

BONN ECON DISCUSSION PAPERS

Discussion Paper 1/2003

**”The Further We Stretch the Higher the Sky” -
On the Impact of Wage Increases on Job
Satisfaction**

by

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January 2003



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“The Further We Stretch the Higher the Sky” – On the Impact of Wage Increases on Job Satisfaction*

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Abstract:

The impact of wage increases on job satisfaction is explored. First, it is empirically confirmed that current job satisfaction rises with the absolute wage level as well as with wage increases. Second, a basic job satisfaction function is constructed based on the empirical results, and theoretical implications are analyzed. Myopic maximization of such a function directly implies increasing and concave shaped wage profiles. It is shown that employees get unhappier over time staying on a certain job although wages increase, which again is empirically confirmed.

Key words: Job satisfaction, Wage increases, Habit formation, Wage profiles, Relative utility

JEL-classification: M54, J28, J30, M12

* A former version of this paper is publicly available as IZA-Discussion Paper No. 387 under the name of “The Impact of Wage Increases on Job Satisfaction – Empirical Evidence and Theoretical Implications”.

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“The Further We Stretch the Higher the Sky” – On the Impact of Wage Increases on Job Satisfaction

The further we stretch
The higher the sky
It gets harder
The harder we try
The faster we run
The longer the road
The stronger we get
The bigger the load
Song from Ezio (1995)

1. Introduction

Traditional economic theory assumes that the utility respectively the well being of a person depends on absolute consumption levels in all periods of the person’s lifetime. Hence, the individual objective in most models requires the maximization of the expected lifetime income, which determines directly the possible lifetime consumption path. On the other hand, increased doubts are audible that this assumption is a good prediction for human behavior. In a growing number of papers the assumption is made and evidence is found that utility is not only based on the absolute amount of income, but also on the relative level with respect to a certain reference point.

The idea that relative rather than absolute utility considerations are appropriate to describe and understand human decision making dates back at least to Duesenberry (1949) and Markowitz (1952) and has found increasing empirical and theoretical support for instance in Kahneman and Tversky’s Prospect Theory.¹ Recently, Rabin (1998) surveyed the economic as well as the psychological literature on this topic.

In this paper we apply this idea to the analysis of job satisfaction² and argue analogously that the perceived utility from a job does not only depend on the absolute wage, but also on wage increases. The wage of the last period acts as a reference point or an aspiration level. In a first

¹ Compare for instance Kahneman and Tversky (1979) or Tversky and Kahneman (1991).

² Note, that the positive link between wages and job satisfaction is even more obvious than the correlation between wages and life satisfaction. Usually the correlation between life satisfaction and job satisfaction is very substantial.

step we start by empirically analyzing determinants of job satisfaction as a proxy for the well being of employees concerning their work. We indeed find strong support for reference-dependent preferences using data of the German Socio-Economic Panel (GSOEP). Wage increases as well as the absolute level of wages have a significant positive impact on job satisfaction. A comparable empirical analysis has previously only been conducted by Clark (1999). Although Clark estimated a similar approach with British data, our results differ slightly from his with respect to the effect of the absolute wage level. However, we confirm the essential result that wage increases matter for employees' job satisfaction.

In a next step, we discuss a set of theoretical implications by including reference-dependent preferences into the utility function of employees. Based on our empirical observations we construct a job satisfaction function which is strictly increasing in the absolute wage level as well as in the wage increase an employee attains. We assume that an employee can exert effort in each period and that his current wage is an increasing function of his effort level. We then find that myopic maximization of current job satisfaction has some interesting implications. First of all, an employee's current effort is strictly increasing in the wage level of the previous period. The higher the previous wage, the more effort the employee has to exert to attain a higher current wage as he enjoys wage increases. We then show that this leads to an increasing wage profile: Although the employee's effort-wage relation remains unchanged, wages increase over time. In any period the employee tries to "beat" the standard set by the previous wage to achieve an additional wage increase. Furthermore, as additional wage increases are increasingly costly to achieve they are declining over time. Our simple model thus predicts that wages are upward sloping and concave in an employee's age or – more precisely – in experience on a certain job.

Hence, we give a new explanation for the typical shape of wage profiles as empirically observed in many studies. Previous explanations include human capital formation as stressed by Becker (1962) and Mincer (1974) or moral hazard problems which lead to deferred wage payments as proposed by Lazear (1979, 1981). For a survey of the arguments see for instance Hutchens (1989).

We then proceed by analyzing the evolution of job satisfaction over time. Most importantly we establish within our model the new theoretical result that *people get unhappier over time*. Attaining further wage increases is more and more costly, as the reference standard set by the

previous wage increases over time. Due to this effect work satisfaction decreases within our model although wages increase. Again this result is empirically confirmed using our data set. We show that an employee's job satisfaction is significantly decreasing in two consecutive years when he or she stays on the same job.

