

Labor Market Fluidity, Productivity, and Wages*

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Abstract

This paper explores the effects of labor market fluidity on productivity, wages, and employment. Cross-country evidence indicates that economies with more fluid labor markets tend to exhibit higher productivity and faster wage growth. To uncover the underlying mechanisms, we develop a quantitative search-and-matching model with dismissal restrictions, calibrated to the Japanese economy. The model shows that relaxing dismissal restrictions increases labor market fluidity, which subsequently raises labor productivity. Higher productivity, in the long run, expands employment and boosts wages. Interestingly, while looser dismissal regulations raise job separations, the higher matching between firms and job seekers mitigates the rise in unemployment, rendering the overall impact on the unemployment rate quantitatively modest.

Keywords: Labor market fluidity, employment protection, employment, wages, productivity, search and matching model

JEL Classification: E24, J63, J64

I. Introduction

Labor market fluidity has attracted renewed attention in Japan. Two structural forces lie behind this growing interest. First, the Japanese economy is undergoing profound changes driven by demographic aging, technological progress, and the transition toward decarbonization. Adapting to these forces requires a labor market that can reallocate workers flexibly across firms and occupations. Second, sustaining long-run economic growth increasingly hinges on productivity improvements. As Japan's working-age population continues to decline, productivity-enhancing reallocation of labor toward its most efficient uses has become

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essential.

A fluid labor market is widely viewed as a key institutional foundation for these processes. By facilitating worker mobility, labor market fluidity improves matching between firms and workers, accelerates structural adjustment, and supports aggregate productivity growth. However, we still lack a quantitative account of how employment protection shapes worker reallocation and, through it, employment, wages, and aggregate productivity.

This paper aims to fill this gap by combining cross-country evidence with a search-and-matching model in which firing restrictions slow the replacement of unproductive matches. We begin by documenting cross-country facts using average job tenure as a proxy for labor market fluidity. Countries with longer tenure—indicative of more rigid labor markets—tend to have lower labor productivity and slower wage growth. These relationships are suggestive but not causal. We then examine the degree of labor market fluidity in Japan using worker-flow data constructed from the Japanese Labour Force Survey. Approximately 3.4 percent of the working-age population changes labor market status each month—substantially less than in the United States—although this rate has increased modestly over time.

To interpret these empirical patterns, we develop a search-and-matching model that emphasizes the role of employment protection.¹ Unlike traditional models of firing restrictions in which firms can immediately dismiss unproductive workers by paying a firing cost, our framework assumes that firms can only gradually separate from workers who have become completely unproductive.² As a result, firms temporarily employ a mix of productive and unproductive workers, lowering average labor productivity.

A key feature of the model is that whether a worker is productive is match-specific.³ Importantly, we assume that a worker who becomes unproductive in one firm can become productive again after being reallocated to another firm, so that human capital is not destroyed at the aggregate level. We also assume that such adverse events occur with equal probability across workers. This structure allows the model to capture a novel mechanism: worker replacement itself can raise a firm's average productivity by rotating workers out of low-productivity matches and into more productive ones.

This match-specific productivity-loss assumption alone, however, would imply that unproductive workers immediately quit, leaving no scope to study dismissals or dismissal regulation. To generate a meaningful role for firing decisions, we introduce an additional as-

¹ Search-and-matching models are developed and surveyed in Mortensen and Pissarides (1994, 1999a, 1999b), Pissarides (2000) and Rogerson et al. (2005), to name a few.

² Traditional models of firing restrictions include Burda (1992), Hopenhayn and Rogerson (1993), Ljungqvist (2002), and Garibaldi and Violante (2005).

³ In our view, productivity loss is a firm-specific outcome that can arise for a variety of reasons—e.g., a worker fails to adapt to a newly adopted technology, workplace relationships deteriorate, a worker performs well as a rank-and-file employee but is poorly suited for managerial tasks, or the worker is displaced in a promotion race when managerial positions are scarce.

sumption that unproductive workers receive the same wage treatment as productive workers. As a result, unproductive workers have little incentive to separate voluntarily, and firms must continue paying wages to workers who no longer contribute to production. This creates an incentive for firms to dismiss unproductive workers. In contrast to much of the existing literature, this mechanism implies that firms have an incentive to induce worker turnover through dismissals and new hires, even in the absence of aggregate shocks.

The final element of the framework is a policy parameter that captures the “ease of dismissal.” When this parameter is zero, firms are effectively prohibited from dismissing workers and must wait for unproductive workers to leave voluntarily. As the parameter value increases, firms can dismiss a larger fraction of unproductive workers each period. We evaluate, both theoretically and quantitatively, how changes in this policy parameter affect labor market outcomes and aggregate productivity.

We conduct a quantitative analysis to assess how easing dismissal restrictions affects labor market outcomes and aggregate productivity. Using parameter values chosen to reflect key features of the Japanese economy, the analysis shows that higher labor market fluidity reallocates unproductive workers through temporary unemployment and raises aggregate labor productivity. When hours are endogenized, productivity gains translate into higher wages as well. These results highlight the importance of effective worker-job matching and smooth labor reallocation for productivity growth. At the same time, although easing dismissal restrictions increases separations, it also raises the probability that firms match with new workers more quickly, thereby limiting the impact on the unemployment rate. Specifically, a 20 percent relaxation of dismissal restrictions has virtually no effect on the steady-state unemployment rate.

The remainder of the paper proceeds as follows. Section II documents empirical facts on labor market fluidity, productivity, and wages, with a focus on Japan. Section III presents the baseline search-and-matching model with employment protection. Section IV conducts the quantitative analysis. Section V extends the model to allow for endogenous hours and examines robustness. Section VI concludes and discusses policy implications.

II. Labor Market Fluidity: Stylized Facts

This section documents empirical patterns linking labor market fluidity to productivity and wage growth and then describes the degree of labor market fluidity in Japan.

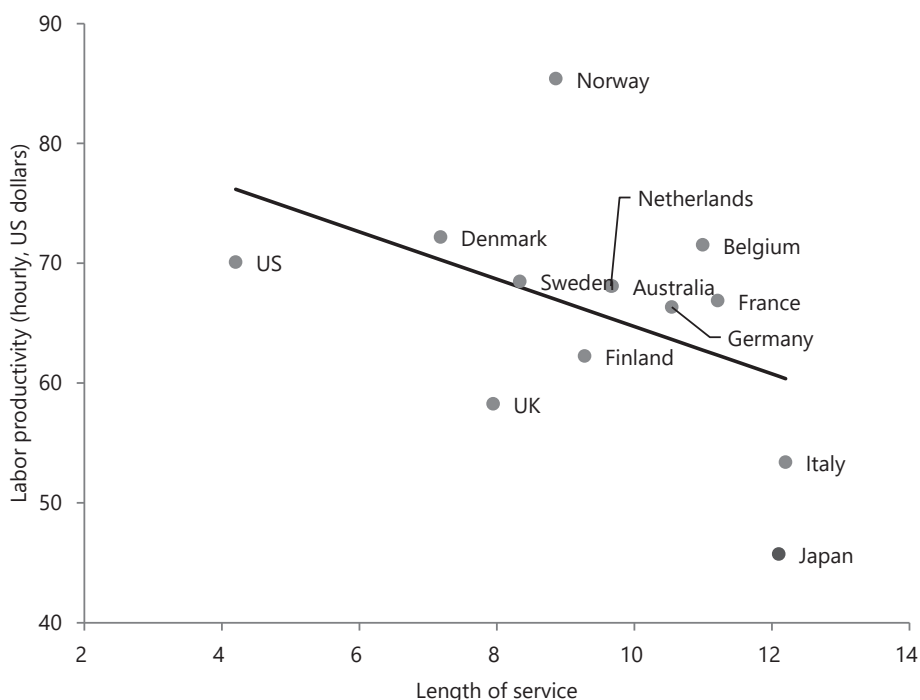
II-1. Cross-country Evidence: Job Tenure, Productivity, and Wage Growth

Aggregate productivity growth reflects not only within-firm improvements in value creation, but also the economy's "reallocation" or "cleansing" process—entry of more productive firms and exit of less productive ones. A fluid labor market is likely to support both channels by facilitating efficient matching between firms and workers and enabling smooth labor reallocation from declining activities to expanding ones.

We proxy labor market fluidity by average job tenure. The rationale is straightforward: in more fluid labor markets, worker mobility is more active and average tenure is shorter; conversely, longer tenure is indicative of more rigid labor markets.

