal rents they create accrue to the worker through base pay.

Measured compensation: dynamics. Consider first base pay. Because hours are efficient in steady state, changes in hours have no first-order effect on the surplus (7), so that, to first order, $S_t - \bar{S} = \sum_{s=0}^{\infty}(\beta\theta)^s(\hat{\lambda}_{t+s} + \hat{a}_{t+s})$, and $V_t - \bar{V} = S_t - \bar{S}$ by Equation (10). Inserting the contract

(A.5) into Equation (3),

$$V_t = \sum_{s=0}^{\infty} (\beta\theta)^s \mathbb{E}_t \left[\lambda_{t+s} \frac{W_t^0}{P_{t+s}} + \left(\exp(\hat{\xi}_t) \frac{\bar{P}}{\bar{\lambda}} \frac{\lambda_{t+s}}{P_{t+s}} - 1 \right) v(N_{j,t+s|t}) \right].$$

The term in parentheses is of first order and equals $\hat{\xi}_t + \hat{\lambda}_{t+s} - \hat{p}_{t+s}$, whose discounted sum is zero by the definition of $\hat{\xi}_t$. With $\hat{w}_t^0 \equiv \log(W_t^0/\bar{W}^0)$, therefore, $V_t - \bar{V} = \frac{b}{1-\beta\theta}(\hat{w}_t^0 - \hat{\xi}_t)$ to first order. Equating the two expressions for $V_t - \bar{V}$,

$$\hat{w}_t^0 = \hat{\xi}_t + \frac{1-\beta\theta}{b} \sum_{s=0}^{\infty} (\beta\theta)^s \left(\hat{\lambda}_{t+s} + \hat{a}_{t+s} \right) = (1-\beta\theta) \sum_{s=0}^{\infty} (\beta\theta)^s \left(\hat{p}_{t+s} - \hat{\lambda}_{t+s} + \frac{\hat{\lambda}_{t+s} + \hat{a}_{t+s}}{b} \right). \tag{A.7}$$

Base pay moves with the marginal-wage shifter and, in addition, absorbs all changes in the match surplus, since the firm's share of the surplus is the constant $\delta/(1-\beta\theta)$. The second effect is scaled by $1/b$: the more market power, the smaller is base pay, and the larger are its percentage fluctuations.

Equation (A.7) is of the form (A.2) with real target $\hat{z}_t = (\hat{\lambda}_t + \hat{a}_t)/b - \hat{\lambda}_t$. Base pay is a nominal contract term, so its real value in a contract signed at $t-s$ is eroded by inflation between $t-s$ and t. Let $\hat{w}_t^{\text{base}} \equiv (1-\theta)\sum_{s=0}^{\infty} \theta^s \hat{w}_{t-s}^0$ denote average nominal base pay across contract vintages, $\pi_t^{\text{base}} \equiv \hat{w}_t^{\text{base}} - \hat{w}_{t-1}^{\text{base}}$ base-pay inflation, and $\hat{\omega}_t^{\text{base}} \equiv \hat{w}_t^{\text{base}} - \hat{p}_t$ average real base pay. By (A.3), with $\hat{x}_t^* = \hat{w}_t^0$ and $\hat{x}_t = \hat{w}_t^{\text{base}}$,

$$\pi_t^{\text{base}} = \beta \pi_{t+1}^{\text{base}} + \gamma \left(\frac{\hat{\lambda}_t + \hat{a}_t}{b} - \hat{\lambda}_t - \hat{\omega}_t^{\text{base}} \right), \qquad \hat{\omega}_t^{\text{base}} = \hat{\omega}_{t-1}^{\text{base}} + \pi_t^{\text{base}} - \pi_t. \tag{A.8}$$

Apart from the surplus term $(\hat{\lambda}_t + \hat{a}_t)/b$, this is the Phillips curve of the allocative wage, Equation (18).

Consider next variable pay. By Equation (A.5), nominal variable pay in period t under a vintage-$(t-s)$ contract is, in log deviations, $\hat{\xi}_{t-s} + (1+\psi)\hat{n}_{t|t-s}$, where $\hat{\xi}_{t-s} - \hat{p}_t = \hat{a}_t - (\psi+\alpha)\hat{n}_{t|t-s}$ by Equation (15). Real variable pay is therefore $\hat{a}_t + (1-\alpha)\hat{n}_{t|t-s}$, the log deviation of output per worker in that vintage. Averaging across vintages, real variable pay per worker equals output in log deviations,

$$\hat{\omega}_t^{\text{var}} = \hat{y}_t. \tag{A.9}$$

Given the schedule (A.5), this proportionality holds match by match and nonlinearly in $A_{j,t}$: since $v'(N)N = (1+\psi)v(N)$, (A.5) and the ex-post condition (6) imply that variable pay is the share $\frac{1-\alpha}{1+\psi}$ of match output in every period. Finally, total compensation is a share $1-\delta$ of output in steady state, of which variable pay accounts for a fraction $\frac{1-\alpha}{(1+\psi)(1-\delta)}$. This gives the following result.

Proposition A.1 (Computing measured compensation)**.** *Suppose $\delta < \frac{\psi+\alpha}{1+\psi}$, and let $\hat{\omega}_t^{\text{tot}}$ denote the log deviation of real total labor compensation per worker. Given an equilibrium path of the*

allocative system (20)–(25)*, measured compensation is given by*

$$\begin{aligned}
\hat{\omega}_t^{\text{tot}} &= \left(1 - \frac{1-\alpha}{(1+\psi)(1-\delta)}\right)\hat{\omega}_t^{\text{base}} + \frac{1-\alpha}{(1+\psi)(1-\delta)}\hat{\omega}_t^{\text{var}}, \\
\pi_t^{\text{base}} &= \beta\pi_{t+1}^{\text{base}} + \gamma\left(\hat{y}_t - \frac{(1+\psi)(\hat{y}_t - \hat{a}_t)}{\psi + \alpha - (1+\psi)\delta} - \hat{\omega}_t^{\text{base}}\right), \\
\hat{\omega}_t^{\text{base}} &= \hat{\omega}_{t-1}^{\text{base}} + \pi_t^{\text{base}} - \pi_t, \\
\hat{\omega}_t^{\text{var}} &= \hat{y}_t.
\end{aligned}$$

Proof. The first equation weights the two components by their steady-state shares in total compensation. The second and third are Equation (A.8), with b substituted from (A.6) and $\hat{\lambda}_t = -\hat{y}_t$ from (A.1), and the fourth is Equation (A.9). □

Measured hourly wage. Since the measure of workers is one, the real hourly wage is, in log deviations, $\hat{\omega}_t^h \equiv \hat{\omega}_t^{\text{tot}} - \hat{n}_t$. Subtracting $\hat{n}_t$ from both components in the first equation of Proposition A.1, whose weights sum to one, splits the hourly wage into base pay per hour, $\hat{\omega}_t^{\text{base}} - \hat{n}_t$, and variable pay per hour, $\hat{y}_t - \hat{n}_t = \hat{a}_t - \alpha\hat{n}_t$. By Equation (A.9), variable pay per hour equals output per hour in log deviations, which with Cobb–Douglas production moves with the marginal product of labor. Base pay is paid per worker and does not scale with hours, so base pay per hour falls one for one with hours.

