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Thomas Burkle

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**Author:**

[Burkle, Thomas](#), Johann Wolfgang Goethe-University, Frankfurt am Main

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Thomas Bürkle

## **The advantage of employing workers with short time perspectives**

(June 2003)

### **Abstract**

*This paper examines labor contracts as a form of insurance contracts. It assumes that workers are risk averse with the time perspective (or planning period) of a worker combining a period of  $T$  distinct spells  $t$ , with length of a spell being the same for all workers (a spell might be a year for example). Workers are assumed to differ only according to their time perspective: For example some workers planning period may consist of only one spell ( $T=1$ ), while for others it may be three spells ( $T=3$ ). The analysis starts with the assumption that workers are hired on a neoclassical spot contract at the beginning of each spell  $t \in T$ . Then it shows that, if workers objective is to maximize the sum of their incomes over all spells in their planning period, income risk that derives from the uncertainty of employment caused by stochastic business cycles in each spell will be more threatening to workers with a shorter time perspective  $T$  than to those with a longer time perspective. Therefore, if a firm offers an institutionalized contract that bears no employment risk and covers the worker's individual planning period  $T$ , the worker's willingness to pay risk premiums by wage concessions decreases, the longer his planning period.*

*On this pure risk theoretical point of view, the firm will prefer workers with short individual planning periods in order to maximize their insurance premiums. Thus this paper contradicts the common argument that long term contracts are advantageous to firms.*

Dr. Thomas Bürkle is employed as an assistant professor at the department of personnel economics of the Johann Wolfgang Goethe -University, Frankfurt am Main, Germany. E-mail: buerkle@wiwi.uni-frankfurt.de

## 1. Introduction

Labor contracts bind individuals to organizations for limited or unlimited times. The character of this partial inclusion can be regarded as a distinguishing characteristic of “staff” as a social category. (Türk, 1978, p. 219). Often labor contracts are institutionalized contracts. This analysis compares two types of contracts: Spot contracts, which are ruled by the market forces, and institutionalized contracts, which are characterized mainly by the job security for all the spells of their duration. The institutionalized contracts can be differentiated in short term contracts, which guarantee employment only for the following spell ( $T=1$ ) and long term contracts which guarantee employment for at least two spells ( $T>1$ ).

Among the advantages of institutionalized contracts are lower transaction costs and aspects of incentive compatibility (Becker, 1985, p. 55). The main argument against long term contracts is that they reduce flexibility: The longer the duration of the contract, the harder it will be for the firm to adjust its employment to changes in its environment (Kossbiel, 1997, p. 22). Labor contracts imply an allocation of risk, because if the wages and the employment of a worker are fixed for a given period, the firm bears the risk of cyclical fluctuations. The willingness of risk averse, Bernoulli-rational (V. Neumann/ Morgenstern, 1944, p. 15-31) workers to pay insurance premiums for the income certainty linked with institutionalized contracts depends on two factors, first the shape of their utility function (or the degree of risk aversion) and second on the perceived risks of unemployment under spot contracting in each spell of their planning period. The greater the probability of employment in each spell, the lower the threat of bearing the risk.

In this paper, the states of nature that could occur if workers take spot contracts are dichotomous: Either they are employed at a (fixed) market wage or they are unemployed and receive an unemployment benefit. So if a worker has a time perspective of  $T$  spells, a lottery in each spell  $t \in T$  is defined. The paper focuses on the impact of the length of an individual's time perspective on his willingness to pay insurance premiums to obtain an institutionalized contract over  $T$  spells which would eliminate the risk of being unemployed in each spell  $t \in T$ . For simplification, it will be assumed that the states of nature in different spells are stochastically independent. The argumentation refers methodically to the comparison of distributions with mean preserving spreads

according to the associated risk developed by ROTHSCILD and STIGLITZ. Therefore the first step will be to analyze the relation between length of time perspective and risk. After that, the implications of this relationship for the optimal duration of institutionalized labor contracts will be examined.

## 2. Basic assumptions of the analysis

The market wage will be regarded as being fixed. The uncertainty of a worker's income derives from the possibility of being unemployed in each spell which is caused to the stochasticity of business cycle. The firm has two alternative labor policies: First, in the beginning of each spell, after the firm detects the true state of nature, workers can be employed by a one -spell spot contract. Second, workers can be employed by an institutionalized contract at the end of a spell for at least the next spell. In this case the contract is made before the firm is able to detect the true state of nature.

The argument of an individual's utility function is the total wealth an individual can accumulate over his planning period  $T^1$ . This total wealth  $\Phi$  is stochastic. The utility function of the risk averse individual is a concave function  $U(\Phi)$  with positive but decreasing marginal utility:  $\frac{\partial U(\Phi)}{\partial \Phi} > 0$  and  $\frac{\partial^2 U(\Phi)}{\partial \Phi^2} < 0$  (Friedman/Savage, 1948, p. 290)<sup>2</sup>.