Related to some of our theoretical results is a model by Frank and Hutchens (1993) where an individual's utility depends on consumption and on the growth rate of consumption. In their model, a situation is analyzed where an employee can distribute an exogenously given fixed amount of money across all periods of his life. They show that the agent will optimally choose an increasing *consumption* profile. However, they verbally refer to self control problems³ by the agent to explain increasing *wage* profiles. In contrast, our model explicitly analyses the effort an agent exerts to attain a certain wage level and does not take life-time wages as given.

A similar strand of literature stresses the point that utility from consumption is not only affected by current consumption but also by agent's habits. This idea is mainly modeled by applying specific parameterized utility functions that are increasing in the ratio of current consumption to a habit stock, the latter being an increasing function of past consumption.⁴ The particular assumptions of Prospect Theory are applied to a consumption savings problem in Bowman et al. (1999).

The paper proceeds as follows. As a starting point, in section 2 the relationship between wages and job satisfaction is empirically examined. In section 3 a simple theoretical model based on the empirical results is presented and its implications are analyzed in the two subsequent sections. Section 4 examines the shape of wage profiles in the model and in section 5 it is theoretically as well as empirically established that employees get unhappier over time when staying on the same job. A brief conclusion discusses other possible implications.

³ Lack of self control is the decisive part of the corresponding Forced Saving Hypothesis. See Clark (1999, pp. 181-184) for a brief overview of the literature on this topic. See Loewenstein and Sicherman (1991) for further arguments why people may prefer increasing wage profiles and corresponding empirical evidence.

⁴ Contributions analyzing different applications with specific utility functions are for instance the seminal article on habit formation by Ryder and Heal (1973), Abel (1990) on asset pricing, Constantinides (1990) on the equity premium puzzle or recently Carroll et al. (2000), who show that with habit formation high growth rates lead to high savings.

2. Wage Increases and Job Satisfaction - Empirical Evidence

The considerations of the introduction lead to the presumption that the utility or well being of employees does not only depend on the absolute wage level but also on wage increases, because people judge their utility with respect to a certain reference point or aspiration level, which is argued to be their wage of the prior period.⁵ Job satisfaction seems to be a reasonable proxy for the well being of employees with respect to their work (see Clark and Oswald 1996: 364). In surveys like the British Household Panel Survey (BHPS) and the German Socio-Economic Panel (GSOEP) people have to rank their job satisfaction by using an ordinal scale. In the GSOEP this scale reaches from “totally unhappy with the job” (0) to “totally happy” (10).

There is only one prior study that analyses the impact of both wages and wage increases on job satisfaction explicitly. Clark (1999), using the first two waves of the BHPS, finds positive effects of both variables, but astonishingly no significant effect of the absolute amount of the wage alone. Several other studies deal with job satisfaction on the basis of the GSOEP in different ways. For example, Clark et al. (1998) detect a negative effect of job satisfaction on subsequent quits. Grund (2001: 212-220) concentrates on increases of job satisfaction after job changes and Hamermesh (2001) analyses longitudinal changes in job satisfaction and points out the link between changes in income inequality and the distribution of job satisfaction. Backes-Gellner/Schmidtke (2002) examine the impact of current wages on job satisfaction for different groups of occupational status.

We use the data of the German Socio-Economic Panel (GSOEP), a large representative German survey, and concentrate on the data of 1994 and 1995. Only in 1995 detailed information about the working conditions are inquired both for West- and East-German employees.⁶ Our sample is restricted to full time employees (blue collar and white collar

⁵ Clark and Oswald (1996) use another possible reference point by estimating a comparison wage for each individual as a kind of aspiration level giving the average income of an employee having the same qualifications, age and so on against which the employees compare themselves. They show that indeed higher comparison wages lead to lower job satisfaction.

⁶ However, the essential empirical results hold for the analysis of other years without the working conditions as well.

workers), who are 20 to 60 years old and receive a gross monthly wage of at least DM 1,000⁷ in 1995 and 1994. We need the 1994 wave of the GSOEP as well, because we want to analyze effects of wage increases. Due to these restrictions we get a sample size of 3,568 employees.

Within the GSOEP the respondents have to answer the question “*How satisfied are you with your job?*” using a scale from 0 (totally unhappy) to 10 (totally happy). The distribution of the answers to this question is shown in Table 1. Nearly half of the respondents state a job satisfaction of 8 or more. These people can be declared as very satisfied. The average level of job satisfaction is 6.97.

Table 1: Frequencies of Job Satisfaction

Job satisfaction	Frequency	Percent (%)	Accumulated (%)
0 (totally unhappy)	19	0.5	0.5
1	23	0.6	1.2
2	78	2.2	3.4
3	114	3.2	6.6
4	142	4.0	10.5
5	421	11.8	22.3
6	416	11.7	34.0
7	658	18.4	52.4
8	974	27.3	79.7
9	456	12.8	92.5
10 (totally happy)	267	7.5	100
Σ	3,568	100	

We use monthly gross wages as our wage variable. There is a slight increase of the average wage from DM 3,924 in 1994 to DM 4,106 in 1995 in our sample. Nearly two out of three employees realize nominal wage increases, but over 20% have to accept wage reductions from 1994 to 1995.

