Search with Wage Posting under Sticky Prices*

Andrew T. Foerster† José Mustre-del-Río‡

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Abstract

We consider the interaction between nominal rigidities and labor market frictions in a framework where firms jointly make pricing and hiring decisions. In our New Keynesian model, firms are subject to sticky prices and post take-it-or-leave-it contracts to attract workers in a frictional labor market. Relative to the standard model that separates search and pricing frictions between wholesale and retail firms, respectively, our model implies more volatility in hourly wages and less volatility in the vacancy-to-unemployment ratio, even though the take-it-or-leave-it assumption makes workers indifferent between employment and unemployment. Nominal rigidities have a larger impact in our framework than the standard model, since firms face stronger trade-offs in their pricing and employment decisions.

Keywords: Search, Matching, Inflation, Sticky Prices

JEL: E10, E30, E50, J60.

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†Research Department, Federal Reserve Bank of Kansas City, 1 Memorial Drive, Kansas City, MO 64198, andrew.foerster@kc.frb.org.

‡Research Department, Federal Reserve Bank of Kansas City, 1 Memorial Drive, Kansas City, MO 64198, jose.mustre-del-rio@kc.frb.org.
1 Introduction

After the Great Recession, labor markets recovered at an anemic rate, and their slow recovery produced a drag on the economy as a whole. High unemployment and low inflation persisted for many years after the end of the recession, leading to renewed investigation of the importance of search frictions paired with inflation in determining unemployment. In particular, the interaction between labor market frictions and aggregates such as output and inflation now plays a central role in understanding the macroeconomy.

In this paper, we consider labor market frictions as a source of real rigidities, how those frictions interact with nominal rigidities in the form of sticky prices, and the implications of this interaction for the macroeconomy. We develop a framework where firms jointly post vacancies, offer workers a compensation-hours contract, and make pricing decisions. The presence of search, compensation, and pricing decisions within the same firm produces trade-offs that affect the labor market and key macroeconomic variables.

We show that the coupling of labor market and pricing frictions has important implications for the behavior of wages, hours, and unemployment when compared to a similar model that separates these two frictions using the traditional wholesaler-retailer construct. In addition, by considering the flexible price version of our economy, we highlight that simply integrating search frictions into firms with market power generates important differences; introducing sticky prices on top of this integration yields additional interactions that affect the macroeconomy.

Using this framework, we consider the effects of changing the benefits paid to unemployed workers. The level of benefits affects the level of compensation that firms offer workers, so changing benefits alters firms’ incentives to hire. In our baseline model, firms doing the labor search and wage posting have market power, which generates less sensitivity of output and employment to unemployment benefits than in an alternative model where hiring firms do not have market power.

We also show that the response to technology, monetary policy, and separation rate shocks changes once combining labor market and pricing frictions. Our model shows more muted responses to technology and separation rate shocks and more amplified responses to
monetary policy shocks than the alternative model with the wholesaler-retailer structure. We show some of this effect is due to the integration of search frictions into a firm with market power, but some of it is also due to these same firms’ nominal rigidities.

Finally, we consider key labor ratios, and show hours per worker are more volatile in our baseline model as price-setting firms respond to shocks by adjusting markups through changes in marginal costs. Greater volatility in marginal costs leads to hourly wages being more volatile in the baseline model despite of the fact that total compensation makes workers indifferent between employment and unemployment. Because of the cyclical sensitivity of hourly compensation the volatility of labor market tightness is reduced. In other words, when firms are price-setters, rigid compensation schemes do not lead to greater unemployment volatility.

Our paper builds upon the literature analyzing the role of frictional unemployment for inflation dynamics by developing a framework that allows firms to jointly make pricing and hiring decisions. Typically, papers specify labor market arrangements that preclude the direct interaction of frictions stemming from the job search process and frictions associated with infrequent price adjustment. For example, Trigari (2006), Walsh (2005), and Christiano et al. (2013) assume a wholesaler-retailer structure, where hiring in the frictional labor market is done by wholesale firms, whereas prices are set separately by monopolistic retail firms. By separating these decisions, the wholesaler-retailer structure mutes the impact of their interactions. In our model, firms making the pricing decisions also make hiring and wage posting decisions, leading to a stronger degree of interaction between these frictions. In particular, because search frictions make labor a firm-specific factor in the short-run, pricing decisions at the firm-level critically depend on the curvature of labor disutility from the existing worker.\(^1\)

In addition to dropping the wholesaler-retailer structure, we also allow firms to post compensation contracts rather than Nash bargain with the worker as is typically assumed.\(^2\) The take-it-or-leave-it assumption allows us to drop the typical assumption that individuals

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\(^1\)Kuester (2010) obtains a similar result when wages and prices are infrequently bargained. 
\(^2\)See for example, Kuester (2010), Barnichon (2010), Thomas (2011), and Dossche et al. (2014), for papers that combine search and Calvo pricing frictions within the same firm when wages are Nash bargained. Krause and Lubik (2007) allow for surplus splitting and quadratic price adjustment.
have perfect consumption insurance through a representative household, while still maintaining tractability. A by-product of eliminating the representative household assumption is that workers cannot use wealth obtained through other workers’ labor supply as a way of increasing their outside option and hence own wage. Additionally, the take-it-or-leave-it assumption eliminates worker’s ability to bargain over increased surplus due to monopoly profits. Lastly, because these offers make the individual indifferent between employment states the link between individual compensation and aggregate labor market tightness is effectively severed.\textsuperscript{3} Hall (2005) and Hall and Milgrom (2008) emphasize that standard search models require a loose connection between individual wages and aggregate conditions in order to generate realistic unemployment fluctuations. Nash bargaining generates too strong of a linkage which produces little volatility in unemployment and vacancies. More recently, Christiano et al. (2013) find that incorporating the bargaining protocol developed by Hall and Milgrom (2008) into a New Keynesian model significantly improves its statistical fit compared to sticky wage alternatives.

In contrast to the random search that we use, Hall and Krueger (2012) and Rogerson and Shimer (2010) note that wage posting models typically assume workers direct their search toward vacancies.\textsuperscript{4} Our analysis of wage posting and random search in a New Keynesian environment builds on the work of Cooper et al. (2007). They allow for wage posting and random search, but by focusing on a real economy, lack the ability to discuss the relationship between inflation and unemployment and the effects of monetary policy on both. From an empirical standpoint, evidence from Hall and Krueger (2012) suggests wage posting is at least as common as bargaining over pay. Finally, compared to sticky wage models along the lines of Christiano et al. (2005), our framework has the more palatable feature that firms rather than workers post wages.