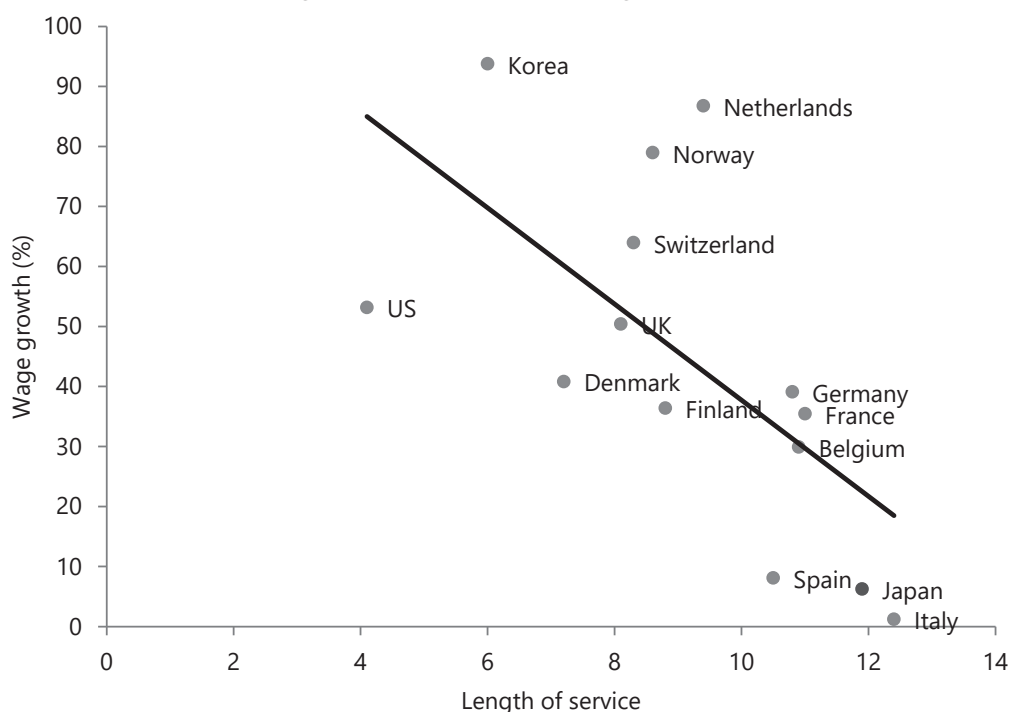
Figure 1 plots average job tenure against labor productivity across countries. A clear negative relationship emerges: namely, economies with longer job tenure tend to exhibit lower labor productivity. The correlation coefficient is -0.45 , indicating a moderately strong association. Japan stands out in this figure, displaying both the longest average job tenure and the lowest labor productivity among the sample countries. This pattern suggests that a rigid labor market, as reflected in long job tenure, may be associated with weaker aggregate productivity performance.

Figure 1: Job Tenures and Labor Productivity



Source: OECDstat, JLPT

Figure 2: Job Tenures and Wage Growth



Source: OECDstat, JLPT

Next, we examine the relationship between labor market fluidity and wage growth. Figure 2 relates average job tenure to wage growth across countries. It shows that economies with shorter job tenure tend to experience faster wage growth. The correlation between job tenure and wage growth is -0.64 , which is stronger than the corresponding correlation observed for labor productivity. This pattern is consistent with the view that greater labor market fluidity improves match quality and, in turn, productivity, which translates into stronger wage growth. As shown in Figure 1, Japan is located at the extreme end of the distribution, with long job tenure and sluggish wage growth.

Taken together, Figures 1 and 2 indicate that labor market fluidity is systematically related not only to productivity levels but also to wage dynamics across countries. While these correlations do not establish causality, they provide suggestive evidence that motivates the structural analysis developed in the subsequent sections.

II-2. Labor Market Fluidity in Japan: Worker Flows

The analysis of job tenure suggests that Japan's labor market is relatively rigid in international comparison. By contrast, the United States exhibits the shortest average job tenure in

the sample, consistent with the view that its labor market is among the most fluid. This sharp contrast between Japan and the United States naturally motivates a closer comparison of labor market dynamics between the two economies.

While job tenure provides a useful summary measure of labor market rigidity, it does not capture the underlying dynamics of worker reallocation. To better understand how fluidity differs between Japan and the United States, we turn to worker-flow data.⁴ Workers change labor market status across employment, unemployment, and nonparticipation. Even when unemployment rates are similar, the intensity of inflows into and outflows from unemployment can differ markedly across countries. Economies characterized by rapid worker flows can be described as having fluid labor markets, whereas sluggish flows reflect labor market rigidity.

Using monthly worker-flow series constructed from Japan's Labour Force Survey for 1980–2024, we find that roughly 3.4 percent of the working-age population (ages 15–64) changes labor market status each month. In the United States, the corresponding figure is about 6.5 percent, implying substantially higher turnover. Japan's flows have risen modestly over time: the monthly share changing status is 3.2 percent in 1980–1999 and 3.6 percent in 2000–2024.

This is also reflected in transition rates: Japan's job-finding and separation rates are both lower than those in the United States. In Japan, the monthly job-finding rate is 13.9 percent, and the separation rate is 0.4 percent, compared with 25.2 percent and 1.2 percent in the United States (Fallick and Fleischman, 2004).

The frequency of job-to-job transitions is another key dimension of labor market fluidity. In the United States, “job-to-job transitions” typically refer to moves between employers without a spell of nonemployment, and measurement requires information on whether an individual is employed by the same employer across survey waves. Fallick and Fleischman (2004) construct a time series of employer-to-employer flows using the CPS, and the U.S. Census Bureau's Longitudinal Employer-Household Dynamics also provides Job-to-Job Flows (J2J).

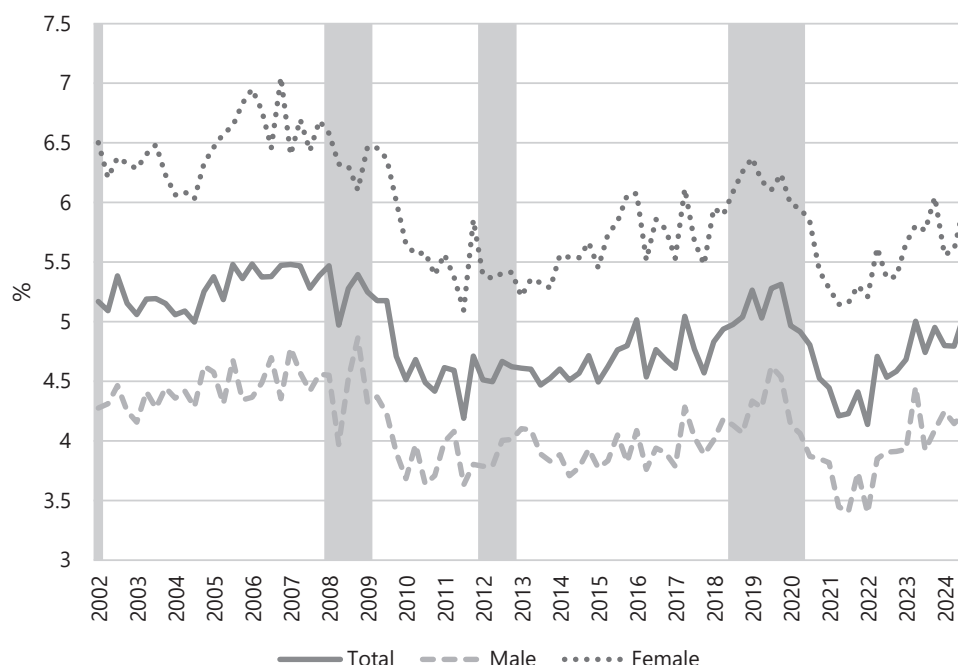
In Japan, comparable job-to-job transition data are not available. While information on job changes can be obtained from the Labour Force Survey and the Employment Trend Survey, the resulting measures do not cleanly isolate employer-to-employer moves without nonemployment. For example, the Labour Force Survey defines job changers as employed individuals with prior job experience who separated within the past year, a definition that can include transitions with nonemployment gaps and other non-comparable cases.

With these measurement differences in mind, the Japanese job-changing rate is approxi-

⁴ An early contribution to the empirical study on worker flows is Blanchard and Diamond (1990). For worker flows in Japan, see Miyamoto (2011), Lin and Miyamoto (2012), Esteban et al. (2017), and Miyamoto (2025).

mately in the mid-4 to mid-5 percent range (Figure 3). It is higher for women than for men by about 1.8 percentage points on average, and it is decreasing with age: the average rate is 7.1 percent for ages 25–34, 4.5 percent for ages 35–44, and 3.3 percent for ages 45–54. In the United States, the job-to-job transition rate is about 2 percent per month (roughly 24 percent at an annual rate), which is approximately four to five times Japan’s job-changing rate.