Proposition A.2 (Computing the measured hourly wage)**.** *Suppose* $\delta < \frac{\psi+\alpha}{1+\psi}$*, and let* $\hat{\omega}_t^h \equiv \hat{\omega}_t^{\text{tot}} - \hat{n}_t$ *denote the log deviation of the real hourly wage, total labor compensation divided by hours worked. Given an equilibrium path of the allocative system* (20)–(25)*,*

$$\hat{\omega}_t^h = \left(1 - \frac{1-\alpha}{(1+\psi)(1-\delta)}\right)\left(\hat{\omega}_t^{\text{base}} - \hat{n}_t\right) + \frac{1-\alpha}{(1+\psi)(1-\delta)}\left(\hat{a}_t - \alpha\hat{n}_t\right),$$

where $\hat{\omega}_t^{\text{base}}$ *is given by Proposition A.1.*

Proof. Subtract $\hat{n}_t$ from the first equation of Proposition A.1, and use $\hat{\omega}_t^{\text{var}} = \hat{y}_t = \hat{a}_t + (1-\alpha)\hat{n}_t$ by Equation (A.9) and Equation (A.1). □

A.3 Unrestricted contracts: Models III and IV

Models III and IV each change one feature of the baseline, who has market power and who manages hours, respectively, and leave the contract space unrestricted. In both, the contracting problem separates as in the baseline.

Model III: worker market power. The roles of workers and firms at the contracting stage are reversed. Workers belong to a continuum of types $i \in [0,1]$, each of mass greater than one, so that unions always have unmatched members. Each type is represented by a union that posts vintage contracts $W_{i,t}(\cdot)$ on behalf of its members, whose utility when unmatched is normalized to zero.

There is a unit mass of jobs, and each job is separated from its worker with probability $1-\theta$ each period. A vacated job j draws taste shocks $\{\varepsilon_{ji,t}\}_{i\in[0,1]}$ over worker types, i.i.d. Type I Extreme Value with dispersion δ, in utility units of the household that owns the firms. The realized shock is fixed for the duration of the match. Production, idiosyncratic productivity, and the firm's right to manage hours are as in the baseline, so hours under a vintage-t contract satisfy Equation (6). The firm's value of a vintage-t match with a worker of type i is

$$J_{i,t} \equiv \sum_{s=0}^{\infty} (\beta\theta)^s \, \mathbb{E}_t \left[\lambda_{t+s} \left(A_{t+s} A_{j,t+s} N_{ji,t+s|t}^{1-\alpha} - \frac{W_{i,t}(N_{ji,t+s|t})}{P_{t+s}} \right) \right],$$

and the worker's value $V_{i,t}$ is defined as in Equation (3). The logit structure implies that type i attracts

$$L_{i,t} = (1-\theta) \frac{\exp\big((1-\beta\theta) J_{i,t}/\delta\big)}{\int_0^1 \exp\big((1-\beta\theta) J_{k,t}/\delta\big)\, dk} \tag{A.10}$$

new matches. The union chooses its contract to maximize the total value to its members, $L_{i,t} V_{i,t}$.

Since $V_{i,t} = S_{i,t} - J_{i,t}$, with $S_{i,t}$ defined as in Equation (7), the union maximizes $L_{i,t}(S_{i,t} - J_{i,t})$ subject to (A.10) and (6). As in the baseline, the surplus $S_{i,t}$ depends on the contract only through the marginal schedule $W'_{i,t}(\cdot)$, while base pay $W_{i,t}(0)$ shifts $J_{i,t}$ one for one. The problem therefore separates. First, $W'_{i,t}(\cdot)$ maximizes $S_{i,t}$ subject to (6). This is the intensive-margin problem (8) of the baseline, so the optimal schedule is unchanged, and hence so are Equations (15)–(19). Second, base pay solves $\max_J L(J)(S-J)$, whose first-order condition gives $V_{i,t} = S_{i,t} - J_{i,t} = \delta/(1-\beta\theta)$. The worker receives a constant value $\delta/(1-\beta\theta)$ per match, and the firm receives the rest of the surplus. The equilibrium is therefore given by Equations (20)–(25), and reduces to (NKWPC I) and (WA I).

Model IV: workers manage hours. The baseline is modified in two ways. First, after a match is formed, the worker chooses hours given the contract, and the firm must accept the hours supplied. Under a vintage-t contract, hours satisfy

$$\lambda_{t+s} \frac{W'_{j,t}(N)}{P_{t+s}} = v'_{i,t+s}(N). \tag{A.11}$$

Second, idiosyncratic shocks hit the disutility of work rather than productivity, $v_{i,t}(N) = \zeta_{i,t} v(N)$, where $\zeta_{i,t} > 0$ is i.i.d. across workers and time (with a smooth non-degenerate distribution on $(0,\infty)$ and finite moments), is realized after matching, and is observed by the worker when choosing hours. There are only aggregate productivity shocks, $A_{j,t} = 1$. Contract posting is given by Equation (5), with $S_{j,t}$ defined using $v_{i,t}$ and with the ex-post condition Equation (6) replaced by Equation (A.11).

The worker's choice of hours depends only on the marginal schedule $W'_{j,t}(\cdot)$, so the surplus $S_{j,t}$ depends on the contract only through $W'_{j,t}(\cdot)$, while base pay shifts $V_{j,t}$ one for one. The problem therefore separates as in the baseline: the marginal schedule maximizes $S_{j,t}$ subject to

Equation (A.11), and $V_{j,t} = S_{j,t} - \delta/(1-\beta\theta)$, as in Equation (10).

