COMPENSATING WAGE DIFFERENTIALS
FOR MANDATORY OVERTIME

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Abstract

Our paper estimates the extent to which employees are compensated

for an unfavorable job characteristic, being required to accept mandatory

assignment of overtime, by receiving higher straight-time wages. Our

estimating equations are derived from a model in which wage rates and the

existence of mandatory assignment of overtime are jointly determined in the

market by the interaction of employee and employer preferences. While on

average, we do not observe the existence of a compensating wage differential

for mandatory overtime, we do observe the existence of such differentials

for unionized workers and workers with only a few years experience at a firm.

Given any estimated compensating wage differential for an unfavorable

working condition, one must decide whether its magnitude is sufficiently

large to allow one to conclude that the differential fully compensates

workers for the disutility of being subject to the unfavorable working condi-

tion. We develop and illustrate a methodology that can be used to answer

this question, at least for the case of mandatory overtime provisions and

other rules that restrict employees' choice of hours.

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I.   Introduction

The overtime pay premium provisions of the Fair Labor Standards Act
(FLSA) currently regulate only two dimensions of the hours of work rela-
tionship; the number of hours after which the overtime premium goes into
effect (40) and the premium's level (time and a half). In their legislation
several European countries regulate other dimensions; for example they
require either prior governmental approval for overtime and/or for employees
to give their consent to working overtime.[1] A bill to amend the FLSA intro-
duced recently into Congress, would have similarly prohibited mandatory
assignment of overtime in the United States.[2]

A rationale for many forms of protective labor legislation is that they
are attempts to correct for failures of private markets and overtime hours
legislation can be analyzed with this in mind.[3] For even if both employers
and their employees were satisfied with long workweeks and no premium pay
for overtime, their private calculations ignore the social costs of unemploy-
ment. An overtime premium can be thought of as a tax to make employers bear
the full marginal social cost of their hours decisions; its intent is to
reduce the use of overtime hours and stimulate employment growth. The pay-
ment of the premium directly to employed workers may be justified if market
imperfections prevent workers from freely choosing their desired workweeks
and force them to work "excessively" long hours. The payment can then be
seen as an attempt to reduce their disutility from long workweeks.

Proposals to legislate prohibitions against mandatory overtime can be
viewed as being based upon the belief that market imperfections persist in
the labor market and that the overtime premium does not fully compensate
employees for the disutility associated with mandatory overtime. However,
one may question if markets have failed here; there appear to be a variety

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of overtime hours provisions offered in the labor market. For example,

only 16 percent of the individuals in the 1977 Michigan Quality of Employment

Survey, who reported working overtime, also reported that the overtime hours

decision was made unilaterally by their employer and that overtime was

mandatory, in the sense that employees who refused it suffered a penalty.[4]

In addition, roughly 20 percent of employees covered by major collective

bargaining agreements in 1976 had explicit provisions in their contracts

that gave them the right to refuse overtime.[5]

To the extent that labor markets are competitive and establishments do

offer a variety of overtime hours provisions (i.e., employer determines,

employee determines, penalty for refusal, etc.), compensating wage differen-

tials should arise. That is, establishments which offered "distasteful"

mandatory overtime provisions would have to pay either higher straight-time

wages, higher overtime premiums, or higher fringe benefits to attract labor

than would establishments in which such provisions did not occur. If

straight-time wage, overtime premium, or fringe benefit differentials exist

that fully compensate employees for the disutility of mandatory overtime

provisions, no case for legislated prohibitions against mandatory overtime

is present.[6] As such, evidence on the extent to which such compensating

differentials currently do exist is of importance to policymakers.[7]

Our paper first attempts in the next section to estimate the extent

to which employees currently are compensated, in the form of higher straight-

time wages, for being required to work mandatory overtime. Our focus is on

compensating straight-time wage differentials because the data base we use,

the 1977 Michigan Quality of Employment Survey (QES), contains no information

on the value of fringes and because preliminary analyses suggested that the

magnitude of the overtime premium was not correlated with the presence of mandatory overtime rules, other variables held constant. Our estimating equations are derived from a model in which wage rates and the existence of mandatory assignment of overtime are jointly determined in the market; an employee's willingness to work mandatory overtime is positively related to the premium he would receive for working mandatory overtime, while an employer's demand for mandatory overtime provisions is negatively related to the premium he would have to pay to institute this work rule. Such a model leads naturally to the estimation of wage equations, using econometric techniques that correct for the sample selectivity problem.

Our empirical analyses do not provide strong support for the proposition that on average employees who work for establishments with mandatory overtime provisions tend to receive higher straight-time wages, ceteris paribus. On the other hand, they do suggest that there is a straight-time wage premium associated with mandatory overtime provisions for union workers and for workers with only a few years experience with a firm. We provide explanations for why these results might occur.

Given any estimated compensating wage differential for an unfavorable working condition, one must decide whether its magnitude is sufficiently large to allow one to conclude that the differential fully compensates workers for the disutility of being subject to the unfavorable working condition. In Section III we develop a methodology that can be used to answer this question, at least for the case of mandatory overtime provisions and other rules that restrict employees' choice of hours. The methodology requires one to estimate the parameters of an explicit utility function and then to use these estimates to compare the utility that a representative

worker would achieve when employed in situations in which mandatory overtime

provisions are, and are not present. For expository convenience we use the

simple Cobb-Douglas function to illustrate the methodology. The final

section, then provides some brief concluding remarks.