Figure 3: Job-Changing Rate



Source: Labour Force Survey. Online at: <https://www.e-stat.go.jp/>

Notes: Gray areas correspond to ESRI recessions

III. The Model

This section presents a baseline model that focuses on the role of firing restrictions. In conventional models of employment protection, such as Burda (1992) and Hopenhayn and Rogerson (1993), the incentive to dismiss workers arises from cyclical employment adjustment, and firms are assumed to be able to lay off workers immediately by paying a fixed firing cost. By contrast, we assume that firms can dismiss workers only gradually. Specifically, we modify a multi-worker search-and-matching framework in the spirit of Bertola and Caballero (1994), Cooper et al. (2007), Cahuc et al. (2008), and Kudoh et al. (2019) by introducing a novel assumption that some workers become completely unproductive but cannot be dismissed instantaneously. For simplicity, we follow Cooper et al. (2007) in assuming that

wages are determined by take-it-or-leave-it offers made by firms.

III-1. Environment

The economy consists of a large number of ex-ante homogeneous workers and a unit mass of homogeneous firms. Time is discrete and infinite, and all agents discount the future at the common discount rate r . Individuals face idiosyncratic uncertainty regarding their future employment status, but there are no aggregate shocks, so the law of large numbers applies at the aggregate level.

The novelty of the model is within-firm worker heterogeneity. While individuals are ex-ante identical, once employed, some workers are hit by a productivity shock at the end of each period and become unproductive—i.e., their productivity falls to zero—starting in the next period.

We abstract from modeling the micro-level origins of such unproductive matches, but the intended interpretation is that the skill requirements faced by employees evolve over time. For example, it is natural to assume that the skills required of middle managers differ from those required of newly hired workers. Another plausible scenario is that ongoing technological progress—such as advances in information technology—gradually changes the skills needed year by year. In our interpretation, a nontrivial fraction of workers fail to adapt to these changes and thus become unproductive in their current firm.

Let total employment in period t be L_t , which satisfies $L_t = \ell_t + n_t$, where ℓ_t denotes the mass of productive workers and n_t denotes the mass of unproductive workers. We treat ℓ_t and n_t as continuous to ensure differentiability. Output is produced according to

$$y_t = A\ell_t^\alpha k_t^{1-\alpha}, \quad (1)$$

where $0 < \alpha < 1$, $A > 0$, and k_t denotes capital used in production. Unproductive workers do not appear in the production function and therefore make no contribution to output. This assumption, while strong, makes it transparent that firms have no intrinsic incentive to retain unproductive workers absent frictions or restrictions.

Because the mass of firms is normalized to one, firm-level labor productivity coincides with aggregate labor productivity. Since unproductive workers are included in employment, labor productivity is given by

$$\frac{A\ell_t^\alpha k_t^{1-\alpha}}{\ell_t + n_t}, \quad (2)$$

implying that labor productivity declines mechanically as n_t rises. Conversely, dismissing unproductive workers raises labor productivity in this economy.

We assume that whether a worker is productive is purely match-specific (firm-specific): there are no “universally unproductive” workers. A key implication is that a worker who becomes unproductive in one firm can become productive again after being reallocated to another firm. Under this assumption, employment protection that prevents the timely separation of unproductive matches generates productivity losses by slowing reallocation. Each firm also has access to technology that converts one unit of the final consumption good into one unit of investment. Let i_t denote investment in period t . The capital stock evolves as

$$k_{t+1} = (1 - \delta)k_t + i_t, \quad (3)$$

where δ is the depreciation rate.

III-2. Worker Flows

We assume that the labor market is frictional: workers find jobs only after searching, and firms must post vacancies to hire.

Let U_t denote the mass of job seekers and V_t the mass of vacancies in period t . New matches are formed according to the Cobb-Douglas matching function:

$$m(U_t, V_t) = m_0 U_t^\xi V_t^{1-\xi}, \quad (4)$$

where $m_0 > 0$ and $0 < \xi < 1$ are parameters.

Define labor market tightness by $\theta_t \equiv V_t/U_t$. The probability that a vacancy is filled within a period is given by

$$q_t = \frac{m(U_t, V_t)}{V_t} = m_0 \theta_t^{-\xi} \equiv q(\theta_t), \quad (5)$$

and the job-finding probability for an individual job seeker is given by

$$\frac{m(U_t, V_t)}{U_t} = \theta_t q(\theta_t) = m_0 \theta_t^{1-\xi}. \quad (6)$$

Tightness θ_t corresponds to the vacancy-to-unemployment ratio (and is closely related to the job-openings-to-applicants ratio commonly reported in labor statistics). Under constant returns to scale in matching, the job-finding probability $\theta_t q(\theta_t)$ is increasing in θ_t , while the vacancy-filling probability $q(\theta_t)$ is decreasing in θ_t .

The timing of events is as follows. Each period t starts with ℓ_t productive workers and n_t unproductive workers employed in firms. After production takes place, a fraction $\lambda_F n_t$ of unproductive workers are successfully dismissed, where $0 < \lambda_F < 1$ is an exogenous parameter capturing the degree of firing restriction. We interpret λ_F as a policy parameter measuring the ease of dismissal. If $\lambda_F = 1$, all unproductive workers are dismissed at the end of each period; if $\lambda_F = 0$, firms are unable to dismiss any unproductive workers and must

retain them until they leave voluntarily. Voluntary quits occur with probability $0 < \lambda_Q < 1$. After the dismissal stage, a voluntary-quit shock is realized. Finally, at the end of the period, productive workers are hit by a productivity shock with probability ϕ , in which case they become unproductive in the next period (conditional on not having quit). Hence, the mass of workers who newly become unproductive is $(1 - \lambda_Q)\phi n_t$.

Given this timing, the laws of motion for employment states are

$$\ell_{t+1} = (1 - \lambda_Q)(1 - \phi)\ell_t + q(\theta_t)V_t, \quad (7)$$

$$n_{t+1} = (1 - \lambda_F)(1 - \lambda_Q)n_t + (1 - \lambda_Q)\phi\ell_t, \quad (8)$$

$$U_{t+1} = [1 - \theta_t q(\theta_t)]U_t + \lambda_Q\ell_t + [\lambda_F + (1 - \lambda_F)\lambda_Q]n_t. \quad (9)$$

The labor force is normalized to one, so $1 = U_t + \ell_t + n_t$.

Equation (7) describes the evolution of productive employment. A worker remains productive next period only if the worker neither quits nor becomes unproductive; this amounts to $(1 - \lambda_Q)(1 - \phi)\ell_t$. New hires $q(\theta_t)V_t$ are assumed to enter as productive workers and therefore increase ℓ_{t+1} . Equation (8) describes the evolution of unproductive employment. Unproductive workers remain in the firm only if they are neither dismissed nor quit, yielding $(1 - \lambda_F)(1 - \lambda_Q)n_t$. In addition, a fraction $(1 - \lambda_Q)\phi\ell_t$ of productive workers become unproductive. Finally, equation (9) describes job seekers. Those who remain unmatched continue searching, $[1 - \theta_t q(\theta_t)]U_t$; productive workers who quit enter unemployment, $\lambda_Q\ell_t$; and unproductive workers who separate—either through dismissal or quitting—enter unemployment in the amount $[\lambda_F + (1 - \lambda_F)\lambda_Q]n_t$.

III-3. Firms

We describe firms' behavior through value functions. We suppress the time subscript whenever doing so does not cause confusion. Let the state vector be $S = (A, \ell, n, k, U)$. The value of a representative firm, $J(S)$, satisfies the following Bellman equation:

$$J(S) = \max_{v,i} \{A\ell^\alpha k^{1-\alpha} - w(S)(\ell + n) - cv - i + \beta J(S_{+1})\}, \quad (10)$$

where v denotes vacancies posted by the firm (treated as a continuous variable) and i denotes investment. The firm's choices are subject to the laws of motion for productive employment and capital, $\ell_{+1} = (1 - \lambda_Q)(1 - \phi)\ell + q(\theta)v$, $k_{+1} = (1 - \delta)k + i$, and the next-period

state is $S_{+1} = (A_{+1}, \ell_{+1}, n_{+1}, k_{+1}, U_{+1})$.⁵

Wages are determined through bargaining. Because the bargaining outcome depends on the value functions of firms and workers, the wage is, in general, a function of the state vector S , denoted by $w(S)$. Writing the wage as a function of the state vector reflects the fact that firms understand how the wage implied by bargaining varies with the state when choosing their vacancy and investment plans.⁶

Each period, the firm produces $A\ell^\alpha k^{1-\alpha}$ units of the final good, pays the wage $w(S)$ to all employees, pays vacancy-posting costs cv , and purchases investment goods. A key departure from standard models is that the firm pays the same wage $w(S)$ not only to productive workers but also to unproductive workers. Due to firing restrictions, the firm is forced to retain workers with zero productivity and continue paying them—specifically, it incurs labor costs wn for workers who do not contribute to production. This is the central mechanism the model is designed to capture.

