Applied Economics Quarterly Vol. 53. N° 3 (2007)
Duncker & Humblot GmbH, 12165 Berlin

Do Wages Compensate for Workplace Disamenities?

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Abstract

Adam Smith's idea that the wage structure reflects differences in work conditions is a central pillar of the competitive theory of the labor market. However, the empirical relevance of this theory of equalizing differences remains unclear. This paper suggests a novel test for compensating wage differentials based on job satisfaction and wages. If wages differentials solely reflect compensation for work conditions, workers will not prefer jobs with high wages to jobs with low wages. Moreover, this new test allows discussing whether industry and firm size wage differentials reflect rents or compensate for work conditions. Results indicate that wage differentials do not exclusively reflect compensation for work conditions.

Keywords: industry wage differentials, compensating wage differentials, job satisfaction

JEL classification: J17, J31

1. Introduction

The theory of equalizing differences is, arguably, the most beautiful, parsimonious, compelling and important theory of the wage structure. However, to date there is widespread unease with the predictive power of the theory in applied work. Such unease is based on theoretical concerns that the labor market is characterized by many non-competitive factors such as rent sharing between firms and workers or unions. A second strand of critique points out that existing data is of insufficient quality to test for compensating wage differentials. The primary concern with data quality is measurement problems relating to individual productivity and to non-monetary work characteristics. It can be shown that both measurement problems introduce an omitted variable bias that invalidates previous attempts at testing the theory of compensating wage differentials.

The focus of the present paper is to test the central implication of the theory that workers with identical preferences would be indifferent between jobs in labor mar-

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ket equilibrium because the only reason a job contract offers high pay is that it also entails more onerous work conditions. Thus, this test of the theory of equalizing differences exploits directly the prediction of the theory concerning utility. This is in contrast to the existing literature that focused primarily on the implications of the theory concerning the wage structure.

In order to perform the test, however, information on how workers evaluate jobs is critical. A single measure capturing all monetary as well as non-monetary characteristics of a job is job satisfaction. If self-reported job satisfaction is related to how workers feel about the entire package of non-monetary as well as monetary returns to work it is possible to test the central implication of the theory of equalizing differences. The theory holds job satisfaction will not vary with the wage rate if wages compensate exactly for the non-monetary returns to work. Thus, regressing job satisfaction on the wage rate directly tests the central prediction of the theory of equalizing differences.

The alternative hypothesis of non-competitive determination of the wage structure holds that high-pay reflects the presence of rents. If this alternative view of the labor market dominates the competitive view wages will be positively correlated with job satisfaction.

In order for this novel test of the theory of equalizing differences to be operational only one monetary or non-monetary characteristic of the job must be measurable. We can regress job satisfaction on any single aspect of the job that is observable, relevant, and measured with precision.[1] This is an important advantage compared to existing approaches to testing the theory of equalizing differences.

This paper also puts forward a new way of addressing the important problem of worker heterogeneity in terms of productivity or tastes. There is some evidence that the income elasticity with respect to some relevant job disamenities such as the risk of injury or illness is greater than unity in absolute terms (Hamermesh, 1999). Thus, workers with higher productivity will tend to accept jobs with lower illness risk and still earn the same as workers with lower productivity. Hwang et al. (1992) show that this problem introduces a serious downward bias into traditional wage regressions that attempt to identify compensating wage differentials.

I address the problem of heterogeneity in unobserved productivity and tastes across workers by using data on dual job holders, i.e. individuals that hold, simultaneously, at least two jobs.[2] These so called 'moonlighters' provide information on job satisfaction and the wage rate in at least two jobs at the same point in time.

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1 Relevant is defined in terms of workers preferences. A relevant characteristic of the job is one where the marginal utility of having more of the characteristic is not identically zero. The precision requirement is important in terms of measurement error.

2 See Conway and Kimmel (1998), Krishan (1990), O'Connell (1979), Paxson and Sicherman (1996), and Shishko and Rostker (1976) for theoretical and empirical analyses of the labor supply of moonlighters in the U.S.

Thus, conventional methods of removing unobserved heterogeneity of workers can be applied.[3] Moreover, by using data on different jobs held by the *same individual at the same time,* we can control for taste differences as well as potential changes in survey design or changes in the identity of the interviewer. These advantages come at a cost: moonlighters may be a non-random sample of the labor force. However, it is possible to correct for the potential selectivity of this sample.

Research on compensating wage differentials has primarily focused on estimating the wage premia associated with important disamenities. Thus, existing research has focused on the qualitative prediction that wages should increase with disamenities such as workplace risks, and decrease with workplace amenities such as fringe benefits. Comprehensive reviews of the this literature can be found in Rosen (1986) and Viscusi (1993). Studies that have addressed the problem of heterogeneous ability (unobserved, time-constant productivity) include Brown (1980), Duncan and Holmlund (1983), and Hwang, Reed and Hubbard (1992). Duncan and Holmlund (1983) and Viscusi (1993) also note the problem of the omitted variable bias due to unobserved job characteristics. Hamermesh (1999) investigates changing inequality in the important non-monetary risk of injury across industries arguing that such an analysis is crucial to understand changing inequality in all returns to work.

Research on job satisfaction in Hamermesh (1977) has focused on the link between job satisfaction and wages.[4] The main finding in this literature is a fairly small effect of wages on job satisfaction. Such a finding is not surprising, however, if few relevant job characteristics are accounted for in the job satisfaction regression and if the theory of equalizing differences holds. Clark (2002) compares industry and occupation wage and job satisfaction differentials in order to test whether workers earn rents. In contrast to Clark (2002), we focus on job satisfaction and the wage rate *for the same individual at the same time.* This means that differential composition of occupational groups or industries with respect to wages and job satisfaction are controlled for.

The following section discusses the empirical strategy. Section 3 gives background on the dataset and some preliminary evidence. Section 4 discusses results concerning the novel test of the theory of equalizing differences. Section 5 concludes.

[3] Note that this approach is superior to an approach that relies on time-variation in job satisfaction and the wage rate because worker productivity is time-varying.

[4] Job satisfaction has found to be important for quit behavior (Clark et al. (1998), Clark (2001)), absenteeism (Clegg, 1983), and productivity (Mangione and Quinn (1975).

