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Employment Protection and Incentives:

Severance Pay vs. Procedural Inconvenience

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Abstract

I consider the effects of employment protection (EP) on workers' incentives and the labor market with search friction. EP is categorized into severance pay and procedural inconvenience. Severance pay is merely a transfer of money from firms to dismissed employees, while procedural inconvenience yields a wasteful cost. This difference is crucial to workers' incentives because severance pay is a benefit for shirking employees. Although it appears to negatively affect workers' incentives, EP, particularly procedural inconvenience, has a positive effect on incentives if EP is not severe. An optimal balance exists between severance pay and procedural inconvenience.

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1. Introduction

In general, it is believed that an employment protection (EP) policy is a major cause for the poor performance of labor markets in European countries; however, the vast literature on EP has shown conflicting results regarding crucial factors such as unemployment rates and social welfare. The ambiguous results can be applied to verify the effect of EP on incentives of workers.

EP is often assumed to negatively affect workers' incentives. A leading theory, the efficiency wage model, holds that the threat of dismissal is a driving force in workers' incentives. If shirking workers are unlikely to be fired because of EP provisions, EP has a *disincentive effect*. However, EP can have a positive effect on workers' incentives. Even if a worker works hard, his/her performance or the state of affairs of his/her firm may be very poor in uncertain situations, resulting in doubts regarding the firm's ability to maintain the employer-employee relationship. When workers who make credible efforts are easily fired because of bad business conditions, they realize that they cannot recover the cost of their efforts; thus, they are discouraged. Because a firm's decision regarding the dismissal of an employee tends to be based on *ex post* optimization, credible job security should be provided in such conditions. A significant function of EP is that it serves as a commitment device for job security. Thus, it has a *commitment effect*. The objective of this paper is to consider the effects of EP on the incentives of workers and the labor market with search friction and to show whether the commitment effect overrides the disincentive effect.

While the disincentive effect of EP has often prevailed, the commitment effect has generally not been given serious consideration, except in some recent studies regarding skill formation. Suedekum and Ruehmann (2003) and Belot, Boone, and van Ours (2007) indicate that the introduction of severance pay (SP) as a type of EP encourages workers to make a human investment, because SP gives workers some of the rent that drives skill formation. Booth and Zoega (2003) suggest that firing policies tend to be excessively implemented because firms are not concerned about the human capital lost when workers quit and move to another industry.[1]

Although previous studies generated insightful results, they are limited to partial equilibrium models. They, therefore, exclude the effects of EP on firms' entry level in terms of the general equilibrium. As a recent study by Demougin and Helm

[1] Some studies show that unions function as commitment devices: Booth and Chatterji (1998) show that unions' bargaining power enhances skill formation and improves social welfare; Eguchi (2002) also points out the significance of unions as commitment devices for job security. Piccirilli (2010) analyzes the effect of employment protection when unions can commit future wages.

(2011) analyzed an incentive problem from the perspective of the search model, I focus on incentive problems of workers rather than on skill formation. I consider, from the viewpoint of the general equilibrium, the effects of EP on the incentives of workers and labor markets with search friction, in particular, wage level, likelihood of firing, employment, unemployment rate, inflows and outflows of unemployment, and social welfare. Furthermore, my infinitely long-term model enables the analysis of EP's effects under short- or long-term economic shocks.

In the literature on EP, EP has been treated as a firing cost that firms incur upon firing workers. In this paper, firing costs are categorized into SP and procedural inconvenience (PI). Both increase the cost of firing for firms; thus, some studies consider SP as a firing cost, while others investigate PI. Although the effects of SP and PI have probably been separately investigated, I compare the effect of SP along with PI and show an optimal balance between SP and PI. SP is merely the transfer of money from a firm to a fired employee, while PI, for example, providing sufficient advance notice or negotiations with a union, leads to a transaction cost. It seems that SP is better than PI, but SP can be a benefit for a shirking employee and may damage workers' incentives. This difference is significant.

Punishment schemes for shirking employees are critical with regard to their incentives. In the context of EP, one crucial issue is whether shirking employees are eligible for SP. Dismissals are therefore categorized into two types of cases: in the case of redundancy, when firms fire workers because of bad financial health, the workers are eligible; in the case where disciplinary action is taken and workers are fired on the grounds of poor performance or unprofessional conduct, they are not eligible.

When EP provides benefits only for diligent employees in the case of redundancy, it is unlikely to cause a negative effect on workers' incentives because only diligent employees are protected, the shirking ones are not. In this case, if monitoring devices work effectively, the negative effect of EP on incentives is unlikely to appear. Thus, Boeri and Jimeno (2005) indicate that EP can be exempted for small companies when shirkers can be easily identified in small companies. Fella (2000) compares SP with PI by using the efficiency wage model with a monitoring device and shows that SP generates a positive effect when the monitoring device effectively functions.

My purpose, however, is to consider a situation in which no monitoring device is available and all fired employees receive SP. In this situation, EP is expected to be the cause of employee moral hazard; however, it will be shown that EP can generate a positive impact on employee incentives and the economy through the commitment effect.[2] According to my computer simulation, the negative effect of SP is apparent when SP is not low. The impact of PI is not significant when SP is low or high. However, when SP is in the middle range, PI intensifies the commitment effect, encourages workers to work hard, and improves social welfare. If credible job security is provided to an employee through PI, a firm can lower wages in exchange for high job security, thus reducing the cost of retaining an employee. When PI is moderately severe, it boosts market tightness and reduces the unemployment rate. The positive effect of PI appears when SP is in the middle range; thus, an optimal balance exists between SP and PI.

The result of numerical illustration indicates that an extensive relaxation in the provisions of EP as well as very severe EP reduces employees' incentives. This result is also similar with those of studies that accept the positive effect of a firing tax without explicit concerns regarding employee incentives, such as Ljungqvist and Sargent (1998) (2007), Rogerson and Schindler (2002), Pissarides (2001), and Blanchard and Tirole (2008).

This paper is organized as follows. Section 2 presents a Mortensen–Pissarides matching model with an incentive problem and considers the effects of SP and PI as EP categories. I also conduct a computer simulation in Section 3 to investigate the effects of SP and PI. Finally, Section 4 presents the conclusions.

2. The Model

1. Employment contract

A firm with a job vacancy is randomly matched to an unemployed worker in the labor market. After matching, the employed worker is required to make an effort to achieve high productivity, and the effort cost c is borne by the employee. Productivity p of an employee who makes an effort is stochastically determined to be $p \in [0,\ \overline{p}]$. The density and distribution functions are denoted as $\phi(p)$ and $\Phi(p)$, respectively. In the

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[2] Galdon-Sanchez and Guell (2003) also focus on the situation in which the court is unable to distinguish between the cases of redundancy and disciplinary action. In their model, firms allege that workers have been fired for disciplinary reasons even if the opposite is true. Hence, the fired workers do not receive SP because of the firms' moral hazards. In the situation where firms' moral hazard regarding firings is pervasive, some regulations that inhibit firms from easily firing employees are likely to provide positive effects on the economy. In contrast, I consider a situation in which the court makes no distinction between cases of redundancy and disciplinary dismissal and I focus on the employee moral hazard. Firms have to pay SP to all fired employees, including shirking employees.

case of a shirking employee, the density and distribution functions are similarly denoted by $\phi^S(p)$ and $\Phi^S(p)$, respectively. The effort cost of a shirking employee is zero. It is assumed that the first-order stochastic dominance holds, i.e., $\Phi(p) \le \Phi^S(p)$ for $p \in [0, \overline{p}]$, with strict inequality for a set of values of *p* with possible probability.