The first-order conditions with respect to v and i , respectively, imply

$$\beta J_\ell(S_{+1}) = \frac{c}{q(\theta)}, \quad (11)$$

$$\beta J_k(S_{+1}) = 1. \quad (12)$$

Equation (11) is the vacancy-posting condition. The left-hand side is the marginal benefit of expanding productive employment. The right-hand side is the marginal cost. Here $c > 0$ is the per-period cost of maintaining one vacancy, and $1/q$ is the expected duration until the vacancy is filled. Thus, c/q is the expected total cost required to fill one vacancy.

The envelope conditions yield

$$J_\ell(S) = \alpha A \ell^{\alpha-1} k^{1-\alpha} - w(S) - w_\ell(S)(\ell + n) + (1 - \lambda_Q)(1 - \phi)\beta J_\ell(S_{+1}), \quad (13)$$

$$J_k(S) = (1 - \alpha)A \ell^\alpha k^{-\alpha} - w_k(S)(\ell + n) + (1 - \delta)\beta J_k(S_{+1}). \quad (14)$$

Equation (13) describes how the firm's value changes when the number of productive workers increases by one unit (more precisely, by a marginal unit). The first term is the marginal product of productive labor. The second term captures the additional wage payment associated with employing an extra worker. The third term captures the general-equilibrium effect on wage payments: because the bargained wage $w(S)$ can itself change with ℓ , the induced change $w_\ell(S)$ affects total wage payments to all employees, $\ell + n$. The final term captures the contribution of the additional worker to next period's firm value, discounted by the prob-

⁵ Note that the firm is assumed to take the stock of unproductive workers as given. A companion paper, Kudoh and Miyamoto (2026), considers a model in which the law of motion for the unproductive workers influences the firm's vacancy choice.

⁶ For more about this issue, see Smith (1999), Cahuc et al. (2008), Kudoh and Sasaki (2011), and Kudoh et al. (2019).

ability that the worker neither separates nor becomes unproductive—i.e., it accounts for both voluntary separation risk and the productivity-shock risk. The interpretation of equation (14) is analogous.

III-4. Workers

As in the previous subsection, we describe workers' behavior using value functions. The value of being a productive worker, $J^E(S)$, satisfies

$$J^E(S) = w(S) + \lambda_Q \beta J^U(S_{+1}) + (1 - \lambda_Q)[(1 - \phi)\beta J^E(S_{+1}) + \phi\beta J^N(S_{+1})], \quad (15)$$

where $J^N(S)$ denotes the value of being an unproductive worker, and $J^U(S)$ denotes the value of being unemployed (i.e., a job seeker). A productive worker is employed at the firm, engages in production, and receives the wage $w(S)$, which is written as a function of the state variables; the determination of wages is discussed below. After production takes place, dismissals occur. Because productive workers are not subject to dismissal, they leave the firm only if they experience a voluntary separation shock, which occurs with probability λ_Q . In that case, the worker becomes unemployed in the next period and receives the discounted value $\beta J^U(S_{+1})$. If separation does not occur, the worker remains employed but is hit by a productivity shock with exogenous probability ϕ , in which case the worker becomes unproductive in the next period. We assume that once a worker becomes unproductive, productivity cannot be restored unless the worker changes jobs.

The value of being an unproductive worker is given by

$$J^N(S) = w(S) + \lambda_F \beta J^U(S_{+1}) + (1 - \lambda_F)[\lambda_Q \beta J^U(S_{+1}) + (1 - \lambda_Q)\beta J^N(S_{+1})]. \quad (16)$$

A key assumption here is that all workers are treated equally, so unproductive workers receive the same wage $w(S)$ as productive workers. As is clear from the production function (1), unproductive workers do not contribute to production or profits. From the firm's perspective, it would therefore be optimal to dismiss all unproductive workers immediately. However, firing restrictions prevent such immediate dismissal, and whether an unproductive worker is dismissed is determined with probability λ_F . The reciprocal $1/\lambda_F$ represents the average duration of employment for unproductive workers, which we interpret as a measure of the stringency of firing restrictions. If an unproductive worker is not dismissed, the worker may quit voluntarily with probability λ_Q ; otherwise, the worker remains at the firm as an unproductive employee in the following period.

Finally, the value of being unemployed (a job seeker) is given by

$$J^U(S) = z + \theta q(\theta)\beta J^E(S_{+1}) + (1 - \theta q(\theta))\beta J^U(S_{+1}), \quad (17)$$

where z denotes the flow value of nonemployment, which can be interpreted as unemployment benefits and the value of leisure measured in consumption units. An unemployed worker receives z each period while searching for a job. With probability $\theta q(\theta)$, the worker finds a job and transitions to employment in the next period. We assume that newly hired workers are productive upon entry and do not become unproductive immediately.

III-5. Wage Determination

In frictional labor markets, firms and workers meet in bilateral matches, which rules out the use of perfectly competitive wage-setting mechanisms that rely on a large number of market participants. In the literature, bargaining-based approaches are commonly used to determine wages in such environments. In the present model, however, textbook Nash bargaining solutions cannot be applied for two reasons. First, firms employ multiple workers, so the wage-setting problem cannot be reduced to a one-to-one bargaining situation. Second, firms employ unproductive workers under the same contractual terms as productive workers. This further complicates the application of conventional bargaining frameworks.

When a firm bargains with L homogeneous workers, Nash bargaining can be applied by treating each worker as the “ L th marginal worker” who bargains bilaterally with the firm. In our model, however, workers are heterogeneous—productive and unproductive workers coexist within the firm—so this approach is not directly applicable. We therefore follow Cooper et al. (2007) and assume that firms make wage offers to workers. This environment corresponds to a take-it-or-leave-it bargaining structure, under which workers are indifferent between employment and unemployment.

A key implication of this setup is that firms have no incentive to retain unproductive workers. Consequently, the wage contract offered by the firm must be such that productive workers are exactly indifferent between remaining employed and becoming unemployed. That is, the contract must satisfy

$$J^E(S_t) = J^U(S_t) \tag{18}$$

An important caveat is that firms generally have an incentive to induce voluntary separations of unproductive workers by setting wages so low that $J^N(S_t) < J^U(S_t)$, making job search more attractive for unproductive workers. However, such a strategy would eliminate the scenario of interest—namely, one in which firms wish to dismiss unproductive workers but are constrained by firing restrictions. To analyze this case, we impose the condition $J^N(S_t) \geq J^U(S_t)$, and we verify below that this condition is satisfied in equilibrium.

Using equations (15) and (17), we have

$$\begin{aligned} J^E(S) - J^U(S) &= w(S) - z + (1 - \lambda_Q)(1 - \phi)\beta[J^E(S_{+1}) - J^U(S_{+1})] \\ &\quad + (1 - \lambda_Q)\phi\beta[J^N(S_{+1}) - J^U(S_{+1})] - \theta q(\theta)\beta[J^E(S_{+1}) - J^U(S_{+1})]. \end{aligned}$$

Imposing condition (18) yields

$$w = z - (1 - \lambda_Q)\phi\beta[J^N(S_{+1}) - J^U(S_{+1})] \quad (19)$$

Equation (19) characterizes the wage contract offered to productive workers. At this stage, the value of the second term on the right-hand side is not yet known. Under the maintained assumption $J^N(S_t) \geq J^U(S_t)$, if this term were strictly positive, wages would be discounted by the probability that a worker becomes unproductive. As we show below, however, this term is equal to zero.