II. Are There Compensating Wage Differentials Associated With Being
    Required to Work Mandatory Overtime

Our goal is to estimate the extent to which individuals who are employed

by firms that require mandatory overtime receive higher straight-time wages

than otherwise identical individuals who are employed in firms in which

overtime is voluntary. If the wage of the ith individual is W_{im} if he

works in a firm in which overtime is mandatory and W_{iv} if he works in a

firm in which overtime is voluntary, then we can define the relative wage

differential received for mandatory overtime, d_i, as

$$(1) \qquad d_i = (W_{im} - W_{iv})/W_{iv} \approx \log(W_{im}/W_{iv})$$

In general it is not possible to observe both W_{im} and W_{iv} with

cross-section data, as at a point in time an individual is typically

observed employed either by a firm that requires mandatory overtime or by

a firm that does not, but not by both.[8] A naive approach that circumvents

this problem is to estimate wage equations separately for individuals in the

mandatory and nonmandatory sectors, use the estimated coefficients from

these regressions and the characteristics of a representative individual to

compute predicted values of the wage rate that the individual would receive

in both sectors, and then estimate the differential by calculating the

percentage difference in these predicted values.

More formally, suppose that we postulate that the wage rate an individual would receive in a job requiring mandatory overtime is a log linear function of a vector of variables, X, which represent his personal characteristics (e.g., education, experience) and the characteristics of his employer (e.g., union status, establishment size, industry) plus a random error term (ε_{im})

$$(2) \qquad \log W_{im} = \sum_{j=1}^{K} \alpha_{jm} X_{ji} + \varepsilon_{im}$$

and that a similar functional relationship exists that describes the wage that an individual would receive in a job in which overtime was voluntary

$$(3) \qquad \log W_{iv} = \sum_{j=1}^{K} \alpha_{jv} X_{ji} + \varepsilon_{iv} \,.$$

The naive approach would involve estimating the parameters of (2) by ordinary least squares from observations on individuals who are required to work mandatory overtime and the parameters of (3) by ordinary least squares from observations on individuals who are not required to work mandatory overtime. Given estimates of these parameters $(\hat{\alpha}_{jm}, \hat{\alpha}_{jv})$ and the characteristics of a representative individual and his employer (X_{ji}), one can then obtain an estimate of the relative straight-time wage premium paid for mandatory overtime by

$$(4) \qquad \hat{d}_i = \log \hat{W}_{im} - \log \hat{W}_{iv} = \sum_{j=1}^{K} (\hat{\alpha}_{jm} - \hat{\alpha}_{jv}) X_{ji}$$

As is now well-known, however, estimates of wage equations from truncated samples will not necessarily yield unbiased estimates of the underlying structural wage equations, since the assumption that the error term

in each equation is random and uncorrelated with the other explanatory
variables is typically violated.[9] This occurs because employees and
employers are not randomly assigned to the mandatory overtime sector, but
rather make explicit choices. Estimates of the wage equation that ignore
the underlying choice model will be biased because they will confound the
effect of an explanatory variable on wages with its effect on the probability
that an individual is, or is not, employed by a firm that requires mandatory
overtime. To correct for this sample selectivity problem requires us to
model the underlying economic choice process that determines whether an
individual is observed working mandatory overtime.

This problem is complicated by the fact that such an event is a product
of both employee and employer decisions. The straight-time wage premium
paid for mandatory overtime will influence both employees' willingness to be
employed in establishments that require mandatory overtime and employers'
demands that their employees work mandatory overtime. Other things equal,
the larger the premium the greater employees' willingness to accept this
working condition and the smaller employers' demands to have their employees
accept it.

An employee's willingness to be required to work mandatory overtime
is also undoubtedly related to a vector of personal characteristics and
characteristics of his employer that influence his desire to regularly
work long workweeks. For example, older employees, employees with "home
responsibilities", and employees working in firms with unpleasant working
conditions might, ceteris paribus, prefer not to be required to work manda-
tory overtime. Similarly, an employer's demand for the provision is also
related to a vector of employee and firm characteristics that influence

the net benefits of having mandatory overtime provisions. For example, an employer operating a firm in a continuous process industry, or in other situations in which the firm's technology depends upon the simultaneous presence of labor and capital or different categories of labor, might perceive it to be important to have mandatory overtime provisions.[10] Similarly, he might believe it more important to have such provisions for skilled production workers, where an absence might otherwise create a "bottleneck", than for unskilled clerical workers.

One can formally model the assignment of workers to the mandatory overtime or voluntary overtime sector in the context of a model in which employers have demand functions for mandatory overtime provisions, employees have supply functions that indicate their willingness to work for employers that offer such provisions, and the assumption is made that an employee will be found in a job requiring mandatory overtime if, and only if, both he and the employer believe that it is in their best interests to have such a provision.[11] Under the appropriate assumptions about the error terms in the demand and supply equations (joint normally distributed) the equilibrium assignment rule is seen to be generated by a truncated bivariate probit model.[12]

Unfortunately softward limitations and our inability to make a sufficient number of a priori restrictions to identify all of the parameters of this model have prevented us from estimating the complete model ((1)-(3) plus the assignment rule) either by maximum likelihood methods or by an iterative approach that leads to consistent estimates. Rather, we have assumed that the assignment rule can be approximated by the univariate probit model

$$(5) \qquad S_i^* = \delta_0 d_i + \sum_{r=1}^{R} \delta_r Y_{ri} + u_i$$

$$S_i = 1 \quad \text{if} \quad S_i^* > 0$$

$$= 0 \quad \text{otherwise} \quad .$$

Here S_i^* is an unobservable continuous variable that indicates the "strength" of employer and employee preferences for mandatory overtime provisions. This variable can be arbitrarily scaled so that when it exceeds zero mandatory overtime is observed $(S_i=1)$, otherwise mandatory overtime is not observed $(S_i=0)$. The Y_r are a set of variables (in addition to the wage differential, d_i) that influence either employees' willingness to work mandatory overtime or employers' desire to have such a working condition. Finally, u_i is a normally distributed random error term and the δ's are parameters to be estimated.

