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**WAS ADAM SMITH RIGHT, AFTER ALL?
ANOTHER TEST OF THE THEORY OF
COMPENSATING WAGE DIFFERENTIALS**

by

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Introduction*

Few propositions in labor economics have more appeal than Adam Smith's statement about compensating wage differentials: "The whole of the advantages and disadvantages of the different employments of labour and stock must, in the same neighbourhood, be either perfectly equal or continually tending to equality. If in the same neighbourhood, there was any employment evidently either more or less advantageous than the rest, so many people would crowd into it in the one case, and so many would desert it in the other, that its advantages would soon return to the level of other employments" (Smith, 1961, p. 111).

This proposition has, however, shown surprising resilience to empirical confirmation. Brown (1980) reviews much of this empirical literature and concludes (p.118) that while there is "some clear support for the theory", there are also "an uncomfortable number of exceptions". Smith's review (1979) distinguishes risks of death or injury on a job from less extreme aspects, such as repetitive or fast-paced work, to which workers may not be sufficiently averse to establish compensating wage differentials in the labor market. He concludes (p.347) that "tests of the theory of compensating wage differentials ... are inconclusive with respect to every job characteristic except the risk of death".

Various reasons are given for this spotty pattern of support. Most of the authors of the empirical work on compensating wage differentials have attempted to estimate their magnitude by adding a set of working condition measures to a standard cross-sectional human capital earnings function. The working condition measures are of two types, both prone to substantial amounts of measurement error. The first type are survey reports from the workers themselves about the working conditions they face. There is a dubious correspondence between these reports and the objective conditions faced by workers, partly because workers may be uninformed about the true risks they face, and partly because the questions posed in many of the survey instruments are often very vague and give respondents too much of an opportunity to interpret the questions in a different way from what the researcher intended. Thus "excessive" noise or "hazardous" conditions may mean different things to different respondents. Methodological work has shown little reliability in some of the typical question sequences regarding working conditions (Quinn, 1977).

Other studies use more objective data on, e.g., occupational or industrial death or injury rates from independent sources and then match this information to individual survey respondents based on the respondent's own report of occupation or industry. The errors in assigning the <u>average</u> characteristic to all <u>individual</u> respondents in a given occupation or industry are obvious. Errors can also arise when the respondents misreport occupation or industry, or when the reports are miscoded.

Another set of criticisms of the conventional tests for compensating wage differentials rests on the inability of typical cross-sectional data sets to control adequately for all relevant worker characteristics. If important but typically unmeasured characteristics such as "motivation" and "intelligence" leads to both higher pay and better working conditions, then the omission of measures of these characteristics may well bias the estimated relationship between wages and working conditions. Brown (1980) makes this argument and attempts to control for the effects of unmeasured personality factors by estimating what amounts to a wage change equation from panel data rather than a wage level equation from cross-sectional data. His working condition variables are assigned from independent data sources, rather than being self-reported, and his results show little consistent evidence of compensating wage differentials.

In this paper, we engage in yet another attempt to test for the presence of compensating wage differentials in the labor market. Like Brown, we use panel data to estimate a wage change equation to control for the effects of unmeasured and unchanging characteristics of workers. Unlike Brown, however, we use direct survey reports by workers themselves of the working conditions they face, obtained from a representative sample of Swedish men in 1968 and 1974. We argue that just as the change formulation eliminates the confounding effects of unmeasured worker characteristics related to productivity, so too does it reduce the effects of the persistent tendencies of the respondents to apply different frames of reference to questions regarding working conditions. So while the problems of reporting error may plague a cross-sectional analysis, an analysis that relates self-reported changes in working conditions to changes in wages will give less biased estimates of the compensating differentials. This enhanced reliability is not a feature of panel analyses that use outside data sources on working conditions.