To see this, subtract equation (17) from equation (16) and impose condition (18). This yields

$$J^N(S) - J^U(S) = w - z + (1 - \lambda_F)(1 - \lambda_Q)\beta[J^N(S_{+1}) - J^U(S_{+1})] \quad (20)$$

Next, under the assumption that all workers—productive and unproductive—receive the same wage w , substitute equation (19) into equation (20) to eliminate w . This gives $J^N(S) - J^U(S) = \chi[J^N(S_{+1}) - J^U(S_{+1})]$, where $\chi = [(1 - \lambda_F) - \phi](1 - \lambda_Q)\beta$. Iterating forward, we obtain

$$J^N(S_t) - J^U(S_t) = \chi[J^N(S_{t+1}) - J^U(S_{t+1})] = \lim_{T \rightarrow \infty} \chi^T [J^N(S_{t+T}) - J^U(S_{t+T})] = 0.$$

It follows that the second term in equation (19) is zero, and therefore the wage contract satisfies $w = z$.

This result follows directly from the take-it-or-leave-it nature of wage offers. Wages are equal to the worker's outside option, which is constant in the model. Consequently, wages are constant and do not depend on output or productivity.⁷ Accordingly, in equations (13) and (14), we have $w_\ell(S) = w_k(S) = 0$.

Although the assumption of constant wages may raise concerns about realism, it does not affect the main results of the paper. As shown in the next section, wages play no role in the mechanism through which firing restrictions affect labor productivity. We therefore abstract from wage variation at this stage to keep the analysis transparent.

⁷ A companion paper, Kudoh and Miyamoto (2026), presents a model with a richer bargaining protocol.

III-6. Steady State

While business-cycle analysis typically focuses on the entire time paths of endogenous variables, the objective of this paper is to obtain insights into the long-run properties of the economy. We therefore study the steady state in which all endogenous variables are constant over time.

Evaluating the envelope conditions (13) and (14) at the steady state and using the first-order conditions (11) and (12) to eliminate the value functions yields the following two equations:

$$[1 + r - (1 - \lambda_Q)(1 - \phi)] \frac{c}{q(\theta)} = \alpha A \ell^{\alpha-1} k^{1-\alpha} - z, \quad (21)$$

$$k = \left(\frac{1 - \alpha}{r + \delta} A \right)^{1/\alpha} \ell. \quad (22)$$

Equation (21) is the job-creation condition, and equation (22) is the capital-demand function. Substituting equation (22) into equation (21) to eliminate k yields

$$[1 + r - (1 - \lambda_Q)(1 - \phi)] \frac{c}{q(\theta)} = \alpha A \left(\frac{1 - \alpha}{r + \delta} A \right)^{\frac{1-\alpha}{\alpha}} - z. \quad (23)$$

All terms in equation (23) except θ are constants. Hence, the steady-state value of labor market tightness θ is uniquely determined by this equation. Importantly, λ_F does not appear in equation (23), implying that firing restrictions are neutral with respect to job creation. This neutrality result relies on the assumption of fixed hours. As shown in Section 5, once hours are endogenized, firing restrictions affect job creation through changes in the level of production.

Given the steady-state value of θ , the remaining variables can be obtained from the worker-flow equations (7), (8), and (9). Steady-state unemployment, productive employment, and unproductive employment are given by

$$U = \frac{\lambda_F + (1 - \lambda_F)\lambda_Q}{\left(\frac{1 - (1 - \lambda_Q)(1 - \phi) + (1 - \lambda_Q)\lambda_F}{1 - (1 - \lambda_Q)(1 - \phi)} \right) \theta q(\theta) + \lambda_F + (1 - \lambda_F)\lambda_Q}, \quad (24)$$

$$\ell = \frac{\theta q(\theta)}{1 - (1 - \lambda_Q)(1 - \phi) + \left(\frac{1 - (1 - \lambda_F)(1 - \lambda_Q) + (1 - \lambda_Q)\phi}{1 - (1 - \lambda_F)(1 - \lambda_Q)} \right) \theta q(\theta)}, \quad (25)$$

$$n = \frac{(1 - \lambda_Q)\phi}{1 - (1 - \lambda_F)(1 - \lambda_Q)} \ell. \quad (26)$$

From equation (26), steady-state labor productivity is

$$LP = \frac{A\ell^\alpha k^{1-\alpha}}{\ell + n} = \frac{1 - (1 - \lambda_F)(1 - \lambda_Q)}{1 - (1 - \lambda_F)(1 - \lambda_Q) + (1 - \lambda_Q)\phi} \left(\frac{1 - \alpha}{r + \delta} \right)^{\frac{1-\alpha}{\alpha}} A^{1/\alpha}. \quad (27)$$

Proposition 1. Suppose $\phi > 0$. Then an increase in λ_F —that is, a relaxation of firing restrictions—raises steady-state labor productivity.

Proof Differentiating equation (27) with respect to λ_F yields

$$\frac{\partial LP}{\partial \lambda_F} = \frac{(1 - \lambda_Q)^2 \phi}{[1 - (1 - \lambda_F)(1 - \lambda_Q) + (1 - \lambda_Q)\phi]^2} \left(\frac{1 - \alpha}{r + \delta} \right)^{\frac{1-\alpha}{\alpha}} A^{1/\alpha} > 0.$$

When $\phi > 0$, a higher value of λ_F reduces the share of unproductive workers and increases labor productivity. By contrast, when $\phi = 0$, labor productivity does not depend on either λ_Q or λ_F .

In the present model, labor market fluidity can be measured by the total number of worker flows each period, defined as the sum of job findings and separations:

$$UE + EU = \theta q(\theta)U + \lambda_Q \ell + [\lambda_F + (1 - \lambda_F)\lambda_Q]n \quad (28)$$

$$= 2 \left[\lambda_Q + \frac{[\lambda_F + (1 - \lambda_F)\lambda_Q](1 - \lambda_Q)\phi}{1 - (1 - \lambda_F)(1 - \lambda_Q)} \right] \ell. \quad (29)$$

Here, the steady-state value of ℓ is given by equation (25). In a steady state with only two labor market states—employment and unemployment—the number of job findings necessarily equals the number of separations ($UE = EU$), so total worker flows are twice either component.

Finally, we consider the labor share. Recent studies, such as Karabarbounis and Neiman (2014), document a global decline in the labor share, spurring renewed interest in its determinants. Because unproductive workers receive the same wage as productive workers in our model—a feature absent from standard frameworks—we can also analyze how firing restrictions affect the labor share. In the present model, the labor share is

$$LS = \frac{w(\ell + n)}{y} = \frac{w}{LP} = \frac{z}{LP} \quad (30)$$

Since the wage per hour is constant, movements in the labor share mirror the inverse of labor productivity.

IV. Quantitative Analysis

This section quantifies the effects of labor market fluidity on employment, wages, and aggregate productivity. We first calibrate the model to key features of the Japanese labor market and then conduct quantitative analysis under the calibrated parameters, focusing on changes in dismissal restrictions.

IV-1. Calibration

We choose parameter values to match key labor-market facts for Japan, following the calibration strategy in Kudoh et al. (2019).⁸

The model period is one quarter. The discount factor is set to $\beta = 0.997$, which implies an annual real interest rate of roughly 4 percent. This choice is standard and consistent with the parameterization in Braun et al. (2006) and related work. We set the labor share parameter in the production function, α , to $2/3$. Based on Braun et al. (2006), the capital depreciation rate, δ , is set to 0.028. We normalize total factor productivity A to one.

The matching function takes the Cobb–Douglas form, $m(U, V) = m_0 U^\xi V^{1-\xi}$, where m_0 is matching efficiency and ξ is the elasticity of matches with respect to job seekers. Following Lin and Miyamoto (2014), we set $\xi = 0.6$, which lies within the plausible range reported by Petrongolo and Pissarides (2001). We choose matching efficiency using targets for the job-finding rate and labor market tightness. Specifically, using the worker-flow estimates in Miyamoto (2025), the monthly job-finding probability is about 13 percent, the separation rate is 0.4 percent, and labor market tightness is 0.95. The calibrated matching efficiency parameter m_0 is 0.398.

We next set parameters governing separations and the emergence of unproductive workers. In the model, separations reflect both voluntary quits (λ_Q) and dismissals of unproductive workers (λ_F). We assume that 65 percent of separations are voluntary and set the voluntary quit probability accordingly, consistent with the approach in Silva and Toledo (2009) and Kuo and Miyamoto (2019). The probability that a productive worker becomes unproductive is pinned down by targeting the share of labor-hoarding workers in the data. Using estimates from the Recruit Works Institute, we target a labor-hoarding share of 5.2 percent (the five-year average over 1995–2015) and later examine robustness to alternative values.

