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## Employment Contracts as a Screening Device in an Institutional Setting

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**EMPLOYMENT CONTRACTS AS A  
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by

Eugenia Kazamaki Ottersten

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# Employment Contracts as a Screening Device in an Institutional Setting

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## Abstract

We develop a model that shows that it is appealing to a firm to sign a screening device contract whenever there are costs and uncertainty involved in making an employment decision. In particular it is emphasized that the characteristics of institutions may enforce this behavior if laws and government measures affect the firm's flexibility to adjust its employment force. We present a formal analysis of the firm's retention decision. The main result is that screening device contracts add flexibility to the employment decision and are preferred to any other form of contract that is definitive whenever the worker's on the job productivity is unknown.

## 1 Introduction

The Swedish labor market has showed an increase in layoffs from short term jobs. There is also evidence for a divided labor market in terms of employment. This division is confirmed by for instance increased unemployment due to a job completed and many short period vacancies (vacancies restricted to a certain time or short term project). Half of all the listed vacancies are temporary jobs. Among these approximately 80 to 90 percent last less than six months. The assertion in this paper is that changes in the institutional framework in part explain the above development. During the early to mid 1970's, new laws were introduced in the Swedish labor market. These imposed restrictions on the employer's flexibility to adjust the labor force and affected the employer's hiring behavior. In the early 1980's some of these restrictions were relaxed. This paper studies the firm's behavior in the presence of institutional restrictions.

Firms have incentives to discriminate in employment length offers, for example productivity, institutional, and adjustment incentives, in order to satisfy their diverse needs

adapt careful screening prior to a new hire and offer short term contracts, when institutional restrictions apply. The aim is to assess how the employment contract functions as a screening device. Screening in general occurs on markets with incomplete information when the uninformed (i.e. employers) move first and the informed (i.e. job applicants) move last.<sup>1</sup> Here the firm's hiring strategy in a two-regime model is assessed. The regimes are a before-law and an after-law regime in which the firms' options are heavily restricted. The model is an extreme case in that it assesses an after-law situation which is subject to more restrictions than the actual 1974 Employment Act gave rise to. The theoretical model does not permit a layoff in the after-law regime once a hire has been made. In practice layoffs could take place in specific cases (after negotiations with the unions). The inference is that in the after-law regime sharpened hiring requirements have encouraged screening device contracts allowing for an increase in the number of short term jobs. In this case, the reservation productivity should be higher in comparison with the before-law situation. We develop a model of layoffs to verify such an assessment.

Section 2 discusses the background. Section 3 presents the model. The model is based on the affiliation literature (Milgrom (1981), Milgrom & Weber (1982)) and optimal stopping decision rules theory. Section 4 describes and presents a numerical example and discusses an analytical example. Section 5 concludes our findings and discusses the policy implications of the model.

## 2 The Theoretical Framework

### 2.1 Contract Incentives and Contract Length

There are obvious advantages for firms and employees to establish employment agreements and specify the employment conditions and in some cases the contract length, whenever information is incomplete on firm and employee characteristics (Baily (1974),

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<sup>1</sup>There is an extensive literature concerned with markets in which one side to a transaction has better information than does the other concerning the potential trade. Examples include models of the market for second hand automobiles, models of insurance markets, labor markets, and credit markets. An early paper to consider such markets was Akerlof (1970). Akerlof considers a market in which the potential sellers of a commodity have better information about its quality than do potential buyers.

Azariadis (1975)). Adjustment and transaction costs also create incentives to reach agreements, which include the right to enjoy certain benefits for the partners reaching the agreement. In the search literature, agreements are motivated since the employers have incomplete information on the applicants characteristics referring to job productivity. This uncertainty encourages binding agreements which specify the employment length and certain job tasks. Thereby economic efficiency is increased, and turnover is reduced. Contract theory further asserts that whenever there is firm specific capital involved an economic bond is created between the worker and the firm. Firm specific capital provides a natural contract incentive (Oi (1962), Becker (1975)), it protects the firms interests (as well as workers interests), and efficiency is gained when workers are retained for extended periods of time. Recent literature has also emphasized the role of efficiency wage arguments. These relate to that offering a long term contract besides a high wage may increase the quality of workers applying for a job, raise the morale of workers, and encourage non-shirking behavior. This increases the firm's profits. For workers it is also efficient to sign arrangements that reduce the income variation resulting from fluctuations in labor demand. This is the insurance aspect of long term employment agreements.