Consistent estimates of the model specified in (1)-(5) can be obtained using an iterative procedure originally suggested by Lung-fei Lee (1978) and James Heckman (1979).[13] One can substitute the wage equations (2) and (3) into (1) and then (5) to obtain a reduced form probit selection model in which the probability of observing an individual working mandatory overtime is specified to be a function of all of the predetermined variables in the model (the X_j and Y_r). From estimates of this probit equation, one can compute estimates of variables (the inverse of the Mills ratio -- see Heckman (1979)) which are then added to the wage equations ((2) and (3)) to control for the probability that an individual is observed working mandatory overtime. These "augmented" wage equations can then be estimated by ordinary least squares and consistent parameter estimates of equations (2) and (3)

obtained.[14] Finally, these estimated parameters and the mean values of the explanatory variables can be substituted back into (4) to compute consistent estimates of the straight-time wage differential associated with the presence of mandatory overtime provisions.

The data we use to implement the above framework come from the 1977 Michigan Quality of Employment Survey.[15] We eliminated from the original 1515 individuals in the survey who were employed full-time those individuals who failed to report their straight-time hourly wage rate and/or whether they were required to work mandatory overtime. An individual was said to be required to work mandatory overtime if he or she reported that he or she could not refuse to work overtime without a penalty. This left us with a usable sample of 1108 observations, of which 165, or 14.89 percent, were categorized as being employed in a job that required mandatory overtime.

Columns (1) and (2) of Table 1 present OLS estimates of wage equations (equations (2) and (3)), estimated separately for individuals in the mandatory overtime and nonmandatory overtime, or voluntary overtime, sectors. We estimated three equations for each sector to permit us to test later for the sensitivity of our estimated differential to the specification of the wage equation used. The first is a standard human capital model, augmented by a variable indicating whether the individual is a union member or covered by a union contract (X_8) and includes measures of the individual's total labor market experience (X_1, X_2), of his or her experience with the current employer (X_3, X_4), of his or her years of formal schooling and trade school (X_5, X_6), of his or her health status (X_7), and measures of the respondent's sex (X_9), race (X_{10}), and marital status (X_{11}). The second specification adds a vector of one-digit major occupation

dichotomous variables. Finally, the third specification adds a vector of
one-digit major industry dichotomous variables. For brevity, only the first
specification is reported in the table.[16] The pattern of coefficients in
each equation is similar to the pattern found in previous studies that
ignored the mandatory overtime question.

We also estimated several reduced form probit equations (equation (5)),
one corresponding to each specification of the wage equations, that explain
whether an individual is employed by a firm requiring mandatory overtime.
The explanatory variables included in these equations are those that
influence either employers' demands for an employee to work mandatory over-
time or an employee's willingness to supply mandatory overtime, or that
influence the wage paid in each sector, and hence the straight-time wage
premium ((4)) paid for mandatory overtime.[17] The pattern of coefficients
did not vary across specifications and again for brevity we report only the
simplest specification, which excluded the occupation and industry variables,
in column (3) of Table 1. Many of the variables in these equations enter
from both the employer and employee sides, and also from the wage equations.[18]
Hence, it is difficult to predict what the expected signs of their coefficients
should be in the reduced form probit model.

Column (3) indicates that while many of these variables' coefficients
prove to be statistically insignificant, the chi-square statistic suggests
that one can reject the hypothesis that the entire vector of coefficients is
statistically insignificantly different from zero. Moreover, when we use
these probit equations to compute predicted values of the inverse Mills
ratios $(\lambda_{mi}, \lambda_{vi})$, enter these variables in equations (2) and (3)
respectively, and then reestimate these augmented wage equations using OLS,
the selectivity variables prove to be statistically significant, at least

at the .90 level of significance (Columns (4) and (5)).[19] This provides
some evidence that the estimated OLS wage coefficients may be inconsistent
estimates of the true coefficients of the wage determination models,
although as noted in footnote 13, the consistency of the estimates when we
control for selectivity bias is condition upon (5) being the correct under-
lying selection rule.

The coefficient estimates contained in Table 1 can be used along with
equation (4) to compute estimates of the straight-time wage premium paid
to workers who are required to work mandatory overtime. We do this initially
for a representative worker who has the mean value of each of the charac-
teristics (X) in the sample. The estimated premium is tabulated in the
top row of Table 2 for each of the three specificatations of the wage equa-
tions, for both the OLS and the selectivity corrected estimates. Quite
strikingly, in only one of the six cases is the estimated premium positive.
On average, market forces do not seem to be producing a compensating wage
differential for mandatory overtime.

Of course the fact that on average such a differential does not exist,
does not imply that no workers in the economy are compensated for being
required to work mandatory overtime. Two groups of workers that one might
want to focus on, in particular, are those covered by collective bargaining
agreements and those newly hired by firms.

Turning first to the role of collective bargaining, recently attention
has been redirected to the many roles unions play in addition to seeking
to increase their members' wages.[20] Empirical studies have indicated that
unions may affect productivity and labor turnover.[21] In addition, it has
been argued that unions may help to compensate for market failures by

providing information on unfavorable working conditions and/or by obtaining compensating wage differentials for employees who are employed under such conditions. Indeed, a recent study suggests that up to two-fifths of the estimated union/nonunion wage differential is simply a compensating differential because unionized employees tend to be employed in more structured and hence less desirable (from the perspective of the employees) work settings.[22] Following this line of reasoning, one might hypothesize that unions will also achieve larger compensating wage differentials for mandatory overtime provisions for their members than those received by otherwise comparable nonunion employees. That is, markets may be sufficiently imperfect that compensating differentials might not arise in the absence of union pressure; unions may serve to help restore the differentials that would exist in the absence of these imperfections.

To test for this possibility, rows B and C of Table 2 present estimates of the percentage straight-time wage premium paid to workers required to work mandatory overtime in the union and nonunion sectors, respectively. These estimates again make use of the estimated wage equations; the differentials paid to union members are evaluated using the mean values of union members' characteristics, while those for nonunion members are evaluated at the mean values of nonunion employees' characteristics.[23] The estimated differentials are positive in the union sector but are negative in the nonunion sector. The OLS estimates suggest that the straight-time wage premium paid to induce workers to accept jobs which require mandatory overtime is roughly 4.0 to 5.3 percent in unionized establishments, while those that control for selectivity bias place the differential in the range of 2.6 to 4.3 percent.