Our results show a marked improvement in the reasonableness of the estimates of compensating wage differentials in going from cross-sectional to panel data. In a single wave of the panel data we use, half of the estimated coefficients on the working condition variables have the "wrong" sign. In the estimates based on two panel waves, however, all of these coefficients change in the "right" direction and some attain statistical significance at conventional levels. The effect of an index of dangerous working conditions estimated in the cross-section is virtually nill, but the index shows a highly significant compensating wage differential in the panel estimates. Indicators of stressful working conditions also appear to lead to compensating wage differentials, while indicators of hard physical work and constrained working hours do not. Our longitudinal estimates are quite robust within various major subgroups in the labor market.

Our analysis is detailed in three sections. In the first, theoretical and empirical issues involved in the estimation of compensating wage differentials are spelled out. In the second section, the data are described and estimates from both cross-sectional and longitudinal models are presented and compared. The results are summarized in the third section.

The Model

The theory of compensating wage differentials rests on the theory of hedonic prices. Rosen (1974) provides a general discussion of this theory; Smith (1979) and Thaler and Rosen (1975) apply Rosen's framework to the issue of compensating wage differentials. Firms with different production technologies in a given labor market are seen as facing different opportunities for trading off wage costs and the costs of supplying different amounts of working conditions at a given level of profit. In labor market equilibrium, there is an envelope of the zero profit iso-profit curves that establishes the combinations of wages and working conditions from which workers may choose. Worker preferences regarding these job dimensions will govern these choices, although the relationship between wages and working conditions observed in a properly specified cross-sectional wage regression is, at best, an estimate of the market envelope curve and not the underlying supply curves of firms or the demand curves of workers.

To motivate the stochastic specification of the model we wish to estimate, we begin with a human capital earnings model, augmented with measures of working conditions (J) and unobserved productivity-related characteristics of workers (Z):

(1) $W_i = f(\underset{\sim}{X}_i, \underset{\sim}{J}_i, \underset{\sim}{Z}_i, u_i)$

where

W_i is the hourly wage rate of the i^{th} individual

$\underset{\sim}{X}_i$ is a vector of observed, productivity-related characteristics, of the i[th] individual

$\underset{\sim}{J}_i$ is a vector of the characteristics of the i[th] worker's job, scaled so that higher values on the J indicate "worse" working conditions

$\underset{\sim}{Z}_i$ is a vector of unobserved productivity-related factors

u_i is a stochastic error term

The human capital model is chosen as the basis for this model because the tradeoff between wages and working conditions is presumed to hold for workers with similar productivity. As pointed out by Smith (1979), there is no compelling reason to believe that f(.) is either log-linear or additive. Cost conditions may lead to a linear or parabolic relationship between working conditions and wages, or to differently shaped relationships for different classes of workers in the labor market. We address these possibilities in our empirical work, but ignore them now by specifying a log-linear and additive version of Eq. (1) at time t, with single X, Z and J variables, and a suppressed individual subscript:

$$(2) \quad \ln W_t = \beta_0 + \beta_1 X_t + \beta_2 Z_t + \beta_3 J_t + u_t$$

with the conventional assumptions that $u_t \sim N(0, \sigma_u^2)$ and u_t is uncorrelated with X_t, Z_t, J_t.

Several problems interfere with the unbiased estimation of β_3 with conventional sets of micro-data. First, the Z variable is not observed and, as discussed earlier, will likely bias the estimates of the crucial parameters. Second, and also discussed above, the J variable is measured with considerable error. There are errors of aggregation, miscoding and mismatching if independent data sources are used for measuring the working condition variable, and errors of misinformation, misreporting and misinterpretation if respondents are relied upon to report their own working conditions.

Let us build these measurement errors explicitly into the model by assuming that:

$$(3) \quad J_t^* = J_t + \varepsilon_t$$

where J_t^* is the observed amount of working condition at time t, $\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$.

The substitution of (3) into (2) can be used to show the conditions under which unobserved individual characteristics and measurement errors will affect the consistency of the estimated effects of J_t on ln W. We have then the estimating equation as

$$(4) \quad \ln W_t = \beta_0 + \beta_1 X_t + \beta_3 J_t^* + u_t^*$$

where $u_t^* = \beta_2 Z_t + u_t - \beta_3 \varepsilon_t$.