Depending on the state of nature, in each spell  $t \in T$ , a worker will receive an income of  $\Phi_{\max}^t$  (market wage) or  $\Phi_{\min}^t$  (unemployment benefit), while  $\Phi_{\max}^t > \Phi_{\min}^t \forall t$ .

So the total income over  $T$  spells is  $\Phi = \sum_{t=1}^T \Phi^t$ . For simplification it will be assumed

$$\Phi_{\max}^t = \Phi_{\max} \forall t \text{ and } \Phi_{\min}^t = \Phi_{\min} \forall t.$$

The probability that the high income will occur in a spell is  $\mu$  for all spells, the probability of the low income  $\Phi_{\min}$  in each spell is  $1 - \mu$ . According to  $T$ , with two possible states of nature in each spell ( $\Phi_{\max}, \Phi_{\min}$ ) there are  $2^T$  different states of

<sup>1</sup>The analysis is confined to utility functions with a single argument. For an expansion on multi -variable utility functions of risk averse agents see for example R.E. Kihlstrom/L.J. Mirman (1974, p. 361 -388).

<sup>2</sup>According to B. Hansson (1988, p. 156), concavity of a utility function including monetary arguments can be explained by consumption increasing in wealth: The individual starts purchasing goods bearing a high utility. While wealth increases, more goods will be purchased but with a decreasing utility.

nature. Each state of nature is characterized as a special sequence of consecutive incomes. If for example  $T = 4$ , one possible state of nature is  $\Phi = \Phi_{\max} + \Phi_{\max} + \Phi_{\min} + \Phi_{\max}$ . If the discount rate is zero, it is possible to aggregate these states of nature: In this context the index  $m$  is introduced:  $m$  is the number of high income spells within  $T$  spells. For example, if  $T = 2$ ,  $\Phi = \Phi_{\max} + \Phi_{\min}$  and  $\Phi = \Phi_{\min} + \Phi_{\max}$  will be regarded as one state of nature characterized by  $m=1$ , although the high income occurs at different points of time. Therefore, the number of states of nature which have to be regarded reduces to  $T + 1$ <sup>3</sup>.

### 3. Determination of the insurance premium for a short term institutionalized contract (T=1).

This section takes a closer look at an institutionalized contract which guarantees employment to the workers for the following spell at a fixed wage. The maximum wage concession an individual would be willing to accept for the employment certainty gained by rejecting spot contracting will be discussed.

Risk premiums are an indicator of an individual's willingness to pay in order to obtain certainty. The risk premium an individual would be willing to pay in order to be insured on the expected value  $RP$  is the difference between the expected value of a stochastic outcome  $E\{\Phi\}$  and the certainty equivalent of the stochastic outcome  $\Phi_s$ :  $RP = E\{\Phi\} - \Phi_s$ . The certainty equivalent  $\Phi_s$  is the certain value of income that has the same utility as the expected utility of a lottery defined over  $T + 1$  states of nature

(Laux, 1982, p.199): 
$$U(\Phi_s) = \sum_{m=0}^T \mu_m \cdot U(\Phi_m)$$
  $\mu_m$  defines the probability of one state

of nature. A person is said to be risk averse if  $\Phi_s < E\{\Phi\}$ .

Usually individuals will not insure themselves to the expected value of wealth but to the highest value of wealth. The corresponding premium in this paper will be referred to "insurance premium"  $s$ . This is the amount of money an individual would be willing to pay to receive the high income in each spell of contract duration  $T$ . So the individual will be insured to a total income of  $T \cdot \Phi_{\max}$ .  $s$  is therefore defined as  $s = \Phi_{\max} - \Phi_s$ .

<sup>3</sup>If  $m=0$ , then this special state of nature is characterized by the sequence of low incomes in each spell.

As is obvious, the insurance premium decreases as the certainty equivalent increases.

The relation between  $R$  and  $s$  will be shown in figure 1:

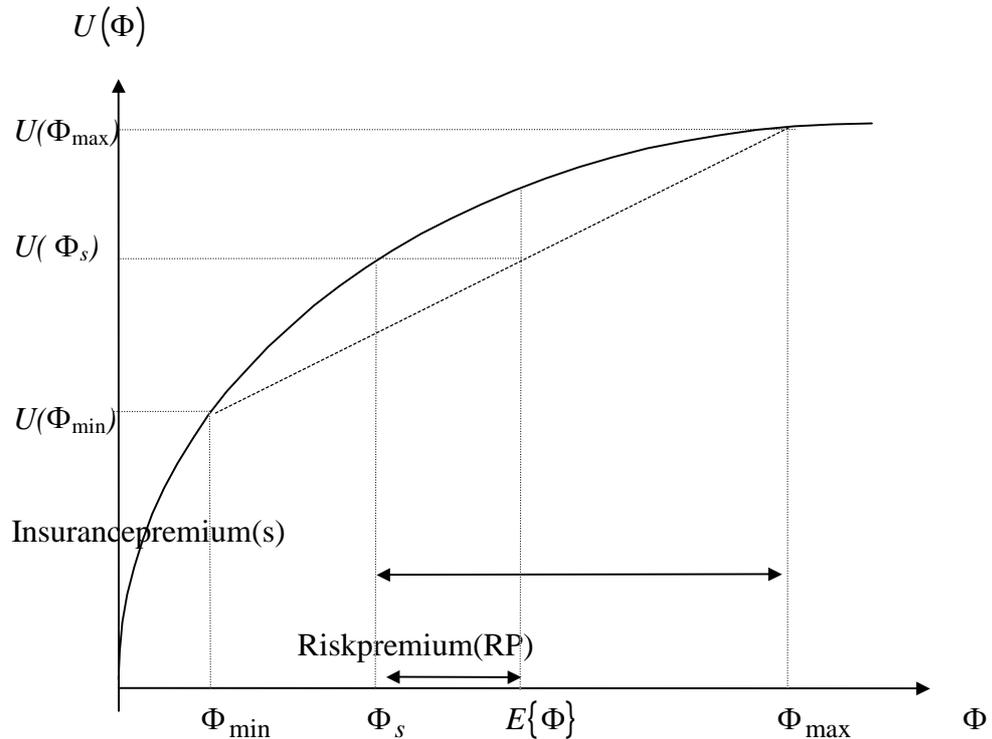


Figure 1: Risk and insurance premium (Taylor, 1987, p. 129 or Sinn, 1989, p. 75)

#### 4. The constitution of a binomial distribution of income associated with spot contracting

The number of possible states of nature increases the higher  $T$  is. For example, let  $\Phi_{\max} = \$1000$  and  $\Phi_{\min} = \$400$ , the following table shows the different states of nature defined by  $\Phi_m = m \cdot \Phi_{\max} + (T - m) \cdot \Phi_{\min}$  that have to be considered with different lengths of the period  $T$ :

$\Phi_m$	$T=1$	$T=2$	$T=3$	$T=4$
$m=0$	400(1x)	800(1x)	1200(1x)	1600(1x)
$m=1$	1000(1x)	1400(2x)	1800(3x)	2200(4x)
$m=2$	-	2000(1x)	2400(3x)	2800(6x)
$m=3$	-	-	3000(1x)	3400(4x)
$m=4$	-	-	-	4000(1x)

The expressions in brackets report the frequency this total income occurs. The example also shows, that an increasing  $T$  lowers the significance of the extreme values

$(T \cdot \Phi_{\max}$  and  $T \cdot \Phi_{\min})$  while the significance of the values in between  $T \cdot \Phi_{\max} > \Phi > T \cdot \Phi_{\min}$  increases.

For the determination of the expected utility of an individual, the number of combinations which are characterized by a high in come in  $m$  spells is important. The number of combinations of  $m$  out of  $T$  elements without repetition is

$$C(m, T) = \frac{T!}{m!(T-m)!} \equiv \binom{T}{m}. \text{ To each state of nature characterized by } m, \text{ a specific}$$

utility  $U_m = U(m \cdot \Phi_{\max} + (T-m) \cdot \Phi_{\min})$  is affiliated. The expected utility of an individual (which corresponds to the utility derived by the certainty equivalent) is then

$$\text{determined by } U(\Phi_s) = \sum_{m=0}^T \binom{T}{m} \cdot (1-\mu)^{T-m} \cdot \mu^m \cdot U_m \cdot \mu_m = \binom{T}{m} \cdot (1-\mu)^{T-m} \cdot \mu^m \text{ is}$$

the probability function of a binomial distribution (Hochstädter, 1989, p. 360).

## 5. The influence of the length of individual time perspectives on the insurance premium

### 5.1. The order of distributions according to the risk involved by Rothschild and Stiglitz

ROTHSCHILD and STIGLITZ argue a distribution  $Y$  is more risky than a distribution  $X$  if the following condition holds: „If  $X$  and  $Y$  have density functions  $f$  and  $g$ , and if  $g$  was obtained from  $f$  by taking some of the probability weight from the center of  $f$  and adding it to each tail of  $f$  in such a way as to leave the mean unchanged, then it seems reasonable to say that  $Y$  is more uncertain than  $X$ “ (Rothschild/Stiglitz, 1970, p. 226) <sup>4</sup>.

Underlying of this definition of increasing risk is that the two distribution functions have the same mean, so one can be regarded as a mean-preserving-spread of the other. If one compares two different distributions  $X$  and  $Y$  of the total income  $\Phi$ , then the condition for an identical mean as a necessary condition in order to be able to compare

$$\text{these distributions is } \int_{\Phi_{\min}}^{\Phi_{\max}} [F(\Phi, Y) - F(\Phi, X)] d\Phi = 0$$

<sup>4</sup>For the proof see Rothschild/Stiglitz, 1970, 227 -234.

