ELSEVIER

Journal of Socio-Economics 33 (2004) 135–151

The Journal of Socio-Economics

www.elsevier.com/locate/econbase

Reported job satisfaction: what does it mean?

Louis Lévy-Garboua [a], Claude Montmarquette [b,*]

[a] *TEAM (CNRS), University of Paris 1 (Panthéon-Sorbonne), Maison des Sciences Economiques, 106–112 Boulevard de l'Hôpital, Paris, France, 75647 and CIRANO*

[b] *CIRANO and Department of Economics, University of Montreal, CIRANO, 2020, 25th Floor, Montreal, Que., Canada H3A 2A5*

Abstract

We emphasize the major influences of experienced utility gaps or regret, i.e. the difference between what happened and what might have happened, on job satisfaction. The main prediction that we test is that job satisfaction correlates with the wage gaps experienced in the past and present, holding other job-related satisfactions constant, with the possible exception of young workers. We further test that this effect of wage gaps on job satisfaction declines with working experience. We find evidence on a Canadian cross-section that the past matters.

JEL classification: J28; C25

Keywords: Job satisfaction; Experienced wage gaps

1. Introduction

Self-reported job satisfaction is a fascinating subjective variable. It is so easy to collect in surveys, seems to relate to the hedonic value of jobs and appears to be a good predictor of quits and union membership. But using subjective variables without knowing what they mean can also be dangerous and misleading. Hence, most economists have cast doubts on the use of subjective variables of this type. The traditional attitude of economists is not defendable in the long run, however, because it cannot be rational to ignore available information of value. Hamermesh (1977), Freeman (1978), Borjas (1979) and, more recently, Clark and Oswald (1996) were the first economists to stress this point and consider job satisfaction as an economic variable. This paper presents a theory of job satisfaction which is consistent with stylized facts and yields new testable implications. This theory requires no

* Corresponding author. Tel.: +1-514-985-4015; fax: +1-514-985-4039.
E-mail address: montmarc@cirano.qc.ca (C. Montmarquette).

1053-5357/$ – see front matter
doi:10.1016/j.socec.2003.12.017

radical departure from the conventional theory of choice and utility. Yet, it is also consistent with the robust finding that relative utility matters for satisfaction judgments.

Our central assumption is that job satisfaction expresses the worker's *experienced preference* for his job. The job satisfaction reported in questionnaires is the mere judgment that the respondent would wish to repeat his past career if he now had to choose again. It indicates how one's experienced sequence of jobs compares with mentally experienced alternatives. Since the individual is supposed to make an ex post comparison of his jobs with what they might have been, his job satisfaction is a real manifestation of his feeling of regret-rejoicing.[1] Note that we are not saying that job satisfaction elicits one's experienced utility of jobs[2] but the *difference* between two experienced utilities, since it is the sign of this difference which indicates the preference relation between jobs. Thus we account for the relativity of satisfaction judgments in a very simple and natural way. Despite the similarity of words, satisfaction and utility have different, though intimately related, meanings.

By restricting our attention to job satisfaction, we can sharpen the theoretical predictions because the relevant subutility then is the expected present value of jobs. Consequently, the main prediction that we test is that job satisfaction correlates with wage gaps experienced in the past and present and that, as a result of discounting, effects of a given wage gap decline with working experience. This analysis borrows from Hamermesh (1977), who was the first economist to regress job satisfaction on the current wage gap, and may be seen as an economic adaptation of the goal-achievement gap theory suggested by Michalos (1980) in the psychological literature. However, we are the first to posit job satisfaction in a lifecycle framework so explicitly and to test the declining effect of wage gaps with working experience on job satisfaction.

Since most of the previous studies on job satisfaction used cross-section data, one goal of the present paper is to provide a simple method for recovering some of the dynamics of the satisfaction judgment from a cross section. We use a Canadian cross-section of employed workers from the General Social Survey (1986) to estimate our model. In Section 2, the model of job satisfaction and experienced wage gaps is presented. In Section 3, we report empirical evidence on job satisfaction. In Section 4, we make concluding remarks.

2. Job satisfaction and experienced wage gaps

We generally define satisfaction or subjective well-being derived from an experienced good z as an ordinal variable taking discrete values. Assuming for simplicity that individuals compare their own situation with a single alternative, we write the satisfaction judgment for a binary answer (not satisfied–satisfied):[3]

[1] Note that we define regret in its usual sense of an ex post feeling without assuming that past regret has a direct influence on future decisions nor considering some expected regret ex ante as Bell (1982) or Loomes and Sugden (1982) do for explaining choices under risk.

[2] By experienced utility of job, we simply mean the decision-utility of job conditional on available information at the time of the survey, including the "surprises" which occurred since the beginning of work.

[3] The analysis is easily extended when more than two answers are allowed (as in the case in the survey we used), by considering several alternative answers in increasing order of value.

$$S = \begin{cases} 1, & \text{if} \quad U(z) > U(z^*) \\ 0, & \text{if} \quad U(z) \leq U(z^*) \end{cases}$$

where z^* designates the mentally experienced alternative and U is the individual's utility function. The continuous latent variable:

$$S^*(z, z^*) \equiv U(z) - U(z^*) \tag{1}$$

enables us to rewrite the satisfaction function as:

$$S = \begin{cases} 1, & \text{if} \quad S^*(z, z^*) > 0 \\ 0, & \text{if} \quad S^*(z, z^*) \leq 0 \end{cases} \tag{2}$$