A wage is specified when a firm is matched to a worker. The wage is not conditional on either the worker's behavior or on his/her productivity *p*, and the wage cannot be changed once it is specified. This setting is identical to the Shapiro and Stiglitz (1984) efficiency wage model.

The chronology of the actions of a worker and a firm is as follows:

[1] When a firm is matched to a worker in the labor market, wage *w* is specified.

[2] The worker chooses whether or not to make an effort.

[3] Productivity $p \in [0, \overline{p}]$ of the worker is observed.

[4] The firm makes a decision regarding the dismissal after the revelation of productivity *p*. If an employee is fired, he/she receives SP, is transferred to the unemployment pool, and gets reservation wage $\overline{w}$. The firm firing the employee posts a job vacancy in the labor market. On the other hand, if a worker retains employment in the firm, he/she produces output of value *p* and receives wage *w*.

[5] In the next period, the fired worker and the firm that dissolved the match search for a new job match in the labor market. On the other hand, if both the employee and the firm that maintain the match repeat the same process: a new wage is specified, the employee chooses whether or not to make an effort, and then the value of his/her productivity is stochastically determined. Each period's productivity is independent of past periods.

2. Employment protection

When a firm fires an employee, the firm bears firing cost *f*. After *p* is revealed, the firm's current profit is either $p - w$ if the firm maintains the match or $-f$ if the firm fires the employee.

Firing cost *f* borne by the firm consists of two factors, *s* and *z*, given as $f = s + z$, where *s* denotes a monetary transfer such as SP, and *z* denotes PI such as administrative costs for notification and certification or negotiation with unions. PI is a socially wasteful transaction cost. SP is always given to all fired employees, including shirkers. SP and PI are social rules and are exogenously determined by the government.[3]

[3] Although SP is a lump-sum transfer, studies have been conducted on the effect of SP proportional to wages. Staffolani (2002) analyzes SP related to wages in the Shapiro–Stiglitz efficiency wage model and shows that increase in SP is likely to increase employment when increase in SP reduces wages. Goerke (2006) compares a lump-sum type of SP with an earnings-related type of SP regarding employment levels and points out that a lump-sum type of SP has a larger effect on

3. Matching technology

The Mortensen-Pissarides-type matching function is given by $m = m(u, v)$, where *u* is the unemployment rate and *v* is the vacancy rate, denoted as the number of vacant jobs as a fraction of the labor force. The vacancy-unemployment ratio *v*/*u* or *v*-*u* ratio, indicating market tightness, is denoted as θ. The matching function is assumed to be a constant return to scale, that is, $q(\theta) \equiv m\left(\frac{u}{v}, 1\right)$, where $q(\theta)$ denotes the probability with which a job vacancy will be matched to an unemployed worker. Clearly, $q'(\theta) \leq 0$. Similarly, the probability with which the unemployed worker will be matched to a job vacancy is given by $\theta q(\theta)$.

In the labor market, all unemployed workers are considered identical regardless of their past behaviors, because their past behaviors are not noted. Hence, the matching probability is equivalent among the unemployed. Similarly, all job vacancies in the market are identical for the unemployed.

4. Incentive compatibility

As I show later, an employee is fired in the case of $p \in [0, \hat{p})$, where threshold $\hat{p}$ is endogenously determined. A diligent worker who makes an effort is fired with probability $\Phi(\hat{p})$. If a diligent worker is fired for low productivity, he/she receives SP from his/her firm and is transferred to the unemployment pool. His/her expected current payoff is given by $\Phi(\hat{p})(s + \overline{w}) + (1 - \Phi(\hat{p}))w - c$.

If an employee shirks work, he/she is fired with probability $\Phi^S(\hat{p})$. The expected current payoff of a shirking employee is $\Phi^S(\hat{p})(s + \overline{w}) + (1 - \Phi^S(\hat{p}))w$. Because the court cannot distinguish between a diligent employee and a shirking one, firms have to pay SP even to shirking employees. No monitoring technology is available to firms.

The present discounted value of the payoff of a diligent or shirking employee is denoted as E^N or E^S, respectively. I apply a discrete-time model; thus, the present discounted value of a diligent employee's payoff is given as

$$E^N = \Phi(\hat{p})(s + \overline{w}) + (1 - \Phi(\hat{p}))w - c + \frac{1}{1+r}\left\{\Phi(\hat{p})U + (1 - \Phi(\hat{p}))E\right\}, \qquad ...(1)$$

where $E \equiv \max\{E^N, E^S\}$, *r* is the time preference rate, and *U* is the present discounted

increasing employment levels than an earnings-related type.

value of the payoff to the unemployed. Similarly, the present discounted value of a shirking employee's payoff is given by

$$E^S = \Phi^S(\hat{p})(s+\overline{w}) + (1-\Phi^S(\hat{p}))w + \frac{1}{1+r}\left\{\Phi^S(\hat{p})U + (1-\Phi^S(\hat{p}))E\right\}. \qquad ...(2)$$

Finally, the present discounted value of the unemployed is given as

$$U = \overline{w} + \frac{1}{1+r}\{\theta q(\theta)E + (1-\theta q(\theta))U\}. \qquad ...(3)$$

where the reservation wage for the unemployed $\overline{w}$ indicates the value of leisure.

Incentive compatibility (IC) and individual rationality (IR) are given by $E^N \geq E^S$ and $E \geq U$, respectively. Wage *w* should be more than reservation wage $\overline{w}$; otherwise, no worker would be willing to search for a new job. It holds from $w > \overline{w}$ that $E^S > U$, because a shirker receives a higher wage *w* or reservation wage $\overline{w}$ with *s* upon being fired. This indicates that $E \geq U$ always holds and IR is slack, provided $E^N \geq E^S$ holds. Therefore, it is sufficient to focus on the constraint $E^N \geq E^S$. The following condition is introduced on the basis of $E^N \geq E^S$ and $E \geq U$:

$$IC(w) \equiv \left(\frac{(r+\theta q(\theta)+1)(w-\overline{w}) - (r+\theta q(\theta))s}{r+\theta q(\theta)+\Phi^S(\hat{p})}\right)(\Phi^S(\hat{p}) - \Phi(\hat{p})) \geq c. \qquad ...(4)$$

If constraint (4) is satisfied, IC and IR hold. Because a firm is willing to minimize the wage, constraint (4) is binding at the equilibrium.

5. Dismissal

The present discounted value *J* of a firm matched to a worker is as follows:

$$J = -\Phi(\hat{p})f + \int_{\hat{p}}^{\overline{p}}(p-w)\phi(p)dp + \frac{1}{1+r}\{\Phi(\hat{p})V + (1-\Phi(\hat{p}))J\}.$$

The present discounted value *V* of a job vacancy is $V = -k + \frac{1}{1+r}\{q(\theta)J + (1-q(\theta))V\}$, where *k* is the job vacancy cost. From the free entry and exit condition on job vacancies,

$V=0$. Hence, I obtain $J=\frac{(1+r)k}{q(\theta)}$. Further, $\tilde{J}$ is defined as $\tilde{J}\equiv\frac{J}{1+r}$; thus,

$$\tilde{J}=\frac{1}{r+\Phi(\hat{p})}\left\{\int_{\hat{p}}^{\bar{p}}(p-w)\phi(p)dp-\Phi(\hat{p})f\right\}\quad\left(=\frac{k}{q(\theta)}\right). \qquad ...(5)$$

If a firm fires an employee, the present discounted profit is –*f*, given that $V = 0$. On the other hand, if the firm maintains the match, the present discounted profit is given by $p-w+\frac{k}{q(\theta)}$. Hence, the threshold is given by

$$\hat{p}=w-f-\frac{k}{q(\theta)}. \qquad ...(6)$$

The threshold depends on the wage and the firing cost. Decrease in wage or increase in the firing cost reduces threshold $\hat{p}$. Note that the threshold is given after the wage has been specified and the effort cost has been sunk. An employee and a firm can consider threshold $\hat{p}$ upon being matched. A firm, therefore, minimizes the wage subject to constraint (4) and threshold (6) by using backward induction.