The focus of this empirical part is to investigate whether there is an effect of wage increases on job satisfaction. As a first indicator we examine the correlation coefficient between job satisfaction and wage increases, which are defined as the ratio of the current monthly gross wage and the monthly gross wage one year before. This correlation is significantly positive and the value (0.07) is not much smaller than the correlation between job satisfaction and the absolute amount of the wages (0.10). But there are other determinants of job satisfaction as well. For example, the descriptive statistics of Table 2 indicate a strong relationship between

⁷ All wages are given in German Mark (DM). A transformation in Euro can be made by a division by 1.95583.

health and job satisfaction and a slightly higher level of job satisfaction for women in our sample.

Table 2: Descriptive statistics of gender and health status

	Frequency (%)	Average job satisfaction	Percent “very satisfied”
Overall	100	6.97	47.6
Men	67.0	6.95	47.0
Women	33.0	7.00	48.7
Very good health	9.3	8.17	76.3
Good health	48.8	7.33	54.9
Satisfying health	30.8	6.52	35.3
Poor health	9.6	5.63	25.8
Very poor health	1.5	5.28	18.9

Note: “very satisfied” is equivalent to a stated job satisfaction of at least 8 at the scale from 0 (totally unhappy) to 10 (totally happy).

Table 3 shows the regression results. First, we regress only gender, health status dummies and the absolute wage on job satisfaction using the ordered probit approach. As can be directly seen wage is positively correlated with job satisfaction. This result supports traditional economic theory, but differs from Clark’s (1999) result for the situation in Great Britain. Controlling for the wage men are less satisfied with their work than women and the health status is strongly correlated with job satisfaction. These results are in accordance with prior results of Clark (1999) and Clark and Oswald (1996).

In the second regression, we include the logarithm of the gross monthly wage in the previous year. We expect that this variable is negatively correlated with job satisfaction. This approach has the following form:

$$Job\ Satisfaction_t = \alpha \cdot \ln WAGE_t + \beta \cdot \ln WAGE_{t-1} + \gamma' X + \varepsilon, \quad (1)$$

where X describes the vector of the other independent variables. As can easily be seen after a simple transformation, the effect of wage increases are measured directly with this approach as (1) is equivalent to

$$Job\ Satisfaction_t = (\alpha + \beta) \cdot \ln WAGE_t - \beta \cdot [\ln(WAGE_t / WAGE_{t-1})] + \gamma' X + \varepsilon. \quad (2)$$

Hence, we expect a negative value for the estimated coefficient β in this specification.

The results confirm our hypothesis (see model (2) of Table 3). There is a positive effect on job satisfaction for the absolute wage as well as the wage increase. This result contradicts traditional economic theory, but is in line with the empirical study of Clark (1999).

In a next step, we enlarge our specification with a large set of possible additional determinants of job satisfaction. There are both demographic (e.g., age, education, foreign, marital status) as well as job based characteristics like industry, firm size, occupational status and especially several dummy variables for working conditions⁸ among them. The qualitative results with respect to the wage of both years are not affected by this specification with more explanatory variables (see model (3) and (4) of Table 3). This result is robust with regard to other specifications with only a subset of the variables and to the subgroups of male and female employees. Also the omission of employees, who change their jobs during the observation period or those with extremely high wage increases and wage losses, does not change the results.⁹ Hence, the empirical findings strongly support the hypothesis that both the absolute wage and wage increases affect job satisfaction positively. This observation leads to several economic implications, which we will present in the following section.

The hypothesis that job satisfaction is strongly influenced by people's aspirations is confirmed by our results with regard to other variables. For instance, one should expect that aspirations increase with education and indeed, we find a negative effect for years of schooling on job satisfaction. Additionally, the higher satisfaction levels of foreigners and immigrants might be explained by lower aspirations. But of course, unpleasant job characteristics also decrease job satisfaction. See, for example, the negative coefficient of the difference between actual and preferred working hours. There are also some significant negative effects of working conditions like supervision, conflicts with supervisors, and mental strenuous work.

⁸ This set of dummy variables controls for variation in work, physically demanding work, self-dependent work, variation of working hours, supervision of productivity, shift work, conflict with supervisors, relationship to co-workers, participation at promotion decisions, acquisition of useful skills, undesirable working conditions, mental strenuousness, and risk of work related accidents. People have to state whether these characteristics do not apply, partly apply, or fully apply in their jobs.

⁹ There are seven employees with wage increases above 100% and eight employees with wage decreases of more than 50% without dramatic changes of the working hours in the sample. The t-statistics of both wage variables become even slightly larger without these outliers. Additionally, the results hold for a re-parameterization, when we replace $\ln WAGE_{t-1}$ with the percentage increase of the wage.