This general definition of satisfaction takes a convenient form when applied to job satisfaction if it can be assumed, as it has become conventional in labor economics, that individuals maximize the expected present value of jobs over a lifetime. Then the latter is the discounted sum of human wealth and the non-pecuniary value of job, and the discounting runs from the beginning of work (conventionally denoted 0). An individual reports satisfaction with his job when he perceives at the survey's period, some time after he has begun to work, that his present job has greater value than the sequence of jobs that he might have taken in the past and that he still may take in the future. But his perception at the survey's period is obviously conditioned by his real experience of job in the past (between 0 and current period, denoted a) and by his mental experience of outside opportunities until then. Letting J^a be an ordinal index of job satisfaction at time a (the individual's index is omitted), we have:

$$J^a = \begin{cases} 1, & \text{if} \quad H^a + v^a > H^{a*} + v^{a*} \\ 0, & \text{if} \quad H^a + v^a \leq H^{a*} + v^{a*} \end{cases} \tag{3}$$

where H^a (H^{a*}) designates the experienced pecuniary value of job (alternative), i.e. human capital, and v^a (v^{a*}) the experienced non-pecuniary value of job (alternative) at time a. Since

$$H^a = \sum_{t=1}^{a} \frac{y_t}{(1+r)^{t-1}} + \frac{E_a V_a}{(1+r)^a}$$

with y_t representing experienced wages or earnings at period t, r is the discount rate, and $E_a V_a (E_a V_a^*)$ is the expected present pecuniary value of job (outside opportunities) in the future discounted from the current period. The latent variable J^{a*} underlying the job satisfaction index is the discounted sum of experienced wage and non-wage gaps in the past and in the future. Thus,

$$J^{a*} \equiv \sum_{t=1}^{a} \frac{y_t - y_t^*}{(1+r)^{t-1}} + \frac{E_a V_a - E_a V_a^*}{(1+r)^a} + v_a - v_a^* \quad \text{and}$$

$$J^a = \begin{cases} 1, & \text{if} \quad J^{a*} > 0 \\ 0, & \text{if} \quad J^{a*} \leq 0 \end{cases} \tag{4}$$

The experienced preference points at, but does not coincide with, the decision of staying in one's current job. Omitting the non-pecuniary value of jobs to simplify the present discussion, Eqs. (3) and (4) indicate that reported job satisfaction means: $eH^a - eH^{a*} > 0$, whereas the decision to stay in the job is governed by: $E_a V_a - E_a V_a^* > 0$. Neither of these two conditions implies the other, but job satisfaction and the propensity to stay in the current job correlate. In a companion paper, Lévy-Garboua et al. (2001) exploit the German Socio-Economic Panel to test predictions of the experienced preference framework for job separations. The foregoing analysis demonstrates that job satisfaction cannot be a consequence, but is rather a cause of job turnover and union affiliation.

In Eq. (4), the discounting runs from the beginning of work. But when does work begin? Two different answers seem natural. A naive answer is that it should begin with the current job; but a worker may be changing jobs within the same firm or have the same kind of job over time in several firms. We argue that successive experiences of a same kind, like successive employment spells, may not be separable from the current job in the total experienced utility of jobs because the "autobiographical self" keeps on storing memories of past salient events, both what happened and what might have happened, since the beginning of life and revising expectations of future events in the light of experience (see Damasio, 1999). In comparing what has been with what might have been, even the remote past may matter as long as the realized and the available, but unrealized, alternative careers differ. Moreover, the remote past would weigh even more heavily than the present and the future because the discounting goes from the beginning of work to the present and the future. Thus, two natural ways of defining the "beginning of work" are either the period of entry in the current firm or minimum school-leaving age. Without unusually long panel data, however, it is very difficult to discriminate between these assumptions.

The experienced preference hypothesis can explain at least three important stylized facts about job satisfaction. The first one is the classical statement by Easterlin (1974, 1995); Duncan (1975) that raising the incomes of all does not increase the happiness of all. Indeed, a uniform growth of all earnings and unemployment benefits would leave job satisfaction judgments unaffected holding non-wage gaps constant.[4] The second empirical regularity about job satisfaction is that the frequency of reported satisfaction eventually increases with age (Hamermesh, 1977; Clark et al., 1996; Lévy-Garboua and Montmarquette, 1998). This means, in the present framework, that the discounted sum of wage and non-wage gaps in the past and in the future is more likely to be positive with rising experience on the job market. Indeed, the past component is increasingly likely to be positive after a sufficient number of years at work, if individuals have rational expectations and capture rents on their job, while the future component gets smaller in absolute value as the remaining life at work diminishes. The third observation that the experienced preference hypothesis can explain is that most people report high levels of job satisfaction. This is actually the case in the present study (see Section 3). More broadly, Sousa-Poza and Sousa-Poza (2000) compare

[4] Our argument is limited to job (or income) satisfaction and does not extend to life-satisfaction and happiness reports without a strong caveat. The latter also reflect satisfaction with health, family and social life, and so forth, for which the reference—say, premature death or the presence of a loved spouse and healthy children—may vary little with economic growth.

average levels of job satisfaction between 21 developed countries[5] and find a high level of satisfaction in all countries, with an unweighted average of 78.7% reporting themselves in the top-three levels of a seven-point scale. The last fact is difficult to explain when job satisfaction is taken to be a direct measure of job's utility. For instance, in the social comparison theory suggested by Clark and Oswald (1996), most workers cannot be above the average. An equal number of satisfied and unsatisfied workers would be more in the spirit of a theory which equates satisfaction with utility. By contrast, the relatively high level of reported job satisfaction can be easily understood in the experienced preference framework. Under certainty and stable preferences, a rational person would always be satisfied with a deliberate decision made in the past. It is merely the occurrence of surprises in the outcomes and/or possibilities which makes the posterior preference deviate from the prior.

Eq. (4) shows that, *after controlling for non-wage gaps, the experienced human capital gap is the sole determinant of job satisfaction*. This strong implication can be tested on individual data because wage gaps can be estimated as the residuals of an earnings function, and non-wage gaps are best captured in the present framework by job-related satisfaction judgments like the satisfaction with leisure, health and married life. Controlling for job-related satisfaction also allows us to control for unobserved individual heterogeneity since the relevant personality traits[6] are highly correlated with any kind of satisfaction, according to "top-down" theories of subjective well-being, but they are far less likely to correlate with the estimated wage gaps. Finally, the expected present value of wage gaps in the future is unobservable and constitutes in the main the error term of an econometric version of the job satisfaction equation. The latter may correlate with the observed present value of wage gaps in the past and bias the estimated coefficient of such variable. This problem is most acute with young workers because, in long run equilibrium, wage gaps that obtain in early career would exhibit an almost perfectly negative correlation with the expected present value of wage gaps in the future in the presence of human investments and deferred payment schemes. The estimated coefficient of the current wage gap is likely to be severely underestimated for young workers because their expected future wage gaps are unobservable and partly form the residual of the job satisfaction equation. The problem resolves at later stages of the career, if past wage gaps are unobservable or very partially observable, because positive and negative correlations tend to offset each other. The following proposition summarizes the main predictions of the experienced preference hypothesis concerning an econometric version of the job satisfaction equation.