Threshold $\hat{p}$ must be positive to maintain an employee's incentive, i.e., $\hat{p}>0$. If $\hat{p}=0$ holds, an employee is never fired; thus, constraint (4) on incentives is never satisfied. The absence of the threat of dismissal motivates an employee to shirk. This is the common result of the efficiency wage model.

6. Beveridge curve

Constraint (4) on incentives, the present discounted value of a firm's profit given by (5), and the threshold of dismissal given by (6) specify search equilibrium (θ, w). The job creation rate is $\theta q(\theta)\frac{u}{1-u}$ and the job destruction rate is $\Phi(\hat{p})$. From the steady state condition in terms of job flow, the job creation rate should be equivalent to the job destruction rate. Thus, the equilibrium unemployment rate is given as the Beveridge curve by

$$u=\frac{\Phi(\hat{p})}{\Phi(\hat{p})+\theta q(\theta)}. \qquad ...(7)$$

7. Search equilibrium

Although unstable equilibria can exist in my model, it is reasonable to focus on stable equilibria. In a match, it is assumed that the adjustment of the entry or exit of job vacancies in the market is slower than the wage adjustment. In addition, a firm is too small to influence market tightness θ, and the firm minimizes the wage given market tightness, subject to constraint (4) on incentives. Constraint (4), therefore, is binding at all times, even if the economy is not in the search equilibrium. The locally stable condition of equilibria is given by

$$IC_w \frac{kq'}{q^2} - IC_\theta \tilde{J}_w < 0, \qquad \text{...(8)}$$

where $IC_w \equiv \frac{\partial IC(w)}{\partial w}$, $IC_\theta \equiv \frac{\partial IC(w)}{\partial \theta}$, and $\tilde{J}_w \equiv \frac{\partial \tilde{J}}{\partial w}$.

The search equilibria are represented by the points of intersection in Figure 1.[4] The wage is adjusted more smoothly than the entry or exit of job vacancies; therefore, the economy is almost always on the IC curve of constraint (4). In Figure 1, point *A* on $IC(w) = c$, which is near equilibrium E_1, is below the JC curve of (5); hence, the expected profit of a job vacancy at point *A* is positive, causing more job vacancies in the market. The economy will be distant from equilibrium E_1; therefore, equilibrium E_1 is unstable, while equilibrium E_2 is stable. Although I do not explicitly consider transition dynamics, my focus is limited to the equilibrium satisfying the locally stable condition (8).

First, I consider how the change in the relative share of SP affects the economy given a constant level of firing cost, that is, $f = \overline{f}$.

Proposition 1

Assume that the share of SP increases given a constant level $\overline{f}$ of the firing cost. Increase in the share of SP boosts the wage, the threshold of dismissal, and the unemployment rate. It also reduces the market tightness.

The proof is provided in the appendix. When the stringency of EP is fixed, that is, $f = \overline{f}$, a firm incurs the same firing cost $f = \overline{f}$ regardless of the share of SP.

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4 The IC curve, constraint (4), may have a downward or upward slope. The slope of the IC curve is irrelevant to the result only if stable condition (8) holds.

Because a shirking employee is entitled to receive SP whenever he/she is fired, SP discourages an employee from delivering the required effort. A high wage offer is therefore necessary to maintain the employee's incentives, which reduces the firm's profit from the match. This is the disincentive effect, which causes firms with vacancies to exit the market, thereby reducing market tightness.

Because the total firing cost does not change, the JC curve of (5) does not shift. On the other hand, increase in the share of SP shifts the IC curve of constraint (4) upward, thereby increasing the wage and reducing market tightness (Figure 2a). Moreover, the job destruction rate depends on threshold $\hat{p}$, which is increased by increase in wage w and decrease in market tightness θ. Therefore, the job destruction rate clearly increases, resulting in increase in the unemployment rate, as mentioned in (7). The Beveridge curve (7) shifts because of increase in the job destruction rate $\Phi(\hat{p})$, as shown in Figure 2b. In addition, the JC curve in Figure 2b shifts clockwise because of decrease in market tightness θ. Increase in the share of SP, therefore, shifts the equilibrium from E_1 to E_2 (Figure 2b). Because market tightness decreases, the unemployment rate unambiguously increases.

In contrast, if the share of PI increases, the wage decreases and market tightness increases. In addition, the threshold of dismissal and the unemployment rate decline.

3. Numerical Illustration

Proposition 1 holds only when the total firing cost is fixed. This situation, however, is restrictive. The total effect of the firing cost is ambiguous from the theoretical perspective; hence, I conduct a computer simulation on the search equilibrium.

The equilibrium is characterized by constraint (4) and the zero profit condition of vacancy (5) along with threshold (6). A baseline situation is given in Table 1. I consider the case in which productivity is uniquely distributed, that is, $\phi(p) \equiv \frac{1}{\bar{p}} = \frac{1}{100}$. Furthermore, the productivity density function of a shirking employee is given by $\phi^S(p) = \frac{1}{10}$ for $p \in [0, 10]$ and $\phi^S(p) = 0$ for $p \in [10, 100]$. The distributions of the productivity of employees satisfy the first-order stochastic dominance. In the baseline situation, a unique search equilibrium exists.

Figure 3a shows the curve of $\Phi^S(p) - \Phi(p)$ in the simulation. The curve first increases, then decreases. Whether the curve increases or decreases is crucial for considering the effect of firing cost on incentives. When a high firing cost deters a firm from firing an employee, threshold $\hat{p}$ of dismissal decreases. The effect on incentives depends on the value of $\Phi^S(\hat{p}) - \Phi(\hat{p})$. If decrease in $\hat{p}$ lowers the value of $\Phi^S(\hat{p}) - \Phi(\hat{p})$, constraint (4) on the incentive of the employee will be tight; thus, the effect of firing cost on incentives is likely to be negative. In contrast, if decrease of $\hat{p}$ caused by high firing cost increases the value of $\Phi^S(\hat{p}) - \Phi(\hat{p})$, the effect can be positive.

Figure 3b shows the curve of $\Phi^S(\hat{p}) - \Phi(\hat{p})$ when the distribution functions are normal with the expectation values 1 and 0 and the common variances are equal to 1. The curve is smoother than, but is similar to, that of Figure 3a. Although the distribution functions in the baseline seem to be restrictive, the result of this simulation is not greatly influenced by the setting of the distribution functions.

1. Wage and market tightness

Proposition 2

In this simulation, the following points are considered:

[1] As Figure 4 shows, the wage initially increases and then decreases with respect to *s* (SP), given a level of *z* (PI).

[2] The influence of PI on the wage is not significant when SP is low. When SP is in the middle range, for example, $s = 25$, increase in PI lowers the incentive-compatible wage.

[3] As Figure 5 shows, increase in SP decreases market tightness.