(Diamond/ Stiglitz, 1974, p. 338). Given this premise,  $F(\Phi, Y)$  is more risky than  $F(\Phi, X)$ , if for every  $\Phi^*$  with  $\Phi_{\min} \leq \Phi^* \leq \Phi_{\max}$

$$\int_{\Phi_{\min}}^{\Phi^*} [F(\Phi, Y) - F(\Phi, X)] d\Phi \geq 0$$

holds (Diamond/Stiglitz, 1974, p. 339).

### 5.2. Application of the Rothschild -Stiglitz-condition to binomial distributions

Now, the central question is if two intertemporal dependent binomial distributions satisfy the Rothschild -Stiglitz-conditions, so that it is possible to speak of an increased risk as a consequence of lowering  $T$  and vice versa. Here intertemporal dependence of two binomial distributions refers to a consideration of average values of income:

According to the stochastic independence, the stochastic total income over  $T$  spells can be regarded as the sum of the stochastic incomes received in each single spell:

$$\Phi = \Phi_1 + \Phi_2 + \dots + \Phi_t + \dots + \Phi_{T-1} + \Phi_T$$

The total income over  $T$  spells can be calculated as an average income per spell by simply dividing the total income in a certain state of nature by the number of intervals  $\frac{\Phi}{T}$ . For a better understanding look at the following example: Let the time perspective

for individual 1 be  $T=1$ . Then you have two possible states of nature:

$\Phi$	m=0	m=1	$E\{\Phi\}$
Prob.	0,4	0,6	
T=1	\$400	\$1.000	\$760

Let the time perspective for individual 2 be  $T=3$ . Then you have to regard 4 different states of nature:

$\Phi$	m=0	m=1	m=2	M=3	$E\{\Phi\}$
Prob.	0,064	0,288	0,432	0,216	
T=3	\$1.200	\$1.800	\$2.400	\$3.000	\$2.280

Transferred into average values  $\frac{\Phi}{3}$ , this leads to

$\Phi/T$	m=0	m=1	m=2	M=3	$E\left\{\frac{\Phi}{T}\right\}$
Prob.	0,064	0,288	0,432	0,216	
T=3	\$400	\$600	\$800	\$1.000	\$760

If one compares the expected values for the two individuals in each spell, it is obvious that they are identical (\$760). This is a common characteristic of a binomial distribution:

The relationship between the expected value of  $T=1$  and the expected value of  $T>1$  is as follows (Maibaum, 1980, p.143):

$$E\{\Phi\} = \sum_{m=0}^T \binom{T}{m} \cdot (1-\mu)^{T-m} \cdot \mu^m \cdot (m \cdot \Phi_{\max} + (T-m) \cdot \Phi_{\min})$$

$$= T \cdot (\mu \cdot \Phi_{\max} + (1-\mu) \cdot \Phi_{\min})$$

If you use the average values described above, you get

$$E\left\{\frac{\Phi}{T}\right\} = T \cdot \frac{1}{T} \cdot (\mu \cdot \Phi_{\max} + (1-\mu) \cdot \Phi_{\min}) = \mu \cdot \Phi_{\max} + (1-\mu) \cdot \Phi_{\min}$$

Therefore the alternation of the number of intervals ( $T$ ) can be regarded as a mean preserving spread if you look at the average values. Graphically this can be shown in figure 2 (Rothschild/Stiglitz, 1970, p.230): If one compares the areas of the distribution functions (average values) for  $T=3$  and  $T=1$ , one will see that the areas are identical which implies  $A+B=C$ . The reason for that is the stochastic independence, e.g. the probability that  $\Phi_{\max}$  or  $\Phi_{\min}$  occurs in each spell, is always  $\mu$  and  $1-\mu$  (Hochstädter, 1989, p.363). So the distribution functions can be compared according to the risk involved.