The remainder of the paper is as follows. Section 2 describes our model of search with wage posting and sticky prices; we also outline an alternative model that separates search and pricing frictions into separate firms. Section 3 contains the main results, and compares our model with the alternative by examining the effects of changing the replacement rate,\textsuperscript{3}In other words, our model delivers a compensation scheme which is equivalent to Nash bargaining when the worker has no bargaining power.
impulse responses to shocks, and key labor market ratios. Finally, Section 4 concludes.

2 Model

The model we present is a variant of the conventional New Keynesian monetary framework. The key changes involve the labor market and the contractual environment. Unemployment is modeled by introducing random search. Rather than assuming firms and workers bargain over wages, hiring firms post take-it-or-leave-it offers that stipulate compensation and hours worked. Nominal rigidities are introduced by assuming hiring firms set prices subject to Calvo frictions.

The following subsections describe the model: individuals who supply labor and consume, final goods producers that bundle intermediate goods, intermediate goods firms that set prices and hire workers in a frictional labor market by posting wages, the evolution of the labor market, the monetary authority and government, and the market clearing conditions. We then sketch an alternative model that separates labor market frictions from price setting frictions. The section concludes with a discussion of the calibration.

2.1 Individuals

There is a unit mass of individuals, indexed by $i \in [0, 1]$, who consume $c_{i,t}$ and work hours $h_{i,t}$, obtaining utility from the period utility function

$$U(c_{i,t}, h_{i,t}) = \frac{\left( c_{i,t} - \varphi h_{i,t}^{1+1/\psi} \right)^{1-\gamma} - 1}{1 - \gamma}.$$  

The period utility function depends on the constant relative risk aversion $\gamma$, a disutility of labor $\varphi$, and the Frisch elasticity $\psi$. Individuals discount future utility at rate $\beta$.

Preferences are of the form devised by Greenwood et al. (1988), which eliminates any wealth effect on the labor supply, an assumption that provides multiple benefits in our framework. First, it greatly simplifies the contractual environment, as the presence of wealth effects on labor supply would imply that firms would vary their wage offering depending upon the wealth of the worker. Wealth effects on labor supply would also counterfactually imply
asset-rich individuals preferring unemployment over employment.\textsuperscript{5} Second, along with the assumption on the contracting environment, it allows us to dispatch with perfect consumption insurance or a large household assumption typical in New Keynesian models with search (for example, Walsh (2005), Thomas (2011), Kuester (2010)). In these models, individuals typically are forced by the household to undertake potentially sub-optimal hours decisions from an individual standpoint to benefit the household as a whole and can use consumption obtained by other workers to bolster their outside option and hence bargained wage. Instead, our model has individuals optimizing their labor market choice without consideration for other individuals.\textsuperscript{6}

Individuals purchase consumption goods at price $P_t$ and buy nominal bonds $B_t$ which have gross return $R_t$ in period $t + 1$. They also own shares in a mutual fund that owns all other firms in the economy; the mutual fund pays real dividends $D_t$.\textsuperscript{7} Finally, they pay real lump sum taxes equal to $T_t$.

The employment status $n_{i,t}$ of each individual varies between being unemployed ($n_{i,t} = u$) and employed ($n_{i,t} = e$). In each period a fraction $n_t$ of individuals are employed, and $u_t = 1 - n_t$ are unemployed.

Unemployed individuals work zero hours ($h_{i,t}^u = 0$), collect real unemployment benefits from the government equalling $b$, and search for employment the subsequent period, which occurs in equilibrium with probability $s_t$.\textsuperscript{8} If $E_t$ denotes the expectations operator conditional on time $t$ information, an unemployed worker’s problem is therefore

$$W_{i,t}^u = \max_{c_{i,t}^u, B_{i,t}^u} \left\{ \frac{(c_{i,t}^u)^{1-\gamma} - 1}{1 - \gamma} + \beta E_t \left[ s_t W_{i,t+1}^e + (1 - s_t) W_{i,t+1}^u \right] \right\} \quad (2)$$

\textsuperscript{5}In contrast, Mustre-del Río (2014) finds that for prime age males employment is roughly flat with household wealth.

\textsuperscript{6}Given the contracting environment and utility specification, our model with individuals making independent choices would be equivalent to a large household model with perfect utility insurance, with all utility of individuals equalized. There has been some progress in considering sticky-price models with more general types of heterogenous consumers, but computational difficulties severely constrain the size of the model (Gornemann et al. (2012)).

\textsuperscript{7}Given symmetric initial conditions, in equilibrium all individuals own equal shares in the mutual fund and no trading occurs, so we impose this result from the outset for notational simplicity. A technical appendix for the entire model is available upon request.

\textsuperscript{8}For simplicity we abstract from the participation decision, hence all non-employed individuals are active searchers.
subject to

\[ P_t c_{i,t}^u + B_{i,t}^u + P_t T_t = P_t b + R_{t-1} B_{i,t-1} + D_t. \] (3)

Employed workers, on the other hand, work positive hours \( h_{i,t} \) and are paid a real compensation level \( \omega_{i,t} \). Their existing job ends with time-varying probability \( \delta_t \), in which case they enter unemployment the following period; with probability \( (1 - \delta_t) \) they remain employed. An employed worker’s problem is therefore

\[
W_{i,t}^e = \max_{c_{i,t}^e, B_{i,t}^e} \left\{ \frac{\left( c_{i,t}^e - \varphi h_{i,t}^{1+1/\psi} \right)^{1-\gamma}}{1-\gamma} - 1 + \beta_t \mathbb{E}_{t} \left[ (1 - \delta_t) W_{i,t+1}^e + \delta_t W_{i,t+1}^u \right] \right\}
\] (4)

subject to

\[ P_t c_{i,t}^e + B_{i,t}^e + P_t T_t = P_t \omega_{i,t} + R_{t-1} B_{i,t-1} + D_t. \] (5)

Note that employed workers do not choose \( H_{i,t} \), as hours are determined within the firm’s contracting environment.