[4] Increase in PI also results in decrease in market tightness when SP is either low or high. However, when SP is in the middle range, for example, approximately $s = 25$, PI may increase market tightness. However, if PI is excessively severe, for example, $z = 12$, market tightness is reduced.

This implies that increase in SP damages an employee's incentives when SP is low. As a result, increase in SP increases the wage required to maintain workers' incentives. High SP leads to small market tightness, which results in a high cost of shirking behavior by employees. In this situation, decline of market tightness influences the worker's incentive more than the wage. Therefore, as Figure 4 shows, the wage decreases after SP exceeds a particular level, approximately $s = 23$.

On the other hand, increase in PI positively affects the incentives of employees.

Because PI deters a firm from frequently firing employees, a diligent employee, the one who can be fired but who is less likely to be fired than a shirking one, benefits from the resultant high job security, and the low wage is sufficient to maintain the incentive in exchange for high job security. This is the positive commitment effect.

2. Threshold of dismissal and unemployment rate

Proposition 3

In this simulation, the following points are considered:

[1] As SP increases, as shown in Figure 6, initially an employee is more likely to be fired and then is less likely to be fired.

[2] Increase in PI does not significantly affect the threshold of dismissal when SP is low. However, increase in PI reduces the threshold significantly when SP is high.

[3] As Figure 7 shows, the unemployment rate tends to be increased by increase in SP, while the unemployment rate is decreased by a hike of SP when SP is in the middle range and PI is moderate.

[4] Increase in PI reduces the unemployment rate when SP is in the middle range.

From (7), the unemployment rate depends on market tightness and the threshold of dismissal. Because increase in SP decreases market tightness (Proposition 2 [3]), the unemployment rate increases when SP increases the threshold of dismissal. On the other hand, when SP is high, the threshold of dismissal reduces as SP increases. If this result dominates the reducing effect of market tightness, the unemployment rate decreases with respect to SP. In fact, at approximately s = 25 and z = 2 or z = 4, increase in SP reduces the unemployment rate.

When SP is in the middle range, Propositions 2 [4] and 3 [2] indicate that as PI increases, market tightness improves and the threshold of dismissal decreases, resulting in reduction in the unemployment rate. The effect of PI in reducing the unemployment rate appears when PI is in the appropriate range. If PI is severe, for example, z = 12, the effect disappears; that is, severe PI causes increase in the unemployment rate. Moreover, when SP is low or high, the influence of PI on the unemployment rate is comparatively small. The positive effect of PI on the unemployment rate clearly appears when SP is appropriately given; thus an optimal balance exists between SP and PI.

In this model, the equilibrium inflows to unemployment, which is equivalent to the outflows from unemployment at the equilibrium, is given by the likelihood of dismissal $\Phi(\hat{p})$. Figure 6 shows that increase in PI reduces the inflows to unemployment. This indicates that PI has a negative effect on the reallocation of the labor force, which is similar to the results in the literature on EP. Consistent with the literature, the simulation shows that the speed of the inflows to and outflows from unemployment is not significantly associated with the unemployment rate.

3. Social Welfare

As the same situation is repeated in every period on the equilibrium path, it is sufficient to consider the social welfare level in one period. Social welfare in one period is given by

$$\Omega \equiv \left\{ \int_{\hat{p}}^{\bar{p}} p\phi(p)dp + \Phi(\hat{p})(\bar{w} - z) - c \right\}(1-u) + u\bar{w} - k\theta u .$$

Figure 8 shows the level of social welfare.

<u>Proposition 4</u>

When SP is in the middle range, appropriate PI improves social welfare through the positive commitment effect.

As shown in Figure 8, social welfare improves gradually with respect to SP when SP is low. Although the effect of SP seems to be positive, this positive effect on social welfare may be due to the elimination of the negative search externality. Thus, it can be inferred that social welfare improves if EP solves the search externality.

I can infer the effect of the search externality on the basis of previous studies. When the bargaining power of an employee is weak compared to the elasticity of the matching function, as the Hosios (1990) condition shows, the unemployment rate is excessively low from the perspective of efficiency. In this case, social welfare improves if a policy or an institutional device increases the unemployment rate. In my model, the level of SP is relevant to the bargaining power of an employee because high SP increases the *ex post* rent *E-U* of an employee. High SP is relevant to the case in which an employee has a strong bargaining power in the textbook model. This implies that social welfare increases with respect to SP when SP is low, as shown in Figure 8. The effect of improving social welfare is attributed in part to the elimination of the negative search externality.

In the textbook model of Pissarides (2000), the efficient level of bargaining power is uniquely determined by the Hosios condition. When the bargaining power of an employee is very weak, as the bargaining power increases, social welfare improves initially and then declines. If the search externality is only crucial to social welfare, the social welfare curve should be mound shaped with respect to SP. In contrast, in my model, the social welfare curve is comparatively complex as shown in Figure 8. Thus, the result that PI improves social welfare in the middle range of SP is not caused by the effect of eliminating the search externality.

4. Long-term shock

The discount rate in this numerical illustration is 0.0125, which indicates that the model uses quarterly periods. Even if the productivity of an employee is low, he/she is unlikely to be fired if the bad financial situation continues only for a quarter. By considering the vacancy cost, a firm would be inclined to retain an employee if the low productivity is expected for only a short period. In contrast, if the low productivity persists for a long time, the firm would be unwilling to retain the match, and thus the match is likely to be dissolved.

To examine the long-term low productivity situation, I implement a numerical illustration with a high discount rate. For example, consider the case of $r = 0.1$, which indicates that the low productivity situation continues for approximately 2-4 years. A high discount rate naturally increases the threshold of dismissal as well as the unemployment rate. However, in the middle range of SP, a more severe PI, $z = 8$, reduces the unemployment rate in the case of $r = 0.1$ to a greater extent than in the case of $r = 0.0125$. The difference in the unemployment rate between $z = 8$ and $z = 4$ is denoted as $\Delta u \equiv u_{z=8} - u_{z=4}$ as shown in Figure 9a. To reduce the unemployment rate, PI is more effective in the case of $r = 0.1$ than in the case of $r = 0.0125$.

Similarly, the difference in social welfare $\Delta\Omega \equiv \Omega_{z=8} - \Omega_{z=4}$ is represented in Figure 9b. The social-welfare-improving effect is larger in the case of $r = 0.1$ than in the case of $r = 0.0125$. Thus, the positive effect of PI is not necessarily smaller when low productivity persists for a long time.

4. Discussion and Conclusion

I examined the efficiency wage model with matching technology to analyze the effects of EP on workers' incentives. EP generates two effects: the *disincentive effect* and the *commitment effect*. If the latter dominates the former, EP improves social welfare. I also examined the differences between SP and PI. Although SP seems better than PI from the perspective of social welfare, SP is an earning for shirking employees, and thus its effects on employee incentives may be negative compared with the effect of PI.

Similar to the results of previous studies regarding EP, my results on the effects of EP were theoretically ambiguous. I therefore conducted a computer simulation and obtained the following results: [1] SP tends to increase the unemployment rate. [2] PI does not have a significant effect on the economy when SP is low or high; however, when SP is in the middle range, it decreases the threshold of dismissal and the unemployment rate, improving social welfare. [3] Very severe PI negatively affects employee incentives. Therefore, it is necessary to design EP appropriately.

In this model, increase in PI reduces the inflows to and outflows from unemployment. Consistent with the literature, the speed of the inflows to and outflows from unemployment is not significantly associated with the unemployment rate.