Proposition. *Job satisfaction correlates with the wage gaps experienced in the past, holding other job-related satisfactions constant. The wage gaps that were experienced at the beginning of work weigh more heavily than those experienced later on.*

[5] They analyzed the data set on Work Orientations from the 1997 International Survey Program. All countries used the same wording for the job satisfaction question and the same seven-point scales for reporting individual answers.

[6] Diener et al. (1999) mention extraversion and neuroticism, self-esteem, optimism and the predisposition to ruminate on the negative events.

The coefficient of the current wage gap is likely to be severely underestimated for young workers. The coefficient of current wage gap, if unbiased, should decrease with the duration of working experience.

3. Empirical evidence on job satisfaction

The main prediction that we test here is that job satisfaction correlates with the wage gaps experienced in the past and present,[7] holding other job-related satisfactions constant, with the possible exception of young workers and that, as a result of discounting, effects of a given wage gap decline with working experience. We use the term "gap" to refer to an estimated difference between the value of observed jobs and outside opportunities at the same moment in time, and we apply the word "experienced" both to the real experience of a job and to the mental experience of the contemporaneous alternative so that it is meaningful to speak of an "experienced gap". Reported job satisfaction will be regressed on wage gaps and other job-related satisfactions (describing the preference for non-pecuniary components of the job and also possibly capturing the effect of unobservable personality traits).

We use a Canadian cross-section of employed workers from the General Social Survey (1986). The working sample consists of 2600 observations of employed individuals (excluding the self-employed) reporting positive wages. Respondents were asked to rate their level of overall job satisfaction in three categories: 9.38% were "totally or rather displeased", 42.12% were "rather satisfied" and 47.50% were "fully satisfied". They also reported their satisfaction with respect to leisure, health and marital situation. We run ordered probit regressions[8] of job satisfaction on several estimated wage gaps and these job-related satisfactions (displeased, or pleased) and include a number of controls like gender, education (four levels), country of birth (Canada or other), mother tongue (English, French or other), linguistic ability, region of residence (Ontario or other), and religion status (no reported religion, or any religion). Since we predict that the coefficient of the current wage gap should decrease with age if there were no bias (it may, in fact, be inversely U-shaped if this coefficient is underestimated for the young), we actually run the same regression on four age groups: 15–24, 25–34, 35–44, and 45 and over. An additional motivation for estimating separate regressions by age group is to take care of cohort effects.

3.1. Current wage gap and job satisfaction

In order to facilitate comparison with previous studies, the wage gap is first defined as the residual of an earnings function that explains the annual wage by weeks worked, part time, education, a quadratic of years of potential experience, socio-economic work status (in three categories), marital status (in three categories), and other variables used in the job satisfaction equation. We slightly depart from other studies (e.g., Hamermesh, 1977; Clark

[7] The word "present" designates here the immediate past. And, so, "current" period will indicate the latest period before the interview.

[8] The ordered probit model was first estimated by McKelvey and Zavoina (1975). Greene (1998, p. 507) discusses the heteroskedasticity correction in this model.

and Oswald, 1996), though, by regressing earnings rather than log earnings because our causative latent variable is additive in wage gaps (see Eq. (4)). The age-specific earnings functions and summary statistics are shown in Appendix A (Table A.1).

A key prediction of the experienced preference model is that any effect that comparison earnings have on job satisfaction be mediated by the discounted sum of experienced wage gaps. We test this prediction by adding other wage variables in the regression and showing that their coefficient is not significantly different from zero but the coefficient of the wage gap is significantly positive. Clark and Oswald (1996) consider the predicted wage along with the current wage in their statistical treatment. An equivalent specification which does not generate the same multicollinearity problem consists in introducing the predicted wage along with the experienced wage gap. Table 1 shows that the coefficient of current comparison earnings, $\hat{y}_{ia}$, is insignificant in the two intermediate age groups after controlling for the current wage gap, $\hat{\varepsilon}_{ia} \equiv y_{ia} - \hat{y}_{ia}$ (y_{ia} being the observed current earnings at age a), non-pecuniary job-related satisfactions, and a few other bottom-up variables, z. The results were the same for the younger and older cohorts, but are not shown here because none of these two wage variables was significant by a likelihood ratio test at the 5% level. Further tests presented in our working paper (Lévy-Garboua and Montmarquette, 1998) rejected the assumption of a non-linear effect of the current wage gap (introduced in a piecewise

Table 1
Test of the experienced preference hypothesis

	Age groups			
	25–34		35–44	
	(1)	(2)	(1)	(2)
Current comparison earnings		0.01140 (0.0071)		0.00874 (0.058)
Current wage gap	0.01841[a] (0.0044)	0.01839[b] (0.0084)	0.00755[b] (0.00387)	0.00827[b] (0.0041)
Bottom-up model[c]	Canadian-borne (+), satisfied with health, with leisure time, and with marital status (+)	Male (−), Canadian-borne (+), satisfied with health, with leisure time, and with marital status (+)	Satisfied with health, and with leisure time (+)	Male (−), satisfied with health, and with leisure time (+)
Loglikelihood[d]	−961.7575	−960.5135	−578.3899	−577.2672

One-tail test for wage gaps and two-tail test for predicted wages. Standard errors in parentheses. The model includes job-related satisfactions (with leisure time, health, and marital status) and individual characteristics (male, education, country of birth, mother tongue, religion status). Estimations are corrected for heteroskedasticity with years of potential experience.