Turning next to the role of job tenure, it is also plausible that whether a premium is paid for mandatory overtime depends upon an employee's job tenure. If an employer seeks to attract a new employee to a firm that requires mandatory overtime and job applicants know of this unfavorable working condition, a compensating wage differential will be required. In contrast, employees who have been with a firm for a number of years and have accumulated "firm-specific" human capital, may find that there is a wedge between the wage they are receiving and the wage they can command from other employers.[24] As such, ex post, the employer may not have to pay them a compensating wage differential for newly instituted unfavorable working conditions.[25] These employees' investments in firm-specific human capital limit the need for such differentials to arise.

This line of reasoning suggests that compensating wage differentials for mandatory overtime will be larger for employees with only a few years experience with a firm than they will be for long-term employees. To test this hypothesis, we divided our sample into employees with less than three years experience, and those with three or more years, with their current employer. OLS wage equations and the selectivity corrected wage equations were reestimated separately for each group and then the estimated straight-time wage premium paid to employers required to work mandatory overtime computed as before.

These estimated differentials are evaluated at the mean values of the characteristics for the individuals in each group and are reported in the last two lines of Table 2. The hypothesis appears to be borne out, at least for the OLS estimates. The OLS estimates suggest that positive compensating differentials for mandatory overtime are paid to inexperienced

workers with less than three years of job tenure, however no such differential is paid to workers with more than three years job tenure. In contrast, the "selectivity corrected" estimates suggest that neither group receives a positive compensating differential for mandatory overtime. Since we have only approximated the true sample selection rule (see footnote 13 and above), the statistical properties of the "selectivity corrected" estimates are not certain and it is not obvious which set of estimates should be considered preferred.

In sum, our results indicate that on average employees who work for establishments with mandatory overtime provisions do not receive compensatingly higher straight-time wages. Focusing on what happens "on average", however, masks important differences between groups. The data suggest that unionized employees do receive a straight-time wage premium for mandatory overtime; this provides support for the view (Duncan and Stafford (1980)) that one role unions play is to establish compensating wage differentials for unfavorable working conditions. The data also provide some weaker support for the view that experienced workers, who are "tied" to firms, fail to receive compensating wage differentials for mandatory overtime, but that workers with less than three years experience with a firm do receive such differentials. How one might attempt to judge whether the magnitude of any estimated differential is sufficient to _fully_ compensate employees for being subject to mandatory overtime provisions is an issue to which we now turn.

III. Are Compensating Wage Differentials for Mandatory Overtime
     Provisions "Fully" Compensating?

A long and growing literature in labor economics provides evidence on

the existence of "compensating" wage differentials for various job charac-

teristics. Among the characteristics examined have been risk of injury,

nonwage forms of compensation (such as retirement system characteristics),

working conditions, and risk of unemployment.[26] A key question that

policymakers must address is whether an estimated differential is suf-

ficiently large to allow them to conclude that a worker is equally well-

off with the job characteristic and the wage differential as he would be

in the absence of the characteristic and the differential? If the answer

is yes, if the differential is indeed "fully compensating", then the case

for government intervention is substantially weakened.

If one truly believes that all labor markets are competitive, then it

is almost a tautology that whatever wage differentials are generated by

markets will be "fully compensating" ones. However, once one allows for

market imperfections, the question becomes an empirical one. In some cases,

it is possible to test whether the "compensating" differential is indeed

"fully compensating". For example, Ehrenberg (1980) found that holding the

factors that influence wages, promised retirement benefits, and the determi-

nants of total compensation constant, that for every dollar that public

employees were required to contribute to their pension fund, their annual

earnings increased by a dollar. It is straightforward to conclude here

that the wage differential associated with employee retirement system

contributions are fully compensating.

In contrast, in other situations it is not easy to establish whether

compensating differentials are fully compensating. Estimates of the

compensating differential associated with the risk of fatal injury at the workplace suggest that individuals are paid a premium of 1 to 4 percent of their wages to compensate them for existing risks of fatal injuries.[27] However, researchers have not evaluated whether such differentials truly fully compensate workers for the risks of fatal injury; all we know is that they are the differentials observed in the market. If labor markets are not perfectly competitive, there is no reason to assume that the differentials are in fact fully compensating. Hence, the potential usefulness of these estimates for public policy in the occupational safety area is unclear.

In the case of mandatory overtime, or any other employment package that specifies a tied wage rate-hours of work bundle, it is possible to evaluate whether the compensating wage differentials that are observed are fully compensating. To understand the logic of our approach, refer to Figure 1 where a familiar indifference curve model is plotted. The individual is assumed to derive utility from leisure time and income; the latter is a proxy for some Hicksian composite commodity whose price is taken as fixed. Suppose an individual has nonlabor income of OT, a wage rate of W_0 for the first $\bar{H}$ hours per week that he works, and he receives an overtime premium of time and a half for all overtime hours. The individual then faces the budget constraint BAOT and, given his indifference map, will locate at point a working H_0 hours and having a total income of Y_0.[28] Thus, his utility would be given by

$$(6) \qquad U(Y_0, L_0)$$

Now suppose the individual was employed by a firm in which mandatory overtime was required and was forced to work H_1-H_0 more hours of overtime than he otherwise would choose. In this case he would wind up at point b with a total income of Y_M. Although Y_M exceeds Y_0, he obviously now would be at a lower level of utility. In fact, to leave him equally well off as he was at point a, if he is forced to work H_1 hours he would require a total income of Y_1. Y_1-Y_M is the lump sum income transfer, or the compensating variation in income, that would be required to fully compensate him for the disutility associated with mandatory overtime.