I have not considered workers' bargaining power explicitly in this paper. Rocheteau (2001) focuses on incentives and the bargaining power of employees, concluding that a firm inflexibly sets the wage, similar to the efficiency wage model, when employees' bargaining power is weak. If employees' bargaining power is strong, the wage and the threshold of dismissal are determined through labor-management negotiations. Therefore, my model, in which firms control the wage and the threshold of dismissal, applies to the case of employees with weak bargaining power. However, this does not indicate that my model is irrelevant to the situation where employees' bargaining power is strong. The degree of employment protection tends to be associated with employees' bargaining power and industrial relationships. Stringent EP is relevant to bargaining power; thus, this study is not quite different from studies regarding EP and industrial relationship such as Belot and van Ours (2001) (2004) and Garibaldi and Violante (2005).

I considered the case in which the wage is flexibly decided during the formation of employment contracts but is inflexible *ex post*. Empirically, the issue of the degree of wage flexibility has been controversial. Differences in views on macroeconomic policy often stem from differences in views regarding the extent to which the wage is flexibly adjusted. As Pissarides (2009) indicates, the wage of a new match relevant to the external wage of outsiders is comparatively flexible, but the continuous wage of an existing match is comparatively inflexible. As a result, the setting of the model is consistent with the real world.

Bewley (1999) conducted interviews with over 200 business people, including firm managers, lawyers, and consultants; Campbell and Kamlani (1997) conducted investigations on firm managers. These studies suggest that wages are inflexible because a wage cut seriously damages motivation. Furthermore, according to behavioral science, some psychological factors deter firm managers from decreasing wages. A well-known psychological effect—the money illusion—makes wage declines less preferable than increases. Kahneman, Knetsch, and Thaler (1986) and Agell and Bennmarker (2007) report that workers tend to prefer constant nominal wages with inflation over nominal wage decline without inflation, even if both result in identical amounts of real wages. In addition to these studies, experimental studies such as that by Fehr and Falk (1999) show wages to be inflexible in the case of excessive labor supply and involuntary unemployment. The experimental studies indicate that firm managers experience difficulty adjusting wages downward.[5] Therefore, my setting in which the wage is flexibly decided during the formation of employment contracts but is inflexible *ex post* is not unrealistic.

Appendix

Proof of Proposition 1

Because constraint (4) is binding at the equilibrium, $IC_w \equiv \dfrac{\partial IC(w)}{\partial w} > 0$ holds at the equilibrium. The proof is as follows. Assume that $IC_w \le 0$. In this situation, a firm can reduce the wage further provided constraint (4) is satisfied, thus increasing the firm's profit. This contradicts the notion that the original wage maximizes the firm's profit. Hence, at the equilibrium $IC_w > 0$ holds.

Next, I conduct comparative statics regarding the search equilibrium with respect to s subject to $df = ds + dz = 0$, as follows:

[5] Recently, the relationship between wage rigidity and the matching model has been a widely discussed issue. Shimer (2005) indicates that the Mortensen–Pissarides matching model can hardly explain the volatility of unemployment and vacancies; Hall (2005) shows that introducing wage rigidity in the model improves its suitability.

While Mortensen and Nagypal (2007) and Pissarides (2009) mention that wage rigidity improves the model's power of explanation, they argue that the model does not require wage rigidity. According to them, the power of explanation improves if other factors such as hiring or firing costs, demand shocks, and on-the-job search behavior are considered in the typical model. In addition, as Kennan (2010), Moen and Roser (2007), and Brugemann and Moscarini (2007) analyze the issue, asymmetric information, such as adverse selection and moral hazard, magnifies the volatility in unemployment and vacancies.

$$\begin{pmatrix} dw/ds \\ d\theta/ds \end{pmatrix} = \frac{-1}{IC_w \frac{kq'}{q^2} - IC_\theta \tilde{J}_w} \begin{pmatrix} \frac{kq'}{q^2} & -IC_\theta \\ -\tilde{J}_w & IC_w \end{pmatrix} \begin{pmatrix} IC_s \\ \tilde{J}_s \end{pmatrix},$$

where $IC_s \equiv \frac{\partial IC(w)}{\partial s} = -\frac{r + \theta q(\theta)}{r + \theta q(\theta) + \Phi^S(\hat{p})} \{\Phi^S(\hat{p}) - \Phi(\hat{p})\} < 0$ and $\tilde{J}_s \equiv \frac{\partial \tilde{J}}{\partial s} = 0$.

Using the locally stable condition (8) and $\tilde{J}_w = -\frac{1 - \Phi(\hat{p})}{r + \Phi(\hat{p})} < 0$,

$$\begin{pmatrix} dw/ds \\ d\theta/ds \end{pmatrix} = \frac{-1}{IC_w \frac{kq'}{q^2} - IC_\theta \tilde{J}_w} \begin{pmatrix} \frac{kq'}{q^2} IC_s \\ -\tilde{J}_w IC_s \end{pmatrix} \text{ holds.}$$

Hence, $\left.\frac{dw}{ds}\right|_{f=\bar{f}} > 0$ and $\left.\frac{d\theta}{ds}\right|_{f=\bar{f}} < 0$. The results lead to $\left.\frac{d\hat{p}}{ds}\right|_{f=\bar{f}} > 0$ from (6), and thus, it holds from (7) that $\left.\frac{du}{ds}\right|_{f=\bar{f}} > 0$.■

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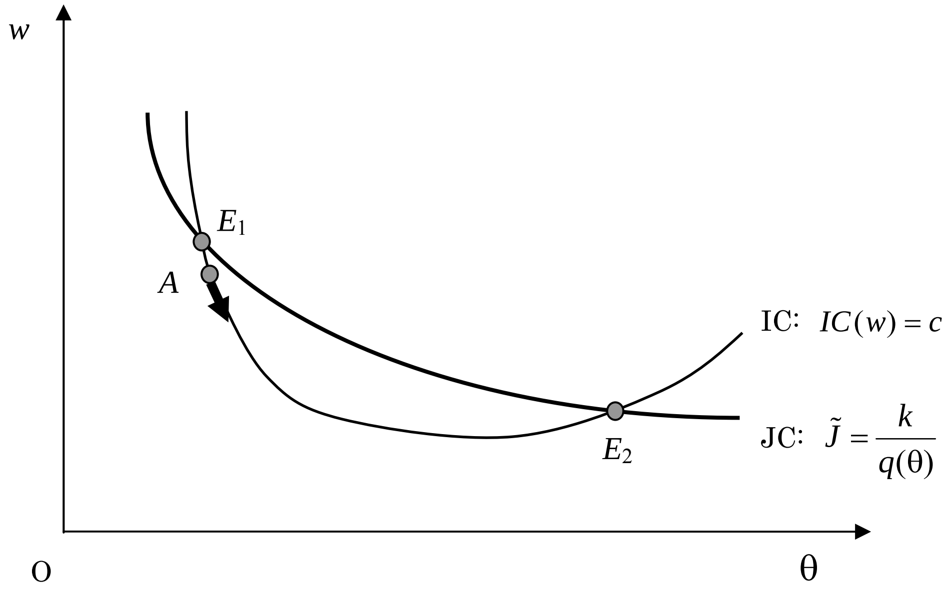

Figure 1

Equilibrium E_1 is unstable but E_2 is stable.