In a steady state with constant aggregates, the first best requires $(1-\alpha)\bar{\lambda}\bar{A}N^{-\alpha} = v_i'(N)$ for every realization of ζ_i. Given Equation (A.11), this is implemented by $W'(N) = (1-\alpha)\bar{P}\bar{A}N^{-\alpha}$: real marginal pay equals the marginal product of labor, so the worker internalizes the firm's marginal product when choosing hours. This is the mirror image of the baseline, in which $W'(N) = \frac{\bar{P}}{\bar{\lambda}}v'(N)$ makes the firm internalize the worker's disutility of work. Away from the steady state, to first order in aggregate shocks, the optimal schedule shifts proportionally, $W_t'(N) = \exp(\hat{\xi}_t)(1-\alpha)\bar{P}\bar{A}N^{-\alpha}$. Relative to steady state at the same realization of $\zeta_{i,t+s}$, exact log hours of worker i under Equation (A.11) satisfy $\hat{n}_{i,t+s|t} = (\hat{\lambda}_{t+s} + \hat{\xi}_t - \hat{p}_{t+s})/(\psi+\alpha)$, whereas first-best hours satisfy $(\hat{\lambda}_{t+s} + \hat{a}_{t+s})/(\psi+\alpha)$. Neither depends on $\zeta_{i,t+s}$, so vintage hours satisfy $\hat{n}_{t+s|t} = \hat{n}_{i,t+s|t}$, and the gap from the first best is $(\hat{\xi}_t - \hat{p}_{t+s} - \hat{a}_{t+s})/(\psi+\alpha)$. To second order in aggregate shocks, the loss in surplus is proportional to the discounted sum of squared gaps, so that the optimal shifter is

$$\hat{\xi}_t = (1-\beta\theta)\sum_{s=0}^{\infty}(\beta\theta)^s\left(\hat{p}_{t+s} + \hat{a}_{t+s}\right),$$

the average nominal marginal product of labor over the expected duration of the contract. In the baseline, the shifter is instead the average price of consumption utility, $\hat{p}_{t+s} - \hat{\lambda}_{t+s}$.

Define $\hat{w}_t^{\text{all}}$ and $\hat{\omega}_t^{\text{all}}$ as in Equation (16). By Equation (A.3) with $\hat{z}_t = \hat{a}_t$, $\pi_t^{\text{all}} = \beta\pi_{t+1}^{\text{all}} + \gamma(\hat{a}_t - \hat{\omega}_t^{\text{all}})$. Aggregating hours across vintages gives the aggregate labor-supply condition $\hat{\omega}_t^{\text{all}} = (\psi+\alpha)\hat{n}_t - \hat{\lambda}_t$. Hence

$$\pi_t^{\text{all}} = \beta\pi_{t+1}^{\text{all}} + \gamma\left(\hat{a}_t + \hat{\lambda}_t - (\psi+\alpha)\hat{n}_t\right),$$

which is the baseline wage Phillips curve implied by Equations (17) and (18), with the sign of the gap reversed. By Equation (A.1), the gap equals $-\frac{1+\psi}{1-\alpha}(\hat{y}_t - \hat{a}_t)$, which gives Equation (NKWPC IV), and the labor-supply condition reads $\hat{\omega}_t^{\text{all}} = \hat{a}_t + \frac{1+\psi}{1-\alpha}(\hat{y}_t - \hat{a}_t)$. First-differencing and using $\Delta\hat{\omega}_t^{\text{all}} = \pi_t^{\text{all}} - \pi_t$ gives Equation (WA IV).

Irrelevance of market power. In neither model does δ enter the equilibrium system. Together with Proposition 1, this gives the following result.

Proposition A.3 (Irrelevance of market power with unrestricted contracts)**.** *In Models I, III, and IV, the equilibrium dynamics of output, hours, allocative marginal-wage inflation, and price inflation are independent of the market power parameter δ, whether market power is held by firms or by workers, and whether hours are managed by firms or by workers.*

Proof. For Model I, see Proposition 1. For Models III and IV, the reduced systems given by (NKWPC I) and (WA I) and by (NKWPC IV) and (WA IV), together with the demand block, contain no occurrence of δ. □

A.4 Flat-wage contracts with demand-determined hours: Model II, the flat-wage version of Model III, and EHL

We now consider contracts restricted to a flat hourly wage with no base pay, $W_t(N) = W_t^* N$, with $\alpha \in (0,1)$: Model II, where firms post the wage, and the flat-wage version of Model III, where unions do. We then derive EHL and show when the three models coincide. Throughout, we have no idiosyncratic shocks, suppress the index of the wage setter, and write $N_s \equiv N_{t+s|t}$ for hours in period $t+s$ under a wage set at t.[7]

Hours and values within the match. Ex post, Equation (2) becomes

$$(1-\alpha) P_{t+s} A_{t+s} N_s^{-\alpha} = W_t^*, \tag{A.12}$$

so that $\partial \log N_s / \partial \log W_t^* = -1/\alpha$. The real wage bill per worker is $(1-\alpha) A_{t+s} N_s^{1-\alpha}$ and profits per worker are $\alpha A_{t+s} N_s^{1-\alpha}$: the labor share is $1-\alpha$ for any degree of market power. The values of a match to the worker and to the firm are

$$V_t = \sum_{s=0}^{\infty} (\beta\theta)^s \left[(1-\alpha) \lambda_{t+s} A_{t+s} N_s^{1-\alpha} - v(N_s) \right], \qquad J_t = \alpha \sum_{s=0}^{\infty} (\beta\theta)^s \lambda_{t+s} A_{t+s} N_s^{1-\alpha},$$

with derivatives

$$\frac{\partial J_t}{\partial \log W_t^*} = -\frac{1-\alpha}{\alpha} J_t, \qquad \frac{\partial V_t}{\partial \log W_t^*} = \frac{1}{\alpha} \sum_{s=0}^{\infty} (\beta\theta)^s \left[v'(N_s) N_s - (1-\alpha)^2 \lambda_{t+s} A_{t+s} N_s^{1-\alpha} \right]. \tag{A.13}$$

A higher wage lowers hours and therefore the value of the match to the firm, and it changes the value of the job to the worker.