Suppose, however, that instead of a lump sum payment, to get the employee to Y_1 the employer offers him a straight-time wage W_1 which is d percent higher than before $(W_1=(1+d)W_0)$. It is easy to see that each value of the straight-time wage premium for mandatory overtime, d, will lead to a new budget line and that there is only one value of d which will permit him to locate at point e where his income will be Y_1, his leisure hours L_1 $(=T-H_1)$ and where

$$(7) \qquad U(Y_1, L_1) = U(Y_0, L_0)$$

This value of d, which leads to the budget line DCOT, is the fully compensating wage differential; the differential which fully compensates the individual for mandatory overtime. Provided that the individual's marginal utilities from income and leisure are both positive, and his indifference curves are convex, it is straightforward to show that higher values of d will more than fully compensate him, while lesser values will less than fully compensate him. Furthermore, how onerous mandatory overtime is depends upon the difference between H_1 and H_0; the larger this gap, the larger

will be the straight-time wage premium necessary to fully compensate him for mandatory overtime.[29] The analysis would of course be similar for any other tied wage-hours employment offer; for example, one could similarly analyze the compensating wage differential required to induce workers to accept jobs with shorter workweeks than they desire.

To operationalize this approach, and estimate what the fully compensating straight-time wage differential is, is no trivial task. In the present example, each individual either works for a firm requiring mandatory overtime or does not. Hence, we can directly observe <u>either</u> W_0 and H_0, or W_1 ($=W_0(1+d)$) and H_1, but not both. Furthermore, it is necessary for us to know the shape of the individual's indifference curve, something which is typically not directly observed.

Fortunately, there is a way in which one can deduce all of the necessary information. To do so requires one to assume a specific functional form for the utility function. To illustrate the methodology, we assume for expositional convenience that the individual's utility function is any monotonic transformation of the Cobb-Douglas utility function.

$$(8) \qquad U = Y^{\alpha} L^{1-\alpha}$$

If α were known, one could compute the level of utility achieved by a representative individual who was required to work mandatory overtime from

$$(9) \qquad U_1 = Y_1^{\alpha} L_1^{1-\alpha}$$

where $Y_1 = W_1 \bar{H} + W_1 (1.5)(H_1 - \bar{H}) + M$

$$L_1 = T - H_1 \ .$$

Here W_1 is the individual's observed wage, H_1 his observed weekly hours of work, M his <u>weekly</u> nonlabor income, $\bar{H}$ the number of hours after which the overtime premium goes into effect (typically 40) and T the total number of hours in a week (168).

Now given the utility function specified in (8), if this individual was employed by a firm which did not require mandatory overtime he would work H_0 hours, where H_0 is given by

$$(10) \quad H_0 = \alpha T + (\alpha-1)(M-.5W_0\bar{H})/W_0(1.5) \qquad \text{if } H_0 > \bar{H}$$

$$= \alpha T + (\alpha-1)(M/W_0) \qquad \text{if } H_0 \leq \bar{H}$$

That is (10) represents the labor supply curve for individuals employed in the nonmandatory overtime sector. Now we do not observe W_0 for the individual employed in the mandatory overtime sector, rather we observe W_1, which equals $W_0(1+d)$. Hence, (10) can be written

$$(11) \quad H_0 = \alpha T + (\alpha-1)(M-.5(W_1/(1+d))\bar{H})/(W_1/(1+d))(1.5) \qquad \text{if } H_0 > \bar{H}$$

$$= \alpha T + (\alpha-1)(M(1+d)/W_1) \qquad \text{if } H_0 \leq \bar{H}$$

Observe that given α, everything on the right-hand side of (11) is known save for d. Moreover, for each value of d, there will exist a corresponding value of H_0 and hence of Y_0 and L_0. Thus, we can specify the individual's utility from being employed by a firm in which mandatory overtime is not required as a function of the size of the differential

$$(12) \quad U_0(d) = (Y_0(d))^\alpha (L_0(d))^{1-\alpha}$$

One can then set (12) equal to (9) and solve for d*. The solution will be the fully compensating straight-time wage differential for mandatory overtime; it can be contrasted to the actual differentials that we have estimated.

Of course, to proceed along this line first requires an estimate of α and it is natural to obtain such an estimate from the sample of people who are employed by firms that do not require mandatory overtime.[30] That is, for this sample of 943 individuals we estimate a labor supply function of the form (from (10))

$$(13) \qquad H_i = \alpha T + (\alpha-1)Q_i + \varepsilon_i$$

where $Q = (M-.5W\bar{H})/1.5W$ if $H > \bar{H}$

        $= M/W$ if $H \leq \bar{H}$

Estimation of (13) yields an estimate of α of .224, with an estimated standard error of .001.[31]

With this estimate in hand, we can compute U_1, using (9) and the mean values of the variables for individuals employed by firms requiring mandatory overtime. Similarly, we can compute H_0 and U_0, conditional upon d, from (11) and (12).[32] Finally, equating U_0 to U_1 and solving the resulting nonlinear equation for d, yields our estimate of the fully compensating straight-time wage differential for mandatory overtime. Our data suggests that this would be approximately 1.1 percent.

This estimate, however, is conditional upon the Cobb-Douglas function being the correct functional form for the utility function. We have used it for _illustrative_ purposes here because it requires us to obtain an estimate of only one parameter (α), and this estimate could be obtained

directly from estimates of the simple labor supply equation (13). However, because the Cobb-Douglas form is very simple and restrictive, results based on it should be considered only illustrative. While we choose not to proceed any further here because our analyses in the previous section suggested that on average compensating wage differentials for mandatory overtime do not exist, researchers working on similar problems should test the sensitivity of their estimates of the fully compensating differential to alternative assumptions about the functional form of the utility function and/or its parameter values.

IV. Concluding Remarks

Do employees who are employed by firms in which mandatory assignment of overtime is required receive compensating straight-time wage differentials? The evidence presented in this paper suggests that on average they do not; this presents some support for the case in favor of legislative prohibition of mandatory overtime. This conclusion should be qualified, however, because in some circumstances, namely for unionized employees and employees with short job tenure with their current employers, compensating wage differentials do exist. Furthermore, the benefits from the legislation must be weighted against the potential costs; these include reduced employer flexibility in scheduling production and consequently increased production costs.