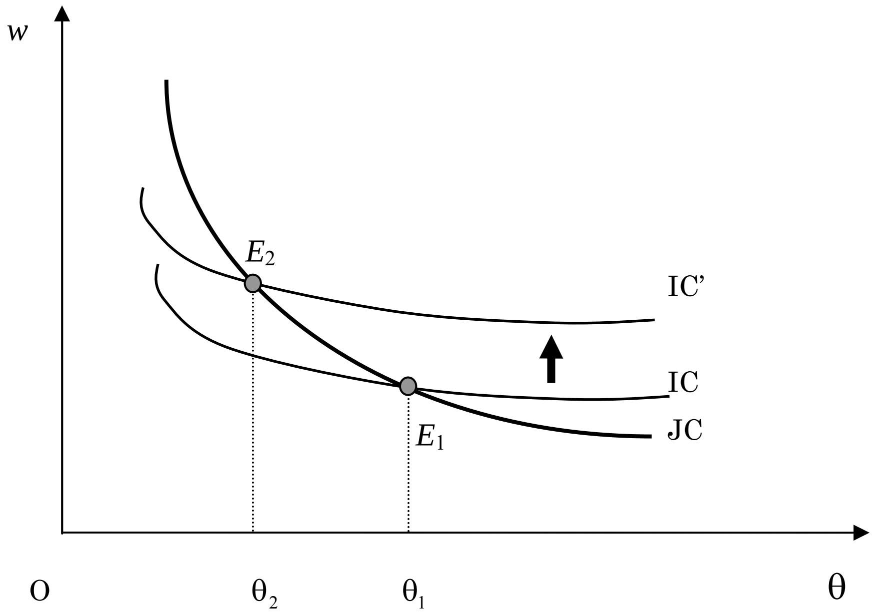

Figure 2a

Search equilibrium

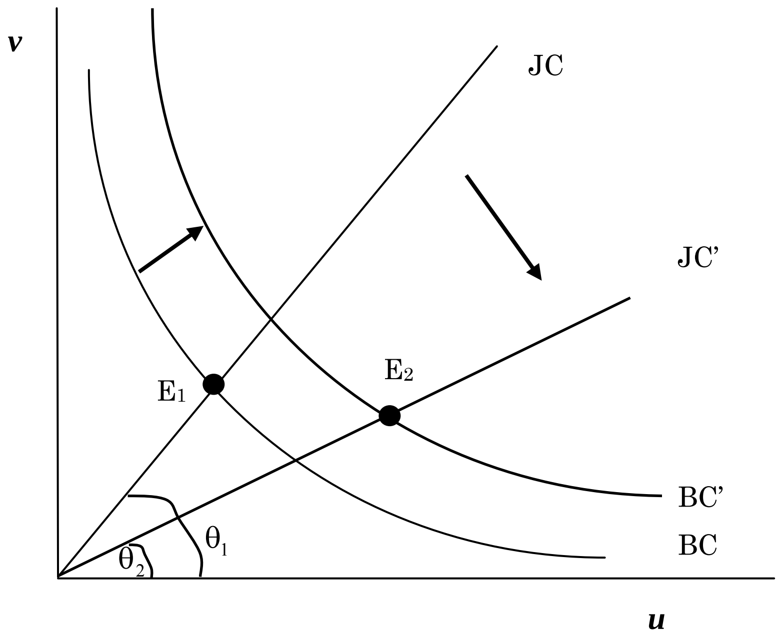

Figure 2b

Search equilibrium

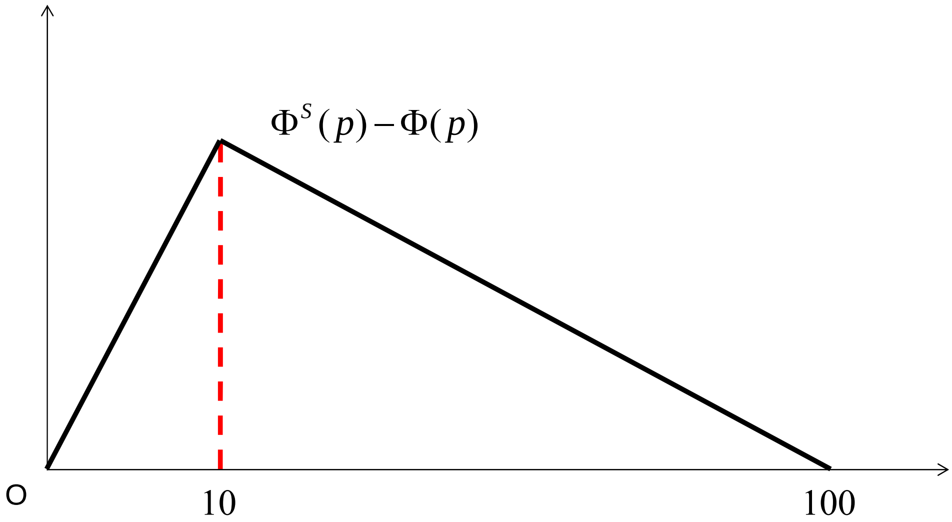

Figure 3a
The curve of $\Phi^S(p)-\Phi(p)$ in the base line case

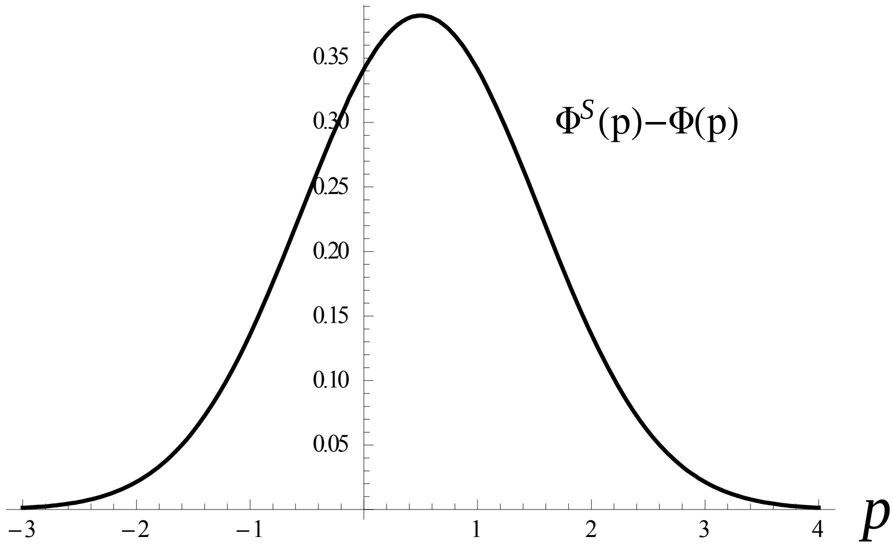

Figure 3b
The curve of $\Phi^S(p)-\Phi(p)$ in the normal distribution case

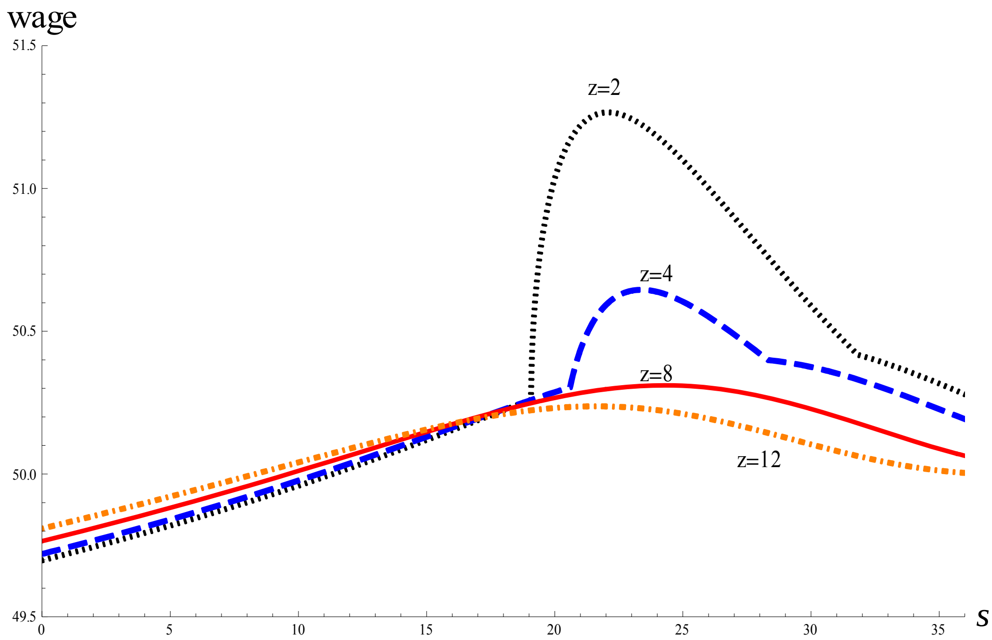

Figure 4: Wage

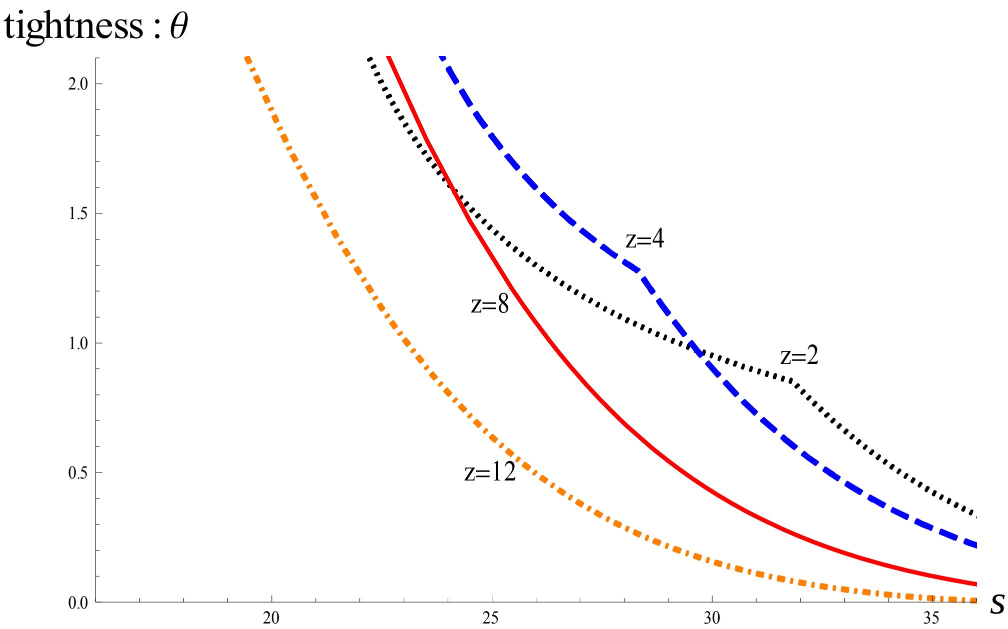