Table 3: Ordered probit regression on job satisfaction

	(1)	(2)	(3)	(4)
Log current gross monthly wage	0.322 (6.395)	0.647 (5.415)	0.413 (4.884)	0.652 (4.940)
Log gross monthly wage one year ago		-0.348 (2.997)		-0.292 (2.359)
Male	-0.126 (3.322)	-0.116 (3.048)	-0.078 (1.587)	-0.067 (1.345)
Health very good	1.017 (15.40)	1.011 (15.30)	0.912 (13.06)	0.911 (13.03)
Health good	0.430 (10.85)	0.429 (10.83)	0.368 (8.912)	0.368 (8.917)
Health poor	-0.409 (6.466)	-0.406 (6.421)	-0.325 (4.998)	-0.324 (4.987)
Health very poor	-0.548 (3.830)	-0.536 (3.743)	-0.417 (2.829)	-0.412 (2.797)
Log current weekly working hours			0.128 (0.623)	0.103 (0.501)
Log weekly working hours one year ago			-0.218 (1.108)	-0.158 (0.792)
Difference between actual and preferred working hours			-0.004 (1.885)	-0.004 (1.948)
Age			-0.019 (1.215)	-0.016 (0.979)
Age-squared (*100)			0.022 (1.161)	0.018 (0.949)
Tenure			-0.002 (0.666)	-0.001 (0.560)
Years of schooling			-0.052 (5.205)	-0.052 (5.165)
Foreign			0.107 (1.872)	0.108 (1.889)
Immigrant			0.175 (1.875)	0.172 (1.864)
Quit one year ago			0.214 (2.127)	0.199 (1.973)
Dismissal one year ago			-0.145 (1.132)	-0.117 (0.910)
Self initiated intra-firm job change one year ago			0.390 (1.501)	0.390 (1.498)
Firm initiated intra-firm job change one year ago			-0.289 (0.908)	-0.297 (0.933)
Marital status dummies (6)	No	No	Yes	Yes
Region dummies (16)	No	No	Yes	Yes
Industry dummies (36)	No	No	Yes	Yes
Firm size dummies (5)	No	No	Yes	Yes
Working condition dummies (2*13)	No	No	Yes	Yes
Occupational status dummies (11)	No	No	Yes	Yes
Observations	3568	3568	3568	3568
Log-Likelihood	-6915.1	-6910.6	-6607.7	-6604.9
Pseudo-R ²	0.035	0.036	0.078	0.078

Note: Absolute T-values in parentheses.

3. A Simple Model

To study some theoretical implications of the previous considerations we introduce a simple model. We make the key assumption that in each period an employee myopically maximises his current job satisfaction. We intentionally depart from a dynamic optimisation standpoint as for instance applied in Bowman et al. (1999) or Frank and Hutchens (1993), who focus on an optimal consumption path. A dynamically optimising agent with reference based utility will for instance undertake less wage increasing activities as he is anticipating that a too high wage increase today will make it harder to achieve a wage increase tomorrow. It seems to us at least doubtful whether such behaviour is plausible and, as a consequence, that dynamic optimisation and reference point relatedness are compatible from a descriptive rather than normative point of view. Easterlin (2001: 474) for instance argues that people do not anticipate that aspiration levels rise with increasing income and supports this claim with empirical evidence. Rabin (1998: 33-36) summarizes psychological literature and concludes: “One pattern is that we tend to underestimate how quickly and how fully we will adjust to changes, not for seeing that our reference points will change”.

We state a basic job satisfaction function, which according to our empirical results is strictly increasing in the current absolute wage w_t and the difference between the actual wage and the last period wage denoted by Δw_t . Furthermore, we assume that in each period the employee can undertake activities that affect his current wage. We denote the level of wage increasing activities in period t by $e_t \in R_0^+$. When the employee attains a wage w , a wage increase of Δw and exerts an effort level e in a certain period, his current job satisfaction is given by¹⁰

$$s(w, \Delta w, e),$$

where the wage increase in a period t is given by

$$\Delta w_t = w_t - w_{t-1}.$$

The variable e may for instance encompass the effort exerted to be awarded with a wage increase or to receive a higher bonus payment. We assume that wage is an increasing and concave function of the worker's effort e :

¹⁰ Note that such a function can of course be easily transformed to the form $u(w_t, w_{t-1}, e_t)$ that has been analyzed in the empirical part of this paper. The first derivative of the transformed function with respect to w_{t-1} yields a negative sign as has been shown in the empirical investigation. However, it has turned out that the formulation given here simplifies the exposition of the theoretical results.

$$w = w(e) \text{ where } \frac{\partial w(e)}{\partial e} > 0 \text{ and } \frac{\partial^2 w(e)}{\partial e^2} \leq 0.$$

There is an initial period 1 in which the employee's career starts. In this period he chooses his wage level for the first time, hence, the wage increase corresponds to the wage level. It is important to note that we assume a time invariant wage function. This implies that to achieve a certain wage level at any point in an employee's career he has to exert the same effort level. This is a natural assumption if the employee stays on his job. However, it may be less clear at first glance if he is promoted. One may think that he may be able to keep the same wage with a lower effort in the consecutive period. But it may well be argued, that the promotion brings about more responsibility and that the employee needs to exert at least as much effort as before the promotion has taken place. However, it will become clear that dropping this assumption should only strengthen our results as it will lead to steeper wage profiles.