2. Testing Equalizing Differences

This section illustrates the novel test of the theory of equalizing differences. Suppose that jobs differ in terms of the hourly wage rate w and one other disamenity D, so D might be risk of injury or illness. Workers are, initially, homogeneous. Utility is increasing in consumption c and decreasing in the disamenity D, $U = u(c,D)$. Each firm is assumed to offer just one type of job that is defined by a pair (w,D). There are costs of offering a job with a low D. These costs may include purchasing equipment that has been certified by an occupational health agency as opposed to working with non-certified equipment. These costs of avoiding D differ across firms indexed by j. Profits (w,D) are negatively related to the wage rate and positively related to D.

In labor market equilibrium, firms earn zero profits. Under the conditions explored in Rosen (1974) the zero profit condition defines a unique, upward sloping (w,D) locus. Workers will be indifferent among combinations of w and D that lie on their indifference curve. Thus, in equilibrium all jobs lie on the workers' indifference curve and satisfy the zero profit condition. This equilibrium is represented graphically in Figure 1.

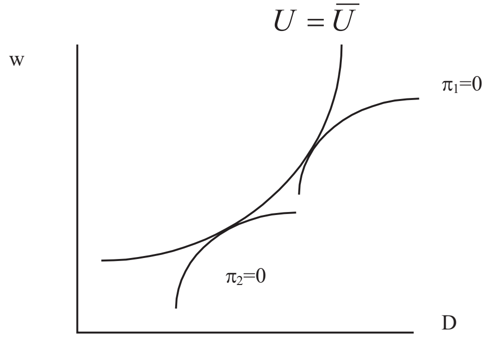

Figure 1: Equalizing Differences in The Labor Market

The condition that workers are indifferent across jobs is

(1) $$U = u(w_j, D_j) = \overline{U}$$

Totally differentiating this equilibrium condition we get

(2) $$dU = \frac{\partial u}{\partial c} dw + \frac{\partial u}{\partial D} dD = 0$$

This implies that

$$\frac{dU}{dw} = \frac{\partial u}{\partial c} + \frac{\partial u}{\partial D}\frac{dD}{dw} = 0 \qquad (3)$$

The left hand side of equation (3) states that the total change in utility due to a change in the wage rate is zero. The right hand side of this equation illustrates why this is the case. A wage increase has two effects. There is a marginal increase in utility due to a higher level of consumption that can be sustained at a higher wage rate. However, there is also a marginal decrease in utility associated with this wage increase because high wage jobs offer more of the disamenity *D*. In case wages differences exclusively reflect compensation for work conditions both effects cancel exactly.

Suppose we have data on utility of worker *i* in job *j*, u_{ij}, and on the hourly wage rate in that job, w_{ij}. An empirical test of equation (3) is carried out by the following regression

$$u_{ij} = \beta_0 + \beta_1 w_{ij} + \xi_{ij} \qquad (4)$$

The coefficient β_1 measures the total variation in utility due to a wage change. Testing for equalizing differences entails performing a simple (one-sided) test of significance on this coefficient. Under the null hypothesis $\beta_1 = 0$, wages entirely reflect compensation for work conditions. The alternative hypothesis $\beta_1 > 0$ states that wage differentials entail a rent in addition to compensation for work conditions.

Note that it is important to omit all other characteristics of job j in order for this test of equalizing differences to work. The 'omitted variable bias' introduced by excluding the work characteristic *D* will lead to an insignificant effect of wages on job satisfaction if wage differentials reflect compensation for work conditions. Suppose marginal utility from consumption and from the disamenity are constant and denoted by β_1 and β_2 respectively.[5] It is well known that the probability limit of the estimated regression coefficient $\hat{\beta}_1$ is

$$\begin{aligned} p\lim \hat{\beta}_1 &= \beta_1 + \beta_2 \frac{\mathrm{cov}(w, D)}{\mathrm{var}(w)} \\ &= \frac{\partial u}{\partial c} + \frac{\partial u}{\partial D}\frac{\mathrm{cov}(w, D)}{\mathrm{var}(w)} \end{aligned} \qquad (5)$$

Thus, $\hat{\beta}_1$ measures the sum of the marginal increase in utility due to a wage increase, $\partial u / \partial c$ and the corresponding marginal decrease in utility due to more *D*. This marginal decrease in utility is the marginal change in the disamenity associated with a wage increase (supposedly positive) evaluated at the marginal utility

[5] This holds only if marginal utility from consumption is constant. The assumption is only for expositional purposes. It is straightforward to allow for non-constant marginal utility of consumption by changing the way in which the wage rate enters regression (4).

of D. The marginal change in D due to an increase in w is the coefficient from a regression of D_{ij} on w_{ij}, $\mathrm{cov}(w,D) / \mathrm{var}(w)$.

Equation (5) illustrates the difference between the existing literature on compensating wage differentials and this novel test. The previous literature primarily focuses on identifying the compensating wage differential. The probability limit of the compensating wage differential is $\mathrm{cov}(w,D) / \mathrm{var}(D)$. This is a reweighted version of the probability limit of the marginal increase in D due to a wage increase, $\mathrm{cov}(w,D) / \mathrm{var}(w)$. The existing literature applies a qualitative prediction of the theory of equalizing differences that wages must rise for disamenities and fall for amenities. However, the prediction of the theory of equalizing differences is sharp. It holds that the marginal increase in utility due to a wage increase must be exactly offset by a corresponding decrease in utility due to changes in the wage disamenity package. The new test of the theory of equalizing differences exploits this sharp prediction.

An important advantage of this novel approach to testing the theory of equalizing differences is that we need to be able to measure exactly one relevant job characteristic. This has been demonstrated so far in a context with exactly two characteristics of the job. In order to carry out the regression in (4) it is immaterial whether D can be measured or not. This advantage carries over to more than one non-monetary characteristic. Suppose jobs are differentiated by k characteristics. The indifference condition in labor market equilibrium holds that

$$\frac{dU}{dw} = \frac{\partial u}{\partial c} + \frac{\partial u}{\partial D_1}\frac{dD_1}{dw} + \ldots + \frac{\partial u}{\partial D_k}\frac{dD_k}{dw} = 0 \tag{6}$$

The regression in (4) measures the left hand side of equation (6). Thus, testing whether wages compensate purely for work characteristics entails, again, performing a test of significance of the coefficient associated with the wage rate. This is an important advantage compared to the existing literature focusing on wage differentials. In this literature it is essential to measure *all* relevant differences across jobs in order to obtain unbiased estimates of the compensating wage differentials.[6]