[a] Significant at the 1% level.

[b] Significant at the 5% level.

[c] Variables are indicated when positively (+) or negatively (−) significant at the 5% level or 10% level. Other included variables (education, language, religion status) are non-significant.

[d] The loglikelihood for the bottom-up model is −971.3765 for the 25–34 age group and −581.2696 for the 35–44 age group. The constant α and the threshold parameter δ_1 are significant in all models. The coefficients of the experience variable to account for the heteroskedasticity are negative and significant in all models.

Table 2
Age-specific coefficients of current wage gaps

	Age groups			
	15–24	25–34	35–44	45+
Current wage gap	0.01407[a]	0.01841[b]	0.007855[a]	005026[a]
	(0.0086)	(0.0044)	(0.00387)	(0.00391)
Loglikelihood	−386.1336	−961.7575	−578.3899	−403.5040
Loglikelihood of the bottom-up model	−387.4733	−971.3256	−581.0159	−404.3404

The bottom-up model omits the current wage gap but includes job-related satisfactions (with leisure time, health, and marital status) and individual characteristics (male, education, country of birth, mother tongue, religion status). Estimations are corrected for heteroskedasticity with years of potential experience.

[a] Significant at the 5% level.

[b] Significant at the 1% level (one tail).

linear form) which might describe several versions of reference-dependent utility functions. Given the fact that Clark and Oswald (1996) either could not reject the hypothesis that the coefficients of current earnings and comparison earnings be equal in absolute value, we believe that our results are consistent with others and corroborate our interpretation of job satisfaction as an experienced preference for the job.

Table 2 estimates the simple version of Eq. (4) that just relates job satisfaction with the current wage gap,[9] other job-related satisfactions and a few bottom-up variables mentioned above. This model is compared with a null hypothesis relating job satisfaction with the same variables except the current wage gap, which we simply call the "bottom-up" model. The coefficient of the current wage gap is always positive and inversely U-shaped across age groups, the peak being attained in the 25–34 age group. The latter is significant by a Student test at the 5% level (one-tail) in all age groups, but the addition of the current wage gap to the "bottom-up" model does not pass a likelihood ratio test at the same level in the younger and older groups. The coefficients of the current wage gap are further shown to be significantly different, by a Wald test at the 5% level, between 25–34 and 35–44 and between 25–34 and 45+, but not so between 15–24 and 25–34 and between 35–44 and 45+. These results are consistent with the prediction that the coefficient of the current wage gap declines with the duration of working experience, since all experienced wage gaps

[9] By not including wages and comparison wages separately in the regression, but only their difference, we avoid the perfect multicollinearity problem faced by Clark and Oswald (1996) for instance. Moreover, we can confidently add variables which also enter the wage equation (mainly gender and education). These variables, which were strongly correlated with wages and comparison wages, are uncorrelated with wage gaps. However, since the wage gap is derived from the data set, it might be objected that significance of this residual in the satisfaction equation might be due to mis-specification. This problem does not seem too serious here because the determinants of earnings are fairly well-known in the literature and it is very unlikely that the earnings equations should be badly mis-specified. The main cause of mis-specification that we can single out from our cross-section data is the inclusion of the effect of individual ability in the wage gap. But this should bias the coefficient of wage gap toward zero in the satisfaction equation because more able workers compare what they earn with their *own* opportunities while we compute the wage gap by comparing the individual wage with the *average* wage (in a broad category to which the worker belongs) on the market.

are discounted from the beginning of work, and that it is biased toward zero in the 15–24 age group. The insignificance of adding the current wage gap to a bottom-up model in the older age group may further suggest that the weight of omitted past circumstances on job satisfaction is increasing with age (tenure[10]).

3.2. The past matters

By assuming that wages and many job-related characteristics are *stochastic* and gradually revealed by search and experience, we are further able to construct new unbiased estimates of wage gaps in the current period and at the beginning of work. Thus we can replicate the test on the age structure of coefficients of the current wage gap with these new estimates. But we can also verify the striking prediction that the wage gap at the beginning of work weighs more heavily than the current wage gap, and check that the coefficient of the former is the same for all age groups. Finally, we are able to recover estimates of the average discount rate from the job satisfaction equation under the additional assumption that work begins with active life.

The definition of the current wage gap adopted in Tables 1 and 2 makes the implicit assumption that workers restrict their own market opportunities to a similar occupation, region, hours of work and so forth. This may not be true. Assuming that individual i does not restrict the size of his random search sample of jobs, given his fundamentals (age, education, gender, nationality), an unbiased estimate of current market opportunities is $\bar{y}_{ia}$, which attributes to each worker the age-specific *average* value of the remaining variables listed in Table A.1. Hence, $\bar{\varepsilon}_{ia} \equiv y_{ia} - \bar{y}_{ia}$ is an unbiased measure of the current wage gap, which differs from the estimated residual of the experienced earnings equation used in Tables 1 and 2, $\hat{\varepsilon}_{ia} \equiv y_{ia} - \hat{y}_{ia}$. The latter is a more adequate measure of current wage gap if the worker decides to restrict the size of his search sample to job offers that fall exactly under his own current situation. Whether $\bar{\varepsilon}_{ia}$ or $\hat{\varepsilon}_{ia}$ is a better measure is an empirical question that will be tested.