Thus, in the literature, the incentives to offer long term employment contracts are most commonly emphasized. It is argued that such contracts reduce the hiring and firing costs by avoiding frequent turnover. However, Grossman & Hart (1983) argue that the form of the contract that is offered depends upon which agent (employer or worker) is most risk averse.<sup>2</sup> Our discussion will take the employers view into consideration and focus on the incentives to offer short term contracts. A short term contract is appealing due to flexibility. Industries subject to uncertainties and critical jobs would in particular value flexibility in order to maintain productivity and adjust the employment force (Milgrom, 1987). Critical jobs are jobs that induce high turnover costs for the employer when the employee quits, is laid off, or has to be kept on the job due to

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<sup>2</sup>Assume that the potential worker is more risk averse than the employer, in that he or she wants to be insured against wage fluctuations. Then, contracts involving less fluctuation in wages but frequent layoffs are chosen. If labor supply, on the other hand, is inelastic the optimal contract may involve less flexibility in employment, thereby encouraging long term contracts.

restrictive laws (despite low productivity performance).

When the firm's employment decisions are affected by changed legislation these issues need further examination. In the literature, there are few references to the influence of institutions (other than to the influence of unions). In this paper it is shown that the institutional framework has important implications on the choice of the type of employment contract. The model we develop is a theory of layoffs from which the optimal retention decision is derived. In particular, it is interesting to assess the characteristics and features of short term contracts when the possibility to adjust employment is restricted through the institutional framework.<sup>3</sup> A description of Swedish labor market law characteristics follows below.

## 2.2 Institutional Framework

During the early to mid 1970's there were important changes in labor market laws in Sweden. The aim was to improve the workers' conditions in the labor market, both in terms of possibilities to affect working conditions and the right to keep a job. The laws favored the workers rather than the employers. This development influenced the employer's hiring decisions. We will focus on the 1974 Employment Act, because it is believed that it has had the broadest effect on the hiring process.

The Employment Act (LAS, Lagen om anställningsskydd, SFS 1974:12) which was implemented in 1974 came into force in 1975 (Schmidt, 1985). The new law intended to improve and secure the workers' right to keep a job. A job offer secured long term employment unless explicit statements were made as to the length of the job. This was the main principle of LAS. Short term employment (restricted to a relatively short time period) was rare. It was offered only subject to specific cases, such as for seasonal jobs and for specific projects (e.g. construction projects). The Employment Act made it difficult to layoff/dismiss workers, thereby inducing high costs for employers. Layoffs (in principle) had to follow the "first in last out" principle (this was to some extent

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<sup>3</sup>A common problem in signing either short term or long term contracts is the firm's inability to observe the workers on the job productivity prior to hiring. Even if the firm has sufficient information on workers previous achievements, the firm's main interest is the worker's productivity on the firm. This is a reason of its own to sign contracts as a screening device.

negotiable). Thus, seniority was awarded. In addition, layoffs were only in effect after a minimum of one months notice.<sup>4</sup>

In 1982, major revisions to the Employment Act were passed (SFS 1982:4). These revisions relaxed some of the previous restrictions, making it easier and less costly to hire and fire workers. The main principle is still in effect, a job offer is assumed to be a long term job unless otherwise stated. In addition, other possibilities have become more common. First, time-limited short term jobs and second, jobs that follow the main principle but are restricted to an in advance stated maximum length. The 1982 Employment Act made temporary employment, e.g. in the presence of a temporary piling up of work, easier than previously. Another possibility which the law introduced and the most significant change was the introduction of short term screening contracts. Such contracts will be referred to as explicit screening device contracts.<sup>5</sup> An employer is allowed to screen the productivity of a worker during a period of 6 months. After that period, the employer can choose to terminate the contract or employ the worker on a permanent basis. The employer's decision should not be subject to an evaluation by the Labor Court in this case. In practice, it is very difficult to extend the trial period. In the 1974 version of LAS screening contracts were in practice not recommended unless explicit statements had been made in collective agreements.

Thus, the 1982 Employment Act introduced some flexibility in the employer's hiring and firing decisions. It was made easier for the firm to dismiss workers. This increased the number of new hires, counteracting the previous fall in hirings (Holmlund, 1986). Paradoxically the Employment Act, which was implemented to encourage long term labor market ties and discourage short term contracts, also induced a development in opposition to the expected one. This assessment is sustained by the empirical evidence of an increase in short term jobs. The assertion here is that short term contracts (implicit or explicit contracts), that possess screening device features may have been encouraged

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<sup>4</sup>Notice periods vary with employment length and the age of the employee. Notice periods longer than one month apply to employees that have been with the firm for at least 6 months. In these cases the notice periods depend on the employee's age. An individual aged 45 years or older has the right to 6 months notice.

<sup>5</sup>It seems that this kind of contract is the outcome of the previously very restricted version of the Employment Act.

through the implementation of LAS in 1974. Short term contracts are expected to facilitate the adjustment to stochastic shocks through the flexibility to adjust employment on a short term basis. The incentives to apply screening device contracts may vary across industries and firms, due to industry and firm characteristics, and the magnitude of informational asymmetries.