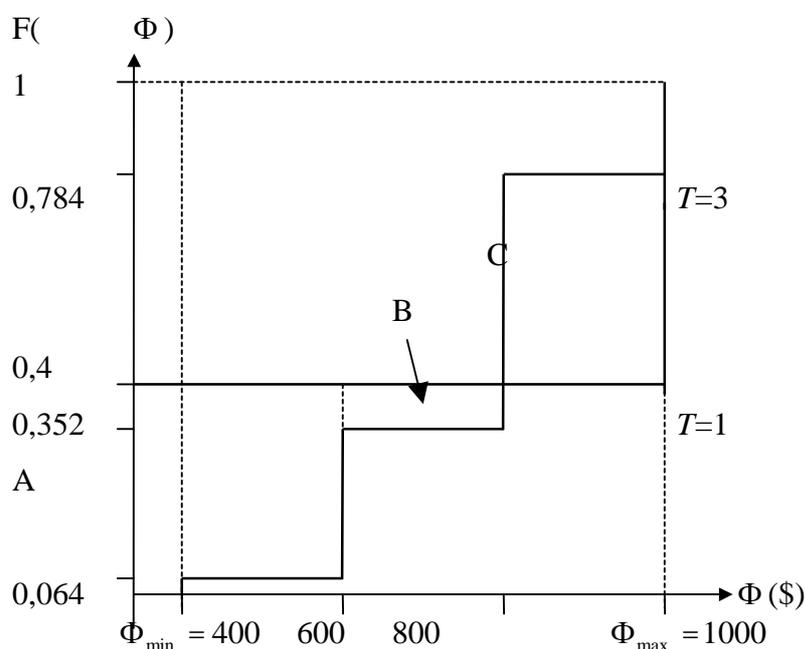


Figure 2: Comparison of the distribution functions for  $T=1$  and  $T=3$

In order to find out if the distribution function for  $T=1$  is more risky than for  $T>1$  we have to check ROTHSCILD and STIGLITZ's second condition. The distribution function for  $T=1$  will be more risky if the following condition holds:

$$\int_{\Phi_{\min}}^{\Phi^*} [F(\Phi, T) - F(\Phi, T+1)] d\Phi \geq 0 \quad \forall \Phi^*$$

In the example this will hold, if

$$A \geq 0$$

$$A+B \geq 0$$

$$A+B-C \geq 0$$

As is obvious, this condition always holds for the comparison of two binomial distributions of the average income for  $T=1$  and  $T>1$ :

The distribution function for  $T > 1$  is strictly increasing and starts for  $m = 0$  below the distribution function of  $T = 1$ . The distribution function of  $T = 1$  is a constant until  $m = T$  ( $F(\Phi, T = 1) = 1 - \mu$ ). Therefore the distribution functions have a single-crossing-property (Diamond/ Stiglitz, 1974, p. 338 -339). This implies that for every  $\Phi^*$  the integral of the distribution function of  $T = 1$  can never be smaller than the integral of the distribution function of an average income of  $T > 1$ . This is the proof that every distribution function of average income for  $T > 1$  is less risky than for  $T = 1$  (Diamond/ Stiglitz, 1974, p. 338). The decrease of risk with increasing  $T$  can be explained by the effect of smoothing income over time with long time perspective.

### 5.3. Implications of decreasing risk in $T$ for the insurance premium

One of the main determinants of the insurance premium is the expected utility  $E[U(\cdot)]$ . ROTHSCILD and STIGLITZ show that if the utility function is concave, the expected utility of the more risky distribution is smaller than the expected utility of the less risky distribution function<sup>5</sup>. In our case the following relation holds because of the effect of smoothing income over time which increases in  $T$ :

$$E[U(\Phi)]_{T=1} < E\left[U\left(\frac{\Phi}{T}\right)\right]_{T>1}$$

In the example, the insurance premium in the case  $T=1$  is:

$$s = 1000 - \left(0,4 \cdot \sqrt{400} + 0,6 \cdot \sqrt{1000}\right)^2 = \$272.42$$

In the case  $T=3$  (average income) the insurance premium is:

$$s = 1000 - \left(0,064 \cdot \sqrt{400} + 0,288 \cdot \sqrt{600} + 0,432 \cdot \sqrt{800} + 0,216 \cdot \sqrt{1000}\right)^2 = \$250.12$$

The lower risk for the individual with larger time perspective who exposes himself to the lottery of spot contracts in each period, results in a lower willingness to pay insurance premiums for a long term contract that avoids this risk in each period because the expected utility of the average income per period is higher. The Total risk premium the person with a time perspective characterized by  $T=3$  would be willing to pay for a certain income of \$1000 in each spell in a contract over three spells would be

$$s_{T=3} = 3000 - \left(0,064 \cdot \sqrt{1.200} + 0,288 \cdot \sqrt{1.800} + 0,432 \cdot \sqrt{2.400} + 0,216 \cdot \sqrt{3.000}\right)^2 = \$750.36 = T \cdot s_{T=1}$$

## 6. Application of the theoretical analysis on the theory of implicit labor contracts

The theory of implicit labor contracts as a theory of risk allocation<sup>6</sup> can be regarded as an application of the Bernoulli -principle of normative decision theory. An important assumption of this theory is that employers and workers have different attitudes towards risk. These assumption goes back to KNIGHT (1921, p. 271 -272). Employers can be characterized as being less risk averse than workers are because they can shift at least part of the risk to capital markets (Rosen, 1985, p. 1148). Workers usually only have their human capital which cannot be used to build diversified portfolios (Rosen, 1985, p. 1148), because it is hardly possible for a worker to be employed in different firms at the same time (Taylor, 1987, p. 126). So employers will be more willing to bear risks. A common assumption in literature is that firms are assumed to be risk neutral, while workers are assumed to be risk averse (Taylor, 1987, p. 126). These different attitudes towards risk offer the possibility of generating a pareto efficient allocation of risk by shifting the income risk from the workers to the firms. The firms earn insurance or risk premiums from the workers. This leads to a substitution of the neoclassical spot market by contractual agreements: „Nevertheless, at least part of the risk an uncertain labor income stream creates for its recipient can be shifted to third parties by employee intermediation, that is, by the tacit or open commitment of the firm to guarantee its personnel that their wage rates, hours worked, employment status, or a combination of all such factors, will be in some degree independent of the vicissitudes of the business cycle“

<sup>5</sup>For the much more complex common proof see Rothschild/Stiglitz, 1970, p.240.