At the beginning of active life, the young knows his fundamentals (education, gender, nationality) and searches for a job. As noted by Manski (1993), youth who are forming earnings expectations confront the same inferential problems as do econometricians when they study the returns to schooling and experience. If they base their own expectation on what older workers with the same fundamentals currently earn on the market, they will form an (inflation-adjusted) estimate which precisely matches the prediction of a cross-sectional earnings equation based on this short list of fundamentals and a quadratic of potential experience (shown in the working paper). The latter is taken here as a good predictor of expected earnings at the beginning of work. In actuality, the young will experience many unpredicted features of his life that will have an incidence on his future activity, like his marital status, region of residence, occupation, hours of work, health and so forth. These will cause his experienced earnings to diverge from the earnings predicted at the beginning of work and, according to our theoretical interpretation, shape his satisfaction with job. Hence, the estimate of earnings based on a longer list of variables including both predictable and not quite predictable variables (shown in Appendix A) is a good description of experienced,

[10] It is usually assumed that tenure eventually increases with age and experience on the job market.

as opposed to predicted, earnings. While current experienced earnings are being observed, past experienced earnings can be inferred from the experienced earnings equation by giving the individually observed values to the fundamentals and the sample's age-specific average value to all remaining variables. The past experienced wage gap $\bar{\varepsilon}_{i1}(a) \equiv \bar{y}_{i1}(a) - \hat{y}_{i1}(a)$ is estimated by the difference between the experienced and the expected value of past earnings. Although, on cross-section data, each of these two values is probably biased by a large cohort-specific experience effect, their difference is an unbiased estimate of the past experienced wage gap when both experience effects are equal. We further allow for a potential cross-section bias when successive cohorts differ by adding a cohort-specific constant α_a to the job satisfaction equation.[11] This brings another motivation for splitting the sample by age group.

Putting together the new estimates of past and current wage gaps, we finally get a two-period specification of age group-specific job satisfaction:

$$J_i^{a*} = \alpha_a + Z_i\beta_a + \Psi_1\bar{\varepsilon}_{1i}(a) + \Psi_a\bar{\varepsilon}_{ia} + \varsigma_{ia} \tag{5}$$

where ς_{ia} is a random disturbance which reflects both the expected present value of wage gaps in the future and the unmeasured part of discounted wage gaps in the past. The crucial assumptions are that ψ_1 and ψ_a are positive, ψ_1 is constant across age groups, ψ_a is likely to be inversely U-shaped, and $\Psi_1/\Psi_a = (1+r)^a$ in which a indicates the mean working experience (current age-minimum school-leaving age) or tenure in one age group.

The results of the estimation of Eq. (5) are shown in Table 3. The effect of current wage gaps on job satisfaction when no restrictions are assumed on the opportunity set is very similar to what is reported in Table 2. The null hypothesis that the coefficients of $\bar{\varepsilon}_{ia}$ are equal in the 25–34 and 35–44 age groups is rejected by a Wald test at the 6% level. The estimated effects of past and current wage gaps are both non-significant at the 5% level (one-tail) for the 15–24, which is consistent with our prediction of a large downward bias in this age group and that $\Psi_1 \cong \Psi_a$ (for reasonable values of the discount rate) for young workers. The bottom-up model is not rejected by a likelihood ratio test at the 5% level in this age group. In the three other age groups, the coefficients of past wage gaps are significantly positive at the 5% level (one-tail) and their equality is not rejected by a Wald test at the same level of significance. The ranking of the coefficients of past wage gaps over and above those of current wage gaps provides strong additional evidence in favor of the experienced preference model. This pattern is observed in all age groups, and the coefficients of $\bar{\varepsilon}_{i_1}$ and $\bar{\varepsilon}_{i_a}$ are truly apart. Likelihood ratio tests of the equality of the two coefficients reject the null for the 25–34, 35–44 and 45+ age groups at P-values of 0.1052, 0.0392 and 0.0549, respectively. These P-values are reasonable to reject the null, considering that we are looking for a one-sided test. As it is, the set of results should be quite convincing because it runs counter the loose intuition that more remote events in the past should be discounted.

One interesting feature of the experienced preference model is the theoretical possibility of retrieving the average discount rate from the coefficients of the time-varying wage gaps under the assumption that working opportunities begin at minimum school-leaving age.

[11] In practice, the cohort-specific constant is indistinguishable from the lower threshold introduced in the ordered probit regression. The further introduction of experience among the explanatory variables of the job satisfaction equation produced no significant result and was eventually abandoned.

Table 3
Age-specific job satisfaction equations including estimates of past and current wage gaps

	Age groups			
	15–24	25–34	35–44	45+
Past wage gap	0.02784 (0.0349)	0.1099[a] (0.0547)	0.1854[b] (0.0973)	0.1101 (0.0722)
Current wage gap (with unrestricted opportunity set)	0.00869 (0.0075)	0.01887[a] (0.0039)	0.00891[a] (0.0036)	0.00627 (0.0042)
Male	0.01703 (0.109)	0.04221 (0.098)	0.3806 (0.253)	0.3265 (0.217)
9–13 years education	−0.5156[a] (0.248)	0.02660 (0.137)	0.3044 (0.161)	0.02532 (0.109)
13 years education or more but no university degree	−0.2240 (0.253)	0.1254 (0.151)	0.1708 (0.195)	0.5712[b] (0.276)
University degree	0.2447 (0.321)	0.3889[b] (0.172)	1.143[b] (0.545)	0.8233 (0.582)
Mother tongue is French	1.0380[a] (0.402)	−0.09214 (0.242)	0.3284 (0.222)	0.2269 (0.228)
Mother tongue is English	1.0226[b] (0.399)	−0.1328 (0.232)	0.3053 (0.213)	0.2022 (0.211)
Canadian borne	−0.3163 (0.198)	0.2961[b] (0.134)	−0.09746 (0.112)	−0.2680 (0.182)
No religion	−0.4589[a] (0.152)	−0.1010 (0.104)	0.1118 (0.120)	−0.3867[b] (0.188)
Dissatisfied with health	−0.3658[b] (0.233)	−0.3780[a] (0.139)	−0.3612[a] (0.143)	−0.2723[b] (0.170)
Dissatisfied with leisure	0.04198 (0.210)	−0.2556[a] (0.115)	−0.4342[a] (0.137)	−0.6534[a] (0.235)
Dissatisfied with marital status	−0.4731[a] (0.215)	−0.5697[a] (0.144)	−0.0568 (0.168)	−0.2371[b] (0.154)
Lower threshold value	0.8527[a] (0.406)	1.0831[a] (0.284)	0.4570[b] (0.348)	0.9132[a] (0.294)
Higher threshold value	1.334[a] (0.134)	1.426[a] (0.119)	1.197[a] (0.173)	1.054[a] (0.256)
Experience (second stage)	−0.04270[b] (0.0279)	−0.00346 (0.008)	−0.01444[b] (0.0082)	−0.00898 (0.00739)
Loglikelihood	−386.6286	−956.9044	−574.9083	−401.2522
N observations	414	1040	670	476

Standard errors in parentheses. One-tail test for wage gaps, job-related satisfactions, threshold values and experience; two-tail test for the remaining variables. Estimations are corrected for heteroskedasticity with years of potential experience.