From the reset condition to the Phillips curve. In both models, the first-order condition of the wage setter log-linearizes to

$$\sum_{s=0}^{\infty} (\beta\theta)^s \left[\Gamma^X \hat{n}_{t+s|t} - (1-\alpha)(\hat{\lambda}_{t+s} + \hat{a}_{t+s}) \right] = 0 \tag{A.14}$$

for a coefficient $\Gamma^X > 0$ that depends on the model ($X \in \{\text{II}, \text{III}'\}$) and on market power; we derive it for each model below. Let $\hat{w}_t^* \equiv \log(W_t^*/\bar{W}^*)$ denote the log deviation of the wage set at t. By Equation (A.12), $\hat{n}_{t+s|t} = (\hat{p}_{t+s} + \hat{a}_{t+s} - \hat{w}_t^*)/\alpha$, so Equation (A.14) is of the form in Equation (A.2)

[7] This is without loss of generality. With idiosyncratic productivity as in the baseline, the ex-post condition $(1-\alpha) P_{t+s} A_{t+s} A_{j,t+s} N_{j,s}^{-\alpha} = W_t^*$ gives $N_{j,s} = A_{j,t+s}^{1/\alpha} N_s$, where N_s denotes hours at $A_{j,t+s} = 1$. Output, the wage bill, and profits per worker are then proportional to $A_{j,t+s}^{1/\alpha}$, and disutility is proportional to $A_{j,t+s}^{(1+\psi)/\alpha}$. Since the shock is i.i.d. and realized after matching, only these moments enter the values of a match, and the model coincides with one without idiosyncratic shocks in which productivity is scaled by $(\mathbb{E}_t A_{j,t}^{1/\alpha})^\alpha$ and κ by $\mathbb{E}_t A_{j,t}^{(1+\psi)/\alpha} / (\mathbb{E}_t A_{j,t}^{1/\alpha})^{1+\psi}$, provided these moments are finite. Neither scale factor enters the log-linearized equilibrium. The scaling of κ reflects that, with a flat wage, hours respond to idiosyncratic productivity with elasticity $1/\alpha$ rather than the efficient $1/(\psi+\alpha)$.

with real target

$$\hat{z}_t \equiv \hat{a}_t - \frac{\alpha(1-\alpha)}{\Gamma^X}(\hat{\lambda}_t + \hat{a}_t).$$

The wage setter targets the real wage $\hat{z}_t$ on average over the expected duration of the contract. With the wage index $\hat{w}_t = \theta\hat{w}_{t-1} + (1-\theta)\hat{w}_t^*$, $\pi_t^w \equiv \hat{w}_t - \hat{w}_{t-1}$, and $\hat{\omega}_t \equiv \hat{w}_t - \hat{p}_t$, Equation (A.3) gives $\pi_t^w = \beta\pi_{t+1}^w + \gamma\,(\hat{z}_t - \hat{\omega}_t)$. Aggregating Equation (A.12) across vintages gives the labor-demand condition $\hat{\omega}_t = \hat{a}_t - \alpha\hat{n}_t$. By Equation (A.1),

$$\hat{z}_t - \hat{\omega}_t = \left(\frac{\alpha}{1-\alpha} + \frac{\alpha(1-\alpha)}{\Gamma^X}\right)(\hat{y}_t - \hat{a}_t),$$

so the wage Phillips curve is $\pi_t^w = \beta\pi_{t+1}^w + \gamma^X \frac{1+\psi}{1-\alpha}(\hat{y}_t - \hat{a}_t)$ with

$$\gamma^X = \gamma\,\frac{\alpha}{1+\psi}\left(1 + \frac{(1-\alpha)^2}{\Gamma^X}\right). \tag{A.15}$$

Market power enters only through Γ^X: the larger is Γ^X, the less the target real wage responds to the marginal rate of substitution, and the flatter is the wage Phillips curve. Finally, labor demand reads $\hat{\omega}_t = \hat{a}_t - \frac{\alpha}{1-\alpha}(\hat{y}_t - \hat{a}_t)$. First-differencing and using $\Delta\hat{\omega}_t = \pi_t^w - \pi_t$ gives the wage-accounting equation (WA II), which does not depend on who sets the wage.

Model II: firms post the wage. The firm chooses W_t^* to maximize $L_t J_t$ subject to the logit hiring rule Equation (4), which implies $\partial \log L_t / \partial V_t = (1-\beta\theta)/\delta$. The first-order condition is $\frac{\partial J_t}{\partial \log W_t^*} + \frac{1-\beta\theta}{\delta}\,J_t \frac{\partial V_t}{\partial \log W_t^*} = 0$. By Equation (A.13), J_t cancels and the condition becomes

$$\sum_{s=0}^{\infty}(\beta\theta)^s \left[v'(N_s)N_s - (1-\alpha)^2\lambda_{t+s}A_{t+s}N_s^{1-\alpha}\right] = \frac{\delta(1-\alpha)}{1-\beta\theta}. \tag{A.16}$$

As $\delta \to 0$, competition for workers drives the wage to the level that maximizes V_t. With $\delta > 0$, the firm trades off a lower job value against higher profits per worker. Without base pay, it can only make this trade-off by moving the wage that also governs hours.

In steady state, using $\bar{\lambda}\bar{Y} = 1$, Equation (A.16) gives $v'(\bar{N})\bar{N} = (1-\alpha)(1-\alpha+\delta)$. Since the wage bill is a share $1-\alpha$ of output, the steady-state real wage relative to the marginal rate of substitution is $1/(1-\alpha+\delta)$. Log-linearizing Equation (A.16) with $v(N) = \kappa N^{1+\psi}/(1+\psi)$ and dividing by $1-\alpha$ gives Equation (A.14) with

$$\Gamma^{\mathrm{II}} \equiv (1+\psi)(1-\alpha+\delta) - (1-\alpha)^2 = (\psi+\alpha)(1-\alpha) + \delta(1+\psi).$$

Substituting into Equation (A.15) gives Equation (NKWPC II) with

$$\gamma^{\mathrm{II}} = \gamma\,\frac{\alpha(1-\alpha+\delta)}{(\psi+\alpha)(1-\alpha)+\delta(1+\psi)}.$$

Since Γ^{II} is increasing in δ, the slope is decreasing in firm market power. At $\delta = 0$, $\gamma^{\text{II}} = \gamma\frac{\alpha}{\psi+\alpha}$, and as $\delta \to \infty$, γ^{II} approaches $\gamma\frac{\alpha}{1+\psi}$.