Assume that the measurement error is uncorrelated with the true values of the RHS variables as well as with the error term u_t, i.e.,

$$Cov(X_t, \varepsilon_t) = Cov(Z_t, \varepsilon_t) = Cov(J_t, \varepsilon_t) = Cov(u_t, \varepsilon_t) = 0$$

The probability limit of the OLS-estimate of β_3 is then

(5) $$\text{plim}\ (\hat{\beta}_3) = \frac{\beta_3 + \beta_2 b_{zj \cdot x}}{1 + Var(\varepsilon_t)/Var(J_t)}$$

where $b_{zj \cdot x}$ is the regression coefficient of J when Z is the dependent variable (and X is included in the equation).

There are two sources of inconsistency affecting the estimate of β_3, the first one due to the measurement error and the other due to the correlation between the omitted Z-variable and the working conditions variable.

Consider now the change version of Eq.(4). Suppose that both the structure of the relationship and the Z characteristics are unchanged between t-1 and t. The wage change equation is then

(6) $$\Delta \ln W = \beta_1 \Delta X + \beta_3 \Delta J^* + \eta$$

where $\eta = u_t - u_{t-1} - \beta_3(\varepsilon_t - \varepsilon_{t-1})$.

Assume that the measurement errors are correlated over time according to

(7) $$\varepsilon_t = \rho \varepsilon_{t-1} + v_t$$

The probability limit of the OLS-estimate of the crucial parameter β_3 is then

(8) $$\text{plim}\ (\hat{\beta}_3) = \frac{\beta_3}{1 + (1-\rho)Var(\varepsilon)/Var(\Delta J)}$$

where $Var(\Delta J) = Var(J_t) + Var(J_{t-1}) - 2Cov(J_t, J_{t-1})$.

The difference between the estimated and the true value of the parameter is increasing with the ratio of the error variance to the variance of ΔJ. It is also increasing with lower autocorrelation between the measurement errors; in the special case with "perfect" autocorrelation ($\rho = 1$), the OLS-estimate is consistent.

The case for our change formulation has several sources, as should be obvious from a comparison of (5) and (8). First, the differencing procedure removes the bias due to unobserved individual fixed effects. Secondly, because of autocorrelation in measurement errors, it reduces the impact of any given size of the variance in measurement errors. The importance of measurement errors is, finally, also reduced if the inequality $Var(J_t) < Var(\Delta J)$ holds.

Consider now the nature of measurement errors in the J variables, first for the case where the J variables are measured with outside information matched on the basis of occupation and industry. Positive or negative changes in these working condition measures will occur when the respondent reports working in a different occupation or industry or when his description of the same job is coded differently between the two points in time.[1] It is unlikely that measurement error due to aggregation or miscoding will be highly correlated over time. But with respondent self-reports of working conditions there will likely be persistent tendencies of some respondents to over- or under-state "true" working conditions. Thus the differencing procedure is "bias-reducing" to a larger extent when self-reported working conditions are used, compared to estimates based on matched, independent information of working conditions.

The Data

The data for our analysis are taken from the Swedish Level of Living Surveys of 1968 and 1974. Those surveys, conducted by the Swedish Institute for Social Research, cover a wide array of personal and occupational characteristics, including a set of unusually precise questions on working conditions. The individuals in the sample represent all kinds of economic activity, from manufacturing industry to government services. Our analysis is confined to male employees with positive wages at both surveys. As is well known, male and female earnings functions appear to exhibit structural differences and the intermittent nature of female labor force participation makes a wage change analysis more difficult for them.

A summary description of the data is given in Appendix A and B. After having excluded a few persons with uncertain wage statements and various other non-responses, the final sample consisted of 1,226 workers. The data were forced to fulfil obvious consistency requirements. Changes in years of schooling and experience were placed in the interval 0 - 6; negative values were set at zero and values greater than 6 were set equal to 6. Changes in squared experience were also forced to consistency.[2] (We did not include any variable for union status. The overwhelming majority of Swedish employees are union members and union wage negotiations are in general decisive for non-members as well).