This new test of the theory of equalizing differences shares the problem of differences across individuals in terms of productivity or tastes with existing tests of the theory. Taste differences imply distinct indifference curves for each worker. Regression (4) identifies the effect of wages on utility in a cross-section of jobs. Because no two jobs necessarily lie on the same indifference curve the prediction may not hold that wage increases have no effect on utility. However, the taste argument does not imply a specific upward or downward bias on the coefficient of the wage rate in (4). This is different with productivity differences across workers. It is useful to distinguish three distinct types of (potentially) unobserved productiv-

6 See concluding remarks in Duncan and Holmlund (1983).

ity: ability a_i, productivity shocks e_{it}, and job match specific productivity p_{ijt}.[7] The productivity argument implies that the error term ξ_{ij} in (4) consists of these three unobserved productivity components

$$\xi_{ijt} = a_i + e_{it} + p_{ijt} + \mu_{ijt} \ . \tag{7}$$

The error term $\mu_{ijt} = D_{ijt}, \delta + \upsilon_{ijt}$, where D_{ijt} is the vector of work characteristics and υ_{ijt} is random measurement error. Influential work by Hwang et al. (1992) shows that unobserved productivity is positively correlated with the wage rate. The intuition for this is that individuals that are more productive will "purchase" less of each disamenity of the job, due to the income effect.[8] This implies that the cross-section estimate of β_1, the main parameter in the novel test of the theory of equalizing differences, is biased upward. This is problematic because one may reject the theory of compensating differentials in favor of a rent explanation even if wages exactly compensate for job disamenities.

The traditional method of accounting for individual heterogeneity in panel data is to allow for individual specific intercepts in (4) to control for ability a_i. This procedure can not be applied in the present context because of the possibility of shocks to productivity e_{it}. Even if ability is held constant, productivity shocks may introduce a severe upward bias in regression (4).

This paper proposes a new way to addressing individual heterogeneity. In the U.S. labor market it is relatively common that individuals hold more than one job at the same time. These dual job holders – so called 'moonlighters' – provide information on at least two jobs for the same individual at the same point in time. One can then analyze how the utility difference between job 2 and job 1 varies with the wage difference between job 2 and job 1.

$$\begin{aligned} u_{i2t} - u_{i1t} &= \beta_1(w_{i2t} - w_{i1t}) + \xi_{i2t} - \xi_{i1t} \\ &= \beta_1(w_{i2t} - w_{i1t}) + p_{i2t} - p_{i1t} + \mu_{i2t} - \mu_{i1t} \end{aligned} \tag{8}$$

Note that in regression (8) neither ability nor productivity shocks will affect $\hat{\beta}_1$. Moreover, taste differences are held constant because the parameter $\hat{\beta}_1$ measures how utility varies with the wage rate for the same individual. Thus, the test based on 'moonlighters' allows addressing individual heterogeneity in a way that is superior to the existing approaches. For instance, both state of the art papers, Brown (1980) and Duncan and Holmlund (1983), are based on a fixed-effects approach that fails in case there are shocks to individual productivity.

The remaining problem is match specific productivity p_{ijt}. We propose to control for job specific productivity by adding seniority with the current employer t_{ijt} to

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[7] See Altonji and Shakotko (1987) for a discussion of these types of productivity.

[8] Hamermesh (1999) demonstrates that the income elasticity of the job disamenity "risk of injury or illness" with respect to productivity is larger than unity in absolute terms.

the list of controls. Tenure is, arguably, a good predictor of match-specific productivity.

An important issue with this new idea to addressing individual heterogeneity concerns the potential selectivity of dual job holders. Moonlighters may be a non-random sample of the labor force. This poses a problem that is similar to that studied in the literature on the labor supply of married women (Mroz, 1987). Section 4 studies the potential selectivity of dual job holders.

Econometric implementation

In order to implement this test, however, information on how workers evaluate their jobs is crucial. While it is not possible to measure utility, an important summary measure for how workers value their jobs is job satisfaction. Job satisfaction is usually measured as an ordinal response to a question similar to the following

> "How do you feel about your job with [Name of employer]? Do you like it very much, like it fairly well, dislike it somewhat, or dislike it very much?"

If this self-reported job satisfaction measure is related to the utility workers derive from their job in a monotonically increasing way, the test becomes operational. The operational test will thus rely on data on job satisfaction for individual i in job j at time t, S_{ijt}.

$$
\begin{aligned}
S^*_{ijt} &= \lambda_0 + \gamma_1 w_{ijt} + \gamma_2 t_{ijt} + \varepsilon_{ijt} \\
S_{ijt} &= 1 \qquad S^*_{ijt} < k_1 \\
S_{ijt} &= 2 \quad k_1 < S^*_{ijt} < k_2 \\
&\dots \\
S_{ijt} &= J \qquad S^*_{ijt} > k_J
\end{aligned}
$$

The novel test will entail testing whether the estimate of γ_1 is zero.

Self-reported job satisfaction data is ordered response data. An appropriate model is the well-known ordered probit model. The problem with the ordered probit model is that it does not lend itself well to the discussion of individual heterogeneity or sample selection. Because these two issues are crucial to the analysis, the analysis focuses on the event that individual i reports that she or he "likes the job [j] very much" as opposed to not stating this response. Thus, the dependent variable in all analyses is L_{ijt}

$$L_{ijt} = I(S_{ijt} = J) = I(S^*_{ijt} > k_J) = I(S^*_{ijt} > 0) \ .$$

$I(.)$ is the indicator function and k_J is normalized to 0. This binary variable can be analyzed by means of the linear probability model, that is, by linear regression (Moffit, 1999). Thus, standard individual worker heterogeneity and sample selection correction methods that are available in the linear model can be used. Moreover, section 3 shows that the response "[*i*] like the job [*j*] very much" contains most of the variation in job satisfaction in our dataset.

3. Data and Descriptive Evidence

The empirical analysis is based on the National Longitudinal Survey of Youth that started in 1979. We use the four biannual waves between 1994 until 2000. In these years respondents were interviewed in detail on up to five different jobs that they held in the year preceding the interview.

We restrict the analysis to all jobs which are active at the date of the interview. This is crucial since the dependent variable is a self-reported subjective measure. Arguably, individuals may have some difficulty stating how they feel about a job they have not carried out for a while due to sick leave or that they have left for a new job. We exclude individuals with missing information on job satisfaction, tenure or education. The log of the hourly rate of pay is restricted to the range between 1 and 6.