Standard optimality conditions for unemployed and employed individuals yield an Euler equation for the unemployed

\[
\lambda_{i,t}^u = \beta_t \mathbb{E}_{t} \left[ s_t \lambda_{i,t+1} + (1 - s_t) \frac{\lambda_{i,t+1}^u}{\Pi_{t+1}} \right] R_t,
\] (6)

and for the employed

\[
\lambda_{i,t}^e = \beta_t \mathbb{E}_{t} \left[ \frac{(1 - \delta_t) \lambda_{i,t+1}^e + \delta_t \lambda_{i,t+1}^u}{\Pi_{t+1}} \right] R_t,
\] (7)

where \( \Pi_{t+1} = P_{t+1}/P_t \) is the gross inflation rate. The marginal utility of consumptions for the unemployed are given by

\[
\lambda_{i,t}^u = (c_{i,t}^u)^{-\gamma},
\]

and for the employed are

\[
\lambda_{i,t}^e = \left( c_{i,t}^e - \varphi h_{i,t}^{1+1/\psi} \right)^{-\gamma}.
\] (8)

Given symmetric initial conditions on bond-holdings, the optimal contact to be discusses
equalizes the value of employed and unemployed workers, which implies

\[ c^u_{i,t} = c^e_{i,t} - \varphi h_{i,t}^{1+1/\psi}. \]

As a result, we get symmetry of the marginal utilities of consumption

\[ \lambda_t = \lambda^u_{i,t} = \lambda^e_{i,t}. \]  \hspace{1cm} (9)

2.2 Final Goods Producers

Final goods producers operate competitively, purchasing \( Y_{j,t} \) from \( j \in [0, n_t] \) operating intermediate goods firms and combine them into final output \( Y_t \) using a technology with constant elasticity of substitution \( \epsilon : \)

\[ Y_t = n_t \left( \frac{1}{n_t} \int_0^{n_t} Y_{j,t}^{-\epsilon} \, dj \right)^{1/\epsilon}. \]  \hspace{1cm} (10)

Standard cost minimization implies that the demand for each intermediate good \( Y_{d,j} \) depends on its relative price according to

\[ Y_{d,j} = \left( \frac{P_{j,t}}{P_t} \right)^{-\epsilon} \frac{Y_t}{n_t}. \]  \hspace{1cm} (11)

The aggregate price level is related to the individual prices by

\[ P_t^{1-\epsilon} = \frac{1}{n_t} \int_0^{n_t} P_{j,t}^{1-\epsilon} \, dj. \]  \hspace{1cm} (12)

2.3 Intermediate Goods Producers

Intermediate goods firms are indexed by \( j \), and produce using the linear technology

\[ Y_{j,t}^s = Z_t h_{j,t}, \]  \hspace{1cm} (13)
where $h_{j,t}$ is hours at firm $j$ and total factor productivity $Z_t$ follows

$$
\log Z_t = \rho_z \log Z_{t-1} + \sigma_z \varepsilon_{z,t}. \quad (14)
$$

Firms sell their output at price $P_{j,t}$ and are subject to a Calvo friction when setting prices. Firms employ a single worker; conditional on being matched with a worker the firm negotiates a contract $\Upsilon_{j,t} = (\omega_{j,t}, h_{j,t})$ that determines a compensation level $\omega_{j,t}$ and an hours requirement $h_{j,t}$. Firms face a two-stage problem: in the first stage they set prices and in the second stage they contract with labor and produce.

In the second stage, given a price $P_{j,t}$, firms make a take-it-or-leave-it offer to their worker. They choose a contract $\Upsilon_{j,t}$ to maximize current period profits

$$
D_{j,t} = \left( \frac{P_{j,t}}{P_t} \right) Y^d_{j,t} - \omega_{j,t}. \quad (15)
$$

subject to their demand (11), the constraint that they must meet demand at the posted price $Y^s_{j,t} \geq Y^d_{j,t}$, and their matched worker’s participation constraint

$$
W^u_{i,t} \leq W^e_{i,t}. \quad (16)
$$

Since the firm will always choose to make the participation constraint (16) bind, then for symmetric initial conditions on asset holdings, the value function for an unemployed individual (2) and an employed one (4) imply the optimal contract satisfies

$$
\omega_{j,t} = b + \varphi h_{j,t}^{1 + \frac{1}{\psi}}. \quad (17)
$$

This equation reveals that the equilibrium compensation contract when firms make take-it-or-leave-it offers to workers is a special case of Nash bargaining when workers’ bargaining weight is zero. Under this scenario individual wages no longer depend on aggregate labor market tightness. Thus, cyclical variation in compensation is solely due to changes in labor demand through hours worked $h_{j,t}$, which will also depend on the firm’s set price.

Typically, New Keynesian models focus on the per hour wage rate that firms and workers
either bargain over, or that is determined in a frictional or frictionless equilibrium. In our setup, we focus on compensation due to the tight link between hours and compensation in the optimal contract equation (17). This compensation scheme is isomorphic to a contract that specifies hours and a wage, since $\Upsilon_{j,t} = (\omega_{j,t}, h_{j,t}) = (w_{j,t}h_{j,t}, h_{j,t})$, where $w_{j,t}$ denotes the wage. However, Figure 1 shows that, while compensation is increasing in hours, the wage is non-monotonic due to the fact that base compensation with zero hours must equal the unemployment benefits $b$.

Given the optimal contract, in the first stage a matched firm can re-optimize its price subject to a Calvo friction. The value of an operating firm with price $P_{j,t}$ is given by

$$J_t(P_{j,t}) = \left( \frac{P_{j,t}}{P_t} \right) Y_{j,t}^d - \omega_{j,t} + \beta (1 - \delta_t) \mathbb{E}_t \frac{\lambda_{t+1}}{\lambda_t} \left[ \zeta J_{t+1}(P_{j,t}) + (1 - \zeta) J_{t+1}(P_{t+1}) \right],$$

(18)

where $\beta \frac{\lambda_{t+1}}{\lambda_t}$ denotes the stochastic discount factor, $\zeta$ the probability of not re-optimizing prices, and $P_{t+1}^*$ denotes the optimal price set by a firm that can re-optimize in $t$. Since the
optimal compensation scheme depends on hours, and firms must meet demand at the posted price, the value is given by

\[ J_t (P_{j,t}) = \left( \frac{P_{j,t}}{P_t} \right)^{1-\epsilon} \frac{Y_t}{n_t} - b - \varphi \left( \frac{P_{j,t}}{P_t} \right)^{-\epsilon} \frac{Y_t}{Z_t n_t} \left[ 1 + \frac{1}{\psi} \right] \]

where we have used the fact that prices, by pinning down demand, consequently pin down hours, and hence total compensation, through the relationship

\[ h_{j,t} = \left( \frac{P_{j,t}}{P_t} \right)^{-\epsilon} \frac{Y_t}{Z_t n_t} \]