(Azariadis, 1975, p. 1184). The change from the principle of the „invisible hand“ to the principle of a so-called „invisible handshake“ (Okun, 1981, p. 89) can be interpreted as a break with the auction market and a turn to an employment relationship governed by (implicit) contracts. A major component of such a contract is the fixed definition of employment and its conditions<sup>7</sup>. This institutionalized contracting will have a value to the workers when they are unable to smooth consumption over time despite their limited access to the capital market (Fudenberg/ Holmstrom/ Milgrom, 1990, p. 2 und Rey/ Salanie, 1990, p. 611).

Key element of the theory of implicit labor contracts is the existence of a contract that insures workers against random variations of their marginal product (Azariadis/Stiglitz, 1983, p. 3). To show this, AZARIADIS und STIGLITZ (1983, p. 3f) use the model of a firm consisting of three departments: Production, finance and insurance. The worker gives his effort to the production department. His marginal product will be passed to his credit by the finance department. Due to an implicit contract the wage will be fixed. If the marginal product is smaller than that wage, the insurance department pays the difference to the worker, if the marginal product is higher than the fixed wage, the insurance department will get the difference as an insurance premium. The finance department pays the worker the fixed wage:

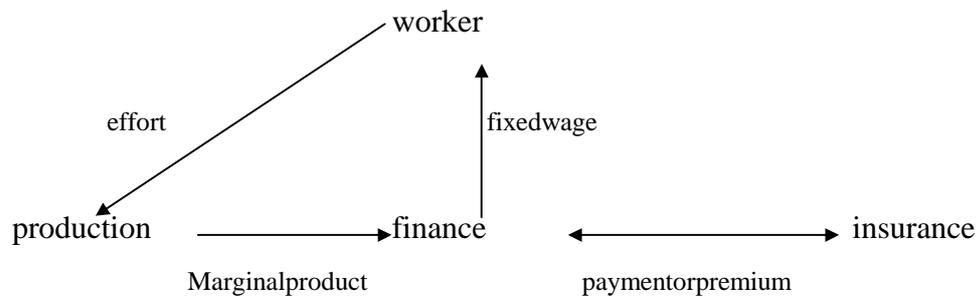


Figure 3: The firm acting as an insurance company

If the firm is risk neutral and the outcome of production is given, then the firm's objective is to minimize the expected sum of wages. Therefore, it will prefer every fixed wage  $\Phi_s = \mu \cdot \Phi_{\max} + (1 - \mu) \cdot \Phi_{\min} - RP = \Phi_{\max} - s$  that lies below the expected value of wage  $\mu \cdot \Phi_{\max} + (1 - \mu) \cdot \Phi_{\min}$  caused by spot contracting. The firm will be better off the higher the value of  $s$  in each period is. The longer the duration ( $T$ ) of the

<sup>6</sup>See for example Bailly, 1974 or Azariadis, 1975.

contract, the longer is the period the firm guarantees rigid wages (or job security) and the smaller will be  $s$  in each period because of the decreasing risk inherent in spot contracting (as a relevant point of reference for the workers). The willingness to pay insurance premiums is therefore maximized if the firm guarantees fixed wages (or certain employment) only for the following spell (this implies  $T=1$ ). Returning to the example ( $\Phi_{\max} = \$1000$  and  $\Phi_{\min} = \$400$ ,  $\mu = 0,6$ ), for a short term contract ( $T=1$ ) the firm earns an insurance premium  $s = \$272.42$  the following spell. If it offers for the following three spells a sequence of such short term contracts than it will get  $3 \cdot 272.42 = \$817.26$ , if the firm insures the workers on the high wage  $\Phi_{\max} = \$1000$  in each spell. If the firm offers a single contract which covers the next three spells ( $T=3$ ), than the fixed wage will decrease, the shorter the contract duration is. Due to this risk theoretical view, short term contracts among institutionalized contracts will be preferred to long term institutional contracts. Note: the worker's time perspective plays an important role: The firm cannot offer contracts of different durations to a single individual, because individual time perspective can be regarded as an individual trait. This means for example, if  $T=3$  for a specific worker, he will never be willing to pay more than  $\frac{\$750,36}{3} = \$250.12$  as an insurance premium in order to get  $\$1000$  in each spell. If the firm offers a short term contract ( $T=1$ ) with an insurance premium of  $\$272.42$ , he will reject it and prefer joining the lottery of spot contracting (which includes the risk of being unemployed).

So the length of the individual workers planning period is decisive. The shorter this time perspective is, the higher is the opportunity for the firm to monopolize insurance premiums. Individuals differ in their willingness to pay insurance premiums if they have different time perspectives. This enables the firm to discriminate: Individuals with comparatively short time perspectives due to their individual circumstances of life, are willing to accept lower fixed wages than individuals with a larger time perspective, because the income risk of spot contracting is higher for those individuals.