We believe that variants of the methodological framework presented in this paper should prove useful in a number of other contexts for at least two reasons. On the one hand, we have suggested the importance of modeling

the selection process and controlling for selectivity bias in the estimation
of compensating wage differentials for undesirable job characteristics.
On the other hand, we have developed a framework that permits one to
estimate if compensating differentials are in fact _fully_ compensating. The
latter is an important step in the analysis which previous investigators,
who focused on related topics, often ignored or forgot to undertake.

We would be less than honest if we did not acknowledge three major
qualifications of the findings we have reported in this paper. First, it
is conceivable that the model we used in Section III understates the true
magnitudes of the fully compensating wage differential. As noted earlier,
it assumes that individuals value only income and leisure time; the
disutility from mandatory overtime provisions arises because employees are
forced to work more hours than they otherwise would prefer. Suppose,
however, that employees also value the way in which overtime hours are
distributed across a week and mandatory overtime provisions cause them to
lose control over this decision (e.g., "you can't work 1 hour overtime per
day like you want but you have to work 5 hours Monday night"). In this
case, even if total hours of work were unchanged, employees would still
demand a premium for accepting mandatory overtime provisions. The model
in Section III does not capture the need for such a premium.

Second, software limitations have prevented us from estimating the
complete statistical model that is required to control for the joint
employee/employer selection problem; the consistency properties of the
selectivity adjusted wage equations and the associated wage differentials
reported in Tables 1 and 2 are conditional upon the approximation (equation
(5)) being a correct one. In addition, our simulations of the fully

compensating wage differentials assume a very simple, and restrictive functional form for the utility function; future researchers working on similar problems must examine the sensitivity of their results to alternative assumptions about the form of the utility function.

Finally, we should stress that we have focused on the trade-off between wages and mandatory overtime provisions, and ignored all other pecuniary and nonpecuniary job characteristics. Our approach is in the tradition of most of the compensating wage differential literature which focuses on the trade-offs between wages and one nonwage characteristic (e.g., risk of injury or pension coverage) at a time. Implicitly, researchers in this tradition have assumed that the partial correlations between the omitted job characteristics and the included one (holding all other included right-hand side variables constant) are close to zero and thus that the omission causes no omitted variable bias.

It is not obvious that this is always a good assumption to make; a preferred approach would be to analyze the trade-offs between all characteristics simultaneously. However, to appropriately model the more general problem would require selection models for every job attribute and that, coupled with greatly reduced degrees of freedom and possible collinearity problems, may well lead to insignificant results. We suspect that this is why such an assumption is typically made.

Table 1

Ordinary Least Squares and Selectivity Bias Corrected
Least Squares Log Wage Equations and Reduced Form
Probit Model for Mandatory Overtime: 1977
Quality of Employment Survey Data[a]

Variable	OLS Log Wage Equations Mandatory Sector (1)	Voluntary Sector (2)	Reduced Form Probit Model (3)	Selectivity Bias Corrected Log Wage Equations Mandatory Sector (4)	Voluntary Sector (5)
C	.265 (2.1)	.654 (9.6	-.279 (1.0)	.453 (2.4)	.420 (3.4)
X_1	.040 (4.4)	.028 (6.7)	-.018 (1.0)	.039 (3.4)	.030 (5.0)
X_2	-.682 (3.6)	-.519 (5.8)	.383 (1.1)	-.651 (2.7)	-.562 (4.3)
X_3	-.007 (0.6)	.040 (6.2)	.027 (1.1)	-.008 (0.5)	.035 (3.8)
X_4	.363 (0.7)	-1.192 (4.6)	-1.300 (1.4)	.414 (0.7)	-.958 (2.6)
X_5	.078 (9.6)	.053 (13.3)	-.052 (3.3)	.084 (7.8)	.060 (9.9)
X_6	.007 (0.2)	.016 (1.0)	-.061 (1.0)	.019 (0.4)	.023 (1.1)
X_7	.016 (0.2)	-.136 (3.2)	-.109 (0.6)	.037 (0.3)	-.121 (2.0)
X_8	.327 (6.2)	.202 (6.9)	.214 (2.0)	.305 (4.5)	.159 (3.6)
X_9	-.282 (4.5)	-.364 (12.6)	-.313 (2.6)	-.198 (2.2)	-.299 (6.5)
X_{10}	-.096 (1.4)	-.109 (2.6)	.187 (1.3)	-.143 (1.6)	-.130 (2.1)
X_{11}	.068 (1.1)	.015 (0.5)	-.244 (2.0)	.093 (1.2)	.040 (0.9)
X_{12}			-.311 (1.5)		
X_{13}			.013 (1.3)		
X_{14}			.242 (0.6)		
X_{15}			.033 (1.0)		
X_{16}			-4.494 (0.0)		
X_{17}			.048 (6.2)		
X_{18}			.058 (0.5)		
X_{19}			-4.736 (0.0)		
X_{20}			-.143 (1.4)		
X_{21}			.046 (1.2)		
X_{22}			-.004 (0.6)		
X_{23}			-.177 (0.9)		
λ				-.204 (1.8)	-.454 (2.9)
R^2	.633	.474		.648	.486
n	165	943	1108	165	943
log-likelihood			-411.4		
Chi-squared			109.8		