Next, we describe how we set the parameters governing separations. In the model, the probability of a voluntary quit is denoted by λ_Q , while the probability that an unproductive

⁸ Useful discussions on calibration of search-and-matching models are found in Shimer (2005) and Hagedorn and Manovskii (2008).

worker is dismissed is denoted by λ_F . We choose these parameters so that their sum matches the empirical separation rate. In standard search-and-matching models, λ_F is typically absent and separations are captured solely by λ_Q , which is often set equal to the observed separation rate. In our framework, by contrast, separations arise both from voluntary quits and from dismissals of unproductive workers. Accordingly, we assume that 65 percent of separations are voluntary and set λ_Q to 0.084. This decomposition strategy follows Silva and Toledo (2009) and Kuo and Miyamoto (2019), who split separations into exogenous and endogenous components.

We set the probability that a worker becomes unproductive, ϕ , by targeting the share of labor-hoarding workers in the data. The Recruit Works Institute estimates the number of hoarded workers by comparing required employment—implied by firms’ performance and related indicators—with actual employment. While the labor-hoarding share varies over time, we target 5.2 percent, the average computed at five-year intervals over 1995–2015. Given nontrivial variation in the underlying estimates, we subsequently conduct a sensitivity analysis with respect to ϕ .

Finally, the flow value of nonwork, z , is set to 61 percent of output. We choose the vacancy-posting cost to ensure that steady-state tightness matches its data counterpart. Table 1 summarizes the calibrated parameter values and their targets.

IV-2. Results

Table 2 reports the steady-state values of key endogenous variables under the calibrated parameters. The model matches the calibration targets for the job-finding probability and labor market tightness by construction. In the steady state, the unemployment rate is 3.2 percent. Productive employment is 0.92 and unproductive employment is 0.05, implying that unproductive workers account for 5.2 percent of total employment, consistent with the labor-hoarding target. The wage level is 1.667 and output is 2.711, matching the calibration target for their ratio. Aggregate labor productivity is 2.80, and the labor share is 0.595.

Table 1: Parameter Values

Parameter	Description	Value		Source/Target
		Value (Baseline)	(Endogenous Hours)	
r	Real interest rate	0.01	0.01	Data
α	Labor share parameter	2/3	2/3	Labor share
δ	Capital depreciation rate	0.028	0.028	Braun et al. (2006)
A	Total factor productivity	1	1	Normalization
ξ	Matching elasticity with respect to job seekers	0.6	0.6	Lin and Miyamoto (2014)
m_0	Matching efficiency	0.398	0.398	Miyamoto (2025)
λ_Q	Quit (voluntary separation) probability	0.084	0.084	See text
λ_F	Dismissal probability of an unproductive worker	0.0876	0.0876	See text
ϕ	Probability a productive worker becomes unproductive	0.0053	0.0053	Labor hoarding share (Recruit Works Institute)
z	Unemployment flow value	1.667	0.1	See text
c	Vacancy cost	5.260	5.259	Miyamoto (2025)
e_0	Scale parameter in the disutility function of hours	-	1.867	$h = 1$
μ	Reciprocal of the Frisch elasticity	-	1.8	Kudoh et al. (2019)

Source: Authors' calibration

Table 2: Model Solution and Comparative Statics Results

Variable	Description	Benchmark steady-state value	Comparative statics	
		($\lambda_F = 0.0876, \phi = 0.0053$)	$\lambda_F = 0.105$	$\phi = 0.0042$
θ	Labor market tightness	0.95	0.95	1.024
ℓ	Mass of productive workers	0.9176	0.9248	0.9301
n	Mass of unproductive workers	0.0503	0.0429	0.0408
u	Mass of job seekers	0.032	0.0323	0.0291
v	Mass of vacancies	0.030	0.031	0.030
w	Wage rate	1.667	1.667	1.667
y	Output	2.711	2.732	2.748
k	Capital stock	23.654	23.839	23.975
$\theta q(\theta)$	Job-finding rate	0.39	0.39	0.402
p	Labor productivity	2.800	2.823	2.830
$n/(n + \ell)$	Unproductive worker share	0.052	0.044	0.042
LS	Labor share of income	0.595	0.590	0.589

Source: Authors' calculations

IV-3. Comparative Statics

We now quantify the effects of easing dismissal restrictions. Motivated by the theoretical result in Section 3 that a higher dismissal probability raises productivity by reducing the stock of unproductive workers, we conduct a comparative statics exercise in which the dismissal parameter λ_F increases by 20 percent relative to its benchmark value. Table 2 reports the resulting steady-state levels.

Easing dismissal restrictions reduces unproductive employment from 0.0503 to 0.0429, lowering the unproductive worker share from 5.2 percent to 4.4 percent. Output rises modestly, from 2.711 to 2.732, and vacancies increase from 0.030 to 0.031, indicating a limited expansion in job creation. Unemployment rises slightly (from 0.032 to 0.0323) because inflows into unemployment from the dismissal of unproductive workers outweigh the relatively small increase in outflows driven by job creation. Quantitatively, however, the effect on unemployment is negligible. Productive employment increases from 0.9176 to 0.9248, and aggregate labor productivity rises from 2.800 to 2.823.

As in the baseline model with take-it-or-leave-it wage setting, wages remain unchanged at 1.667 because the flow value of nonwork pins them down. The labor share ($LS \equiv w(n + \ell)/y$) moves inversely with labor productivity in this baseline model because wages remain fixed. Thus, relaxing dismissal restrictions leads to higher labor productivity and a corresponding decline in the labor share—from 0.595 in the benchmark to 0.590 under a 20 percent relaxation.

To interpret the implied change in labor market fluidity, consider the number of workers who change labor market status in a period, $\theta q(\theta)u + \lambda_Q \ell + [\lambda_F + (1 - \lambda_F)\lambda_Q]n$. Under the 20 percent relaxation, this flow measure increases slightly (from 0.0250 to 0.0252), indicating that the reform raises worker turnover, but only modestly at the calibrated parameter values.

Next, we conduct comparative statics with respect to the probability that an employed worker becomes unproductive, ϕ . Specifically, we consider a 20 percent reduction in ϕ from its benchmark value; the results are reported in Table 2.

A lower ϕ reduces the stock of unproductive workers: unproductive employment declines and the unproductive share falls from 5.2 percent to 4.2 percent. This improvement raises firm value and stimulates job creation, increasing labor market tightness from 0.95 to 1.024. As a result, unemployment declines from 0.032 to 0.029. Vacancies, however, remain essentially unchanged. Because productive employment increases, aggregate output rises. The increase in the capital stock—from 23.654 to 23.975—further contributes to the rise in output.

Although total employment increases when ϕ falls, output rises by more, implying an

increase in labor productivity from 2.80 to 2.83. As discussed above, because wages are constant in the baseline model, the labor share moves inversely with labor productivity; accordingly, the labor share declines from 0.595 to 0.589.

V. Extensions and Robustness

V-1. Endogenous Hours

As discussed above, the baseline model delivers a constant wage, which prevents us from capturing how a relaxation of firing restrictions affects wages through changes in labor productivity. This subsection extends the baseline framework by endogenizing hours worked. The extension allows wages to vary through changes in hours. The production function is $y_t = A_t(h_t \ell_t)^\alpha k_t^{1-\alpha}$, where h_t denotes hours per worker.

With endogenous hours, equation (15) is replaced by

$$J^E(S) = W(h; S) - e(h) + \lambda_Q \beta J^U(S_{+1}) + (1 - \lambda_Q)[(1 - \phi)\beta J^E(S_{+1}) + \phi\beta J^N(S_{+1})],$$

where $W(h; S)$ denotes labor income (rather than the wage rate) and $e(h)$ denotes the disutility of working h hours. Similarly, equation (16) is replaced by

$$J^N(S) = W(h; S) - e(h) + \lambda_F \beta J^U(S_{+1}) + (1 - \lambda_F)[\lambda_Q \beta J^U(S_{+1}) + (1 - \lambda_Q)\beta J^N(S_{+1})].$$

As in the baseline model, we assume that firms offer the same contract to all workers, productive and unproductive. Moreover, all workers supply h hours, and the firm chooses h (Kudoh et al., 2019). The value of unemployment becomes

$$J^U(S) = b + \theta q(\theta)\beta J^E(S_{+1}) + (1 - \theta q(\theta))\beta J^U(S_{+1}),$$

where b represents unemployment benefits.⁹

The firm's value function is

$$J(S) = \max_{h, v, i} \{A h^\alpha \ell^\alpha k^{1-\alpha} - W(h; S)(\ell + n) - c v - i + \beta J(S_{+1})\}$$

subject to $\ell_{+1} = (1 - \lambda_Q)(1 - \phi)\ell + q(\theta)v$, and $k_{+1} = (1 - \delta)k + i$. The first-order conditions with respect to v and i are still given by (11) and (12). The first-order condition with respect to h is

$$\alpha A h^{\alpha-1} \ell^\alpha k^{1-\alpha} = W_h(h; S)(\ell + n). \quad (31)$$

⁹ The value of nonwork is given by $z = e(h) + b$. See Hall and Milgrom (2008) and Kudoh and Miyamoto (2023) on this point.