The Employment Act may have influenced the employers' recruitment strategies. An employer becomes more selective when hiring workers if his opportunity to dismiss workers is limited and costly. In addition the reservation productivity is set higher.<sup>6</sup>

In conclusion, the institutional development of the labor market has most likely encouraged short term, on the job screening contracts. The firm's motives have been,

- i) to quickly adjust to stochastic shocks and productivity changes that require employment changes, e.g. in order to avoid costs associated with layoffs initiated by the firm, because firms have been partially penalized through the labor market laws, and
- ii) to avoid the losses associated with keeping low productivity workers longer than preferred instead of substituting them for high performance workers.

The two motives are a bit different. The first specifically refers to basic incentives to keep some flexibility despite the advantages of long term agreements. The second motive is closely associated with the law, and affects the form of the contract. However, both motives are accentuated in the presence of the law.

Hence, although the initial aim of LAS was to secure long term commitments, the anticipated decrease in short term contracts did not occur. This can be seen as a paradox because we would have expected a growing market of long term contracts. An expla-

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<sup>6</sup>Early empirical studies (Holmlund, 1976) have shown that hirings decreased at given levels of vacancies and unemployment. In Holmlund (1986) these findings are further confirmed. However, Edin & Holmlund (1990) in a recent attempt to capture the effects of the Employment Act, from when it was first implemented to the period when some restrictions were relaxed (1982), find weak evidence of a decline in the flow of hirings during this period. Even though Edin & Holmlund's study produces weak evidence, one way to interpret the change in strategies is that in the after-law period the reservation productivity of workers is set higher in comparison with the before-law period.



nation of this paradox may be that the Employment Act induced more flexibility by encouraging screening through implicit/explicit short term screening device contracts.<sup>7</sup>

### 3 Short Term Contracts as a Screening Device

This section develops the rationale for some circumstances under which the contract as a screening device is applicable. The firm's objective is to maximize profits, often in the presence of stochastic shocks and informational asymmetries. The key concept here is that the firm needs some flexibility to adjust its employment and thereby worker productivity on a short term basis. Therefore, the firm applies short term contracts with screening device features.<sup>8</sup>

When the firm makes an employment decision it screens the applicants. It is plausible that the seller, in this case the applicant, has access to private information. The applicant may choose different policies to report this information. The following description follows the approach taken in Milgrom & Weber (1982). Among the possible policies are

- i) *concealment* (no information is reported)
- ii) *honesty* (all information is always reported completely)
- iii) *censoring* (only the most favorable information is reported)
- iv) *summarizing* (only a brief summary is reported)
- v) *randomizing* (noise is added to the data before reporting).

It is assumed that the most common reporting policy among job applicants is the *summarizing* policy. In this case, the firm is interested in further screening of the applicant, independent of the duration of the firm's agreement with the worker. Furthermore, even if the applicant is perfectly honest about his/her skills (his/her reporting policy is ii)

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<sup>7</sup>While the demand for quality increased the possibilities to be given an opportunity to try a job might have been equally ameliorated.

<sup>8</sup>It is argued that the screening features are associated with short term contracts, however, long term contracts also may have such features in terms of wage adjustment after a trial period.

*honesty*), the employer has no prior knowledge on the applicant's on the job productivity. Thus, a screening device contract is always applicable.

The screening device contract is even more motivated in the case of labor market laws intervening with the firm's decision making, because such a situation would not allow the firm complete flexibility to adjust its employment force once the employee's true productivity is revealed. The cost of errors made by the firm may increase in comparison with the before-law period. Thus, any contract that values flexibility and allows on-the-job screening should be favorable for the firm in this case.

We will develop a model of layoffs where the firm has to determine an optimal retention decision. This model applies the notion of affiliation through the screening device contract. The idea behind the affiliation theory is that individual pieces of information can be ordered by favorableness, where a signal is "good news" if it is more favorable than another signal. We apply this idea to the employer's search problem. Monotonicity plays an important role here. Affiliation implies that if a worker is a good quality worker, then if his/her performance during the first screening period is satisfactory it is likely to be satisfactory in the periods to come. Hence, a situation of favorableness appears. Milgrom (1981) illustrates the usefulness of the affiliation idea by a series of applications. The applications refer to a securities market model, a moral hazard model, a persuasion-game model (i.e. a salesman tries to influence a consumer by selectively providing data to the decision), and an auction model.<sup>9</sup> Our application of the affiliation theory is yet a new illustration of the usefulness of this theory. In our model being a high quality worker in a period signals a high quality performance in the periods to come. This is "good news". Thus, screening prior to a new hire could facilitate the adjustment process, and may be favored by the employer.