The analysis is based on 8,145 individuals that generate 25,316 person-year observations. Thus, almost all individuals are observed in all four waves. There are 27,778 observations concerning up to five jobs per individual. Respondents held 1.1 jobs at the date of interview on average. In total there are 2,222 person-year observations on 1,413 dual job holders. The fraction of individuals holding at least two jobs simultaneously is roughly 8.7% (= 2,222 / 25,316). Paxson and Sicherman (1996) report a figure of 6% dual job holders in the past week (based on the CPS) or almost 20% of dual job holders in the past year (based on the PSID). Krishan (1990) finds that 4.9% of a sample of men in the SIPP are dual job holders. Given the fact that these four datasets cover different subpopulations the overall picture is that the rate of dual job holding in the NLSY is comparable to that reported in other datasets. However, because there is no information on job satisfaction pertaining to all jobs in the CPS, PSID, and SIPP the empirical analysis has to be based on the NLSY.

Table 1 reports the distribution of respondents' satisfaction with the job at the main employer.[9] Almost 48% of respondents like the job with their current main employer very much. The proportion of respondents liking their job fairly well is slightly smaller. And less than 10% of respondents dislike the job with their current main employer. The job satisfaction variable in the NLSY is almost binary the two outcomes being the respondent "likes the job very much" and the respondent

[9] The main employer is the current employer for those with one employer. It is the employer for whom the respondent worked the most hours for those with two or more employers. For those who worked the same number of hours with two employers, the main employer is the employer for whom the respondent worked the longest.

"does not like the job very much". The empirical analysis in section 4 is based on a binary variable reflecting these two outcomes.

Table 1

Satisfaction with the main job

like job very much	12094	47,77
like job fairly well	11309	44,67
dislike job somewhat	1440	5,69
dislike job very much	473	1,87
Observations	25316	100

Source: NLSY.

Table 2 reports the distribution of job satisfaction on the main and on the second job for dual job holders. The distribution of satisfaction with the main job closely resembles the distribution of job satisfaction in the entire sample. Moreover, satisfaction with the second job is very similar to satisfaction with the main job.

Table 2

Satisfaction with the main and second job
Dual job holders

	Main Job		Second Job	
like job very much	1075	48,38	1144	51,49
like job fairly well	969	43,61	926	41,67
dislike job somewhat	121	5,45	117	5,27
dislike job very much	57	2,57	35	1,58
Observations	2222	100	2222	100

Source: NLSY.

Figure 2 reports the fraction responding that they like the main job very well as a function of the logarithm of the hourly rate of pay in current US$.[10] As Section 2 argues there should be no relationship between job satisfaction and the wage rate if

10 Data on respondents' usual earnings (inclusive of tips, overtime, and bonuses but before deductions) have been collected during every survey year for each employer for whom the respondent worked since the last interview date. The actual responses of those respondents who report wages with an hourly time unit in the earnings question appear in this variable. For those reporting a time unit other than "per hour" in the initial earnings question, Center for Human Resource Research (who is in charge of the NLSY) calculates an hourly rate of pay.

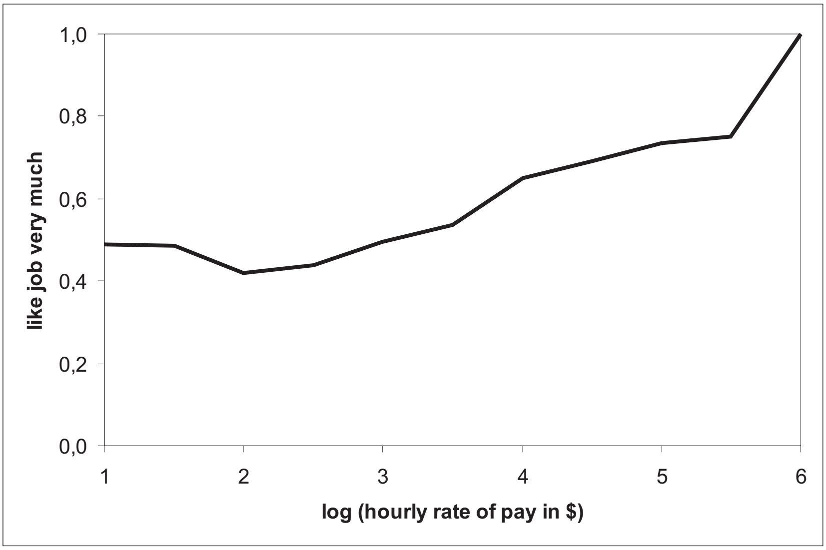

Figure 2: Job Satisfaction and the wage rate

wage differentials exist purely to compensate for differences in job amenities or disamenities and if unobserved heterogeneity plays no role. Figure 2 shows, however, that there is a strong positive relationship between the fraction of respondents liking their job very much and the logarithm of the hourly wage rate. The fraction of those who are very satisfied with their current main job increases from a level of about .4 when the log of the hourly rate of pay is 2 to about .8 at a log hourly rate of pay of 5. The increase in the fraction of those who are very satisfied per log point is roughly.

An important caveat to the descriptive analysis in figure 2 is unobserved productivity. Figure 3 addresses this problem. The horizontal axis shows the difference in the log of the hourly rate of pay in the second job and the corresponding value for the main job. The vertical axis shows the mean difference between satisfaction with the second job and satisfaction with the main job for dual job holders that experience a certain log wage differential. In this descriptive analysis, unobserved worker productivity can not play a role because it is based on job satisfaction and log wage information for the same individual. The difference in liking the job very much is slightly negative for negative wage differences and the opposite for positive wage differences. Clearly, the relationship between job satisfaction and the wage rate is still positive but considerably less strong than that in Figure 2.

The descriptive analysis in Figure 3 is only available for a sub sample of workers – dual job holders. Thus, it is important to investigate potential differences between dual job holders and the average worker in the sample. Table 3 reports the

Figure 3: Job difference in satisfaction and wage rate (Second job minus main job)

means of selected variables used in the empirical analysis for all workers, and for moonlighters.[11] The top panel of the table reports job information. The first two rows display the mean of the dependent variable used in the empirical analysis of section 4, the fraction of respondents liking their main (or second) job very much. This variable will be called "job satisfaction" henceforth. The third and fourth row report the average log hourly rate of pay. In the main job the log hourly wage rate is about 2.5, which translates to roughly 12 US$. The hourly wage rate of dual job holders in the main job is roughly 5 percentage points lower than the overall average wage rate. The hourly rate of pay in the second job is even lower than in the main job. The difference in the log rate of pay is about .10 or roughly 10 percentage points. Overall tenure in the main job is about 5.5 years. Job seniority with the main employer is slightly lower for dual job holders, whereas job seniority with the second employer is about 3 years which is considerably lower than the overall average tenure.