Flat-wage version of Model III: unions post the wage. A resetting union chooses W_t^* to maximize $L_t V_t$ subject to Equation (A.10), with first-order condition $\frac{\partial V_t}{\partial \log W_t^*} + \frac{1-\beta\theta}{\delta} V_t \frac{\partial J_t}{\partial \log W_t^*} = 0$. By Equation (A.13), this becomes

$$\sum_{s=0}^{\infty}(\beta\theta)^s \left[v'(N_s)N_s - (1-\alpha)^2\lambda_{t+s}A_{t+s}N_s^{1-\alpha}\right] = \frac{(1-\alpha)(1-\beta\theta)}{\delta} V_t J_t. \tag{A.17}$$

A higher hourly wage changes the value of the match to the worker, but it also lowers the value to the firm and hence the number of matches. In steady state, Equation (A.17) becomes

$$v'(\bar{N})\bar{N} - (1-\alpha)^2 = \frac{\alpha(1-\alpha)}{\delta}\left(1-\alpha-\frac{v'(\bar{N})\bar{N}}{1+\psi}\right) \quad \Longrightarrow \quad v'(\bar{N})\bar{N} = \frac{(1-\alpha)^2(1+\psi)(\alpha+\delta)}{\alpha(1-\alpha)+(1+\psi)\delta}.$$

The steady-state real wage relative to the marginal rate of substitution, $(1-\alpha)/(v'(\bar{N})\bar{N})$, equals $1/(1-\alpha)$ in the limit of full worker market power, $\delta \to \infty$, in which the union maximizes the value of a match to its members, and $1/(1+\psi)$ in the limit of perfect competition among workers, $\delta \to 0$, in which competition drives the value of a match to the worker to zero. Log-linearizing Equation (A.17) around this steady state gives Equation (A.14) with

$$\Gamma^{\text{III}'} \equiv (1-\alpha)(\psi+\alpha)\frac{\alpha^2(1-\alpha)+(1+\psi)\delta(\alpha+\delta)}{\alpha^2(1-\alpha)+(1+\psi)\delta(2\alpha+\delta)}. \tag{A.18}$$

Substituting into Equation (A.15) gives the slope reported in the main text,

$$\gamma^{\text{III}'} = \gamma\frac{\alpha}{\psi+\alpha}\left(1+\frac{\alpha(1-\alpha)\delta}{\alpha^2(1-\alpha)+(1+\psi)\delta(\alpha+\delta)}\right).$$

The fraction in Equation (A.18) lies in $(0,1]$, so that $\Gamma^{\text{III}'} \leq (1-\alpha)(\psi+\alpha)$ and $\gamma^{\text{III}'} \geq \gamma\frac{\alpha}{\psi+\alpha}$, with equality in both limits $\delta \to 0$ and $\delta \to \infty$. The slope is therefore non-monotonic in worker market power.

EHL. The canonical model of wage rigidity in the applied New Keynesian literature is EHL; see, e.g., Christiano et al. (2005) and Auclert et al. (2025). Firms are identical, and households supply differentiated labor types $i \in [0,1]$, which are bundled into the labor input $N_t = \left(\int_0^1 N_{i,t}^{(\varepsilon_w-1)/\varepsilon_w}\,di\right)^{\varepsilon_w/(\varepsilon_w-1)}$ with elasticity of substitution $\varepsilon_w > 1$. Firms produce $A_t N_t^{1-\alpha}$ and choose labor at given wages, so that $N_{i,t} = (W_{i,t}/W_t)^{-\varepsilon_w}N_t$ and $W_t/P_t = (1-\alpha)A_t N_t^{-\alpha}$. Workers supply whatever hours firms demand at the posted wage. A union that can reset the wage of type

i at t, which happens with probability $1-\theta$, chooses W_t^* to maximize

$$\sum_{s=0}^{\infty}(\beta\theta)^s\left[\lambda_{t+s}\frac{W_t^*}{P_{t+s}}N_{i,t+s|t}-v(N_{i,t+s|t})\right]\quad\text{s.t.}\quad N_{i,t+s|t}=\left(\frac{W_t^*}{W_{t+s}}\right)^{-\varepsilon_w}N_{t+s}.$$

The first-order condition is $\sum_{s=0}^{\infty}(\beta\theta)^s N_{i,t+s|t}\left[\lambda_{t+s}W_t^*/P_{t+s}-\frac{\varepsilon_w}{\varepsilon_w-1}v'(N_{i,t+s|t})\right]=0$: with flexible wages, the union sets a markup $\varepsilon_w/(\varepsilon_w-1)$ over the marginal rate of substitution. Log-linearizing,

$$\hat{w}_t^*=(1-\beta\theta)\sum_{s=0}^{\infty}(\beta\theta)^s\left(\hat{p}_{t+s}+\widehat{\text{mrs}}_{t+s|t}\right),\qquad\widehat{\text{mrs}}_{t+s|t}=\psi\hat{n}_{t+s}-\hat{\lambda}_{t+s}-\varepsilon_w\psi(\hat{w}_t^*-\hat{w}_{t+s}),$$

where the last term reflects that a higher own wage lowers the hours demanded from the type and hence its marginal rate of substitution. Solving for $\hat{w}_t^*$ gives (A.2) with $\hat{z}_t-\hat{\omega}_t=(\psi\hat{n}_t-\hat{\lambda}_t-\hat{\omega}_t)/(1+\varepsilon_w\psi)$, so that, by (A.3),

$$\pi_t^w=\beta\pi_{t+1}^w+\gamma^{\text{EHL}}\left(\psi\hat{n}_t-\hat{\lambda}_t-\hat{\omega}_t\right),\qquad\gamma^{\text{EHL}}\equiv\frac{\gamma}{1+\varepsilon_w\psi}.$$

Labor demand is $\hat{\omega}_t=\hat{a}_t-\alpha\hat{n}_t$, as in the two flat-wage models, so the wage-accounting equation is the same, and by (A.1) the gap equals $\frac{1+\psi}{1-\alpha}(\hat{y}_t-\hat{a}_t)$. EHL therefore reduces to

$$\pi_t^w=\beta\pi_{t+1}^w+\gamma^{\text{EHL}}\frac{1+\psi}{1-\alpha}(\hat{y}_t-\hat{a}_t),\tag{NKWPC EHL}$$

$$\pi_t=\pi_t^w+\frac{\alpha}{1-\alpha}\Delta\hat{y}_t-\frac{1}{1-\alpha}\Delta\hat{a}_t.\tag{WA EHL}$$

Proposition A.4 (Flat-wage contracts and EHL)**.** *Model II and the flat-wage version of Model III have the same demand block and wage-accounting equation as EHL, and a wage Phillips curve of the same form.*

(i) Model II is isomorphic to EHL if and only if $\varepsilon_w=\frac{\psi(1-\alpha)+\delta(1+\psi-\alpha)}{\psi\alpha(1-\alpha+\delta)}$, which is increasing in δ and satisfies $\varepsilon_w\geq 1/\alpha$.