For simplicity we assume additive separability of the job satisfaction function, in satisfaction arising from wages and wage increases on the one hand and the costs of effort on the other:

$$s(w, \Delta w, e) = v(w, \Delta w) - c(e).$$

Job satisfaction is strictly increasing in w and Δw , the cost function increasing in the effort level. In addition we impose the following assumptions:

$$\frac{\partial c(0)}{\partial e} = 0, \frac{\partial^2 c(e)}{\partial e^2} \geq 0, \frac{\partial^2 v(w, \Delta w)}{\partial w^2} < 0 \text{ and } \frac{\partial^2 v(w, \Delta w)}{\partial \Delta w^2} < 0.$$

Hence, the marginal costs of effort are zero for an effort level of zero, the costs of wage raising activities are convex and the marginal impacts of wages and wage increases on job satisfaction are decreasing. Finally, we assume that the marginal work satisfaction of a wage increase is decreasing in the wage level

$$\frac{\partial^2 v(w, \Delta w)}{\partial w \partial \Delta w} < 0.$$

Recall that Δw measures the absolute and not the relative wage increase. Hence, it is natural to assume that raising a wage for someone who earns \$ 1,000 a month by \$ 100 increases his satisfaction in a stronger way than raising the wage of someone who earns \$ 10,000 by the same amount.

4. Wage Profiles

To examine the implications of such a work satisfaction function, we inspect the optimization problem of an employee in a given period t :

$$\begin{aligned} \max_{e, w_t} & v(w_t, w_t - w_{t-1}) - c(e_t) \\ \text{s.t.} & w_t = w(e_t) \end{aligned}$$

As a reference case, first consider a situation where Δw_t does not enter the job satisfaction function. Then of course the optimization problem is independent from the previous wage and hence, identical in all periods. The agent would choose a constant optimal value of e_t and thus obtain a constant wage level across all periods of the working life.

If, however, as we have shown in Section 2 and stated in the assumptions of the model Δw_t enters the job satisfaction function a different picture arises as we will see in this section. By substituting $w_t = w(e_t)$ in the optimization problem and taking the first derivative we obtain the following first order condition:

$$\left(\frac{\partial v(w(e_t), w(e_t) - w_{t-1})}{\partial w} + \frac{\partial v(w(e_t), w(e_t) - w_{t-1})}{\partial \Delta w} \right) \frac{\partial w(e_t)}{\partial e} - \frac{\partial c(e_t)}{\partial e} = 0 \quad (3)$$

As can be easily verified, the optimisation problem is strictly concave. Hence, Equation (3) defines a unique value of e_t . The optimal effort level is attained when marginal “gross” job satisfaction is equal to marginal costs of effort. This expression implicitly defines the current effort e_t as a function of the previous wage w_{t-1} . To analyse the effect of the previous wage on the worker’s effort choice and, hence, on his current wage, we implicitly differentiate this condition and compute $\partial e_t / \partial w_{t-1}$. We obtain the following result:

Lemma 1: An employee’s effort and his current wage are strictly increasing in the previous wage. In the initial period a strictly positive effort and wage level is chosen.

Proof: See Appendix.

In addition to the absolute wage level, the employee enjoys wage increases above the previous wage. The higher the reference standard defined by the previous wage, the harder the employee has to work to achieve the additional satisfaction from beating this standard. From a

more technical point of view, note that a higher value of w_{t-1} reduces the size of the wage increase Δw_t achieved with a given effort level. Due to the concavity of the work satisfaction function a higher previous wage raises the marginal impact of Δw_t and thus the marginal return of effort for any value of e_t . Hence, in the optimum the employee will choose a higher effort level. As the current wage is a monotonically increasing function of e_t , it is of course also increasing in the previous wage. To see that a positive wage level is chosen in the first period, note that the reference point in the first period is a wage of zero. As the employee enjoys positive wage levels and wage increases and as we assumed that the marginal costs of effort are zero for an effort level of zero, the employee starts his career with a strictly positive wage level.

The previous result shows a positive relationship between wages in consecutive periods. It is now interesting to check whether something can be said about the slope of the earnings profile. Hence, we examine whether w_t monotonically changes over time. Indeed we get the following result:

Proposition 1: Wages strictly increase over time.

Proof: See Appendix.

A kind of “ratchet effect”¹¹ exists. The higher the wage an employee attained in the previous period, the higher is the reference standard at which he evaluates current job satisfaction. Satisfaction due to a wage increase can only be achieved by exerting even more effort than in the previous period.

To understand this result, it is important to note that the marginal impact of effort on the employee’s well being in a certain period is higher than in the preceding period if he chooses the same effort level in both periods. Therefore effort levels have to increase over time. The former is due to two effects: First, with a constant effort level, Δw has a value of zero and due to the decreasing marginal returns its marginal impact on job satisfaction is higher in the current period if there has previously been a strictly positive wage increase. But in addition,

¹¹ This of course should not be confounded with the ratchet effect in incentive theory.

the marginal job satisfaction from the absolute wage level is also higher as absolute wage and wage increase are substitutes in generating job satisfaction.¹²

Hence, the current wage the employee attains will always exceed the previous wage. We have therefore shown that earnings profiles are indeed upward sloping. Finally, we examine whether our simple model yields some results on the shape of wage profiles.