The envelope conditions can be rewritten as

$$\begin{aligned} J_\ell(S) &= \alpha A h^\alpha \ell^{\alpha-1} k^{1-\alpha} - W(h; S) - W_\ell(h; S)(\ell + n) + (1 - \lambda_Q)(1 - \phi)\beta J_\ell(S_{+1}), \\ J_k(S) &= (1 - \alpha)A h^\alpha \ell^\alpha k^{-\alpha} - W_k(h; S)(\ell + n) + (1 - \delta)\beta J_k(S_{+1}) \end{aligned}$$

As in the baseline model, we assume that the firm makes take-it-or-leave-it offers to productive workers. Hence, the contract is such that productive workers are indifferent between employment and unemployment, i.e., $J^E(S) = J^U(S)$. This implies that the contract must satisfy

$$W(h; S) = e(h) + b - (1 - \lambda_Q)\phi\beta[J^N(S_{+1}) - J^U(S_{+1})] \quad (32)$$

This contract condition is a modification of (19), but it is written in terms of labor income that depends on hours. As in the baseline model, we assume that unproductive workers work under the same contract as productive workers—namely, unproductive workers also supply h hours and incur the same disutility $e(h)$. Under these assumptions,

$$\begin{aligned} J^N(S) - J^U(S) &= W(h; S) - e(h) - b + (1 - \lambda_F)(1 - \lambda_Q)\beta[J^N(S_{+1}) - J^U(S_{+1})] \\ &= [(1 - \lambda_F) - \phi](1 - \lambda_Q)\beta[J^N(S_{+1}) - J^U(S_{+1})] \\ &= \lim_{T \rightarrow \infty} [(1 - \lambda_F - \phi)(1 - \lambda_Q)\beta]^T [J^N(S_{t+T}) - J^U(S_{t+T})] \\ &= 0 \end{aligned}$$

Therefore, labor income satisfies

$$W(h; S) = e(h) + b. \quad (33)$$

This wage schedule, as in Cooper et al. (2007), does not directly depend on output. However, when productivity increases and the firm chooses higher hours, labor income rises to compensate workers for the higher disutility of work. In this sense, wages are no longer constant in the extended model.

From (33), we have $W_h(h; S) = e'(h) > 0$, $W_\ell(h; S) = 0$, and $W_k(h; S) = 0$. Substituting these into the envelope conditions yields

$$\frac{(1 + r)c}{q(\theta)} = \alpha A h^\alpha \ell^{\alpha-1} k^{1-\alpha} - e(h) - b + (1 - \lambda_Q)(1 - \phi)\frac{c}{q(\theta)}, \quad (34)$$

$$r + \delta = (1 - \alpha)A h^\alpha \ell^\alpha k^{-\alpha}. \quad (35)$$

Substituting (35) into (34) to eliminate k delivers a job-creation condition analogous to (23). Likewise, substituting (35) into the hours-optimality condition (32) to eliminate k yields a relationship between employment and hours. Collecting terms, we obtain

$$\frac{(1+r)c}{q(\theta)} = \alpha A h \left(\frac{1-\alpha}{r+\delta} A \right)^{\frac{1-\alpha}{\alpha}} - e(h) - b + (1-\lambda_Q)(1-\phi) \frac{c}{q(\theta)}, \quad (36)$$

$$\alpha A \ell \left(\frac{1-\alpha}{r+\delta} A \right)^{\frac{1-\alpha}{\alpha}} = (\ell + n) e'(h). \quad (37)$$

In the baseline model, labor market tightness θ is pinned down solely by the job-creation condition (23). Here, by contrast, the job-creation condition (36) links θ and h and therefore does not determine θ on its own. Moreover, the optimal-hours condition (37) depends not only on θ and h but also on n . As a result, the steady-state values of the five variables θ, h, U, ℓ , and n must be determined jointly from equations (24), (25), (26), (36), and (37). Analytical solutions are therefore difficult to obtain in this extended model. In what follows, we study the model's properties through quantitative analysis.

V-2. Quantitative Analysis with Endogenous Hours

We now turn to the quantitative analysis of the model with endogenous hours. The parameterization largely follows that of the baseline model in Section 4, with additional parameters introduced to govern labor disutility (e_0 and μ).

Endogenizing hours introduces two additional parameters governing the disutility of labor. The parameter μ is the inverse of the Frisch elasticity of labor supply, and we follow Kudoh et al. (2019) in setting $\mu = 1.8$. We then calibrate e_0 so that steady-state hours per employed worker equal one.

In this endogenous-hours model, unlike the benchmark model in Section III, the wage does not coincide with the flow value of unemployment. We therefore calibrate the unemployment benefit parameter z in the standard way. Specifically, we set z to 60 percent of the model's average wage, consistent with Nickell's (1997) view that a replacement rate of 0.6 is a reasonable benchmark.

The vacancy cost (c), the flow value of nonemployment (z), the probability that an unproductive worker is fired (λ_F), and the probability that a productive worker becomes unproductive (ϕ) are recalibrated to ensure that the model continues to match the same targets as in the baseline specification. The resulting parameter values and steady-state outcomes are reported in Tables 1 and 3, respectively.

Table 3: Endogenous Hours

Variable	Description	Benchmark steady-state value	Comparative statics	
		($\phi = 0.0053, \lambda_F = 0.0876$)	$\lambda_F = 0.105$	$\phi = 0.0042$
θ	Labor market tightness	0.95	0.952	1.025
ℓ	Mass of productive workers	0.918	0.925	0.930
n	Mass of unproductive workers	0.0503	0.0429	0.0408
u	Mass of job seekers	0.032	0.0322	0.0291
v	Mass of vacancies	0.0304	0.0307	0.0298
W	Earnings	1.667	1.675	1.678
h	Hours worked	1.000	1.005	1.006
y	Output	2.711	2.744	2.764
k	Capital stock	23.654	23.946	24.116
$q(\theta)$	Vacancy filling rate	0.39	0.3904	0.402
p	Labor productivity	2.800	2.836	2.846
$n/(n + \ell)$	Unproductive worker share	0.052	0.044	0.042
LS	Labor share of income	0.595	0.591	0.590

Source: Authors' calculations

A comparison of steady states across the baseline and endogenous-hours models reveals that labor market tightness, employment, and unemployment are identical by construction, as they share the same calibration targets. Hours per worker also match the target value of one. As a result, capital, output, productivity, and wages coincide across the two models in the benchmark steady state.

We next conduct comparative statics exercises analogous to those in the baseline model. Specifically, we consider a 20 percent increase in the probability that an unproductive worker is dismissed (λ_F) and a 20 percent reduction in the probability that a worker becomes unproductive (ϕ).

Table 3 reports the steady-state values of the endogenous variables under each scenario. A key feature of this exercise is that changes in employment and output operate through adjustments in hours and wages. This reflects the fact that, while wages are constant in the benchmark model, they are linked to production through hours worked in the present model.

Consider first an increase in the dismissal probability. As in the baseline model, unproductive employment declines from 0.0503 to 0.043, reducing the unproductive share from 5.2 percent to 4.4 percent. Job creation increases and labor market tightness rises, although the quantitative magnitude remains limited. Unemployment increases slightly, but the change is very small, consistent with the baseline results. Productive employment increases from 0.918 to 0.925.

Hours worked per employee rise qualitatively, but the magnitude is small: the change is only about 0.5 percent. Nevertheless, this pattern suggests that relaxing dismissal restrictions affects not only separations and hiring, but also firms' adjustment along the intensive margin. This is particularly relevant for Japan, where hours adjustment has been emphasized as an important margin of labor-market adjustment (Kudoh et al., 2019). Consistent with this channel, the increase in hours translates into higher wages, with the wage rising from 1.667 to 1.675.

Aggregate output and total employment both increase. Because output grows more than total employment, labor productivity rises. As in the benchmark model, the labor share is determined by the relationship between wages and labor productivity; however, because wages are no longer constant in the present model, their dynamics are more complex than in the benchmark case. Nevertheless, the qualitative conclusion remains unchanged: an increase in the dismissal probability leads to a decline in the labor share. This occurs because labor productivity rises more significantly than wages. Overall, these results suggest that the economic effects of easing dismissal restrictions do not differ substantially between the endogenous-hours model and the benchmark model.