A firm that can re-optimize prices, hence, takes this dependence of hours and compensation on the relative price, with the optimal reset price satisfying

\[ P_t^* = \text{arg max } J_t (P_{j,t}) . \]  

### 2.4 Vacancy Posting and the Labor Market

Firms post vacancies at cost \( \kappa \), which are filled with probability \( q_t \) and become productive the following period. At the beginning of \( t + 1 \) price adjustment occurs, then contracting and production. New entrants inherit a price level in period \( t \) equal to the aggregate price level \( P_{j,t} = P_t \), and receive a Calvo shock before production in \( t + 1 \). Because of free entry, firms post vacancies until the vacancy posting cost equals the expected return which implies

\[ \kappa = q_t \beta \mathbb{E}_t \frac{\lambda_{t+1}}{\lambda_t} \left[ \zeta J_{t+1} (P_t) + (1 - \zeta) J_{t+1}^* (P_{t+1}) \right] . \]

Matches \( m_t \) depend upon the number of unemployed \( u_t \) and the number of vacancies \( v_t \) according to

\[ m_t = \sigma_m u_t^\alpha v_t^{-1-\alpha} \]
where $\sigma_m$ governs the efficiency of the matching function, and $\alpha$ is the elasticity of matches with respect to the number of unemployed. The job filling rate is $q_t = m_t/v_t$.

New matches take one period to form, and existing matches are destroyed at an exogenous rate $\delta_t$. Consequently, employment evolves according to

$$n_t = (1 - \delta_{t-1}) n_{t-1} + m_{t-1}. \quad (24)$$

The separation rate $\delta_t$ is time-varying according to the process

$$\log \delta_t = (1 - \rho_\delta) \log \delta_{t-1} + \log \delta_{t-1} + \sigma_{\delta} \varepsilon_{d,t}. \quad (25)$$

Figure 2 summarizes the timing of the model.

### 2.5 Monetary Authority and Government

Monetary policy follows a Taylor Rule, setting the nominal rate $R_t$ according to

$$\frac{R_t}{R_{ss}} = \left( \frac{R_{t-1}}{R_{ss}} \right)^{\rho_r} \left( \frac{\Pi_t}{\Pi_{ss}} \right)^{(1-\rho_r)\gamma_\pi} \exp \left( \sigma_r \varepsilon_{r,t} \right), \quad (25)$$

where $\Pi_{ss}$ indicates the inflation target, $R_{ss}$ the nominal rate target, $\rho_r$ the degree of interest rate persistence, $\gamma_\pi$ the response to inflation, and $\varepsilon_{r,t}$ denotes a monetary policy shock.
Fiscal policy adjusts lump sum taxes to balance the budget. The government pays unemployment benefits $b$ and interest on debt by issuing debt and collecting lump-sum taxes:

$$P_t u_t b + B_{t-1} R_{t-1} = B_t + P_t T_t.$$  \hfill (26)

### 2.6 Market Clearing

Market clearing requires that aggregate output equals aggregate consumption

$$Y_t = C_t,$$  \hfill (27)

while aggregate consumption is the consumption of all individuals

$$C_t = C^e_t + C^n_t.$$  \hfill (28)

Aggregate hours is defined as the hours worked by all employed individuals

$$H_t = \int_0^{n_t} h_{j,t} dj,$$  \hfill (29)

which is related to aggregate output by

$$Z_t H_t = \zeta_t Y_t.$$  \hfill (30)

The rate of domestic absorption, also called the loss in output due to price dispersion, is defined as

$$\zeta_t = \frac{1}{n_t} \int_0^{n_t} \left( \frac{P_{j,t}}{P_t} \right)^{-\epsilon} dj.$$  \hfill (31)

We can also define average compensation per worker as

$$\omega_t = \frac{1}{n_t} \int_0^{n_t} \omega_{j,t} dj.$$  \hfill (32)
which in turn gives an average hourly wage equal to

\[ w_t = \frac{\int_0^{n_t} \omega_j t dj}{\int_0^{n_t} h_{j, t} dj} = \frac{n_t \omega_t}{H_t}. \]  

(33)

Lastly, we define the average markup of prices over marginal cost \( MC_{j, t} \) as

\[ \text{markup}_t = \frac{1}{n_t} \int_0^{n_t} \frac{P_{j, t} Y_{j, t} t}{MC_{j, t} Y_t / n_t} dj = \frac{1}{n_t} \int_0^{n_t} \frac{P_{j, t}}{P_t \varphi (1 + \frac{1}{\psi}) h_{j, t}^{\frac{1}{\psi}} Y_t / n_t} \frac{Y_{j, t}}{Y_t} dj. \]  

(34)

### 2.7 Comparison with Wholesaler-Retailer Model

To isolate the importance of allowing pricing and labor market frictions to interact within the firm we outline an alternative model with the customary wholesaler-retailer structure and posted wages. Wholesale producers hire labor in the frictional labor market using wage posting and produce a competitively priced good. Monopolistically competitive retail firms face Calvo price frictions and purchase the wholesale good and convert it into a differentiated good. The remaining aspects of the alternative model are the same as the baseline.