Proposition 2: The wage increases Δw_t decrease over time.

Proof: See Appendix.

In the previous result, we have shown that effort levels and wages rise over time. But of course, attaining further wage increases becomes more and more costly, as the marginal costs of effort increase with the effort level due to the convexity of the cost function. Therefore, the size of attained wage increases gets weaker over time. Hence, our simple theory implies that wage profiles are increasing and concave, which is an empirically well established observation.

The most prominent explanation of increasing and concave shaped wage profiles results from human capital accumulation (see Mincer 1974). Further rationales for increasing wage profiles such as bonding and deferred compensation (Lazear 1979, 1981) or screening (Salop and Salop 1976) do not derive the concave shape of wage profiles explicitly.

We do not doubt that these explanations are highly relevant. However, we have shown that employees' preferences for wage increases yield another explanation. Our result is in line with the empirical findings of Loewenstein/Sicherman (1991) that people perceive pleasure from wage increases. The respondents to their survey had to choose among different wage profiles and explain the decision thereafter. The majority of the respondents preferred increasing over decreasing and flat wage profiles in spite of lower net present values.

¹² As another consequence, job satisfaction declines if a wage increase fails to appear in one period for instance because of an exogenous shock. However, if the employee realizes constant wages during more than two periods he would "get used" to missing wage increases and his job satisfaction would be constant.

5. Why People Get Unhappier over Time

We have now analyzed the behavior of employees who maximize their current job satisfaction. As we have seen, their wages indeed increase over time. However, it seems interesting to look at the evolution of the job satisfaction of such an employee.

At first glance, the increasing wage profile might hint at an increasing job satisfaction, as the latter is an increasing function of wages. However, the second important determinant of job satisfaction in our model are the wage increases. As we have seen in the last section, it gets more and more costly to achieve further wage increases. Indeed we can show that the latter effect dominates the former:

Proposition 3: Job satisfaction decreases over time.

Proof:

Take any two consecutive periods t and $t+1$. Denote the current work satisfaction in period t by s_t . From Proposition 1 we know that w_{t+1} is larger than w_t which in turn is larger than w_{t-1} . Furthermore, we must have that

$$s_t = s(w_t, w_t - w_{t-1}, e_t) \quad \text{and}$$

$$s_{t+1} = s(w_{t+1}, w_{t+1} - w_t, e_{t+1}).$$

Now suppose that the agent chooses the higher wage w_{t+1} and effort level e_{t+1} already in period t . His job satisfaction s'_t would then be given by

$$s'_t = s(w_{t+1}, w_{t+1} - w_{t-1}, e_{t+1}).$$

Note that s'_t is strictly larger than s_{t+1} as wage level and thus the effort exerted are unchanged but the wage increase is larger with s'_t . But by revealed preferences we must have that $s_t \geq s'_t$. It immediately follows that

$$s_t > s_{t+1}. \quad \blacksquare$$

In a next step we will test this theoretical result empirically by investigating the impact of tenure on job satisfaction. Within such a cross section analysis there is a strong selection effect. People who are very satisfied with their jobs, tend to stay longer with the same company, which would lead to a positive relationship between job satisfaction and tenure within a cross section analysis. Hence, this effect counteracts the prediction of proposition 3. But in spite of this important selection effect, the coefficient of tenure has a negative sign in

our regression of Table 3. Therefore, although the coefficient is insignificant, this observation yields a first indication for the relevance of our theoretical considerations.

In order to avoid the selection problem, we additionally observe the satisfaction level of the same employees in the year before. Indeed we find mean declining job satisfaction in subsequent years for German employees, who stay on their jobs, but increasing job satisfaction levels after job changes¹³ (see Table 4). The job satisfaction of employees, who stay on their job between 1994 and 1995 – the decisive group for our analysis – declines significantly from 7.10 to 6.96 on average. The hypothesis that these numbers do not differ can be rejected at the 1%-level on the basis of a non-parametric Wilcoxon test, which confirms our theoretical result. A comparison of this outcome to the longer observation period from 1985 to 1997 indicates that our result is not an exception. During the longer period employees, who stay on their jobs during two consecutive years, also report decreasing levels of job satisfaction on average.¹⁴

Table 4: Mean job satisfaction in consecutive years

			JS_{t-1}	JS_t	$JS_t - JS_{t-1}$
Our sample (1994-1995)	Stayer	(n=3331)	7.10	6.96	-0.14
	Job change	(n=237)	6.52	7.08	+0.56
GSOEP (1985-1997)	Stayer	(n=49730)	7.34	7.19	-0.16
	Job change	(n=3688)	6.72	7.22	+0.50

Note: JS_{t-1} and JS_t = reported level of job satisfaction in two consecutive years. Source of GSOEP (1985-1997): Grund (2001: p. 216).