The middle panel in table 3 reports the means of years of schooling, female, ethnic group, age, and family situation. Dual job holders have slightly more years of schooling (13.5) than the average worker in the sample (13.2). They are to a slightly larger extent black and not married. The bottom panel reports household

[11] In the empirical analysis, we also use the additional characteristics family size, urban / rural, region (north, central, south, west), local unemployment rate (3% to 6%, 6% to 9%, 9% to 12%, 12% to 15%, 15% and higher), and year dummies.

Table 3

Descriptive Statistics

	All	Dual Job Holders
Job information		
Likes main job very much	0,478	0,484
Likes second job very much		0,515
log(hourly rate of pay) in main job	2,514	2,465
log(hourly rate of pay) in second job		2,376
tenure in main job	5,508	5,123
tenure in second job		3,274
Individual characteristics		
years of schooling	13,216	13,524
female	0,471	0,465
white	0,530	0,522
hispanic	0,186	0,174
black	0,284	0,304
age	35,902	35,983
single	0,213	0,229
– married	0,593	0,571
separated	0,052	0,051
divorced	0,141	0,149
Household characteristics		
family size	3,219	3,158
household is below poverty line	0,499	0,471
spouse works	0,066	0,045
Observations	25316	2222

Source: NLSY.

characteristics. Moonlighters tend to be from slightly smaller households, are more likely to have a non-working spouse and are not from poor households.

Table 3 suggests that there are no important differences between dual job holders and the average worker in the sample in terms of observable characteristics. This is perhaps not so surprising given the prevalence of dual job holding. While fewer than 10% of the workforce hold simultaneously at least two jobs at any given date, research by Paxson and Sicherman (1996) shows that about 50% of continuously working males will at some time during their career be a dual job holder. In our dataset, 1,413 individuals are dual job holders. More than 60% moonlight at just one of the four interview dates and less than 6% do so at all interview dates. Thus, dual job holding is not a persistent labor market state affecting a small group of workers. Nevertheless, section 4 discusses the potential selectivity of the moonlighter sample.

4. Results

This section applies the novel test for equalizing wage differentials on the labor market. The idea is that if wage differentials reflect purely differences in job characteristics, there should be no correlation between wages and job satisfaction.

Table 4 tests this hypothesis in a linear probability regression model. The specification in Column A is

$$L_{i1t} = \gamma_0 + \gamma_1 w_{i1t} + \gamma_3 ten_{i1t} + \varepsilon_{i1t} \tag{9}$$

The dependent variable L_{i1t} is the $0/1$ variable reflecting whether the respondent likes the main job (indexed by $j = 1$) very much. It is common to analyze $0/1$ variables with logit or probit models. We use the linear probability model because it is straightforward to allow for fixed-effects and for sample selection in linear models. None of the results is affected by the choice of estimation method, however. It is well known that the error term is heteroskedastic in the linear probability model. Therefore we report White (1980) standard errors which account for heteroskedasticity.

Column A in table 4 regresses job satisfaction on the log of the wage rate and on tenure. Tenure serves as a control for productivity on the job. Moreover, it is important include tenure with the current employer to control because respondents may like a new job better than a task they have performed for a while (Grund and Sliwka, 2001).

The coefficient on the log of the hourly rate of pay is positive and statistically significant. Individuals earning a higher wage are more likely to be very satisfied with their main job. A log point increase in the wage rate is associated with an increase in the probability liking their main job very much of about 11 percentage points. This is a strong effect in comparison with the average probability of liking one's job very much of about 50 percent. There is a negative, statistically significant relationship between tenure and job satisfaction. The quantitative importance of the effect of tenure on job satisfaction is lower: An increase by one standard deviation in the wage rate increases job satisfaction by 6.2 percentage points, whereas an increase by one standard deviation in tenure increases job satisfaction by 2.9 percentage points.

Column A in table 1 does not control for differences in worker productivity. Therefore, there is an upward bias in the estimate of the coefficient on the wage rate. Column B uses years of schooling to assess the size of this bias. The coeffi-

Table 4

Do Wages compensate for Job Disamenities?
Dependent variable: "like main job very much"

	(A)	(B)	(C)	(D)
Job characteristics				
log(hourly rate of pay)	0.108	0.096	0.092	0.091
	(0.006)***	(0.006)***	(0.007)***	(0.020)***
years of tenure	-0.006	-0.006	-0.007	-0.007
	(0.001)***	(0.001)***	(0.001)***	(0.002)***
Individual characteristics				
years of schooling		0.007	0.007	0.004
		(0.001)***	(0.001)***	(0.005)
female			0.033	0.038
			(0.006)***	(0.022)*
hispanic			0.028	0.030
			(0.009)***	(0.032)
black			-0.044	0.028
			(0.008)***	(0.027)
age			0.030	-0.056
			(0.020)	(0.068)
age squared / 100			-0.036	0.079
			(0.028)	(0.093)
married			0.048	0.034
			(0.009)***	(0.035)
separated			0.049	-0.135
			(0.015)***	(0.051)***
divorced			0.007	-0.079
			(0.011)	(0.035)**
Household characteristics				
family size			0.000	0.002
			(0.002)	(0.008)
spouse works			-0.007	-0.026
			(0.008)	(0.027)
household below poverty line			-0.002	0.054
			(0.013)	(0.054)
Additional Characteristics	Yes	Yes	Yes	Yes
Constant	0.240	0.179	-0.492	1.263
	(0.014)***	(0.019)***	(0.361)	(1.215)
Observations	25316	25316	25316	2222
R-squared	0.02	0.02	0.03	0.04

Notes: White standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional characteristics are degree of urbanization, region, local unemployment rate, year dummies.

Source: NLSY, own calculations.

cient on the wage rate drops slightly to about 9.5 percentage points. However, there is still a positive and significant relationship between wages and job satisfaction.