[a] Significant at the 1% level.

[b] Significant at the 5% level.

Two methods are applied. The first exploits the fact (see Eqs. (4) and (5)) that Ψ_1/Ψ_a approximately equals $(1+r)^{a}$ in the 25–34 age group, and $(1+r)^{a+10}$ in the 35–44 age group, where a is the mean age (counted from minimum school-leaving age) in the younger group. From this, we compute $\hat{r} = 12.72$ and $\hat{a} = 14.69$. We note that the latter is a plausible value for the mean age in 25–34 age group given a minimum school-leaving age of 16. Another way of retrieving r is from Table 2's estimates since $\Psi_a(25\text{–}34)/\Psi_a(35\text{–}44)$ approximates $(1+r)^{10}$. Hence, we have $\hat{r} = 7.79$. Interestingly, these estimates of the discount rate fall well within the range of many estimates of the rate of return on human capital found in the literature.

All the estimations were done correcting for multiplicative heteroskedasticity of the second stage estimation with the experience variable. The estimates of this variable's coefficient are always negative, and statistically significant in two regressions (see Table 3). The negative value suggests that the residual variance in the level of reported job satisfaction decreases with the labor market experience of individuals. This result is consistent with the fact that the future part of human wealth gap (see Eq. (4)) is in the residual and decreases with experience on average as the span of the remaining working life decreases.

Looking at other coefficients in the ordered probit regressions of Table 3 yields additional insights. Job-related satisfactions with health, leisure, and marital status, which capture non-wage gaps and unobserved individual heterogeneity, logically exert significant and substantial effects. Not surprisingly, leisure is increasingly valued with age; and bad surprises about health or marriage are less strongly felt by the older individuals as they are then to be less unexpected. Job satisfaction appears to increase with the level of education. In the experienced preference framework, such dependence is suggestive of job rationing which would thus decrease with education level. This is consistent with the fair wage-effort hypothesis put forward by Akerlof and Yellen (1990) according to which firms are willing to share rents with the more educated workers at the expense of rationing the less educated. A positive effect of education on happiness and satisfaction holding income constant has generally been found in the literature (see Oswald, 1997). One exception, however, is Clark and Oswald (1996) who find greater job satisfaction for the less educated on British data collected in the late 1991. They note that "the low satisfaction of the higher educated might then just result from their sharp drop in income relative to those with lower qualifications, due to the recession that hit the middle class unexpectedly hard in Britain in the early 1990s". This may be interpreted as indirect evidence that the unexpected drop experienced in the past had a persistent effect on satisfaction as we assume in this paper. The independence between the level of satisfaction and gender of the respondent is never rejected on our data. Such result is not surprising even though a few studies have found that women were more satisfied with their job than men (e.g. Clark, 1997). Finally, the positive influence of religion on job satisfaction may signify that more religious people show more empathic concern for the experience of currently more unfortunate others, which helps them feel happier with their own lot.[12]

How do the results of this two-period specification compare with the simpler current wage gap model reported in Table 2? The simpler model is not nested in this two-period specification, but it is not difficult to specify another model which nests these two models

[12] Ellison (1991) suggests, in line with our interpretation, that the effects of religion are mainly cognitive, providing an interpretive framework by which one can make sense of his or her experiences.

since $\bar{\varepsilon}_{ia} = \hat{\varepsilon}_{ia} - (\bar{y}_{ia} - \hat{y}_{ia})$. A test is presented along these lines in Appendix B, that shows that Eq. (5) is to be preferred to the simpler model reported in Table 2. Thus, our results indicate that market opportunities are not restricted to a similar occupation, region, hours of work and so forth. Moreover, they suggest that past experienced wage gaps matter for job satisfaction.

4. Concluding remarks

The empirical evidence shown in this paper rather supports the view that self-reported job satisfaction indicates an experienced preference for this job over available opportunities. In simple words, reporting one's satisfaction is the judgment that one would now repeat one's past experience if one had to choose again. Under certainty and stable preferences, a rational person would always be satisfied with a deliberate decision made in the past. It is merely the occurrence of surprises in the outcomes and/or possibilities which makes the posterior preference deviate from the prior.

This new interpretation does not invalidate the empirical findings of psychological and sociological research on the subject, which emphasized the role of discrepancies between objective conditions and a reference on reported satisfaction. It is exactly what the new theory predicts. However, this important result does not require utility to be relative and comparable across persons, because choice and preference are obviously relative and ordinal concepts. Furthermore, the new theory characterizes the reference from where gaps are appreciated as the individual's best alternative at the time he makes a satisfaction judgment. This comes closest to the pioneering analysis of Hamermesh (1977), but we believe Festinger (1954) had essentially the same reference in mind in his illuminating theory of social comparison processes.

Recognition of the intertemporal dimension of satisfaction judgments significantly improves the empirical content of the theory and illuminates several hidden aspects of human behavior. For instance, older persons appear less sensitive to current gaps than younger ones and gaps experienced in the remote past have greater weight on job satisfaction judgments than what happens at present. These two predictions are reminiscent of the fact that wisdom comes with age and that traumas suffered during childhood have quite persistent effects on human satisfaction. The observation that current earnings gaps have a negligible effect on the job satisfaction of young workers is another striking testimony that individuals have a long planning horizon and consciously make on-the-job investments. Such a result is remarkable because studies using training data have often been unable to find consistent evidence of workers paying for their training through lower starting wages. Moreover, the estimated values for the average discount rate fall within the plausible 8–12% range commonly found for rates of return on education and training.