Table 1 (continued)   25

where

C   intercept term

X_1 total years of labor market experience

X_2 X_1 squared/1000

X_3 total years of experience with current employer

X_4 X_3 squared /1000

X_5 years of formal school

X_6 years of trade school

X_7 1=health limits work; 0=otherwise

X_8 1=union member or covered by union contract; 0=otherwise

X_9 1=female; 0=male

X_{10} 1=nonwhite; 0=white

X_{11} 1=married, spouse present; 0=otherwise

X_{12} 1=employee has a second job; 0=otherwise

X_{13} hours of work on second job if reported; 0=otherwise

X_{14} 1=hours on second job not reported; 0=otherwise

X_{15} size of establishment (number of employees/1000) if reported; 0=otherwise

X_{16} 1=size of establishment not reported; 0=otherwise

X_{17} weekly overtime hours

X_{18} travel time to work if reported; 0=otherwise

X_{19} 1=travel time to work not reported; 0=otherwise

X_{20} 1=respondent feels comfort on the job is "okay"; 0=otherwise

X_{21} number of dependents (excluding spouse)

X_{22} other family members' earnings if reported; 0=otherwise

X_{23} 1=other family members' earnings not reported; 0=otherwise

λ estimated value of the inverse of the Mills ratio

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[a] The numbers in parentheses are the absolute value of the t ratios for the OLS
model, the absolute value of the corrected t ratios for the selectivity bias
corrected model, and the absolute value of the asymptotic t ratios for the
probit model.

Table 2

Summary of Estimated Percentage Straight-Time
Wage Premium Paid to Workers Required to
Work Mandatory Overtime: 1977 Quality
of Employment Survey Data[a]

		OLS			Selectivity Corrected		
		(1)	(2)	(3)	(1)	(2)	(3)
(A)	All Workers	-0.6	1.1	-1.0	-3.5	-1.8	-3.6
(B)	Union Workers	4.0	5.3	4.2	2.6	4.3	3.4
(C)	Nonunion Workers	-3.0	-1.0	-3.6	-7.0	-5.3	-7.6
(D)	Less Than 3 Yrs. With Current Employer	3.1	2.8	5.0	-2.3	-5.9	-3.3
(E)	3 or More Yrs. With Current Employer	-7.3	-5.7	-5.8	-11.5	-9.6	-11.2

[a]For (A), (B) and (C) separate wage equations were estimated for those
people who worked mandatory overtime and those who did not. The dif-
ferentials are evaluated in (A) using the mean values of the explanatory
variables for all workers, in (B) using the mean values of union workers'
characteristics, and in (C) the mean values of nonunion workers' charac-
teristics. For (D) and (E) the two wage equations (mandatory, nonmandatory)
are estimated separately for "new" and "experienced" workers and the dif-
ferentials computed in an analogous manner. The sample sizes are:

	(A, B, and C)	(D)	(E)
mandatory sector	165	68	97
nonmandatory sector	943	434	509

(1) Basic human capital model (including union status).

(2) Basic human capital model plus occupation binary variables.

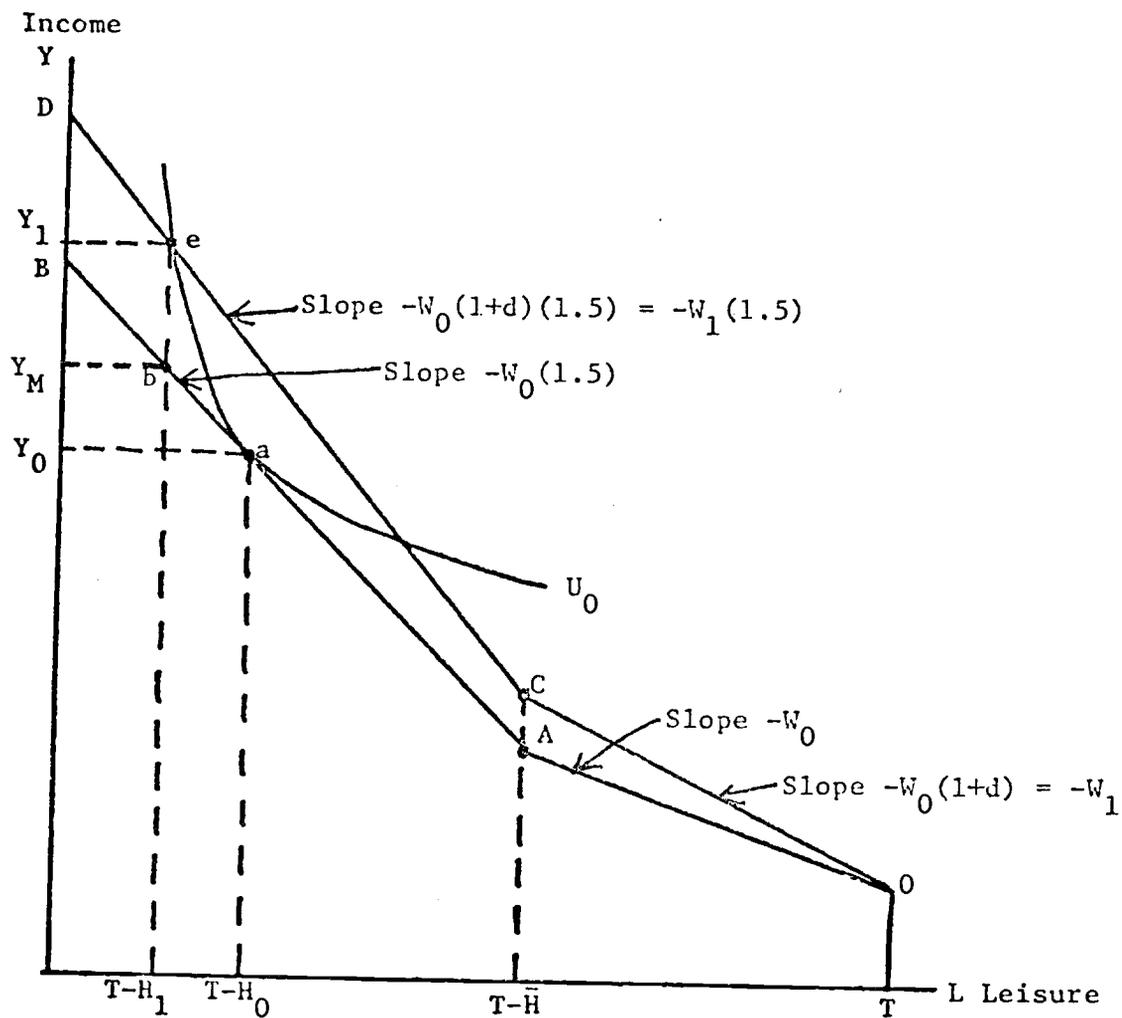(3) Basic human capital model plus occupation and industry binary
variables.