Column C in table 4 adds the remaining control variables. There is a further small drop in the estimate of the coefficient on the wage rate. Still, there is a significantly positive correlation between wages and job satisfaction suggesting the presence of rents on the labor market. With respect to the control variables, table 4 shows that an additional year of schooling increases job satisfaction by .7 percentage points. Females are more satisfied with their current main job than males, a fact that has been studied by Clark (1997). Hispanics like their job better and blacks like their job less than whites. There is no effect of age on job satisfaction. This may be due to the particularity of NLSY sample covering a specific age cohort. Respondents who are married or separated tend to like their current job better than singles or divorced respondents. None of the household characteristics affect the probability of "liking one's main job very much".

Column *D* in table 4 reports the determinants of satisfaction with the current main job for dual job holders as an informal check for selectivity. If moonlighters evaluate job satisfaction differently than the average worker, one would expect that the coefficient estimates differ between column C and column D. Results indicate that the model describing dual job holders' satisfaction with the main job is similar to the model describing the average workers' satisfaction with the current job. An exception is marital status. While separated respondents in the entire sample are more satisfied with the current job than singles, the opposite is true for moonlighters. Moreover, divorced respondents in the entire sample are estimated to have roughly the same job satisfaction as singles. In the dual job holder sample, divorced respondents are significantly less satisfied with the current job than singles.

Unobserved worker heterogeneity

It is crucial for the proposed test of the theory of equalizing differences that worker productivity is held constant. It is unlikely that years of schooling capture all relevant differences in productivity across workers. Moreover, unobserved worker productivity will generate a positive correlation between wages and job satisfaction even if the theory of equalizing differences holds for the labor market. This is because more productive workers will sort into better jobs paying a higher wage and offering fewer disamenities.

Table 5 reports the regression of job satisfaction on the log of the hourly rate of pay and tenure allowing for person-year fixed effects. This means that only the difference between the second and the main job in job satisfaction, wage rate and tenure for the same individual at the same time is used to perform the proposed test of the theory of equalizing differences. The specification is

$$\underbrace{L_{i2t} - L_{i1t}}_{\tilde{L}_{it}} = \gamma_1 (\underbrace{w_{i2t} - w_{i1t}}_{\tilde{w}_{it}}) + \gamma_2 (\underbrace{ten_{i2t} - ten_{i1t}}_{\tilde{ten}_{it}}) + \underbrace{\varepsilon_{i2t} - \varepsilon_{i1t}}_{\tilde{\varepsilon}_{it}} \tag{10}$$

The main advantage of this test the dependent variable is does not contain any individual specific unobserved characteristic, such as worker productivity or tastes, as has been shown in section 2.

Table 5

Do Wages compensate for Job Disamenities?
Unobserved heterogeneity and Sample Selection
Dependent variable: Difference in „like job very much“

	(A)	(B)
log(hourly rate of pay)	0.049	0.050
	(0.021)**	(0.021)**
years of tenure	-0.008	-0.008
	(0.002)***	(0.002)***
Person-year fixed effects	Yes	Yes
Sample selection correction	No	Yes
Constant	0.021	-0.167
	(0.014)	(0.213)
Observations	2222	2222
R-squared (within)	0.01	0.01
F(11, 2208)		0,95

Notes: White standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Cosslet (1984) semiparametric sample correction method. Step function allows for 11 steps.
Source: NLSY, own calculations.

Column A in table 5 shows that there is a positive, statistically significant increase in job satisfaction associated with a wage increase. The estimated coefficient implies a 5 percentage point increase in the fraction being very satisfied with their job for each log point increase in the wage rate. One interpretation of these results is that unobserved worker productivity did affect results in table 4 in a quantitatively important way. In table 4, the increase in job satisfaction due to a log point increase in the wage rate was estimated to be almost twice as strong. Nevertheless, it is not possible to reject the presence of rents even when controlling for individual heterogeneity in a comprehensive way.

Sample Selection

A second interpretation of the findings in table 5 is that the relatively small sample of dual job holders may be selective. The dependent variable in (10) is observed only for dual job holders. Define the indicator variable M_{it} as taking the value 1 if respondent i is a dual job holder at time t. The conditional expectation of the change in job satisfaction is

$$E(\tilde{L}_{it}|\tilde{w}_{it}, \tilde{ten}_{it}, M_{it} = 1) = \gamma_1 \tilde{w}_{it} + \gamma_2 \tilde{ten}_{it} + E(\tilde{\varepsilon}_{it}|\tilde{w}_{it}, \tilde{ten}_{it}, M_{it} = 1) \ .$$

Suppose the state of holding at least two jobs simultaneously is determined as follows

$$M_{it}^{*} = x_{it},\lambda + \eta_{it}$$
$$M_{it} = I(M_{it}^{*} > 0)$$

where x_{it} is a vector of variables affecting the decision to hold at least two jobs. The conditional expectation of the error term in the outcome equation is

$$E(\tilde{\varepsilon}_{it}|\tilde{w}_{it}, \tilde{ten}_{it}, M_{it} = 1) = E(\tilde{\varepsilon}_{it}|\tilde{w}_{it}, \tilde{ten}_{it}, x_{it}, \lambda > \eta_{it})$$

This expression is non-constant if the error term in the moonlighter equation η_{it} and the error term in the (difference in) job satisfaction equation $\tilde{\varepsilon}_{it}$ are correlated.

The standard sample correction method developed by Heckman (1974) assumes that both error terms are jointly normal. This assumption is clearly violated in the present application. The dependent variable in the (difference in) job satisfaction equation can only take three values –1, 0, 1. However, Cosslet (1990) developed a semiparametric approach to sample selection that does not place any assumptions on the joint distribution of the error terms. The idea is to recognize that the conditional expectation of $\tilde{\varepsilon}_{it}$ is a function of the probability of being a dual job holder. Thus, if this probability is estimated consistently, one can introduce this probability as an additional regressor in the outcome equation in order to control for sample selection. The approach is semiparametric because it allows for an arbitrary way in which the probability of moonlighting enters the outcome equation. The approach suggested by Cosslet involves specifying a step function of this probability and to ensure that the number of steps grows asymptotically at the right speed. This gives a consistent estimator of the parameters of the outcome equation. Moreover, the asymptotic distribution of this estimator is known (Newey, 1988).

In order to control for sample selection it is important to have valid instruments, i.e. variables that determine dual job holding that do not enter directly the outcome equation. In this application, we can use as instruments all non-job specific characteristics. The reason is that they may enter the job satisfaction equation in levels. The outcome equation here is the difference in job satisfaction between the second and the main job. This means that all non-job specific characteristics do not enter the outcome equation directly.