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<sup>9</sup>In the security model an announcement of good news about a security's future causes its price to rise, in the principal-agent model greater profits are assumed to be evidence of greater effort by the agent, and in the persuasion-game the interested party reports the information that is most favorable to his case. Finally, in the auction model, if an agent wins the auction we have "bad news", because the winner's estimate is higher than the value of the object being sold. That is a bidder is more likely to win an auction when he overestimates the object being sold.

### 3.1 The Model

We derive a three period model with two regimes, a before-law regime and an after-law regime where all information is public. However, there is uncertainty on prospective employees' on the job productivities. Period one is a hiring period, period two a screening period, and period three refers to a permanent employment situation. This is a model for short term and long term contracts. It is assumed that the wage,  $w$ , is rigid, e.g. preset through bargaining to some fixed minimum level. Thus, the firm does not have the option to adjust the wage once a workers true productivity is revealed. Note that the firm's concern is the possibility to adjust the employment force.

Suppose that the worker can commit himself to any policy of reporting information that he chooses. Then, the employer is not confident about the policy the worker has chosen until after a period of screening. However, a high productivity worker in one period makes it likely that this same worker will be a high performance worker in the periods to follow. The firm screens workers before hiring in both regimes. The two regimes differ in the following way.<sup>10</sup>

#### **Before-law regime**

The firm does not observe the true worker productivity. It may sign a short term contract with the option of on the job screening. After the screening period, the worker is either laid off or retained. This decision depends on revealed productivity characteristics during the short term contract period.

#### **After-law regime**

The firm faces the same information problem as in the before-law regime. However, in this case the firm has to keep the worker after the employment decision.<sup>11</sup>

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<sup>10</sup>This is a simplified hypothetical case, in practice the firm may find ways to adjust the employment force even in the after-law regime.

<sup>11</sup>Observe that this indeed is an extreme case. It is a strict version of the 1974 Employment Act (1974-82 period), because the law still left some room for exceptions. However, the strict case provides interesting implications. Relating our theoretical regimes to the real world the before-law regime would correspond to the pre-74 and post-82 period, whereas the after-law regime corresponds to the 1974-82

It seems plausible that a firm would prefer a screening device contract.<sup>12</sup> Let  $R$  be the decision of retention before the law and  $\hat{R}$  the retention decision after the law. We expect more workers to be retained in the after-law regime since all hired workers are retained despite their on the job performances. Denote the wage  $w$  and the worker ability  $\tilde{\theta}$ . The worker ability is the productivity of the worker at the firm and is assumed to be a random variable. This productivity is associated with firm characteristics. Thus, different firms will have different demands of the minimum required characteristics.

Our way of modeling the productivity differs from the mainstream literature in that the focus is on the worker productivity at the firm. Furthermore, the productivity variable reflects the firm's projects, characteristics, and matching ability, because the probability of a worker at a firm is associated with that firm's characteristics. Thus, the worker's productivity and the firm's characteristics are simultaneously considered when an employment decision is made.

The productivity,  $\tilde{\theta}$  is assumed to be normally distributed with mean  $\mu$  and variance  $\sigma_{\tilde{\theta}}^2$ ,

$$\tilde{\theta} \sim N(\mu, \sigma_{\tilde{\theta}}^2) \quad (1)$$

The definition of  $\tilde{\theta}$  allows a flexible interpretation of worker ability as discussed above. The worker's output  $X_t$  in each period,  $t$ , is a noisy measurement of the productivity

$$X_t = \tilde{\theta} + \epsilon_t \quad (2)$$

where  $\epsilon_t$  is a random variable, which is normally distributed with mean 0 and variance  $\sigma_{\epsilon}^2$ ,

$$\epsilon_t \sim N(0, \sigma_{\epsilon}^2). \quad (3)$$

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period. Keeping this in mind we proceed the theoretical discussion.

<sup>12</sup>The screening contract gives the employer an extra option. Further, observe that we do not discuss the explicit costs of signing contracts. Assume that the costs were included. This would most likely not affect the general line of reasoning (neither the results of our model). Signing contracts may be assumed to be costly in both regimes. The costs for breaking a contract in the after-law regime are higher due to high layoff costs in comparison with the before-law regime. This further sustains our assertion that the costs of errors are greater in the after-law regime.

## 3.2 The Optimal Retention Rule

Let us study the firm's problem in the two regimes. In both regimes the firm's objective is to maximize expected profits. Denote the firm's expected profit at time  $t$ ,  $V_t$ . The firm's goal is to maximize its expected profit  $V_t$ .

### Before-law regime

At  $t = 1$ , an applicant is hired (retained) if  $V_1 > 0$ , not hired (retained) if  $V_1 \leq 0$ .

At  $t = 2$ , an applicant is retained if  $V_2 > 0$ , not retained if  $V_2 \leq 0$ .