¹³ See Grund (2001: pp. 213-216) for a detailed analysis of the impact of job changes on satisfaction.

¹⁴ There are lower reported satisfaction levels in our sample due to the fact that the GSOEP includes data for East-German employees only since 1991 (after German re-unification) and noticeably lower levels of job satisfaction are observable for East-Germany.

6. Conclusion

Our empirical investigation confirmed that job satisfaction strongly depends on the relative wage increase as well as on the absolute wage level. We have then built a simple model encompassing a job satisfaction function that reflects such preferences. The myopic maximization of job satisfaction leads indeed to increasing and concave wage profiles. An agent works harder when a previous wage has been higher as a wage increase in itself yields additional utility.

Of course we have abstracted from many factors affecting wage profiles that are of importance in reality such as human capital formation, moral hazard problems, promotions to different jobs and so on. However, the omission of those factors strengthens our key point: Wages rise over time even in an otherwise completely stationary constant environment simply because employees enjoy attaining increasing wages.

However, the drawback is that it gets more and more difficult to achieve further wage increases on the same job. Hence, as we have shown in our theoretical model and established empirically, job satisfaction decreases over time if people stay on the same job. This yields a simple explanation for the casual observation cited in the beginning of the paper, that “*the stronger we get, the bigger the load*”.

There are many other research questions in labor and personnel economics that might be addressed fruitfully applying reference point related utility functions. For instance, wage increase dependent well being might be another explanation for fast track effects¹⁵ in employees’ careers without any necessity of information effects or ex ante heterogeneous individuals. Employees who receive high wage increases or promotions early in their career form higher reference points or aspiration levels. Hence, they work harder as compared to workers without these early successes in their occupational careers to keep up with such a standard. This should in turn lead again to quicker promotions and so on.

¹⁵ Fast track effects within a firm are observable if quickly promoted employees are promoted quickly at the next level of the hierarchy as well. For theoretical explanations of and empirical evidence for fast track promotions see e.g., Rosenbaum (1979), Pucik (1991) and Baker et al. (1994). See Chiappori et al. (1999) for a corresponding “late beginner effect”.

Further on, it seems interesting to look at incentive contracts in the light of such behavior. If an agent's compensation depends on his performance, this nearly always entails uncertainty as is well understood in agency theory. However, income uncertainty comes along with the possibility of income losses relative to the previous period. The kind of job satisfaction utility function suggested in this paper then leads to a double loss in the agent's well being: First, of course, as his absolute income level is lower. But in addition his satisfaction is further decreased due to the relative loss. This observation might help to understand why incentive contracts are much less observed in practice than suggested by standard agency theory.

Appendix

Proof of Lemma 1:

$$\begin{aligned} \frac{\partial e_t}{\partial w_{t-1}} &= - \frac{\left(\frac{\partial^2 v}{\partial w \partial \Delta w} (-1) + \frac{\partial^2 v}{\partial \Delta w^2} (-1) \right) \frac{\partial w}{\partial e}}{\left(\frac{\partial^2 v}{\partial w^2} \frac{\partial w}{\partial e} + \frac{\partial^2 v}{\partial w \partial \Delta w} \frac{\partial w}{\partial e} + \frac{\partial v}{\partial \Delta w} \frac{\partial w}{\partial e} + \frac{\partial^2 v}{\partial \Delta w^2} \frac{\partial w}{\partial e} \right) \frac{\partial w}{\partial e} + \left(\frac{\partial v}{\partial w} + \frac{\partial v}{\partial \Delta w} \right) \frac{\partial^2 w}{\partial e^2} - \frac{\partial^2 c}{\partial e^2}} \\ &= \frac{\left(\frac{\partial^2 v}{\partial w \partial \Delta w} + \frac{\partial^2 v}{\partial \Delta w^2} \right) \frac{\partial w}{\partial e}}{\left(\frac{\partial^2 v}{\partial w^2} + \frac{2\partial^2 v}{\partial w \partial \Delta w} + \frac{\partial^2 v}{\partial \Delta w^2} \right) \left(\frac{\partial w}{\partial e} \right)^2 + \left(\frac{\partial v}{\partial w} + \frac{\partial v}{\partial \Delta w} \right) \frac{\partial^2 w}{\partial e^2} - \frac{\partial^2 c}{\partial e^2}} \end{aligned}$$

The sign of this expression is positive:

$$\frac{([-]+[-])[+]}{([-]+[-]+[-])[+]+([+]+[+])[-]-[+]} = \frac{[-]}{[-]} = [+]$$

The positive relation between the current and previous wage follows directly as $w_t = w(e_t)$ is strictly increasing in e_t .

To see that initially a positive wage level is chosen just check that the first order condition (3) cannot hold for $e_1=0$ as $w_0=0$: The first derivative of the work satisfaction function with respect to e_1 is strictly positive at $e_1=0$. ■

Proof of Proposition 1:

We will proceed by showing that indeed $e_t > e_{t-1}$ and therefore $w_t > w_{t-1}$. As $s(w(e), w(e) - w_{t-1}, e)$ is strictly concave in e a sufficient condition for this is that

$$\left. \frac{\partial s(w(e), w(e) - w_{t-1}, e)}{\partial e} \right|_{e=e_{t-1}} > 0$$

as in that case the employee will always be able to attain a higher job satisfaction within that period by raising his effort level above the previous period's.