An important task is now to identify the determinants of the individual time perspective. In other words: What makes some people more short sighted than others? There are three main determinants that can be identified:

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<sup>7</sup>,...they are exchanged for some implicit set of commitments, hereinafter called an implicit labor contract, on the part of the firm to employ the owner of those labor services for a reasonable period of

- Individual circumstances of life
- Liquidity
- Individual traits

Examples for the individual circumstances of life are age, health or the option of a socially accepted alternative role (Offe/Hinrichs, 1977). An example for the correlation between age and individual attitude towards risk are the various investment funds offered by banks and insurance companies which are developed for people at different ages: Funds which aim to provide a provision for old age vary in the fractions of safe assets and risky assets; funds with a relatively higher fraction of risky assets are designed for younger people. This can be regarded as an answer to the constantly reducing time perspective associated with a higher age.

Liquidity is influenced by the individual's wealth: It determines the individual ability to survive over several periods without any work income. If liquidity is very low, a lottery for even the next spell can be regarded as an existential threat.

There is a link between liquidity and the individual circumstances of life: For example for older people it is more difficult to receive a mortgage loan than for younger individuals. In addition the existence of private wealth enables a person to join in an alternative besides the role as a worker without the need to finance life through social systems. There is also empirical evidence that the income of other household members really influences the labor supply of an individual (W. Franz, 1981, p. 104).

Finally even if two persons are identical according to their individual circumstances of life and liquidity they might differ in their time perspectives: This residual difference can be explained by genetic predisposition or socialisation (Argyris, 1957, p. 48-50).

Apart from their willingness to work for less, having workers with short time perspectives may have some severe disadvantages for the firm: For example the time to amortize investments in human capital is less, transaction costs will be higher due to fluctuation, and the hazards of opportunistic behavior increase. So the usability of short sighted workers will be restricted for the firm. Therefore, there is no reason to expect that a higher demand for less costly, short sighted workers will occur and so competition could eliminate those wage differences. If the firm establishes different classes of positions, designed for workers with different time perspectives and differing according

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time and on terms mutually agreed upon in advance". Azariadis, 1975, S. 1185.

to the degree of specificity of traits, this can be interpreted as a segmentation of the labor market caused by differences in time perspectives.

## 7. The need of coexisting spot contracts

The analysis above was based on the implicit assumption that spot contracting still exists besides institutionalized contractual agreements including the insurance argument. One objection that can be raised could be as follows: If the insurance of the workers is advantageous for the firms, no firm will be willing to offer spot contracts. If there are no more spot contracts, the firms could lower the wages until workers receive a reservation wage determined by an outside option.

This is not likely to occur for the following reason: The objection above only focuses on wages. This is not realistic because fixed employment contracts have one severe disadvantage for the firm: They reduce flexibility for the firms. Even an institutionalized short term contract creates this problem because the firm will not be able to get rid of workers for the next period. If the business cycle declines, the firm may suffer from costly staff overloads. Thus firms offer spot contracts so they can adjust their workforce immediately to sudden changes in environment (Bürkle 2000, 2002). So there may be two coexisting employment systems within a single firm: An external labor market which will be ruled by the market (spot contracting) and an internal labor market where market powers will be substituted by institutional arrangements<sup>8</sup>. The optimal size of the two labor market segments can be found by taking into account two components, the expected costs caused by wages  $C_w$  and the expected costs caused by inflexibility  $C_f$ . Figure 4, which is regarded to be heuristic, will show the shape of these two functions depending on the degree of internalization, which increases the larger the number of workers employed in the internal segment is. The degree of internalization  $I$  (Bürkle, 2002) is operationalized by

$$I = \frac{h}{\max\{PR_t\}}$$

The number of workers employed in the internal labor market is given by  $h$ . This is divided through the maximum of the staff requirements  $PR$  that is expected by the firm

<sup>8</sup> As an example for the extensive literature on internal labor markets see Doeringer/Piore, 1971 and Kerr, 1954 or Alewell, 1993.

<sup>9</sup> This can be understood as a dilemma between the firm's endeavor of keeping degrees of freedom in staff planning and the constraint of lowering wages (Dräger/Heering, 1987, p. 145)

to occur in the future during its planning period. For  $I=1$ , the internal labor market is large enough to satisfy all possible future personnel requirements. If the firm only offers spot contracts (no internal labor market,  $h=0$ ), then  $I=0$ .