The interpretation of satisfaction judgments discussed in this paper is intuitive and consistent with both the economic theory of utility and reference-dependent behavior. This should make economists less reluctant to exploit the wealth of easy-to-collect subjective data of this kind in econometric studies of job mobility, job matching, union membership, firms' compensation policies, and many other sorts of human behavior. It may also help somewhat bridging the gap between economics and other social or behavioral sciences.

Acknowledgements

The authors thank Sophie Masheredjian for her assistance in conducting this research. Helpful suggestions and comments from Andrew Clark, Greg Duncan, Dan Hamermesh and numerous seminar participants on various drafts on this paper are gratefully acknowledged.

Appendix A

See Table A.1.

Appendix B

We present a simple test between the two non-nested models reported in Tables 2 and 3. The principle of this test is to specify another model which nests these two models since $\bar{\varepsilon}_{ia} = \hat{\varepsilon}_{ia} - (\bar{y}_{ia} - \hat{y}_{ia})$. Eq. (5) is compared with three alternative specifications:

$$J_i^{a*} = \alpha_a + Z_i\beta'_a + \Psi'_1\bar{\varepsilon}_{i1} + \Psi'_a\hat{\varepsilon}_{ia} + \varsigma'_{ia} \tag{B.1}$$

with $\hat{\varepsilon}_{ia} = y_{ia} - \hat{y}_{ia}$,

$$J_i^{a*} = \alpha''_a + Z_i\beta''_a + \Psi''_1\bar{\varepsilon}_{i1} + \Psi''_2\hat{\varepsilon}_{i2} + \Psi''_a\hat{\varepsilon}_{ia} + \varsigma''_{ia} \tag{B.2}$$

with $\hat{\varepsilon}_{2i} = \hat{y}_{ia} - \bar{y}_{ia}$, and

$$J_i^{a*} = \alpha_a + Z_i\beta'''_a + \Psi'''_a\hat{\varepsilon}_{ia} + \varsigma'''_{ia} \tag{B.3}$$

(B.1) and (B.2) nest the current-period specification (B.3) estimated in Table 2, and (B.2) nests (B.1) and the specification estimated in Table 3 (Eq. (5)) since the latter follows if $\Psi''_2 = \Psi''_a$. The coefficients of the wage gaps and loglikelihoods of Eqs. (5), (B.1) and (B.2) are reported in Table B.1; and the corresponding statistics for (B.3) are found in Table 2. For all specifications, the coefficients of past or current wage gaps are close and positive. But the loglikelihoods of (B.1) and (B.2), which include the past wage gap, are significantly greater at the 5% level than that of (B.3), for all age groups except the 15–24 (the negative result in this last case is not surprising since the past and present are hardly distinguishable for the young). The *P*-values for rejecting the current-period specification (B.3) with respect to the more extensive specification (B.2) are 0.0016, 0.0080, 0.033 for respectively the 25–34, 35–44, 45+ age groups; for the alternative two-period specification (B.1), the corresponding *P*-values are 0.1180, 0.042, 0.0601. Moreover, specification (B.2) nests the alternative two-period specification (B.1) and the latter is rejected by a likelihood ratio test at 1% level in the 25–34 age group and at 10% level in the 35–44 age group. On the contrary, (B.2), which also nests the two-period specification (3), is unambiguously rejected by a likelihood ratio test in all age groups. Hence, the two-period specification (5) is to be preferred to the current period specification (B.3) in all age groups but the young; and to the alternative two-period specification (B.2) in the two intermediate age groups. The first result states that the past matters for understanding job satisfaction and subjective well-being

Table A.1
Age-specific earnings functions and summary statistics

	Dependent variable				Summary statistics, mean (S.D.) (5)
	Wages				
	15–24 (1)	25–34 (2)	35–44 (3)	45+ (4)	
Constant	−3.936 (2.44)	−4.610 (2.15)	−11.93 (3.02)	−4.164 (3.46)	
Male	3.800 (0.623)	7.581 (0.561)	8.249 (0.829)	10.19 (0.870)	0.541
9–13 years education	−0.222 (1.69)	−1.214 (1.24)	1.036 (1.25)	0.400 (1.07)	0.480
13 years education or more but no university degree	2.970 (1.78)	0.800 (1.35)	3.895 (1.40)	2.418 (1.55)	0.303
University degree	6.478 (2.01)	5.253 (1.63)	9.284 (1.79)	7.800 (2.18)	0.151
Experience	0.829 (0.442)	1.436 (0.221)	0.427 (0.224)	0.185 (0.191)	13.849 (11.55)
Experience^2	0.0159 (0.074)	−0.072 (0.012)	−0.0100 (0.0075)	−0.0051 (0.0035)	
Canadian borne	0.283 (1.21)	−1.236 (1.11)	1.676 (1.09)	1.440 (1.09)	0.879
Weeks worked in the last year	0.234 (0.021)	0.347 (0.026)	0.409 (0.039)	0.337 (0.047)	47.79 (10.14)
Working mostly part time	−2.653 (0.723)	−5.358 (1.01)	−7.506 (1.34)	−8.281 (1.51)	0.103
Professional, high level management	3.980 (1.03)	2.820 (1.05)	8.879 (1.29)	10.79 (2.23)	0.133
Specialized work, technician, supervisor	2.608 (0.682)	2.374 (0.608)	4.810 (0.892)	4.295 (0.904)	0.456
Bilingual (English and French)	−1.848 (2.24)	2.252 (2.44)	2.588 (3.21)	−2.030 (2.45)	0.014
Resides in Ontario	0.759 (0.710)	−1.004 (0.651)	3.363 (1.05)	2.326 (1.10)	0.222
Married	2.600 (0.664)	0.379 (0.616)	1.342 (1.11)	0.753 (1.45)	0.632
Divorced	3.749 (2.16)	1.067 (1.24)	0.909 (1.45)	−0.440 (1.51)	0.084
No religion	0.425 (0.782)	0.920 (0.903)	3.197 (1.53)	2.554 (1.42)	0.113
Dissatisfied with health	−0.670 (1.17)	0.208 (1.08)	0.568 (1.69)	−1.472 (1.36)	0.067
Dissatisfied with leisure time	−2.023 (0.791)	0.854 (1.02)	−0.289 (1.72)	−1.348 (1.54)	0.077
$\bar{R}^2$	0.420	0.382	0.468	0.509	
N observations	414	1040	670	476	2600

Standard errors (in parentheses) are heteroskedasticity-consistent. The reference categories—when more than two categories—are (less than 9 years education), (semi and unskilled workers, farmers and farm laborers).