(ii) The flat-wage version of Model III is isomorphic to an EHL economy ($\varepsilon_w>1$) if and only if $\varepsilon_w=\frac{1}{\alpha}-\frac{(1-\alpha)(\psi+\alpha)\,\delta}{\psi[\alpha^2(1-\alpha)+\alpha(2+\psi-\alpha)\delta+(1+\psi)\delta^2]}>1$, which satisfies $\varepsilon_w\leq 1/\alpha$, with equality in the limits of full worker market power ($\delta\to\infty$) and perfect competition among workers ($\delta\to 0$). The inequality $\varepsilon_w>1$ holds for all $\delta>0$ whenever $\psi\geq\alpha$.

Proof. With the same $(\beta,\theta,\psi,\alpha)$, the three systems differ only in the slope of the wage Phillips curve. By Equation (A.15), a flat-wage model with coefficient Γ^X coincides with EHL if and only if $\gamma^{\text{EHL}}=\gamma^X$, that is,

$$1+\varepsilon_w\psi=\frac{(1+\psi)\,\Gamma^X}{\alpha\,(\Gamma^X+(1-\alpha)^2)}.\tag{A.19}$$

The right-hand side is increasing in Γ^X and equals $(\psi+\alpha)/\alpha$, that is, $\varepsilon_w=1/\alpha$, at $\Gamma^X=(1-$

$\alpha)(\psi+\alpha)$.

(i) Substituting Γ^{II} into Equation (A.19) and solving gives the stated ε_w. Since Γ^{II} is increasing in δ and equals $(1-\alpha)(\psi+\alpha)$ at $\delta=0$, ε_w is increasing in δ and $\varepsilon_w \geq 1/\alpha > 1$.

(ii) Substituting $\Gamma^{\mathrm{III}'}$ into Equation (A.19) and solving gives the stated ε_w. Since $\Gamma^{\mathrm{III}'} \leq (1-\alpha)(\psi+\alpha)$, with equality only in the limits $\delta \to 0$ and $\delta \to \infty$, $\varepsilon_w \leq 1/\alpha$, with equality only in these limits. Finally, $\varepsilon_w > 1$ if and only if the right-hand side of (A.19) exceeds $1+\psi$, that is, $\Gamma^{\mathrm{III}'} > \alpha(1-\alpha)$. By Equation (A.18), this is equivalent to

$$\psi\alpha^2(1-\alpha) + (1+\psi)\delta\left[\alpha(\psi-\alpha)+\psi\delta\right] > 0,$$

which holds whenever $\psi \geq \alpha$. □

At $\delta = 0$, Model II is EHL with $\varepsilon_w = 1/\alpha$: the wage setter faces the labor-demand elasticity $1/\alpha$ of a single match, with steady-state markup $1/(1-\alpha)$.

A.5 Flat-wage contracts with supply-determined hours: the flat-wage version of Model IV and Dennery (2020)

We now restrict the contract in Model IV to a flat hourly wage, $W_t(N) = W_t^* N$, derive the model of Dennery (2020), which inverts EHL so that hours are supply-determined, and show when the two coincide. There are no idiosyncratic shocks and we write $N_s \equiv N_{t+s|t}$.[8]

Flat-wage version of Model IV: hours, values, and wage posting. Hours satisfy

$$\lambda_{t+s}\frac{W_t^*}{P_{t+s}} = v'(N_s), \tag{A.20}$$

so that $\partial \log N_s / \partial \log W_t^* = 1/\psi$. Using $\lambda_{t+s} W_t^* N_s / P_{t+s} = v'(N_s)N_s$, the values of a match to the worker and to the firm are

$$V_t = \frac{\psi}{1+\psi}\sum_{s=0}^{\infty}(\beta\theta)^s v'(N_s)N_s, \qquad J_t = \sum_{s=0}^{\infty}(\beta\theta)^s\left[\lambda_{t+s}A_{t+s}N_s^{1-\alpha} - v'(N_s)N_s\right].$$

The firm chooses W_t^* to maximize $L_t J_t$ subject to the logit hiring rule Equation (4). Since $\partial J_t/\partial \log W_t^* = \frac{1}{\psi}\sum_{s=0}^{\infty}(\beta\theta)^s\left[(1-\alpha)\lambda_{t+s}A_{t+s}N_s^{1-\alpha} - (1+\psi)v'(N_s)N_s\right]$ and $\partial V_t/\partial \log W_t^* = \frac{1+\psi}{\psi}V_t$, the first-order condition $\frac{\partial J_t}{\partial \log W_t^*} + \frac{1-\beta\theta}{\delta} J_t \frac{\partial V_t}{\partial \log W_t^*} = 0$ becomes

$$\sum_{s=0}^{\infty}(\beta\theta)^s\left[(1-\alpha)\lambda_{t+s}A_{t+s}N_s^{1-\alpha} - (1+\psi)v'(N_s)N_s\right] + \frac{(1+\psi)(1-\beta\theta)}{\delta} J_t V_t = 0. \tag{A.21}$$

[8] This is again without loss of generality. With idiosyncratic disutility, hours satisfy $\lambda_{t+s}W_t^*/P_{t+s} = \zeta_{i,t+s}v'(N_{i,s})$, so that $N_{i,s} = \zeta_{i,t+s}^{-1/\psi}N_s$, where N_s denotes hours at $\zeta_{i,t+s}=1$. Pay and disutility are then proportional to $\zeta_{i,t+s}^{-1/\psi}$, and output to $\zeta_{i,t+s}^{-(1-\alpha)/\psi}$. The model therefore coincides with one without idiosyncratic shocks in which κ is scaled by $(\mathbb{E}_t\zeta_{i,t}^{-1/\psi})^{-\psi}$ and productivity by $\mathbb{E}_t\zeta_{i,t}^{-(1-\alpha)/\psi}/(\mathbb{E}_t\zeta_{i,t}^{-1/\psi})^{1-\alpha}$, neither of which enters the log-linearized equilibrium.