### After-law regime

At  $t = 1$ , an applicant is hired if  $\hat{V}_1 > 0$ , not hired if  $\hat{V}_1 \leq 0$ .

The difference between the two regimes is that in the after-law regime the firm is constrained in its maximization problem. Under the above assumptions, the firm's expected profit at the end of each period can be expressed in terms of  $X_1, X_2$  and  $w$ . At  $t = 2$ , the expected profit of the third period in the before-law regime is

$$V_2(X_1, X_2) = \max[0, E\{X_3 - w \mid X_1, X_2\}], \quad (4)$$

which is an increasing function of  $X_1$  and  $X_2$ . The firm's profit when it fires a worker is zero. By keeping a worker the value is  $E\{X_3 - w \mid X_1, X_2\}$ . At  $t=1$ , the firm's expected profit from periods two and three in the same regime is

$$V_1(X_1) = \max[0, E\{X_2 - w \mid X_1\} + E\{V_2\}]. \quad (5)$$

The assumption that  $X_t$  is normally distributed implies that the  $X_t$ 's are affiliated over time (Milgrom & Weber, 1982), i.e. higher values of  $X_1$  make higher values of  $X_2$  relatively more likely. The notion of affiliation is based on the likelihood ratio property, see Milgrom (1981).

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**Lemma 1** *If the variables  $X_1$  and  $X_2$  are affiliated and  $f$  is an increasing function, then  $E\{f(X_1, X_2) \mid X_1 = x_1\}$  is an increasing function of  $x_1$ .*

Then by affiliation  $V_1(X_1)$  in (5) is an increasing function of  $X_1$ .

In the after-law regime at  $t = 1$ , the expected profit of periods two and three is

$$\hat{V}_1(X_1) = \max[0, E\{X_2 - w + X_3 - w \mid X_1\}] \quad (6)$$

and at  $t = 2$ ,

$$\hat{V}_2(X_1, X_2) = E\{X_3 - w \mid X_1, X_2\}. \quad (7)$$

We denote the reservation productivity set by the firm, both in the hiring decision and the retention decision, by  $R$ . The threshold,  $R$  is the firm's requirement when applying the hiring or retaining decision rule. It may in itself for simplicity be referred to as a retention rule. The firm's problem is to find a retention decision  $R_1, R_2$  in the before-law regime and  $\hat{R}_1$  in the after-law regime. The worker is retained after periods one and two in the before-law case and period one in the after-law case. We wish to show that the retention decision is increasing in  $X_1$  and  $X_2$  and further, that the retention decision is monotone in worker output in period  $t$ .

**Theorem 1** *In the before-law regime, the retention rule is of the form retain if  $X_1 > R_1$  at  $t = 1$  and,  $X_1 + X_2 > R_1 + R_2$  at  $t = 2$  where  $R_1 + R_2 = [w - b\mu]/a$ . In the after-law regime, the rule is of the form  $X_1 > \hat{R}_1$  at  $t = 1$ , where  $\hat{R}_1 = \frac{w - \bar{b}\mu}{a}$ .*

**Proof** The proof is given in several steps.

### Before-law regime

The firm retains a worker if  $V_2(X_1, X_2) > 0$ . This is true if,

$$\begin{aligned} E\{X_3 - w \mid X_1, X_2\} &= E\{\tilde{\theta} + \epsilon_3 \mid X_1, X_2\} - w \\ &= E\{\tilde{\theta} \mid X_1, X_2\} - w > 0 \end{aligned} \quad (8)$$

where  $\epsilon_i$  and  $\tilde{\theta}$  are independently distributed.

Thus, the conditional expectation must be greater than the wage. It is shown in Appendix A that

$$E\{\tilde{\theta} \mid X_1, X_2\} = a(X_1 + X_2) + b\mu \quad (9)$$

where  $a = \frac{\sigma_\theta^2}{\sigma_\epsilon^2 + 2\sigma_\theta^2}$  and  $b = -\frac{\sigma_\epsilon^2}{\sigma_\epsilon^2 + 2\sigma_\theta^2}$ .

It then follows that,

$$X_1 + X_2 > [w - b\mu]/a = R_1 + R_2 \quad (10)$$

which proves one part of our theorem.

The worker is hired at  $t = 1$  if  $V_1(X_1) > 0$ . This implies,

$$\begin{aligned} E\{X_2 - w \mid X_1\} + E\{V_2\} &= E\{\tilde{\theta} + \epsilon_2 \mid X_1\} - w \\ &\quad + E\{\max[0, a(X_1 + X_2) + b\mu - w]\} \\ &= \bar{a}X_1 + \bar{b}\mu - w \\ &\quad + E\{\max[0, aX_1 + aX_2 + b\mu - w]\} \\ &= \bar{a}X_1 + \bar{b}\mu - w \\ &\quad + \int_{X_2 = \frac{w - aX_1 - b\mu}{a}}^{\infty} (aX_1 + aX_2 + b\mu - w) \times \\ &\quad \times f_{X_2}(X_2) dX_2 \end{aligned} \quad (11)$$

$$> 0, \quad (12)$$

where  $\bar{a} = \frac{\sigma_\theta^2}{\sigma_\epsilon^2 + \sigma_\theta^2}$  and  $\bar{b} = -\frac{\sigma_\epsilon^2}{\sigma_\epsilon^2 + \sigma_\theta^2}$ .