Table 6 reports the estimated probit model for holding at least two jobs simultaneously. The dependent variable is the indicator variable taking the value 1 if person *i* is a dual job holder at time *t*, and 0 otherwise. We include all non-job specific characteristics as regressors. Years of schooling increase the probability of being a dual job holder significantly. The effect is quantitatively important. A one standard deviation increase in schooling increases the probability of being a dual job holder by 3 percentage points. Respondents from poor households and respondents with a working spouse are less likely to hold at least two jobs simultaneously. While the other characteristics are not significant at the 5% level, the likelihood ratio test of overall significance indicates that the instruments are not weak.

Table 6

The determinants of dual job holding
Dependent Variable: Respondent is dual job holder
Probit estimates

years of schooling	0.029 (0.005)***
female	-0.014 (0.023)
hispanic	-0.006 (0.034)
black	0.056 (0.029)*
age	-0.113 (0.072)
age squared / 100	0.166 (0.100)*
married	-0.034 (0.038)
separated	-0.019 (0.055)
divorced	0.011 (0.038)
family size	0.002 (0.009)
spouse works	-0.060 (0.029)**
household below poverty line	-0.202 (0.052)***
Additional Characteristics	Yes
Constant	0.278 (1.298)
Observations	25316
Log-likelihood	-7482.1671
Test of significance (LR, chi2(22))	71,61

Notes: Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional characteristics are degree of urbanization, region, local unemployment rate, year dummies.

Source: NLSY, own calculations.

Table 5 Column B reports the estimated relationship between (differences in) wages and (differences in) job satisfaction controlling for sample selection. The specification is

$$\tilde{L}_{it} = \gamma_1 \tilde{w}_{it} + \gamma_2 \tilde{ten}_{it} + \gamma_3 I(.05 < \hat{p}_{it} < .06) + \gamma_4 I(.07 < \hat{p}_{it} < .08) + \ldots + \gamma_{13} I(\hat{p}_{it} > .15) + \tilde{\varepsilon}_{it}$$

Thus, a step function with 11 steps was added to the regression reported in table 5 column A.[12] The estimated effect of wages on job satisfaction is even slightly larger than that reported in table 5 column A that does not correct for sample selectivity. Moreover, the F-test that assesses whether it is necessary to control for the probability of being a dual job holder is insignificant. Thus, results suggest that there is no sample selection. A potential reason why sample selection is not important in this application is the fact that the outcome equation here is the difference between two outcome variables. Thus, taking this first difference may remove many of the unobserved determinants of job satisfaction that are correlated with unobservables in the dual job holder equation. Moreover, the state of holding at least two jobs is relatively common in the U.S. labor market.

Two previous studies have addressed sample selection for wages and hours in the moonlighter context using Heckman type selectivity correction models (Prishan, 1990; Conway and Kimmel, 1998). Both studies do not find that the correction for selectivity is important for wages. Sample selection correction is important for hours. Thus, our findings regarding job satisfaction are – at least partly – consistent with previous results.

Results that account for unobserved productivity and sample selection indicate that high wages reflect rents as well as compensation for job disamenities. The theory of equalizing differences predicts that an increase in the wage rate should result in a zero effect on job satisfaction. Our results show that increasing the wage rate by one standard deviation raises job satisfaction by 3 percentage points. This effect is statistically significant but relatively small considering the overall average job satisfaction of almost 50%.

Industry and firm size wage effects

A substantial literature in labor economics addresses the question whether the observed persistent wage differentials across industries are indicative of the presence of rents or compensating wage differentials (Krueger and Summers, 1988). A related literature addresses the question whether the firm size wage effect constitutes a rent or whether working in a big firm is a disliked feature of one's job which must be compensated (Brown and Medoff, 1989).

Within this new framework for testing for compensating wage differentials these important issues can be analyzed in a straightforward way. The idea is to introduce

[12] Experimentation with the number and width of the steps indicates that neither affect results.

controls for the respondents' industry or firm size, respectively. If the wage premium associated with working in a particular industry purely compensates for onerous work conditions, the estimated coefficient on the wage rate must increase when an industry indicator is added. In the regression with controls for the industry, the coefficient on the wage rate reflects the marginal effect of wages on job satisfaction holding job conditions constant.

The probability limit of the coefficient on the wage rate in a regression that does not control for industry can be decomposed as follows

$$p\lim\hat{\gamma}_1 = \gamma_1 + \delta_1\frac{\text{cov}(\hat{\tilde{w}},\tilde{I}_1)}{\text{var}(\hat{\tilde{w}})} + \delta_2\frac{\text{cov}(\hat{\tilde{w}},\tilde{I}_2)}{\text{var}(\hat{\tilde{w}})} + \ldots + \delta_k\frac{\text{cov}(\hat{\tilde{w}},\tilde{I}_k)}{\text{var}(\hat{\tilde{w}})}$$

γ_1 is the wage effect on job satisfaction in the regression that controls for industry, $\hat{\tilde{w}}$ is the residual from regressing $\tilde{w}$ on $\tilde{ten}$, and $\tilde{I}_1$ is the job difference of the indicator of industry 1. The industry effect on job satisfaction δ is negative for "bad" industries and positive for "good" industries. $\text{cov}(\hat{\tilde{w}},\tilde{I})/\text{var}(\hat{\tilde{w}})$ is the coefficient from regressing the job difference of the industry dummy on $\tilde{w}$. It is positive for high wage industries, and negative for low wage industries. if wages purely compensate for work conditions, "bad" industries with negative δ will have positive wage differentials, implying positive $\text{cov}(\hat{\tilde{w}},\tilde{I})\text{var}(\hat{\tilde{w}})$. In "good" industries with positive δ, the wage differential will be negative. This implies that the product of the industry job satisfaction effect δ with $\text{cov}(\hat{\tilde{w}},\tilde{I})\text{var}(\hat{\tilde{w}})$ is negative in all industries. Thus, the wage effect on job satisfaction γ_1 when controlling for industry must exceed the wage effect when omitting industry $\hat{\gamma}_1$ if industry wage differentials equalize utility across industries.

Table 7 Column A reports the estimated effect of wages on job satisfaction when industry dummies are added to equation (10). No correction for sample selectivity was added. The estimated effect of wages on job satisfaction decreases when compared to table 6 column A and becomes statistically insignificant. This is inconsistent with the view that industry wage differentials primarily reflect compensation for work conditions. If this were the case, the estimated effect of wages on job satisfaction would have increased to reflect more closely the marginal effect of wages on job satisfaction. Thus, it must be the case that there exist "really good" industries with positive industry job satisfaction and wage effect. Also, there may be "really bad" jobs with negative industry job satisfaction and wage effect.