Focusing on the wholesaler problem, they operate a linear technology

\[ Y_{t, w} = Z_t h_t. \]  

(35)

Wholesalers take their price \( P_{t, w} \) as given and choose hours worked to maximize

\[ J_t = \max_{h_t} \frac{P_{t, w}}{P_t} Z_t h_t - b - \varphi h_t^{1+1/\psi} + \beta (1 - \delta_t) \mathbb{E}_t \frac{\lambda_{t+1}}{\lambda_t} J_{t+1}. \]  

(36)

Note that this expression already includes the definition of the optimal contract when firms offer take-it-or-leave-it contracts to workers. The first-order condition with respect to hours implies:

\[ h_t = \left[ \frac{P_{t, w} Z_t}{\varphi (1 + 1/\psi)} \right]^{\psi}. \]  

(37)

For ease of comparison, consider the equations characterizing the hours choice of firms in
each model. In log, equation (20) is

$$\log(h_{j,t}) = -\epsilon \log \left( \frac{P_{j,t}}{P_t} \right) + \log \left( \frac{Y_t}{Z_t} \right),$$

and equation (37) is

$$\log(h_t) = \psi \log \left( \frac{P^w_t}{P_t} \right) + \psi \log Z_t + \text{const.}$$

Because hiring firms are price setters and demand for their differentiated good is decreasing in their relative price, so are hours worked. In contrast, hiring firms in the alternative model are price takers and because supply for their good is increasing in the relative price of wholesale goods, so are hours worked. All else equal, technology shocks also have differential effects on hours worked across models. In the baseline model, because output is pinned down given relative prices, any increase in productivity is labor saving and hence hours worked fall. Meanwhile, an increase in productivity in the alternative model increases hours since each existing employment match is more valuable given prices.

Next, under the alternative model the free-entry condition takes the usual form

$$\kappa = q_t \beta E_t \frac{\lambda_{t+1}}{\lambda_t} J_{t+1}$$  \hspace{1cm} (38)

Comparing this equation to (22), the free entry condition under the baseline model, highlights that frictions related to price adjustment do not affect vacancy creation in the alternative model. Similarly, in the baseline model any factors that alter how future profits are discounted, such as shocks to the discount factor or separation rate shocks, have differential impacts on firms who reset or inherit prices. In contrast, all firms are ex-post identical in the alternative model.

To close the alternative model, retailers face a standard problem summarized by the optimal reset price condition

$$\sum_{k=0}^{\infty} (\beta \zeta)^k \frac{\lambda_{t+k}}{\lambda_t} \left[ \frac{P_t^*}{P_{t+k}} - \mu \frac{P^w_{t+k}}{P_{t+k}} \right] Y_{t+k} P^*_{t+k} = 0$$  \hspace{1cm} (39)

where $\mu = \frac{\epsilon}{\epsilon - 1}$ is the flexible price markup, $Y_t$ is demand for the final good, and $P_t$ is the
aggregate price level.

For comparison, the expression the optimal reset price satisfies in our baseline model is

\[
\sum_{k=0}^{\infty} (\beta \zeta)^k \prod_{i=1}^{k} (1 - \delta_{t+k-i}) \lambda_{t+k} \frac{P_{t+k}^*}{\lambda_t} \left[ \frac{P_{t+k}^*}{P_{t+k}} - \mu \frac{\varphi(1 + 1/\psi)h_{j,t+k}^{1/\psi}}{Z_{t+k}} \right] n_{t+k} P_{t+k}^* = 0. \tag{40}
\]

There are two important differences between equations (39) and (40). First, in our baseline model because intermediate firms face pricing and labor market frictions they discount future revenues both by the expected duration of the current price, which depends on $\zeta$, and the expected duration of the current match, which depends on $\delta_{t+k}$. In contrast, in the alternative model retail firms do not care about match duration when setting their prices. Additionally, across the two models marginal costs are notably different. In the alternative model, marginal costs are simply given by the relative price of wholesale goods $\frac{P^w_{t+k}}{P_{t+k}}$, whereas in our baseline model marginal costs depend on the marginal disutility of hours worked $\varphi(1 + 1/\psi)h_{j,t+k}^{1/\psi}$.

### 2.8 Calibration

The parameters fall into two categories: parameters that are fixed at standard values and parameters that are chosen to match certain targets in steady state.

Table 1 lists the parameters fixed at standard values. The discount factor $\beta$ is set to imply a model period is one quarter. The coefficient of risk aversion $\gamma$ and the Frisch elasticity of labor supply $\psi$ are set to standard values in the literature. The probability of not re-optimizing prices $\zeta$ is set to match a median price duration of six months as reported in Bils and Klenow (2004). Following Gertler et al. (2008), we set the elasticity of substitution across goods to $\epsilon = 10$.

Consistent with empirical estimates in Shimer (2005) and den Haan et al. (2000) we target a mean quarterly separation rate of 10 percent, so $\bar{\delta} = 0.10$. In line with Ramey (2007) and Fujita and Ramey (2009), we set the persistence and the standard deviation parameters for the separation rate process to be $\rho_{\delta} = 0.97$ and $\sigma_{\delta} = 0.015$. The elasticity of the matching function with respect to unemployment $\alpha$ is set to 0.5, which is the midpoint of values typically cited in the literature. Lastly, the parameters governing shocks and monetary
Table 1: Standard Calibrated Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta$</td>
<td>Discount factor</td>
<td>0.9951</td>
</tr>
<tr>
<td>$\gamma$</td>
<td>Risk aversion</td>
<td>2</td>
</tr>
<tr>
<td>$\psi$</td>
<td>Frisch elasticity</td>
<td>0.5</td>
</tr>
<tr>
<td>$\zeta$</td>
<td>Prob. not re-optimizing prices</td>
<td>0.66</td>
</tr>
<tr>
<td>$\epsilon$</td>
<td>Elasticity of substitution</td>
<td>10</td>
</tr>
<tr>
<td>$\delta$</td>
<td>Mean separation rate</td>
<td>0.1</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>Matching function elasticity</td>
<td>0.5</td>
</tr>
<tr>
<td>$\Pi_{ss}$</td>
<td>Inflation target</td>
<td>1</td>
</tr>
<tr>
<td>$\rho_r$</td>
<td>Policy persistence</td>
<td>0.6</td>
</tr>
<tr>
<td>$\gamma_\pi$</td>
<td>Response to inflation</td>
<td>1.5</td>
</tr>
<tr>
<td>$\rho_z$</td>
<td>Technology persistence</td>
<td>0.95</td>
</tr>
<tr>
<td>$\rho_\delta$</td>
<td>Separation persistence</td>
<td>0.97</td>
</tr>
<tr>
<td>$\sigma_r$</td>
<td>Std Dev MP shock</td>
<td>0.0025</td>
</tr>
<tr>
<td>$\sigma_z$</td>
<td>Std Dev technology shock</td>
<td>0.01</td>
</tr>
<tr>
<td>$\sigma_\delta$</td>
<td>Std Dev separation shock</td>
<td>0.015</td>
</tr>
</tbody>
</table>

Policy are also set to standard values.