The expression in (12) defines  $R_1$ . In general, an explicit expression cannot be obtained since  $X_2$  is a normally distributed random variable. However, since  $V_1(X_1)$  is an increasing function,  $V_1(X_1)$  is positive if and only if  $X_1 > R_1$ . Thus, the rule is of the form  $X_1 > R_1(\sigma_\theta, \sigma_\epsilon, w)$ .

### After-law regime

The worker is hired if  $\hat{V}_1(X_1) > 0$ . Then,

$$\begin{aligned} E\{X_2 - w + X_3 - w \mid X_1\} &= E\{\tilde{\theta} + \tilde{\theta} \mid X_1\} - 2w = \\ &= E\{\tilde{\theta} \mid X_1\} + E\{\tilde{\theta} \mid X_1\} - 2w \\ &= 2(\bar{a}X_1 + \bar{b}\mu) - 2w > 0. \end{aligned} \quad (13)$$

Thus,  $X_1 > \frac{(w - \bar{b}\mu)}{\bar{a}} = \hat{R}_1$ . This completes our proof.  $\square$

**Theorem 2** *The reservation productivity in the after-law regime is greater than in the before-law regime,  $\hat{R}_1 > R_1$ .*

Intuitively our theorem is always true. The employer sets a higher reservation productivity in the after-law regime than in the pre-law regime, because all hired workers are retained after the screening period 2. The firm is constrained in the after-law regime, because of the retainment requirement. It is then obvious that the reservation productivity is set higher in this case. If we consider the marginal worker, then any information that induces a change in the employment flexibility is valuable to the firm. Anything that adds to uncertainty will sustain this condition.

Next, we compare the two regimes, by comparing  $V_1(X_1)$  with  $\hat{V}_1(X_1)$ . It is crucial to our model that the worker in the after-law regime cannot be fired. In our model at  $t = 1$ , the value of the firm in the before-law period is

$$\begin{aligned} V_1(X_1) &= \max[0, E\{X_2 - w \mid X_1\} + E\{\max[0, E\{X_3 - w \mid X_1, X_2\}]\}] \\ &= \max[0, E\{X_2 - w \mid X_1\} + E\{\max[0, E\{X_3 - w \mid X_1, X_2\}] \mid X_1\}], \end{aligned} \quad (14)$$

where expression (4) has been substituted into expression (5). In the after-law regime at  $t = 1$ , the expected value is

$$\begin{aligned} \hat{V}_1(X_1) &= \max[0, E\{X_2 - w + X_3 - w \mid X_1\}] \\ &= \max[0, E\{E\{X_2 - w + X_3 - w \mid X_1, X_2\}\}] \\ &= \max[0, E\{X_2 - w \mid X_1\} + E\{E\{X_3 - w \mid X_1, X_2\} \mid X_1\}]. \end{aligned} \quad (15)$$

This is obtained through a substitution of expression (7) into expression (6).

Comparing (4) and (7), the firm's expected value at  $t = 2$  in the before-law case exceeds the value in the post-law regime, thus  $V_2 > \hat{V}_2$ . Comparing (14) and (15) it also follows that  $V_1 > \hat{V}_1$ . Further, it is easy to see that since  $V_1$  and  $\hat{V}_1$  are increasing functions and  $V_1 > \hat{V}_1$  it follows that  $\hat{R}_1 > R_1$  which proves Theorem 2.



## 4 A Numerical Example

We have already shown how the two regimes encourage employers to adopt different recruitment behavior. The hypothesis is that employers prefer a situation with screening. Next, we compare the expected values given by expressions (14) and (15) in more detail. Let the random variable  $X_1$  be the outcome in the first period. To make a comparison between the two regimes we will assume a certain distribution. The distribution is the same in both regimes in order to undertake a comparison under the same state of the world. Then it is sufficient to compare

$$E\{\max[0, E\{X_3 - w \mid X_1, X_2\}]\} \quad (16)$$

the before-law value with

$$E\{X_3 - w \mid X_1, X_2\} \quad (17)$$

the after-law value.