The working conditions variables were grouped into four broad categories:

$\underset{\sim}{J}_1$ = Hours Constraints = {Inflexible hours, punch clock, difficult to run errands}

$\underset{\sim}{J}_2$ = Hard Physical Work = {Heavy lifting, otherwise physically demanding, daily sweating}

$\underset{\sim}{J}_3$ = Dangerous Work = {Noise, smoke, shake, poison}

$\underset{\sim}{J}_4$ = Stressful Work = {Mentally demanding, hectic}

Empirical results

Our estimations include wage level equations as well as wage change equations. In the wage level equations, the elements of the four J-vectors were included, first, as separate regressors. This implies the use of dummy variables for 12 different job characteristics. Secondly, we computed indices of the form

$$\underset{\sim}{J}_i = \sum_{j=1}^{k} J_{ij} \qquad (i=1-4)$$

where J_{ij} is job characteristic j of the vector $\underset{\sim}{J}_i$. By using those indices as regressors, equality restrictions on the individual elements of the $\underset{\sim}{J}$-vectors are imposed.

In the wage change equations, we first included <u>changes</u> in the 12 working condition variables. Next, we included changes in the J-indices, i.e.,

$$\Delta\underset{\sim}{J}_i = \sum_{j=1}^{k} J_{ijt} - \sum_{j=1}^{k} J_{ijt-6} \qquad (i=1-4)$$

where t and t-6 refer to 1974 and 1968, respectively. Since all J-variables are scaled so that higher values mean worse conditions, it is clear that our a priori expectation is to find positive coefficients on all J-related variables.

Table 1 displays the basic results. The first three columns give estimates of the 1974 wage level equations. The last three columns present estimates from wage change equations. Estimates of the 1968 wage level equations are given in Appendix C.

Comparing, first, columns (1) and (4), we can note that the basic human capital earnings model have expected effects both in the level version and in the differenced form. Increases in years of education and work experience are major explanatory factors for wage growth. Married workers have higher wage rates (and a "positive" change in marital status implies higher wage growth). Job changes and more supervisory responsibilities also imply higher wage growth. Unemployment experiences do not appear to affect wage growth.[3]

Turning next to the working conditions variables, we find a disturbing number of cases with wrong-signed coefficients in the wage level equation. In fact, out of 12 working conditions variables, 6 show up with unexpected negative coefficients. In two cases - "difficult to run errands" and "heavy lifting" - the wrong-signed coefficients are even significant at conventional levels. Overall, it appears [from column (3)] as if hours constraints and hard physical work are associated with lower wage rates, clearly at variance with the theoretical predictions. It seems, furthermore, as if

Table 1 Estimated wage level and wage change equations. Standard errors in parentheses

	Dependent variable: ln(1974 wage) Independent variables measured at 1974 levels			Dependent variable: ln(1974 wage) - ln(1968 wage) Independent variables measured as change from 1968 to 1974		
	(1)	(2)	(3)	(4)	(5)	(6)
Hours Constraints			-0.015 (0.007)*			-0.006 (0.008)
Inflexible hours		-0.013 (0.016)			0.002 (0.017)	
Punch clock		0.017 (0.014)			0.020 (0.018)	
Difficult to run errands		-0.047 (0.014)**			-0.036 (0.015)*	
Hard Physical Work			-0.023 (0.007)**			-0.007 (0.008)
Heavy lifting		-0.053 (0.015)**			0.010 (0.017)	
Otherwise physi cally demanding		-0.022 (0.015)			-0.014 (0.016)	
Daily sweating		0.012 (0.714)			-0.012 (0.018)	
Dangerous Work			-0.001 (0.006)			0.022 (0.007)**
Noise		-0.004 (0.017)			0.038 (0.017)*	
Smoke		0.002 (0.016)			0.031 (0.017)*	
Shake		0.030 (0.020)			0.010 (0.022)	
Poison		-0.022 (0.015)			0.002 (0.017)	