Table 2 lists the parameters calibrated to match steady state values, and how these differ between our baseline and the alternative models. The disutility of hours worked $\varphi$ is such that steady state hours worked per employed person equal $1/3$. Given that preferences are identical across models, this implies $\varphi = 2.7$ in both the baseline and alternative. Following Blanchard and Diamond (1990) we target a steady state unemployment rate of 11 percent, which includes both individuals who are categorized as unemployed and those out of the labor force who want a job. Following den Haan et al. (2000), we target a steady state worker finding rate of 70 percent, so $q_{ss} = 0.7$. These assumptions directly pin down the matching efficiency parameter $\sigma_m$. Again, since the matching function and evolution of employment are identical across models, this produces $\sigma_m = 0.7526$ in both cases.

We calibrate $b$ conservatively such that in steady state the replacement ratio, defined as the ratio of unemployment benefits to the average compensation in steady state, equals $1/2$, which is roughly the mid-point between values in the literature. By construction our model implies a replacement ratio of one if unemployment benefits include the consumption equivalent of the disutility of hours worked. Given our assumption on hours per worker and

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9For example, Shimer (2005) considers a value of 0.4 while Hagedorn and Manovksii (2008) consider a value close to one.
identical preferences across the two models, we have \( b = 0.1 \) in both cases.

Lastly, given our calibration and targets, the vacancy posting cost \( \kappa \) is implied from the steady state free-entry condition. This criteria is the only place the calibration across models differs. In the alternative model, firms posting vacancies are attempting to enter a market in which they sell a good in a competitive market, whereas our baseline model has entering firms selling a differentiated product in a monopolistically competitive environment. For this reason, the baseline model has a higher vacancy posting cost than the alternative model.\(^{10}\)

### 3 Results

We now turn to analyzing the differences between the baseline and alternative models. First, we consider how changing the level of the unemployment benefits affects the steady state of each economy. Second, we consider the impulse responses to the various shocks in the economy, and third we consider how key labor market ratios behave across models. In all these cases, our main focus is to contrast the baseline model with the alternative model, but we also highlight the effects of sticky prices—which are central to the mechanism—by discussing the results under flexible prices as well.

#### 3.1 Unemployment Benefits and the Steady State

In order to gauge the importance of wage posting and search in our environment, we first analyze the steady state of the economy. The steady state of the model has no aggregate shocks, but with idiosyncratic firm- and individual-level shocks still operational. The result

\(^{10}\)Note that if we alternatively had fixed an identical value of \( \kappa \) across models, we would need to allow different steady state unemployment rates, as there would tend to be more entry and lower unemployment in our baseline model.
is an economy with a degenerate price distribution where all firms having the same price and the unemployment rate equalling its time invariant steady state value as gross flows in and out of employment net out.\textsuperscript{11}

Figure 3 gives indication as to the differences between models. The figure shows the effect, in steady state, of changing the unemployment benefits $b$ to vary the replacement ratio, 

\textsuperscript{11}Lago Alves (2012) considers the effects of different trend inflation rates in a model where firms jointly make pricing and hiring decision. For an overview of the implications of trend inflation without full price indexation, see Ascari and Sbordone (2014).
relative to our calibrated replacement ratio of $1/2$ ($b = 0.1$), holding preference parameters fixed. In both models, as unemployment benefits decrease, the base level of compensation decreases as well, which makes firms more willing to post vacancies, so unemployment declines, and aggregate output increases.

However, the relative elasticities of wages and other labor market variables to changes in $b$ differ across models. In our baseline model, firms demanding hours from workers also have pricing power. As profits are higher compared to the alternative model, where hiring firms operate in a competitive product market, this requires a higher vacancy posting cost $\kappa$ to match an equal level of steady state unemployment. As a result, identical changes in $b$ have different effects across models since the fixed cost of finding and employing a worker—in other words the vacancy posting cost plus a base level of compensation—moves by a smaller relative amount in the baseline model. With lower vacancy posting costs, the alternative model shows bigger effects of $b$ on the labor market and output.

These results suggest that the implications of policies changing unemployment benefits may depend on the modeling assumptions. Our analysis suggests that, once allowing for both price-setting and labor market decisions to be made within the same firm, the economy becomes less sensitive to the level of benefits. Consequently, decreases in benefits will imply a lower impact on unemployment in our model than the alternative.

### 3.2 Impulse Responses

Having discussed some of the steady state properties of our model, we now turn to considering the dynamics associated with different shocks. Again we compare our specification of wage posting and search directly by firms that have pricing power and nominal rigidities with the alternative retailer-wholesaler environment that separates the these actions into different firms. The three shocks in the model are total factor productivity, separation rate, and monetary policy innovations; their effects differ in magnitude and persistence depending on the model assumptions. In addition, we consider the flexible price version of both the baseline and alternative models to highlight the importance of sticky prices for the propagation of shocks.
3.2.1 Technology Shock

Figure 4 shows the response to a one standard deviation positive innovation in total factor productivity under the assumption of flexible prices ($\zeta = 0$). The responses of both our baseline model and the alternative are similar qualitatively, although the magnitudes differ for the labor market variables.

In our baseline model, higher productivity expands output, induces firms to post more vacancies, and drives down unemployment. Firms face a trade-off between increasing their
prices, which stifles demand but keeps hours low, and not increasing prices, which leads to high demand, a need for hours, and hence a high compensation level. Firms increase their prices, leading to an increase in inflation on impact. Higher prices tend to lead to lower average hours per worker, but higher demand overwhelms this channel, leading to more hours and hence a higher compensation rate and higher average wage. Since firms’ marginal costs are the average hourly wages in this case, these changes in labor demand and prices in net lead to a decline in firms’ markups. In periods after the shock, real activity gradually returns to normal, and inflation is slightly negative as prices decline in accordance with the average hourly wages.

Many of the channels in the baseline model are present in the alternative model, but with varying magnitudes. Wholesale good firms receive the technology shock, which increases labor demand, but because they sell their product in a competitive market, they have no pricing power that offsets some of the shock. As a result, vacancies, unemployment, output, and hours per worker move to a greater degree. The main difference relative to the baseline is that retail firms, while setting the final goods prices in a similar manner to the firms in the baseline model, have unchanged markups, reflecting a one-for-one change in the final good and wholesale good prices. This movement in wholesale prices is what generates the larger swing in labor market variables.