Since  $E\{X_3 - w \mid X_1, X_2\}$  is a random variable  $\xi$  that is normally distributed with mean  $\mu$  and variance  $\sigma^2$ ,  $N(\mu, \sigma)$ , we compare  $E\{\max[0, \xi]\}$  with  $E\{\xi\}$ . Thus,

$$E\{\max[0, \xi]\} = \int_{-\infty}^{\infty} \max[0, \xi] f(\xi) d\xi . \quad (18)$$

After some manipulation we obtain

$$E\{\max[0, \xi]\} = \sigma f_{N(0,1)}\left(\frac{\mu}{\sigma}\right) + \mu(1 - F_{N(0,1)}\left(-\frac{\mu}{\sigma}\right)). \quad (19)$$

In Figure 1,  $E\{\max[0, \xi]\}$  is plotted versus  $E\{\xi\}$ , comparing  $\frac{E\{\max[0, \xi]\}}{\sigma}$  with  $\frac{E\{\xi\}}{\sigma}$ . The numerical solution has been obtained using a normal distribution approximation (Drake, 1967).<sup>13</sup> Suppose we have a case where the mean is negative, relative to some nominal value. This implies a low  $X_1$ , which means that the worker is a low performance worker.<sup>14</sup> In

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<sup>13</sup>This approximation is of the form:

$$P(x) = 1 - Z(x)(b_1 t + b_2 t^2 + \dots b_5 t^5), t = \frac{1}{1 + px}, \quad (20)$$

and  $|\epsilon(x)| < 7.5x10^{-8}$ , where  $P, b_1, b_2, b_3, b_4, b_5$  as given in Abramowitz & Stegun (1972).

<sup>14</sup>Observe that we need not necessarily talk about low performance workers, in fact workers can be productive (good quality workers) and still not hired. The reason is that they do not provide enough profit to the firm, see Kazamaki (1991, Chapter 4).

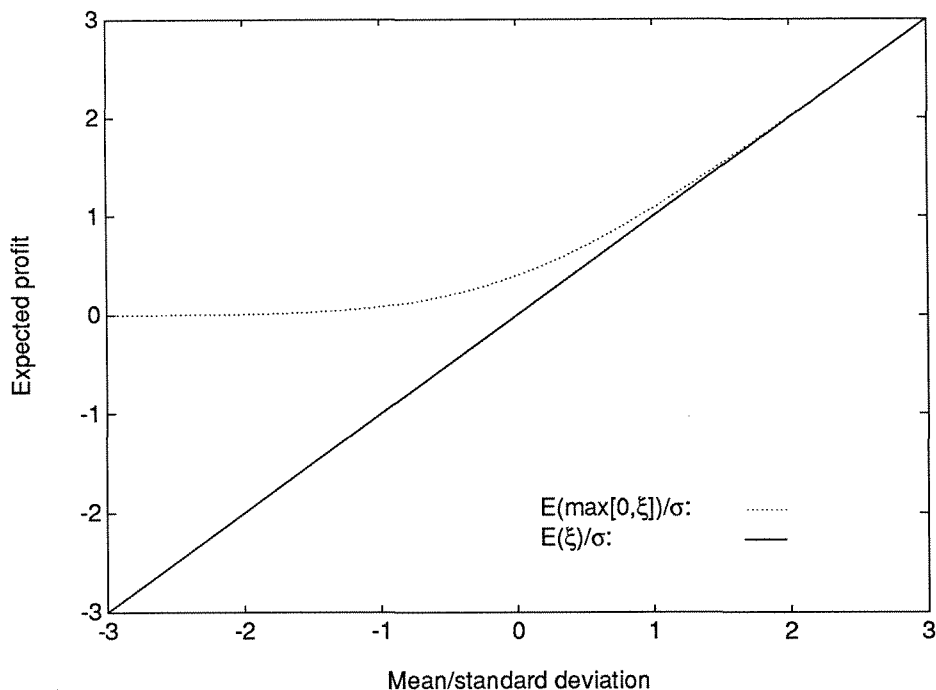


Figure 1: Evaluation of  $\frac{E\{\max[0, \xi]\}}{\sigma}$  and  $\frac{E\{\xi\}}{\sigma}$ .

the before-law case, this worker could have been fired. In the after-law case, this option is not available to the employer and thus he has to keep the worker. If on the other hand the worker is a high performance worker the difference between the two regimes is small. These results sustain that it is highly plausible in the presence of informational and institutional asymmetries that the employer may prefer a screening device contract.

In the after-law regime, it is beneficial to the employer to set higher requirements in order to eliminate some uncertainty in making a hiring decision. However, it is shown here that the expected profit of the firm in the before-law regime still will exceed the expected profit in the after-law regime. This is in particular the case where the employer hires a low productivity worker. Our results are in favor of the assertion that the increase in layoffs from short term jobs in part may be explained by the institutional development in the Swedish labor market. A situation of more flexibility, the pre-law case, is always preferred by the firm to a situation with less flexibility, the after-law case. This conclusion may seem trivial. However, its policy implications are interesting. The firm always seem to adapt to outside disturbances in form of shocks, laws, and labor market policies. The firm adjusts its employment behavior and develops new strategies. Thus, institutional

means to affect employer behavior do not always result in the way governments predict.