Table 1, continued

	(1)	(2)	(3)	(4)	(5)	(6)
Stressful Work			0.033 (0.009)**			0.034 (0.010)**
Mentally demanding		0.047 (0.014)**			0.046 (0.016)**	
Hectic		0.018 (0.014)			0.020 (0.015)	
Control Variables						
Education	0.043 (0.002)**	0.039 (0.002)**	0.039 (0.002)**	0.020 (0.006)**	0.020 (0.006)**	0.020 (0.006)**
Experience	0.016 (0.002)**	0.016 (0.002)**	0.016 (0.002)**	0.019 (0.006)**	0.018 (0.006)**	0.018 (0.006)**
$(\text{Experience})^2/$ 1 000	-0.251 (0.040)**	-0.239 (0.040)**	-0.248 (0.040)**	-0.455 (0.067)**	-0.409 (0.068)**	-0.427 (0.067)**
Married	0.064 (0.017)**	0.054 (0.017)**	0.056 (0.017)**	0.093 (0.021)**	0.091 (0.021)**	0.089 (0.021)**
Handicap	-0.019 (0.011)+	-0.025 (0.010)*	-0.022 (0.011)*	-0.001 (0.013)	-0.002 (0.013)	-0.003 (0.013)
Supervise others	0.067 (0.006)**	0.054 (0.006)**	0.056 (0.006)**	0.025 (0.008)**	0.020 (0.008)**	0.021 (0.008)**
Unemployment 1969-74				0.018 (0.027)	0.013 (0.026)	0.016 (0.027)
Job change 1969-74				0.072 (0.019)**	0.076 (0.019)**	0.075 (0.019)**
Intercept	6.945 (0.042)**	7.033 (0.048)**	7.015 (0.047)**	0.545 (0.032)**	0.525 (0.032)**	0.533 (0.031)**
R^2	0.406	0.432	0.422	0.138	0.160	0.153
MSE	0.051	0.049	0.050	0.082	0.081	0.081

Notes:

+ significant at 10 percent level (two-tailed test)
* significant at 5 percent level (two-tailed test)
** significant at 1 percent level (two-tailed test)

dangerous work yields no compensating wage premium at all. The exception that conforms to the a priori hypotheses is stressful work: employees who claim their job to be "mentally demanding" receive a wage premium around 4-5 percent.

A much more reasonable picture emerges for the wage change equations. Out of 12 working conditions variables, 9 have now coefficients with the expected positive signs (column(5)). Dangerous work yield positive wage premiums of around 2 percent; the (correctly signed) coefficient for the "dangerous-index" is significant at the 1-percent level. It can be noted that this estimate is below Viscusi's (1979) estimate on U.S. data. He finds that workers on jobs perceived as dangerous receive an earnings premium of 5.5 percent. Anomalous signs are still present for "Hours Constraints" and "Hard Physical Work", but the significance arising in the wage level equation has disappeared in the estimated wage change equation.

The robustness of the results presented in column (6) of Table 1 were investigated with a series of comparable regressions on subgroups of the sample defined by age, education level and the absence of unemployment in the interval between the two interviews. In all cases, the indices of dangerous and stressful work had positive and significant coefficients, while the indices of hours constraints and hard physical work had coefficients that were not significantly different from zero at conventional levels. To test Smith's (1979) conjecture that a transformation of the wage variable might fit the data better, we estimated an equation with change in the square of the wage as dependent variable and all independent variales included as sets of dummy variables. The fit of that formulation was considerably worse than the fit of a comparable equation with change in the natural logarithm of the wage as dependent variable.

We also checked robustness by including the various J-variables one at a time (Table 2). The basic empirical results remain unaffected: dangerous and stressful work yield significant compensating wage premiums whereas hours constraints and hard physical work do not. Overall, the estimated J-coefficients in Table 2 are very close to those given in Table 1.

Summary

Past attempts to estimate the magnitude of compensating wage differentials in the labor market have been hindered by the biasing effects of omitted variables and measurement error. We argue that a wage change formulation with job characteristics reported by workers themselves reduces both of these biases. Our empirical work appears to confirm these conjectures. While our cross-sectional results show many coefficients with "wrong" signs, our panel results have many more reasonable coefficients. An index of dangerous working conditions is associated with a compensating wage differential in the change formulation but not in the level formulation. Indicators of stressful working conditions also appear to lead to compensating wage differentials. Indicators of constrained work hours and hard physical work, on the other hand, did not have consistent effects on wages.