Now considering sticky prices, Figure 5 again shows the response to a one standard deviation positive innovation in total factor productivity. Focusing first on our baseline model, output, average hours per worker, and the average hourly wage all show significantly larger movements upon impact than in the case with flexible prices, as the inability of a fraction of firms to re-optimize their prices in the period of a shock means relative demand increases significantly, which boosts their hours and compensation levels. Firms that can re-optimize face a similar trade-off between high prices with low hours and low prices with high hours as in the flexible price case. In the flexible price case, there was an initial surge in inflation followed by slight deflation; with sticky prices firms that can re-optimize are forward looking and hence hesitant to raise prices. Instead, prices decline slightly, feeding into the increase in average hours per worker, and compressing the markup. Vacancies shoot up upon impact leading to a sharp fall in unemployment in the following period, which
Figure 5: Response to a Technology Shock with Sticky Prices

Compresses profits. In response, firms raise markups, which decreases hours and wages. As posting vacancies becomes less attractive in a tighter labor market and as the technology shock wanes, vacancies revert to a more normal path, which induces a correction in output, hours, and wages in periods following the initial shock.

The alternative model under sticky prices generates much bigger effects from a technology shock. Since firms searching in the labor market operate in a competitive market, they do not face the same pricing and compensation trade-off faced by firms in the baseline model.
Retail firms with the opportunity to set their price do not have to worry about the effect of prices on compensation, and increase prices by a larger amount in response to the shock. Wholesale firms post more vacancies and demand more hours, which boosts average hours per worker and the average hourly wage. In subsequent periods, a higher number of wholesale firms produces more output and demands more hours from workers, but since they sell their product in a competitive environment, the wholesale good price declines, and retail firms that can re-optimize lower their prices significantly in order to stabilize markups. Because more adjustment occurs through prices, real variables exhibit less of a correction in subsequent periods compared to the baseline model. Lower inflation causes a larger decline in the nominal interest rate than in our baseline case.

To summarize, after a technology shock, while many of the responses are qualitatively similar, our baseline model has firms that use their combined pricing and hiring power to mute the effects of the shock. In contrast, the alternative model, with hiring firms operating in a competitive market and retail firms not facing hiring and employment decisions, sees larger initial swings in real and nominal variables.

3.2.2 Separation Rate Shock

Figure 6 shows the responses to a one standard deviation separation rate shock under the assumption of flexible prices. The responses of the variables across models are nearly identical, as a separation rate shock leads to more unemployment. In the baseline model, firms with market power have a muted response in vacancy posting, reflecting a greater desire to enter because of monopoly profits. Wholesale firms in the alternative model, on the other hand, operate in a competitive environment, producing bigger swings in vacancy posting. The separation shock produces lower output and an initial decrease in inflation in both models.

Again moving to the sticky price case, Figure 7 shows the responses to a one standard deviation separation rate shock. In contrast to the flexible price case, the baseline and alternative models show different responses to the separation rate shock. Upon impact the value of posting a vacancy in the baseline model falls as matches are expected to be shorter. As a consequence, the number of vacancies posted falls. This effect is short-lived because in subsequent periods the pool of unemployed grows, which drives up the probability of matching
with a worker inducing firms to post more vacancies. In the baseline model hiring firms can also offset the impact of shorter duration matches by increasing their markups. They do this by decreasing marginal costs through lower hours worked and hence compensation. Allowing firms to adjust profit margins through marginal costs has important consequences. Lower marginal costs increases the value of forming a match which leads to vacancies temporarily overshooting their steady state level. Moreover, as markups adjust more through marginal costs than changes in the price level, inflation does not move much and the monetary au-
Figure 7: Response to a Separation Rate Shock with Sticky Prices

In contrast, in the alternative model wholesale firms cannot adjust prices in response to the separation rate shock. Vacancies fall on impact but revert to their steady state level without overshooting. As the pool of unemployed grows an increased job filling probability offsets the shorter duration of each match. Overall, labor market tightness falls more drastically in the alternative model. Since retail firms cannot control how the separation shock affects their marginal costs, their ability to control markups is diminished, and inflation
Figure 8: Response to a Monetary Policy Shock with Sticky Prices

3.2.3 Monetary Policy Shock

Now, considering the effect of a monetary policy shock, we ignore the case of flexible prices, since in that case shocks feed directly into inflation and have no effect on any real variables.

Figure 8 shows the responses to a one standard deviation monetary policy shock and how, in contrast to technology shocks, our baseline model shows more responsiveness than the
alternative model. In our baseline model, an increase in the interest rate lowers output, and affects the stochastic discount factor firms are using to discount profits. In an environment where firms make both the search and pricing decisions, firms that can re-optimize respond by increasing the size of their markup by lowering their hours and compensation in order to improve current margins. Potential entrants have a lower incentive to enter because expected profits are discounted more, so they post fewer vacancies leading to higher unemployment. Absent other frictions in the economy, the effects of monetary policy on variables such as output, hours, and inflation, are short lived. However, labor market variables show a longer lasting impact primarily because future profits are discounted more, which discourages vacancy posting.

The alternative model, by contrast, shows significantly smaller responses to an interest rate shock. Again, this result is due to the separation of labor search and pricing between two different firms. Since wholesale hiring firms operate in a competitive environment, an interest rate shock that distorts the stochastic discount factor cannot be offset by changing markups via hours worked. Additionally, an interest rate shock does not have a differential impact on incumbent and entering firms when prices are determined competitively, hence vacancies and unemployment respond less. In contrast, a monetary policy shock leads to a larger decline in inflation in the alternative model, as price-setting firms increase their markup but do not have to consider the direct implications of their relative price change on hours and compensation in the wholesale market. The result is that monetary policy shocks move inflation more in the alternative model, but aggregate quantities and labor market variables less.

### 3.3 Cyclical Properties

Save for the monetary shock, the previous results highlight that by giving hiring firms pricing power the labor market is more readily able to absorb shocks. We formalize this intuition by considering what our baseline and alternative models imply about important labor market ratios when all shocks are taken into account.