## 5 Concluding Discussion

We have shown that it is appealing to a firm to sign a screening device contract whenever there is uncertainty involved in making an employment decision. There is clear evidence for such employer behavior. The characteristics of institutions enforce this behavior when laws and government measures affect, in particular restrict, the firm's flexibility to adjust its employment force. Screening is favorable in situations where government intervention and laws increase the costs of the employment process. Being constrained through the labor market laws the firm may, paradoxically, find new means to allow flexibility in the hiring process. Our model is based on the productivity argument. In addition, it reflects the changes in the type of jobs offered and firm characteristics because these are assumed related with the requirements on the job productivity of workers. The value of the screening device contract is most likely firm and industry specific. Furthermore, where layoffs are not permitted, the reservation productivity is set high. The reservation productivity depends on the uncertainty of the productivity, the noisy measurement on the output (e.g. incorrect measuring the output or productivity), and the wage. The policy implications here are that firms even in the presence of institutional restrictions will find means to ask for more information as well as means to reveal information. Concluding, the firm's objectives are clearly to maximize profits, given certain restrictions. Institutional restrictions affect the firm's behavior meanwhile encouraging new ways of adjustment which clearly affect the hiring process.

## Appendix A

The conditional density function of  $\theta$  given  $X_1$  and  $X_2$  is

$$\begin{aligned} f_{\theta | X_1, X_2}(\theta) &= \frac{f_{\theta, X_1, X_2}(\theta, x_1, x_2)}{f_{X_1, X_2}(x_1, x_2)} \\ &= \frac{f_{\theta}(\theta) f_{X_1, X_2 | \theta}(x_1, x_2)}{\int_{-\infty}^{\infty} f_{\theta, X_1, X_2}(\theta, x_1, x_2) d\theta} \end{aligned} \quad (\text{A.1})$$

$\epsilon_1$  is independent of  $\epsilon_2$ , thus

$$f_{\theta | X_1, X_2}(\theta) = \frac{f_{\theta}(\theta) f_{X_1 | \theta}(x_1) f_{X_2 | \theta}(x_2)}{\int_{-\infty}^{\infty} f_{\theta}(\theta) f_{X_1 | \theta}(x_1) f_{X_2 | \theta}(x_2) d\theta}. \quad (\text{A.2})$$

Examine

$$\begin{aligned} f_{\theta}(\theta) f_{X_1 | \theta}(x_1) f_{X_2 | \theta}(x_2) &= \frac{1}{\sigma_{\theta} \sqrt{2\pi}} e^{-\frac{(\theta-\mu)^2}{2\sigma_{\theta}^2}} \frac{1}{\sigma_{\epsilon} \sqrt{2\pi}} e^{-\frac{-(x_1-\theta)^2}{2\sigma_{\epsilon}^2}} \frac{1}{\sigma_{\epsilon} \sqrt{2\pi}} e^{-\frac{-(x_2-\theta)^2}{2\sigma_{\epsilon}^2}} \\ &= \frac{1}{2\pi \sigma_{\epsilon} \sqrt{\sigma_{\epsilon}^2 + 2\sigma_{\theta}^2} \sqrt{2\pi} \bar{\sigma}} e^{-\frac{-(\theta-\bar{\mu})^2}{2\bar{\sigma}^2}} e^{-\bar{c}} = C g(\theta) \end{aligned} \quad (\text{A.3})$$

here

$$\bar{\mu} = \frac{\mu \sigma_{\epsilon}^2 + (x_1 + x_2) \sigma_{\theta}^2}{\sigma_{\epsilon}^2 + 2\sigma_{\theta}^2} \quad (\text{A.4})$$

$$\bar{\sigma}^2 = \frac{2\sigma_{\theta}^2 \sigma_{\epsilon}^2}{\sigma_{\epsilon}^2 + 2\sigma_{\theta}^2}. \quad (\text{A.5})$$

and  $C$  is independent of  $\theta$ ;  $g(\theta)$  is a normal density with mean  $\bar{\mu}$  and variance  $\bar{\sigma}^2$ .

Thus,

$$\begin{aligned} E\{\theta | X_1, X_2\} &= \int_{-\infty}^{\infty} \theta f_{\theta | X_1, X_2}(\theta) d\theta \\ &= \frac{C \int_{-\infty}^{\infty} \theta g(\theta) d\theta}{C \int_{-\infty}^{\infty} g(\theta) d\theta} = \bar{\mu}. \end{aligned} \quad (\text{A.6})$$

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