Steady state. Let $\mathrm{LS} \equiv \bar{\omega}\bar{N}/\bar{Y}$ denote the steady-state labor share. By Equation (A.20), $\mathrm{LS} = v'(\bar{N})\bar{N}$. Equation (A.21) in steady state becomes a quadratic in the labor share,

$$\psi \mathrm{LS}^2 - \big(\psi - (1+\psi)\delta\big)\mathrm{LS} - (1-\alpha)\delta = 0, \tag{A.22}$$

whose unique positive root is

$$\mathrm{LS} = \frac{\psi - (1+\psi)\delta + \sqrt{\big((1+\psi)\delta - \psi\big)^2 + 4\psi(1-\alpha)\delta}}{2\psi} \in \left(\frac{1-\alpha}{1+\psi}, 1\right).$$

The hourly wage relative to the marginal product of labor is $\mathrm{LS}/(1-\alpha)$. In the limit of perfect competition among firms, $\delta \to 0$, $\mathrm{LS} \to 1$: profits are competed away and the wage equals the average product of labor. In the limit of full monopsony, $\delta \to \infty$, $\mathrm{LS} \to (1-\alpha)/(1+\psi)$: the firm acts as a monopsonist over hours within the match and sets a markdown $1/(1+\psi)$. In applied work, the labor share can be calibrated directly, and we express the results below in terms of it, using the two quadratics

$$\begin{aligned}
\mathcal{N}(\mathrm{LS}) &\equiv (1+\psi)\mathrm{LS}^2 - 2(1-\alpha)\mathrm{LS} + (1-\alpha), \\
\mathcal{D}(\mathrm{LS}) &\equiv (1+\psi)^2\mathrm{LS}^2 - (1-\alpha)(2+3\psi+\alpha)\mathrm{LS} + (1+\psi)(1-\alpha).
\end{aligned}$$

Both are positive for all LS: the discriminant of $\mathcal{N}$ is $-4(1-\alpha)(\psi+\alpha) < 0$, and the discriminant of $\mathcal{D}$ is $(1-\alpha)\left[(1-\alpha)(2+3\psi+\alpha)^2 - 4(1+\psi)^3\right] < 0$, since the term in brackets equals $-\psi^2(3+4\psi)$ at $\alpha = 0$ and is decreasing in α. Solving Equation (A.22) for $\delta = \psi\mathrm{LS}(1-\mathrm{LS})/\left((1+\psi)\mathrm{LS} - (1-\alpha)\right)$ and differentiating gives $\partial\delta/\partial\mathrm{LS} = -\psi\,\mathcal{N}(\mathrm{LS})/\left((1+\psi)\mathrm{LS} - (1-\alpha)\right)^2 < 0$, so the labor share is strictly decreasing in firm market power δ.

Wage Phillips curve and wage accounting. Log-linearizing Equation (A.21) around the steady state, and using Equation (A.22) to eliminate δ, gives

$$\sum_{s=0}^{\infty} (\beta\theta)^s \left[\mathcal{D}(\mathrm{LS})\,\hat{n}_{t+s|t} - (\psi+\alpha)\mathrm{LS}\,(\hat{\lambda}_{t+s} + \hat{a}_{t+s})\right] = 0.$$

By Equation (A.20), $\hat{n}_{t+s|t} = (\hat{\lambda}_{t+s} + \hat{w}^*_t - \hat{p}_{t+s})/\psi$, so the reset wage is of the form Equation (A.2) with real target

$$\hat{z}_t \equiv \frac{\psi(\psi+\alpha)\mathrm{LS}}{\mathcal{D}(\mathrm{LS})}\,(\hat{\lambda}_t + \hat{a}_t) - \hat{\lambda}_t,$$

and Equation (A.3) gives $\pi^w_t = \beta\pi^w_{t+1} + \gamma(\hat{z}_t - \hat{\omega}_t)$. Aggregating Equation (A.20) across vintages gives the labor-supply condition $\hat{\omega}_t = \psi\hat{n}_t - \hat{\lambda}_t$. By Equation (A.1),

$$\hat{z}_t - \hat{\omega}_t = -\psi\left[\frac{(\psi+\alpha)\mathrm{LS}}{\mathcal{D}(\mathrm{LS})} + \frac{1}{1-\alpha}\right](\hat{y}_t - \hat{a}_t) = -\frac{1+\psi}{1-\alpha}\,\frac{\psi\,\mathcal{N}(\mathrm{LS})}{\mathcal{D}(\mathrm{LS})}\,(\hat{y}_t - \hat{a}_t),$$

which yields Equation (NKWPC IV′) with

$$\gamma^{\mathrm{IV}'} = \gamma\psi\,\frac{\mathcal{N}(\mathrm{LS})}{\mathcal{D}(\mathrm{LS})}. \tag{A.23}$$

Moreover,

$$(\psi+\alpha)\,\mathcal{N}(\mathrm{LS}) - \mathcal{D}(\mathrm{LS}) = (1-\alpha)\,[(1+\psi)\mathrm{LS} - (1-\alpha)]\,[1-\mathrm{LS}] \geq 0, \tag{A.24}$$

so that $\gamma^{\mathrm{IV}'} \geq \gamma\frac{\psi}{\psi+\alpha}$, with equality only in the limits $\delta \to 0$ and $\delta \to \infty$. The labor-supply condition reads $\hat{\omega}_t = \hat{a}_t + \frac{1+\psi-\alpha}{1-\alpha}(\hat{y}_t - \hat{a}_t)$. First-differencing and using $\Delta\hat{\omega}_t = \pi^w_t - \pi_t$ gives Equation (WA IV′).

The model of Dennery (2020). In Dennery (2020), firms are ex ante identical, but households view jobs at different firms as imperfect substitutes. Firm j produces $A_t N_{j,t}^{1-\alpha}$ and faces the firm-level labor-supply curve $N_{j,t} = (W_{j,t}/W_t)^{\varepsilon_f} N_t$, where W_t is the aggregate wage index and $\varepsilon_f > 0$ is the firm-level labor-supply elasticity. Households choose aggregate hours on their labor-supply curve, and the firm must accept the hours supplied at its posted wage. The elasticity ε_f is the counterpart of ε_w in EHL: there, firms substitute across varieties of labor, and here, households substitute across firms. A firm that can reset its wage at t, which happens with probability $1-\theta$, chooses W_t^* to maximize

$$\sum_{s=0}^{\infty}(\beta\theta)^s\lambda_{t+s}\left[A_{t+s}N_{j,t+s|t}^{1-\alpha} - \frac{W_t^*}{P_{t+s}}N_{j,t+s|t}\right] \quad \text{s.t.} \quad N_{j,t+s|t} = \left(\frac{W_t^*}{W_{t+s}}\right)^{\varepsilon_f} N_{t+s}.$$