The top panel of Table 3 presents statistics summarizing the movement of key labor market variables in each model when prices are flexible. Because the volatility of output
Table 3: Labor Market Ratios with Flexible Prices

<table>
<thead>
<tr>
<th>Model</th>
<th>All Shocks</th>
<th>Tech Shock Only</th>
<th>Separation Shock Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Alternative</td>
<td>Baseline</td>
</tr>
<tr>
<td>Prices Flexible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>std(u/v)</td>
<td>corr(u, v)</td>
<td>std(Y)</td>
</tr>
<tr>
<td></td>
<td>std(Y)</td>
<td>std(Y)</td>
<td>std(Y)</td>
</tr>
<tr>
<td>All Shocks</td>
<td>11.9971</td>
<td>-0.5344</td>
<td>0.0168</td>
</tr>
<tr>
<td></td>
<td>0.3176</td>
<td>0.2858</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>12.9331</td>
<td>-0.5688</td>
<td>0.0171</td>
</tr>
<tr>
<td></td>
<td>0.3113</td>
<td>0.2801</td>
<td></td>
</tr>
<tr>
<td>Alternative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.8451</td>
<td>-0.9351</td>
<td>0.0164</td>
</tr>
<tr>
<td></td>
<td>0.3255</td>
<td>0.2929</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>11.2092</td>
<td>-0.9308</td>
<td>0.0168</td>
</tr>
<tr>
<td></td>
<td>0.3185</td>
<td>0.2867</td>
<td></td>
</tr>
<tr>
<td>Alternative</td>
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<tr>
<td></td>
<td>32.8127</td>
<td>-0.9557</td>
<td>0.0037</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Baseline</td>
<td>32.3527</td>
<td>-0.7037</td>
<td>0.0036</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Alternative</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In both models all standard deviations are normalized relative to output. In both models wages are fairly stable and hence both models deliver significant labor market volatility. Importantly, both models generate greater volatility along the extensive relative to intensive margin of labor supply. Overall, when prices are flexible and both technology and separation shocks are active the volatility of key labor market variables is nearly identical across models.

The second panel of Table 3 shows the differences across models when technology shocks are the only source of aggregate uncertainty. In the baseline model pricing power by hiring firms leads hours and real wages to vary slightly more over the cycle and hence vacancies respond less when compared to the alternative model. As a result, the volatility of the v/u ratio in the baseline model is 88 percent of the alternative model’s value.

The last panel of Table 3 considers separation shocks as the only source of aggregate uncertainty. As highlighted in Figure 6, this panel shows that the responses of both models to separation shocks are very similar when prices are flexible. With take-it-or-leave it offers, wages are isolated from labor market tightness and hence hourly wages do not respond to a separation shock. As a consequence, all adjustment occurs along the extensive margin and both models imply very volatile v/u ratios relative to output. The only major difference is the correlation between vacancies and unemployment, which is more muted in the alternative model due to larger swings in vacancies than in the baseline model.

Table 4 repeats the quantitative exercise when prices are sticky. Looking across panels of this table reveals that sticky prices, through their effects on markups or marginal costs,
accentuate the differences between our baseline model and the alternative model where hiring firms have no pricing power. In the first panel, considering all shocks produces a lower $v/u$ volatility and Beveridge curve, along with lower volatility in employment and much higher volatility of hours and wages than the alternative model. The second, third, and fourth panels show the differential effects of the various shocks, but considering all shocks demonstrates that the technology and separation shocks primarily drive the aggregate moments.

Focusing on the second panel, the baseline model continues to deliver a relative volatility of the $v/u$ ratio that is smaller, at roughly 73 percent of what the alternative model obtains. With sticky prices, price setting firms in the baseline model adjust their own marginal costs via the intensive margin. Greater volatility in hours leads to more volatility in hourly wages. In effect, wages are more flexible in the baseline model relative to the alternative model, which dampens fluctuations in labor market tightness.

The third panel of Table 4 considers monetary policy shocks as the only source of aggregate uncertainty. Echoing the results from the previous section, the baseline model is comparatively more responsive to monetary shocks than the alternative model. Recall that a monetary shock affects the stochastic discount factor used by hiring firms to evaluate future profits. In the baseline model, existing firms respond to this by increasing markups and new firms choose to post fewer vacancies as expected profits are discounted more. Overall, both models imply modest volatility in labor market tightness when monetary policy drives
uncertainty. Since the monetary policy shock tends to move these moments in opposite directions of the technology shock and the separation shock, the only way we could possibly overturn the qualitative differences in our baseline and alternative models when considering all shocks is to have an economy that relies primarily on monetary policy shocks as a driver of fluctuations.

The last panel of Table 4 considers the effects of separation shocks. The alternative model delivers a very volatile $v/u$ ratio as compensation is isolated from aggregate labor market tightness yet separation shocks affect the number of unemployed workers and hence the job filling probability. The alternative model, however, implies only a very modest Beveridge curve since vacancies quickly return to their steady state value. In the baseline model, while compensation is also isolated from labor market conditions hours are not. Firms adjust markups by changing hours and hence the extensive margin and vacancies vary less. This model implies a counterfactually positive Beveridge curve as vacancies overshoot their steady state level as wages are temporarily depressed due to the change in hours.

### 4 Conclusion

We consider the macroeconomic implications of the interaction between pricing and labor market frictions. In our New Keynesian model, workers randomly search for jobs and monopolistically competitive firms post take-it-or-leave-it wage contracts taking into account infrequent adjustment of their own price. By allowing for wage posting by firms, the model provides a direct link between pricing and hiring behavior at the micro level.

A comparison of our baseline model with an alternative model that separates pricing and hiring across different sectors reveals key differences. We find that our baseline model is less sensitive to changes in benefits paid to unemployed workers because hiring firms, who have pricing power, can adjust to workers’ changing reservation wages by adjusting prices and hence labor demand.

An analysis of the cyclical responses of the models reveals that the separation of pricing and hiring is not innocuous for labor market variables of interest. Over the cycle, price-setting firms in our baseline model use the intensive margin of labor more readily in response to
shocks compared to price-taking firms in the alternative model. As a result, hourly wages are more volatile in the baseline model and vacancy posting activity is reduced. This finding is despite of the fact that the take-it-or-leave-it assumption leaves workers indifferent between employment and unemployment, which would tend to increase the volatility of the extensive margin.

A key message from our analysis is that separating pricing and hiring frictions matters greatly even in our parsimonious framework. Even in the flexible price case of our model, incorporating labor market search decisions into a firm with market power alters the effects of shocks and changes the volatility of the labor market. The addition of sticky prices leads to further difference between our baseline model and the alternative. These results imply that differences in the stickiness of prices or the market power of firms may lead to different conclusions about the importance of the link between labor markets and inflation.

References