For the effort in the previous period e_{t-1} the following first order condition must hold

$$\left(\frac{\partial v(w_{t-1}, \Delta w_{t-1})}{\partial w} + \frac{\partial v(w_{t-1}, \Delta w_{t-1})}{\partial \Delta w} \right) \frac{\partial w(e_{t-1})}{\partial e} - \frac{\partial c(e_{t-1})}{\partial e} = 0.$$

Now we examine the first derivative of work satisfaction with respect to the employee's effort in the current period t :

$$\left(\frac{\partial v(w(e), w(e) - w_{t-1})}{\partial w} + \frac{\partial v(w(e), w(e) - w_{t-1})}{\partial \Delta w} \right) \frac{\partial w(e)}{\partial e} - \frac{\partial c(e)}{\partial e}$$

But if $e_t = e_{t-1}$ we have that $w_t = w_{t-1}$ and therefore $\Delta w_t = 0$. Hence, the value of this expression is

$$\left(\frac{\partial v(w(e_{t-1}), 0)}{\partial w} + \frac{\partial v(w(e_{t-1}), 0)}{\partial \Delta w} \right) \frac{\partial w(e_{t-1})}{\partial e} - \frac{\partial c(e_{t-1})}{\partial e}.$$

As

$$\left(\frac{\partial v(w(e_{t-1}), 0)}{\partial w} + \frac{\partial v(w(e_{t-1}), 0)}{\partial \Delta w} \right) > \left(\frac{\partial v(w(e_{t-1}), \Delta w_{t-1})}{\partial w} + \frac{\partial v(w(e_{t-1}), \Delta w_{t-1})}{\partial \Delta w} \right)$$

for $\Delta w_{t-1} > 0$ we must indeed have that

$$\left. \frac{\partial s(w(e), w(e) - w_{t-1}, e)}{\partial e} \right|_{e=e_{t-1}} > 0$$

From Lemma 1 we know that the employee started his career with a positive wage level and, hence, in the first period $\Delta w > 0$. As we have shown this carries over to all consecutive periods. ■

Proof of Proposition 2:

We know that wages increase over time. Hence, it suffices to establish the relationship between $\Delta w_t = w(e_t) - w_{t-1}$ and w_{t-1} . First, note that

$$\frac{\partial \Delta w}{\partial w_{t-1}} = \frac{\partial w}{\partial w_{t-1}} - 1.$$

But,

$$\frac{\partial w}{\partial w_{t-1}} = \frac{\partial w}{\partial e} \frac{\partial e}{\partial w_{t-1}}.$$

In Lemma 1 we have computed $\partial e / \partial w_{t-1}$. We can use this to get

$$\begin{aligned} \frac{\partial w}{\partial w_{t-1}} &= \frac{\partial w}{\partial e} \frac{\left(\frac{\partial^2 v}{\partial w \partial \Delta w} + \frac{\partial^2 v}{\partial \Delta w^2} \right) \frac{\partial w}{\partial e}}{\left(\frac{\partial^2 v}{\partial w^2} + \frac{2\partial^2 v}{\partial w \partial \Delta w} + \frac{\partial^2 v}{\partial \Delta w^2} \right) \left(\frac{\partial w}{\partial e} \right)^2 + \left(\frac{\partial v}{\partial w} + \frac{\partial v}{\partial \Delta w} \right) \frac{\partial^2 w}{\partial e^2} - \frac{\partial^2 c}{\partial e^2}} - 1 \\ &= \frac{\left(-\frac{\partial^2 v}{\partial w^2} - \frac{\partial^2 v}{\partial w \partial \Delta w} \right) \left(\frac{\partial w}{\partial e} \right)^2 - \left(\frac{\partial v}{\partial w} + \frac{\partial v}{\partial \Delta w} \right) \frac{\partial^2 w}{\partial e^2} + \frac{\partial^2 c}{\partial e^2}}{\left(\frac{\partial^2 v}{\partial w^2} + \frac{2\partial^2 v}{\partial w \partial \Delta w} + \frac{\partial^2 v}{\partial \Delta w^2} \right) \left(\frac{\partial w}{\partial e} \right)^2 + \left(\frac{\partial v}{\partial w} + \frac{\partial v}{\partial \Delta w} \right) \frac{\partial^2 w}{\partial e^2} - \frac{\partial^2 c}{\partial e^2}} \end{aligned}$$

Checking the signs, we get

$$\frac{(-[-]-[-])[+]-([+][+])[-]+[+]}{([-]+[-]+[-])[+]+([+][+])[-]-[+]} = \frac{[+]}{[-]} = [-]$$

Indeed, we can conclude that

$$\frac{\partial \Delta w}{\partial w_{t-1}} < 0,$$

i.e. wage increases get smaller over time. ■

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