Table 2 Working conditions and wages. Estimated coefficients when the working conditions variables are entered one at a time. Dependent variable: ln(1974 wage) - ln(1968 wage). Standard errors in parentheses.

Variables with negative coefficients		Variables with positive coefficients					
		Not significant		Significant at 5 percent level		Significant at 1 percent level	
Hours Constraints	-0.005 (0.008)	Punch clock	0.021 (0.018)	Hectic	0.028 (0.015)	Dangerous Work	0.021 (0.007)
Hard Phys. Work	-0.001 (0.008)	Heavy lifting	0.010 (0.016)	Smoke	0.038 (0.016)	Stressful Work	0.034 (0.010)
Inflexible hours	-0.001 (0.017)	Shake	0.020 (0.021)			Mentally demanding	0.053 (0.015)
Diff. to run errands	-0.032 (0.015)	Poison	0.012 (0.017)			Noise	0.044 (0.017)
Otherwise physically demanding	-0.006 (0.016)						
Daily sweating	-0.007 (0.017)						

There are many ways in which our estimates could be improved still further. The most obvious way is to improve the validity of the working condition measures themselves, perhaps by gathering information about them at the work place itself by individuals trained to collect such information. Such a data collection effort would be very expensive, however, and most future research must rely on data reported by workers themselves or by matching outside information on the basis of worker reports of occupation or industry. We favor the former approach, although we have just begun to address issues associated with the errors of measurement inherent in it.

FOOTNOTES

* Constructive comments from Anders Klevmarken, Charles Brown, Anders Björklund, Robert Topel and several seminar participants at University of Michigan and IUI are gratefully acknowledged.

[1] Working conditions for a given occupation or industry may change if the outside information is gathered at more than one point in time. Nearly all studies using outside information take them from a single point in time.

[2] The procedure was the following:

Let EXP68 and EXP74 denote years of work experience in 1968 and 1974, respectively. If $\Delta EXP = EXP74 - EXP68 < 0$, set $\Delta(EXP)^2 = 0$. If $\Delta EXP > 6$, define

$\overline{EXP} = (EXP68 + EXP74)/2$ and set

$$\Delta(EXP)^2 = (\overline{EXP}+3)^2 - (\overline{EXP}-3)^2.$$

[3] Other Swedish studies have reported some wage effects from long-term unemployment (see Björklund, 1981). It is conceivable that this effect is captured by our experience variable.

Appendix A. Definitions of Variables

Wage	Wage level, Swedish öre
Education	Years of schooling
Experience	Years of labor market experience
Married	Dummy for married workers
Handicap	Index (1,2,3,4) for physical capabilities (walking, running etc). Normal = 1. Drastically reduced = 4.
Supervise others	Index (0,1,2,3,4,5) for the number of workers supervised. 0 No supervisory function 1 1 - 5 workers 2 6 - 10 workers 3 11 - 30 workers 4 31 - 100 workers 5 More than 100 workers
Unemployment 1969-74	Dummy for workers with at least one spell of unemployment 1969-74
Job change 1969-74	Dummy for workers changing employers between 1969-74
<u>Working conditions</u> (all dummy variables)	
Inflexible hours	Punctuality is important at the job
Punch clock	The use of punch clock is required
Difficult to run errands	Not possible to run an errand for half an hour without telling supervisor
Heavy lifting	Need to lift 60 kilo sometimes, once a week or daily
Otherwise physically demanding	The work is physically demanding in ways not covered by heavy lifting
Daily sweating	The physical activity at work causes daily sweating
Noise	The work is sometimes or always very noisy (ear-deafening)

Smoke	Sometimes, often or always exposed to gas, dust or smoke
Shake	Sometimes, often or always exposed to strong shakes or vibrations
Poison	Sometimes, often or always exposed to poison, acids or explosives
Mentally demanding	The work is mentally demanding
Hectic	The work is hectic

Sources: Codebooks for the Level of Living Surveys, 1968 and 1974. The Institute for Social Research, Stockholm.