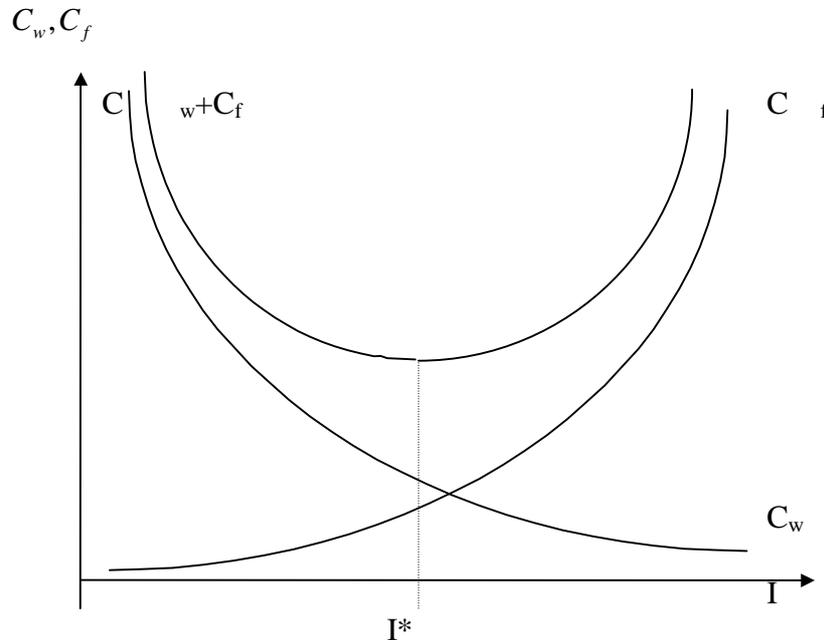


Figure 4: Determination of the optimal degree of internalization

$C_w$  will decrease in  $I$  because of the lower contract wages paid to the workers in the internal labor market caused by the job security in this segment, so  $\frac{\partial C_w(I)}{\partial I} < 0$ .  $C_f$  is linked to the risk of the alimentation of personnel overloads which increases in  $I$ , so  $\frac{\partial C_f(I)}{\partial I} > 0$ . For  $I=0$   $C_f$  will be zero because there are no institutional agreements (no internal labor market) which might restrict the firm's possibility to adjust its labor force. The optimum of  $I^*$  will be the minimum of the sum function. For all  $0 < I^* < 1$  spot contracting and institutionalized contracts coexist. This coexistence of both types of employment relations will be the most likely case to expect in an uncertain environment. It can be described as a "hybrid" (Williamson, 1991, p. 23) form of organization because it combines elements of the market with institutional elements. The existence of spot contracting enables the firm to transfer the risks of adjustment to the external labor market (Brandes/Weise, 1983, S. 63) and therefore it enables the firm to adjust the size of their labor force to shocks caused by product markets.

So as a conclusion, spot contracting will still occur. As a consequence workers always have the possibility to join the lottery. So every institutional arrangement will be compared by the workers to the lottery. The coexistence of the lottery is one of the key assumptions underlying the risk theoretic results derived earlier in this paper.

## 8. Final Conclusions

This paper analyses the impact of a risk averse individual's time perspective on his willingness to pay for an insurance to avoid the income risk which is derived from the employment risk. Based on the assumptions which led to a binomial distribution of a worker's income over a given time period, we showed that willingness to pay for an insurance decreases as the individual time perspective grows longer. This effect can be explained by the transfer of probability weight from the extreme results to the moderate results. Besides the theoretical analysis a survey made by the author during lessons with 79 graduates at the University of Frankfurt, Germany, in April 2003 supports this statement: A questionnaire with the following lottery (for one period) was presented to the students:

State of world	S1	S2	Expected Income
Probability	0,5	0,5	
Income	\$0	\$2000	\$1000

First the students had to estimate the highest price, they would individually pay to join in the lottery. Second, the students were asked if they are willing to pay less, the same or a higher amount in each period if they had to join in the same lottery for three periods (the lottery is regarded in this case as being repeated for three times). The results were as shown:

- 6 students (7,59%) were willing to pay for the single lottery more than \$1000. They can be regarded as being venturesome.
- 11 students (13,92%) were willing to pay for the single lottery a prize of exactly \$1000. They can be regarded as being risk neutral.
- 62 students (78,48%) were willing to pay for the single lottery less than \$1000. They can be regarded as being risk averse.

In the case of the (three times) repeated lottery, 43 students belonging to the group of the risk averters, pointed out that they would be willing to pay more than in the single

period case, 17 (risk averse) students were willing to pay exactly the same amount each period, only two (risk averse) students pointed out that their willingness to pay in each of the three periods would decrease. So if you look at the risk averse students more than 69 % were willing to pay a higher amount in each period if the lottery is repeated. Without the claim of being representative this survey can be regarded as an indication, that risks are really perceived by a significant fraction of people in a way that corresponds to the analysis developed in this paper.

From a risk theoretical point of view a sequence of short term contracts ( $T=1$ ) will be advantageous for the firm. If a worker's time perspective  $T$  is an individual trait, then it might be advantageous for the firm to employ workers with short time perspectives. If workers are employed at positions without specific traits the advantages of long term contracts do not exist. So in this case the firm is better off if it employs workers with short time perspectives.

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