Figure 5: Market Tightness

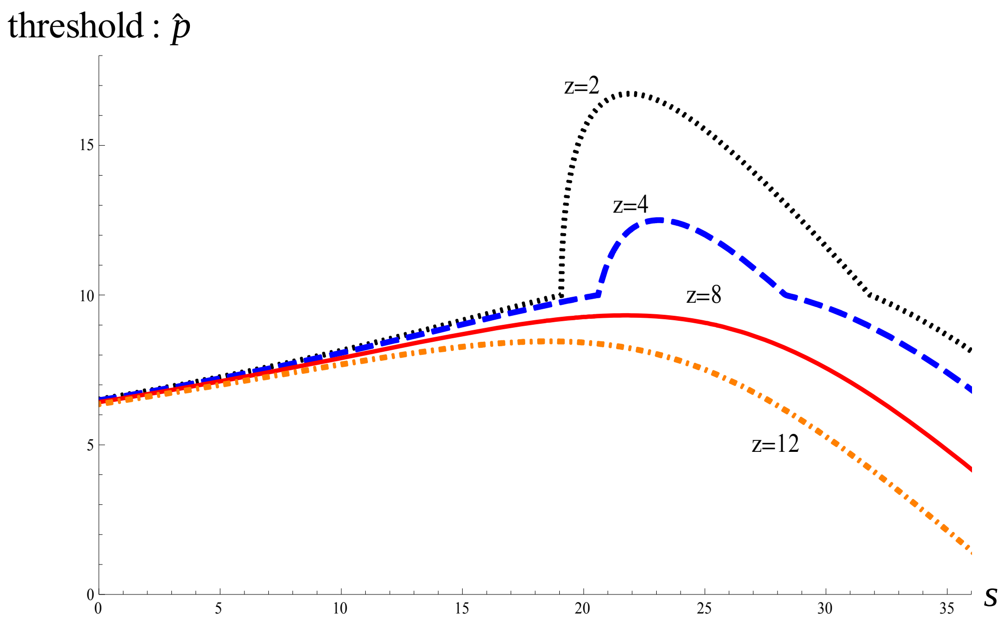

Figure 6: Threshold of Dismissal

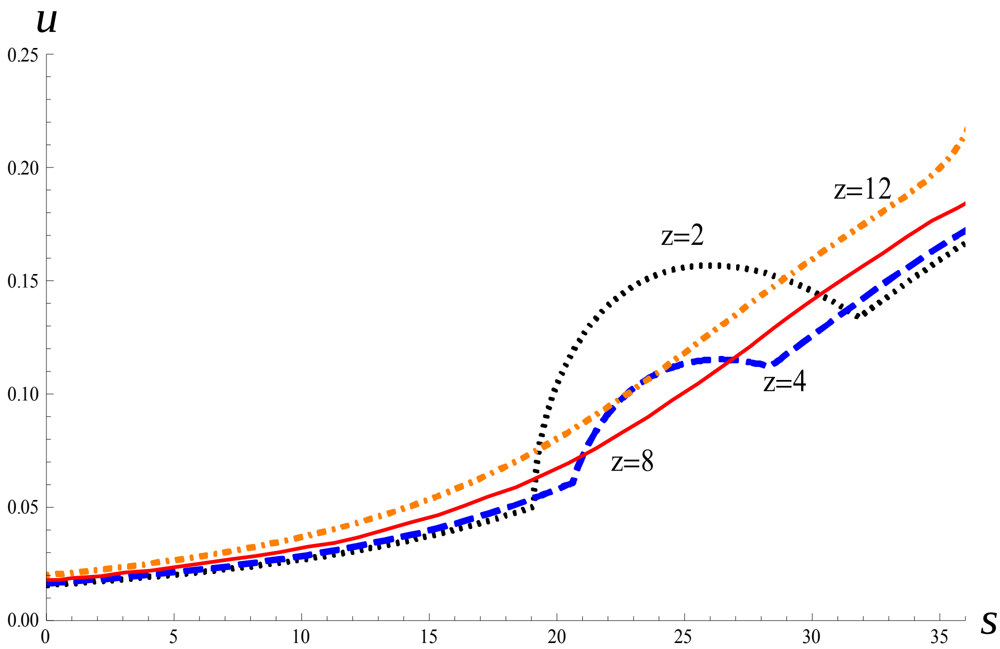

Figure 7: Unemployment Rate

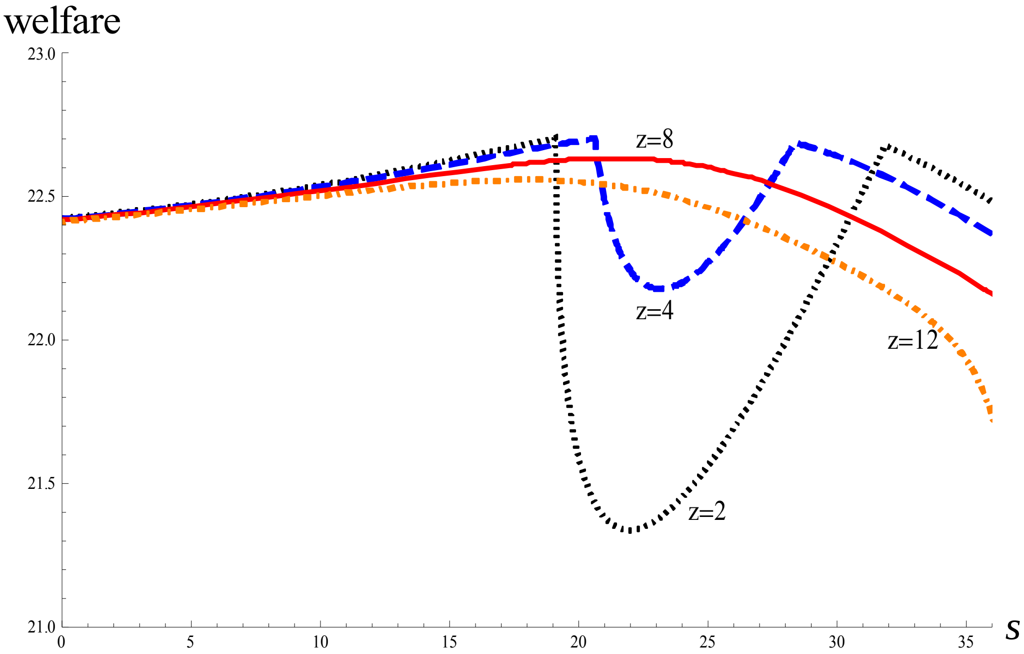

Figure 8: Welfare

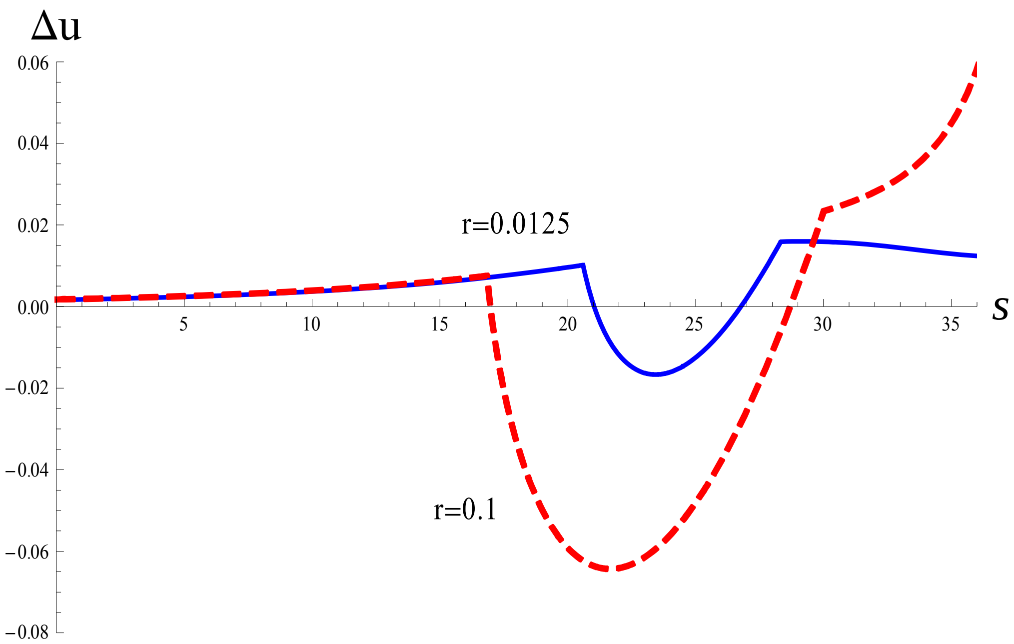

Figure 9a

Effect of long-term shock on the unemployment rate

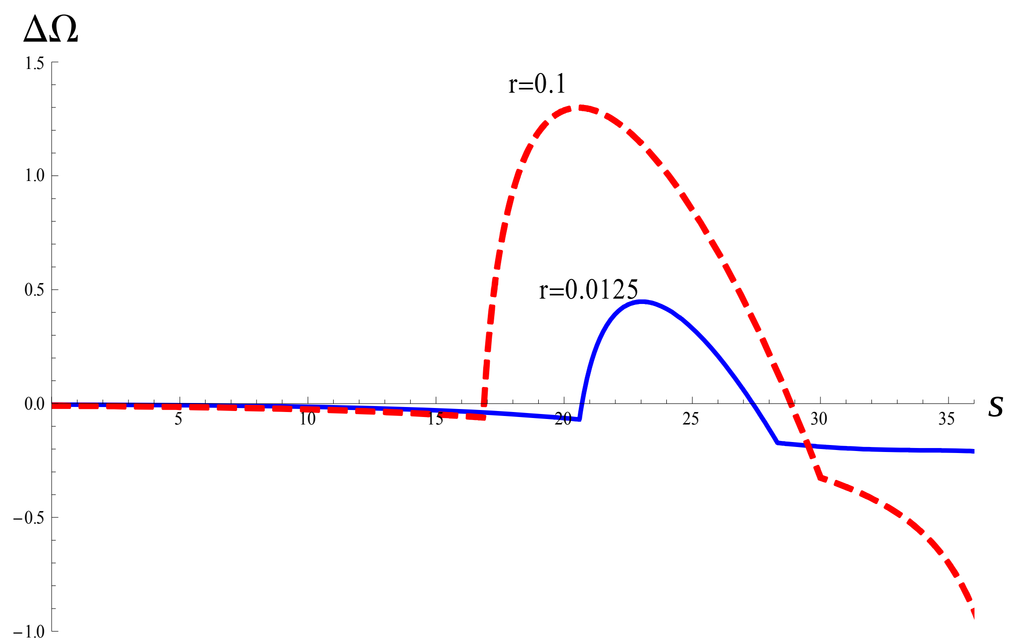

Figure 9b

Effect of long-term shock on social welfare

Table 1

Values of Parameters

Parameters	***Values***
range of state	$p \in [0, 100]$
density function of diligent workers	$\phi(p) = \frac{1}{100} \quad for \quad p \in [0, 100]$
density function of shirking workers	$\phi^S(p) = \begin{cases} \frac{1}{10} & for \quad p \in [0, 10] \\ 0 & for \quad p \in [10, 100] \end{cases}$
reservation wage	$\overline{w} = 10$
interest rate	$r = 0.0125$
effort cost	$c = 25$
vacancy cost	$k = 5$
matching function	$m = 0.7(uv)^{0.5}$