Appendix B. Means of Variables (n = 1,226)

	Mean 1968	Mean 1974	Mean of the change 1968-1974
ln Wage	7.04	7.63	0.59
Human Capital Variables			
Education	8.9	9.5	0.86
Experience	19.6	25.3	5.10
Married	0.71	0.82	0.11
Handicap	1.1	1.2	0.08
Supervise others	0.59	0.73	0.14
Unemployment 1969-74	0.12		
Job change 1969-74	0.35		
Hours Constraints			
Inflexible hours	0.77	0.74	-0.030
Punch clock	0.36	0.38	0.019
Difficult to run errands	0.63	0.54	-0.090
Hard Physical Work			
Heavy lifting	0.43	0.44	0.009
Otherwise physically demanding	0.41	0.37	-0.042
Daily sweating	0.33	0.29	-0.048
Dangerous Work			
Noise	0.22	0.27	0.052
Smoke	0.46	0.47	0.005
Shake	0.13	0.15	0.021
Poison	0.27	0.29	0.020
Stressful Work			
Mentally demanding	0.34	0.43	0.095
Hectic	0.68	0.68	0.002

Note: All working condition variables are (0,1)-dummies.

Appendix C Wage level equation for 1968
Dependent variable: ln (1968 wage)
Standard errors in parentheses.

	(1)	(2)	(3)
Hours Constraints			-0.021 (0.008)*
Inflexible hours		0.011 (0.021)	
Punch clock		-0.010 (0.018)	
Difficult to run errands		-0.057 (0.018)**	
Hard Physical Work			-0.036 (0.008)**
Heavy lifting		-0.057 (0.019)**	
Otherwise physically demanding		-0.046 (0.019)*	
Daily sweating		0.002 (0.021)	
Dangerous Work			0.0003 (0.008)
Noise		-0.011 (0.021)	
Smoke		0.013 (0.019)	
Shake		0.029 (0.026)	
Poison		-0.022 (0.019)	
Stressful Work			0.055 (0.012)**
Mentally demanding		0.081 (0.019)**	
Hectic		0.028 (0.018)	

Appendix C, continued

	(1)	(2)	(3)
Control Variables			
Education	0.068 (0.003)**	0.061 (0.003)**	0.061 (0.003)**
Experience	0.038 (0.003)**	0.036 (0.003)**	0.036 (0.003)**
$(\text{Experience})^2/1\ 000$	-0.691 (0.058)**	-0.655 (0.057)**	-0.661 (0.057)**
Married	0.126 (0.021)**	0.108 (0.021)**	0.112 (0.021)**
Handicap	-0.029 (0.019)	-0.022 (0.019)	-0.022 (0.018)
Supervise others	0.069 (0.008)**	0.052 (0.008)**	0.054 (0.008)**
Intercept	5.975 (0.043)**	6.090 (0.050)**	6.077 (0.049)**
R^2	0.498	0.524	0.518
MSE	0.080	0.077	0.077

Notes:

* significant at 5 percent level (two-tailed test)

** Significant at 1 percent level (two-tailed test)

References

Björklund, A., Studies in the Dynamics of Unemployment. Stockholm 1981.

Brown, C., "Equalizing Differences in the Labor Market." Quarterly Journal of Economics, February 1980.

Quinn, R., "Effectiveness for Work Roles: Employee Responses to Work Environments". Ann Arbor, Institute for Social Research, 1979.

Rosen, S., "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition". Journal of Political Economy, January-February 1974.

Smith, A., The Wealth of Nations. London 1961.

Smith, R.S., "Compensating Wage Differentials and Public Policy: A Review." Industrial and Labor Relations Review, April 1979.

Thaler, R. and S. Rosen, "The Value of Saving a Life: Evidence from the Labor Market." In N. Terleckyj, (ed.), Household Production and Consumption. New York 1975.

Viscusi, W.K., Employment Hazards. Cambridge, Massachusetts 1979.

WORKING PAPERS (Missing numbers indicate publication elsewhere)

1976

1. Corporate and Personal Taxation and the Growing Firm
   by Ulf Jakobsson

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