Figure 4 displays a scatter plot of δ versus the industry wage differential across 189 3-digit industries. Recall that the industry wage differential is a reweighed version of $\text{cov}(\hat{\tilde{w}},I)\text{var}(\hat{\tilde{w}})$. We prefer to report the industry wage differential because it has a straightforward interpretation. The top left panel contains industries where low wages reflect compensation for "good" work conditions. The largest five industries in this category are "Elementary and secondary schools",

Table 7

Firm-size and industry
Rents vs. compensating wage differentials.
Dependent variable: Difference in „like job very much"

	(A)	(B)
log(hourly rate of pay)	0.030	0.055
	(0.022)	(0.020)***
years of tenure	-0.005	-0.005
	(0.003)*	(0.002)**
log(firm size)	–	-0.029
	–	(0.005)***
Industry fixed effects	Yes	No
Person-year fixed effects	Yes	Yes
Sample selection correction	No	No
Constant	0.030	-0.003
	(0.017)*	(0.014)
Observations	2222	2222
R-squared (within)	0.12	0.03

Notes: White standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: NLSY, own calculations.

"Colleges and universities", "Real estate, incl. real estate-insurance-law offices", and "Employment and temporary help agencies". The bottom right panel displays industries which pay a wage premium to compensate for bad work conditions. The top five industries are "Hospitals", "Trucking service", "Motor vehicles and motor vehicle equipment", "Printing, publishing, and allied industries, except newspapers", and "Legal services". Out of a total of 189 industries for which we can identify job satisfaction and wage differentials, there are 84 industries that are consistent with the theory of equalizing differences.

The top right panel and the bottom left panel contain industries which are strongly at odds with compensating wage differentials. The top right industries pay high wages but work conditions (as reflected in the job satisfaction differential) are "good". The five largest "really good" industries are "Insurance", "Business services, not elsewhere classified", "Banking", "Postal service", and "Telephone (wire and radio)". The bottom left industries are also at odds with competitive theory of the labor market. Work conditions are bad and wages do not compensate for this fact. The five largest of these "really bad" industries are "Special trade contractors", "Eating and drinking places, "Grocery stores", "Convalescent institutions", and "Department and mail order establishments". In total, there are 67 "really bad" and 38 "really good" industries, thus more than one half of all industries are inconsistent with the theory of equalizing differences.

Table 7 column B reports the estimated effect of wages on job satisfaction when controlling for firm size. Again, if firm size wage differentials primarily reflect compensation for bad work conditions (such as reduced autonomy, increased monitoring, etc.) one would expect that the estimated effect of wages on job satisfaction increases. Results show that there is indeed a slight increase in the estimated effect of wages on job satisfaction. The change in the estimated coefficient is, however, not statistically significant. This result is consistent with firm size wage differentials reflecting both, compensation for bad work conditions and the presence of rents.

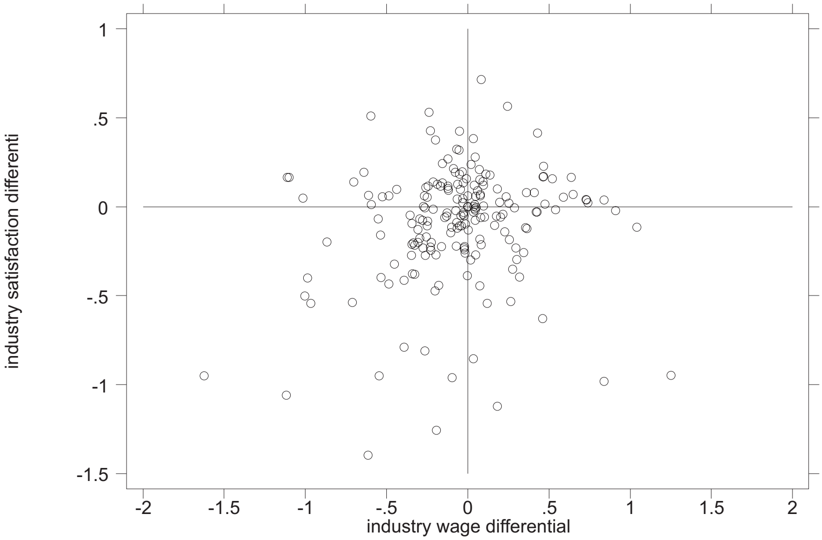

Figure 4: Estimated satisfaction differential vs. wage differential across 3 digit industries

5. Conclusions

The theory of equalizing differences is a simple, parsimonious and complete theory of the wage structure. The theory holds that wage differentials for equally productive workers reflect merely differences in work conditions. The empirical content of this theory has proven difficult to assess. There are mainly two problems in applications. First, it is not possible to measure all relevant work conditions. Second, conventional labor force data is not rich enough to allow for satisfactory control for unobserved differences across individuals. Yet, assessing the empirical content of the theory is important. For instance, cost-benefit studies of occupational safety regulation measure the benefits to such regulation by assessing the compensating wage differential for workplace risk of injury or illness.

This paper suggests a novel test of the theory of equalizing differences. The test is based on satisfaction with the current job and only one relevant characteristic of this job, such as the wage rate. If wage differentials purely reflect compensation for work conditions workers are indifferent between jobs. The new test of the theory of equalizing differences consists of simply regressing job satisfaction on the wage rate.

In contrast to the previous literature this paper directly tests the central prediction of the theory of equalizing differences. Second, it is necessary to measure only one single job characteristic in order to apply the test. Third, we suggest a novel way to address the problem of unobserved worker heterogeneity. In order to control for unobserved worker characteristics, this paper uses data on individuals who are observed simultaneously in at least two jobs – moonlighters. Finally, the novel test of the theory of equalizing differences lends itself well to addressing the important question whether industry and firm size wage differentials reflect rents or compensation for work conditions.

Results indicate that wage differentials do not solely reflect compensation for work conditions. Workers systematically prefer jobs that pay a high wage rate to jobs that pay a lower wage rate even when we control for the most important differences across workers. The estimated effect of wages on job satisfaction is, however, relatively small suggesting that rents are present but not of substantial magnitude. Second, results indicate that industry wage differentials reflect the presence of rents on the labor market rather than compensation for work conditions. Finally, the firm size wage effect is both, a compensation for bad work conditions as well as a rent.

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