Table B.1
Three specifications of age-specific job satisfaction including past and current wage gaps

	Age groups			
	15–24	25–34	35–44	45+
Eq. (5)				
Past wage gap	0.02784 (0.0349)	0.1099 (0.0547)	0.1854 (0.0973)	0.1101 (0.0722)
Current wage gap (with unrestricted opportunity set)	0.00869 (0.0075)	0.01887 (0.0039)	0.00891 (0.0036)	0.00627 (0.0042)
Loglikelihood	−386.6286	−956.9044	−574.9083	−401.2522
Eq. (B.1)				
Past wage gap	0.01968 (0.0360)	0.08847 (0.0550)	0.1680 (0.0932)	0.1015 (0.073)
Current wage gap (with restricted opportunity set)	0.01394 (0.00860)	0.01805 (0.00435)	0.00806 (0.00391)	0.00583 (0.00453)
Loglikelihood	−385.9919	−960.5360	−576.3246	−401.7373
Eq. (B.2)				
Past wage gap	0.01301 (0.0397)	0.1138 (0.0551)	0.1883 (0.0986)	0.1112 (0.0731)
Net increase in current wage gap when the opportunity set broadens	−0.00718 (0.0164)	0.02235 (0.0081)	0.01032 (0.00616)	0.00701 (0.0083)
Current wage gap (with restricted opportunity set)	0.01393 (0.0085)	0.01795 (0.0043)	0.00846 (0.00410)	0.00600 (0.0045)
Loglikelihood	−385.8752	−956.7874	−574.8731	−401.2447

Standard errors in parentheses. All bottom-up variables and job-related satisfactions are included in the regressions. The latter are corrected for heteroskedasticity with the experience variable.

research needs to go beyond the benchmark of simple discrepancy theories. This is probably a robust conclusion since it was obtained in spite of the presumably great imprecision of cross-section estimates for past wage gaps, which drives the related coefficients towards zero. The second result shows that workers, perhaps with the exception of older ones, do not limit their search of a job to a small opportunity set.

References

Akerlof, G.A., Yellen, J.L., 1990. The fair wage-effort hypothesis and unemployment. Quarterly Journal of Economics 105, 255–283.

Bell, D., 1982. Regret in decision making under uncertainty. Operations Research 30, 961–981.

Borjas, G., 1979. Job satisfaction, wages and unions. Journal of Human Resources 14, 21–40.

Clark, A., 1997. Job satisfaction and gender: why are women so happy at work? Labour Economics 4, 341–372.

Clark, A.E., Oswald, A.J., 1996. Satisfaction and comparison income. Journal of Public Economics 61, 359–381.

Clark, A.E., Oswald, A.J., Warr, P.B., 1996. Is job satisfaction U-shaped in age? Journal of Occupational and Organizational Psychology 69, 57–81.

Damasio, A.R., 1999. The Feeling of What Happens: Body and Emotion in the Making of Consciousness. Harcourt Brace & Co., New York.

Diener, E., Suh, E.M., Lucas, R.E., Smith, H.L., 1999. Subjective well-being: three decades of progress. Psychological Bulletin 125, 276–303.

Duncan, O.D., 1975. Does money buy satisfaction. Social Indicators Research 2, 267–274.

Easterlin, R.A., 1974. Does economic growth improve the human lot? Some empirical evidence. In: David, P.A., Reder, M.W. (Eds.), Nations and Households in Economic Growth. Academic Press, New York, pp. 89–125.

Easterlin, R.A., 1995. Will raising the incomes of all increase the happiness of all? Journal of Economic Behavior and Organization 27, 35–47.

Ellison, C.G., 1991. Religious involvement and subjective well-being. Journal of Health and Social Behavior 32, 80–99.

Festinger, L., 1954. A theory of social comparison processes. Human Relations 7, 117–140.

Freeman, R.B., 1978. Job satisfaction as an economic variable. American Economic Review: Papers and Proceedings 68, 135–141.

General Social Survey, 1986. Statistics Canada, Canada.

Greene, W.H., 1998. LIMDEP, version 7, Usuer's Manual. Econometric Software, Inc., Plainview.

Hamermesh, D.S., 1977. Economic aspects of job satisfaction. In: Ashenfelter, O.C., Oates, W.E. (Eds.), Essays in Labor Market Analysis. Wiley, New York, pp. 53–72.

Lévy-Garboua, L., Montmarquette, C., 1998. Reported Job Satisfaction: What Does it Mean? CIRANO Working Paper.

Lévy-Garboua, L., Montmarquette, C., Simonnet, V., 2001. Job Satisfaction and Quits: Theory and Evidence from the German Socioeconomic Panel. CIRANO Working Paper.

Loomes, G., Sugden, R., 1982. Regret theory: an alternative theory of rational choice under uncertainty. The Economic Journal 92, 805–824.

Manski, C., 1993. Adolescent econometricians: how do youth infer the returns to schooling? In: Clotfelter, Rothschild, M. (Eds.), Studies of Supply and Demand in Higher Education. pp. 43–57.

McKelvey, R., Zavoina, W., 1975. A statistical model for the analysis of ordinal level dependent variables. Journal of Mathematical Sociology 4, 103–120.

Michalos, A.C., 1980. Satisfaction and happiness. Social Indicators Research 8, 385–422.

Oswald, A.J., 1997. Happiness and economic performance. Economic Journal 107, 1815–1831.

Sousa-Poza, A., 2000. Well-being at work: a cross-national analysis of the levels and determinants of job satisfaction. Journal of Socio-Economics 29, 517–538.