With flexible wages, the optimal wage is a markdown $\varepsilon_f/(1+\varepsilon_f)$ below the marginal product of labor. Log-linearizing the first-order condition,

$$\hat{w}_t^* = (1-\beta\theta)\sum_{s=0}^{\infty}(\beta\theta)^s\left(\hat{p}_{t+s} + \widehat{\mathrm{mpl}}_{t+s|t}\right), \qquad \widehat{\mathrm{mpl}}_{t+s|t} = \hat{a}_{t+s} - \alpha\hat{n}_{t+s} - \alpha\varepsilon_f(\hat{w}_t^* - \hat{w}_{t+s}),$$

where the last term reflects that a higher own wage attracts more hours and lowers the firm's own marginal product. Solving for $\hat{w}_t^*$ gives (A.2) with $\hat{z}_t - \hat{\omega}_t = (\hat{a}_t - \alpha\hat{n}_t - \hat{\omega}_t)/(1+\alpha\varepsilon_f)$, so that, by Equation (A.3), we obtain Equation (7) of Dennery (2020),

$$\pi_t^w = \beta\pi_{t+1}^w + \gamma^{\mathrm{D}}\,(\hat{a}_t - \alpha\hat{n}_t - \hat{\omega}_t), \qquad \gamma^{\mathrm{D}} \equiv \frac{\gamma}{1+\alpha\varepsilon_f}.$$

The labor-supply condition is $\hat{\omega}_t = \psi\hat{n}_t - \hat{\lambda}_t$, as in the flat-wage version of Model IV, so the wage-accounting equation is the same, and by Equation (A.1) the gap equals $-\frac{1+\psi}{1-\alpha}(\hat{y}_t - \hat{a}_t)$. The model

therefore reduces to

$$\pi_t^w = \beta\pi_{t+1}^w - \gamma^{\mathrm{D}}\frac{1+\psi}{1-\alpha}(\hat{y}_t - \hat{a}_t), \tag{NKWPC D}$$

$$\pi_t = \pi_t^w - \frac{1+\psi-\alpha}{1-\alpha}\Delta\hat{y}_t + \frac{\psi}{1-\alpha}\Delta\hat{a}_t. \tag{WA D}$$

Since $\gamma^{\mathrm{D}} > 0$, the wage Phillips curve has a negative slope.

Proposition A.5 (Flat-wage contracts and Dennery 2020)**.** *For $\alpha \in (0,1)$, the flat-wage version of Model IV has the same demand block and wage-accounting equation as Dennery (2020), and a wage Phillips curve of the same form. It is isomorphic to a Dennery (2020) economy ($\varepsilon_f > 0$) if and only if*

$$1 + \alpha\varepsilon_f = \frac{\mathcal{D}(\mathrm{LS})}{\psi\mathcal{N}(\mathrm{LS})} > 1.$$

The implied ε_f satisfies $\varepsilon_f \leq 1/\psi$, with equality in the limits of full monopsony ($\delta \to \infty$) and perfect competition among firms ($\delta \to 0$).

Proof. With the same $(\beta, \theta, \psi, \alpha)$, the two systems differ only in the slope of the wage Phillips curve, and coincide if and only if $\gamma^{\mathrm{D}} = \gamma^{\mathrm{IV}'}$ with $\varepsilon_f > 0$; for $\alpha \in (0,1)$ and by (A.23), this is the stated condition. By (A.24), the ratio $\mathcal{D}(\mathrm{LS})/(\psi\mathcal{N}(\mathrm{LS}))$ is at most $(\psi+\alpha)/\psi$, with equality only in the limits $\delta \to 0$ and $\delta \to \infty$, and $1 + \alpha\varepsilon_f = (\psi+\alpha)/\psi$ corresponds to $\varepsilon_f = 1/\psi$. □

In the limit of full monopsony, the firm behaves as a monopsonist over hours within the match, facing the worker's labor supply, whose elasticity is $1/\psi$, which is why the implied ε_f equals $1/\psi$ and the markdown $1/(1+\psi)$ equals the markdown $\varepsilon_f/(1+\varepsilon_f)$ of a Dennery (2020) firm. For intermediate degrees of market power, the implied ε_f is lower, and for some parameter values it is non-positive. It is positive, as required in Dennery (2020), if and only if $\mathcal{D}(\mathrm{LS}) > \psi\mathcal{N}(\mathrm{LS})$, that is,

$$(1+\psi)\mathrm{LS}^2 - (1-\alpha)(2+\psi+\alpha)\mathrm{LS} + (1-\alpha) > 0.$$

Since the minimizer $\mathrm{LS} = \frac{(1-\alpha)(2+\psi+\alpha)}{2(1+\psi)}$ lies in $\left(\frac{1-\alpha}{1+\psi}, 1\right)$, a necessary and sufficient condition for this to hold at all degrees of market power is $(1-\alpha)(2+\psi+\alpha)^2 < 4(1+\psi)$, which is satisfied, for example, for $\alpha = 0.5$ and $\psi = 1$. Otherwise, there is an intermediate range of δ for which the implied ε_f is non-positive, and no Dennery (2020) economy reproduces the flat-wage version of Model IV.

Relation to the textbook New Keynesian model. For this remark only, let utility from consumption have curvature ς, so that $\hat{\lambda}_t = -\varsigma\hat{y}_t$; elsewhere $\varsigma = 1$. Let $\hat{l}_t \equiv -\hat{n}_t$ be a measure of leisure. Absent productivity shocks and with linear production, $\alpha = 0$, so that $\gamma^{\mathrm{D}} = \gamma$, the

equilibrium dynamics of the model of Dennery (2020) are determined by

$$\hat{l}_t = \hat{l}_{t+1} - \frac{1}{\psi}(i_t - \pi^w_{t+1} - \rho),$$
$$\pi^w_t = \beta\pi^w_{t+1} + \gamma(\varsigma + \psi)\hat{l}_t.$$

These equations in leisure $\hat{l}_t$ and inflation in the price of leisure, that is, wage inflation π^w_t, are *exactly* the two non-policy equations of the standard New Keynesian model in output $\hat{y}_t$ and inflation in the price of the output good, π_t,

$$\hat{y}_t = \hat{y}_{t+1} - \frac{1}{\varsigma}(i_t - \pi_{t+1} - \rho),$$
$$\pi_t = \beta\pi_{t+1} + \gamma(\varsigma + \psi)\hat{y}_t,$$

except that the curvature of utility with respect to consumption, ς, is replaced by the curvature of utility with respect to hours worked, ψ. In the model of Dennery (2020), a "contractionary" monetary policy shock leads to a contraction in *leisure*, that is, an output boom.