We next examine the effects of a reduction in the probability that workers become unproductive. The qualitative results closely mirror those of the baseline model. A decline in ϕ reduces the stock of unproductive workers, raises firm value, and stimulates job creation, leading to higher labor market tightness and lower unemployment. Employment increases, while vacancies remain largely unchanged.

In contrast to the baseline model, however, hours per worker increase, which leads to higher wages. The rise in hours also contributes to a larger expansion in output relative to the baseline case. As a result, labor productivity increases by more than in the baseline model.

Taken together, these exercises illustrate how labor market fluidity affects firms' productivity, wages, and job creation. When unproductive workers remain within firms for extended periods, the process of economic reallocation is impeded, leading to lower aggregate productivity and, in turn, weaker wage outcomes. By contrast, higher labor market fluidity—through the more rapid separation of unproductive workers—allows firms to allocate capital and labor more efficiently, thereby raising productivity and promoting job creation. Although separations of unproductive workers operate to increase unemployment, the quantitative effect is small. In some cases, higher job-finding rates even raise employment, so unemployment durations do not lengthen. As a result, concerns about unemployment remain limited in quantitative terms.

V-3. Sensitivity Analysis

In this subsection, we examine the robustness of the quantitative results. In the previous analysis, model parameters were calibrated to match a labor-hoarding share of 5.2 percent, corresponding to the average share of unproductive workers over 1995–2015. However, the share of labor-hoarding workers has exhibited an upward trend. According to estimates by the Recruit Works Institute (2015), this share is projected to reach 8.2 percent by 2025. We therefore re-examine the quantitative implications of the model using this higher value as the calibration target. Because our focus here is on wage responses, we employ the endogenous-hours model rather than the benchmark model with constant wages.

To this end, we recalibrate the vacancy cost c , the flow value of unemployment z , the labor disutility parameter e_0 , the dismissal probability of unproductive workers λ_F , and the probability that an employed worker becomes unproductive ϕ so that the model matches the new target. The resulting parameter values are $c = 6.062$, $z = 0.969$, $e_0 = 1.808$, $\lambda_F = 0.0555$, and $\phi = 0.0057$.

Under these recalibrated parameters, we conduct comparative statics exercises analogous to those in the benchmark analysis. Specifically, we consider a 20 percent increase in λ_F and a 20 percent reduction in ϕ relative to their benchmark values. Table 4 reports the steady-state outcomes and comparative statics results under the new calibration. For ease of comparison, the results are presented as percentage changes relative to the benchmark steady state, rather than as levels.

Table 4: Sensitivity Analysis

Variable	Benchmark			New target: $n/(n + \ell)=0.082$			New target: $n/(n + \ell)=0.20$	
	Solution	$\lambda_F = 0.105$	$\phi = 0.0042$	Solution	$\lambda_F = 0.105$	$\phi = 0.0042$	Solution	$\lambda_F = 0.0455$
θ	0.95	0.0	7.9	0.95	0.5	9.1	0.95	4.8
ℓ	0.918	0.8	1.4	0.8886	1.2	2.0	0.774	9.0
n	0.0503	-14.7	-18.9	0.0794	-13.9	-18.4	0.194	-37.0
u	0.032	0.6	-9.1	0.032	0.9	-9.4	0.032	6.9
w	1.667	0.5	0.7	1.6141	0.8	1.0	1.407	5.9
v	0.030	1.0	-2.0	0.030	1.6	-1.3	0.03	12.2
h	1.000	0.5	0.6	1.000	0.7	0.9	1.000	5.0
y	2.711	1.2	2.0	2.6249	1.9	2.9	2.288	14.4
k	23.654	1.2	2.0	22.9051	1.9	2.9	19.961	14.4
$\theta q(\theta)$	0.39	0.0	3.1	0.39	0.2	3.5	0.39	1.9
p	2.800	1.3	1.6	2.7118	1.9	2.6	2.363	14.7
$n/(n + \ell)$	0.052	-15.4	-19.2	0.082	-13.8	-18.7	0.200	-36.9

Source: Authors' calculations

We first consider the scenario in which λ_F increases. The direction of change for all endogenous variables is the same as in the benchmark case. Focusing on magnitudes, however, the responses of most variables—except for unproductive employment and its share in total employment—are larger under the new calibration than under the benchmark calibration.

A similar pattern emerges in the scenario in which ϕ declines. Overall, these results indicate that when the labor-hoarding share is higher (8.2 percent), the qualitative comparative statics remain unchanged, while the quantitative responses of wages and productivity become more pronounced.

We also consider an extreme case in which unproductive workers account for 20 percent of total employment, which is approximately 2.5 times larger than the values examined in the previous sensitivity analysis. We recalibrate the model to target this share. Under this calibration, the implied dismissal probability of unproductive workers is $\lambda_F = 0.023$. Whereas the previous exercises examined a 20 percent increase in λ_F , we now analyze the effects of a 100 percent increase, corresponding to a substantial relaxation of dismissal restrictions. The resulting steady-state values are reported in Table 4.

The results show that a large increase in λ_F leads to sizable changes in the model's endogenous variables. Specifically, unproductive employment declines by 37 percent, and the share of unproductive workers in total employment falls by a similar magnitude. By contrast, productive employment increases by 9 percent, resulting in a 14.7 percent increase in labor productivity. Notably, despite the large separations of unproductive workers, the unemployment rate rises only modestly—from 3.2 percent to 3.4 percent, corresponding to an increase of about 7 percent. This muted unemployment response reflects a simultaneous and substantial expansion in job creation, with vacancies increasing by 12.2 percent. In sum, even when dismissal restrictions are substantially relaxed, aggregate productivity improves markedly, while the impact on unemployment remains limited.

VI. Conclusion

This paper examined how labor market fluidity affects employment, wages, and aggregate productivity using both cross-country evidence and theoretical analysis. We first documented suggestive international patterns using average job tenure as a proxy for labor market fluidity. Economies with shorter tenure—indicative of more fluid labor markets—tend to exhibit higher labor productivity and faster wage growth. While these findings are correlational and do not establish causality, they are consistent with the hypothesis that labor market fluidity facilitates better matching and smoother reallocation, thereby raising productivity and, ultimately, wages.

We then explored mechanisms through a search-and-matching model featuring dismissal restrictions. The model departs from standard frameworks in which firms can immediately lay off workers by paying a firing cost. Instead, we allow for the coexistence of productive and completely unproductive workers within firms, reflecting the idea that some workers cease to contribute to production in their current match yet cannot be removed instantly because separations are gradual under dismissal restrictions. This structure provides a channel through which employment protection can reduce average productivity by slowing the replacement of unproductive matches.

The model highlights a simple mechanism. When unproductive workers remain within firms for extended periods, the process of economic reallocation is impeded: resources are not rotated from low- to high-productivity matches, average productivity declines, and wage outcomes deteriorate accordingly. By contrast, when labor market fluidity increases—captured in the model by a higher probability that unproductive workers separate—firms can replace unproductive matches more quickly, allocate capital and labor more efficiently, and thereby raise aggregate productivity and promote job creation. Importantly, these predictions are consistent with the empirical patterns that more fluid labor markets are associated with higher productivity and faster wage growth.

Two important issues are left for future work. First, we abstracted from job-to-job transitions. Our analysis focused on dismissal restrictions as a driver of labor market fluidity, but worker mobility also occurs through job changes. While job switching has been increasing among younger cohorts in Japan, overall mobility remains low. Understanding how job-to-job transitions affect employment, wages, and productivity—potentially within an extension of our model—is an important next step.¹⁰

Second, labor market fluidity may shape the effectiveness of macroeconomic policies. Recent work (e.g., Kuo and Miyamoto, 2023) suggests that fiscal policy multipliers can depend on labor market fluidity, yet the underlying mechanism remains incompletely understood. Extending the search-and-matching framework developed here to analyze how labor market institutions interact with macroeconomic policy transmission is another promising direction.

Our results suggest that improving labor market fluidity can contribute to higher aggregate productivity and stronger wage growth, but the case for labor market reforms is not limited to productivity and wage considerations alone. As Japan's economic environment changes rapidly—with ongoing automation driven by AI and robots and structural transformation associated with decarbonization—both firms and workers will need to adapt.¹¹ A flexible labor market is essential for reallocating labor in response to these shifts.

¹⁰ Miyamoto and Takahashi (2011) provide a framework for studying job-to-job transitions.

¹¹ Kudoh and Miyamoto (2025) explore the impact of robots and AI on unemployment.

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