27

Figure 1

Fully-Compensating Wage Differential
for Mandatory Overtime

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<center><u>Footnotes</u></center>

1. See National Board for Prices and Income (1970).

2. HR 1784 introduced into Congress on February 1, 1979.

3. A more extensive discussion of this conceptual framework, and of how the history of hours of work legislation in the United States relates to it, is presented in Ronald G. Ehrenberg and Paul L. Schumann (1981).

4. Robert Quinn and Graham Staines (1979), pp. 90-91.

5. U.S. Bureau of Labor Statistics (1979).

6. Such compensating differentials can also be viewed as an insurance payment made by employers, who are faced with the need for regularly scheduled overtime or with random fluctuations in their demands for overtime, to guarantee them the availability of the appropriate number <u>and</u> skill mix of employees to work overtime. Viewed in this way, prohibitions against mandatory overtime would limit the freedom of the parties to agree to the issuance of such "insurance policies".

7. A separate policy issue is whether the overtime pay premium required under the FLSA should be raised from time-and-a-half to double-time in the hopes that this would reduce employers' usage of overtime hours and stimulate employment growth. We discuss this issue in detail in Ehrenberg and Schumann, (1982).

8. If one had longitudinal data one could estimate the extent to which changes in overtime hours provisions were correlated with changes in straight-time wages over time, other things equal. An example of the use of longitudinal data in a similar context is Greg Duncan and Frank Stafford (1980) who use the Michigan Income Dynamics Panel data to analyze the interrelationship between changes in unionization, wages, and two other working conditions.

9. See James Heckman (1979) and Lung-fei Lee (1978).

10. See Alan Deardorff and Frank Stafford (1976) who point out that in situations in which such complementarities exist, that straight-time wage differentials might arise to compensate workers for workday lengths that depart from those that they would freely choose, given their alternative wage rates.

11. See Ehrenberg and Schumann (1982) for a more complete description of the model.

12. Dale Poirer (1980).

13. One must caution, however, that because we have only approximated the true sample selection rule with a univariate probit model, the statistical properties of our estimates of (2) and (3) when we control for selectivity bias are not obvious. That is, their consistency is conditional upon (5) being the correct underlying selection rule (see Poirer (1980)).

14. The conventionally reported OLS standard errors are inappropriate, however, since the estimated values of the inverse of the Mills ratio (the λ in Table 1) are estimated from data in a previous stage. Heckman (1979) derives a method to consistently estimate the correct standard errors, and the results reported in Table 1 in the next section present these estimates. Unfortunately, as Heckman (1980) notes, this procedure may lead to negative estimated standard errors in finite samples and whenever this occurred the conventional OLS estimates were reported in the table instead.

15. For a complete description of these data, see Quinn and Staines (1979).

16. The complete results, both here and below, are reported in Ehrenberg and Schumann (1982).

17. We must caution that some of these variables (e.g., overtime hours, hours on second job or extent of unionization (see Duncan and Stafford (1980)) are undoubtedly simultaneously determined with the presence of mandatory overtime provisions. To keep our problem manageable, we treat all of the variables in column 3 of Table 1 as being predetermined. We did experiment with omitting overtime hours from the reduced form probit equation; such an omission actually increased the magnitude of the compensating wage differential for mandatory overtime above the level that we report below.

18. See Ehrenberg and Schumann (1982) for a discussion of why each of the explanatory variables enters the probit equation and its expected sign.

19. Our estimation of the "selectivity corrected" wage equations were facilitated by our colleague William Greene, who provided us with a computer program he has written to estimate such models.

20. For an excellent expository survey of this literature, see Richard Freeman and James Medoff (1979).

21. See, for example, Charles Brown and James Medoff (1978), Kim Clark (1980), and James Medoff (1979).

22. Duncan and Stafford (1980).

23. The sample sizes available were unfortunately too small to permit us to reestimate the model separately for union and nonunion employees and then to base estimated differentials on such equations.

24. See Gary Becker (1964).

25. This statement should be qualified by noting that if, ex ante, job applicants expect to have long tenures with a firm and they are aware that an unfavorable working condition exists or may be instituted at the firm in the future, then they would accept employment only if they expected to receive compensating differentials throughout their tenure with the firm.

Footnote 25 continued:

Our argument in the text essentially assumes that the unfavorable working condition was imposed unexpectedly (to them) sometime after the initial hire date.

26. For risk of injury, see Robert S. Smith (1976) and Richard Thaler and Sherwin Rosen (1975). For nonwage forms of compensation, see Ronald Ehrenberg (1980). For working conditions, see Greg Duncan (1976) and Duncan and Stafford (1980). Finally, for risk of unemployment, see John Abowd and Orley Ashenfelter (1979).

27. Robert Smith (1979).

28. The assumption that the individual would voluntarily choose to work overtime is not essential to what follows.

29. Our analysis assumes that the individual is concerned about total hours of leisure in a week not how it is allocated across days. If he was concerned about the latter, he might require a premium to be employed by a firm requiring mandatory overtime even if H_0 was equal to H_1. This is a complication which we do not deal with here. We should also emphasize that the fully-compensating premium is a function of the gap between H_1 and H_0, not of the level of overtime that the individual actually works.

30. This procedure assumes that α is the same for individuals in both sectors -- an assumption that is somewhat inconsistent with the model discussed previously in which individuals are "sorted" into the mandatory sector at least partially on the basis of their willingness to work overtime. Other things equal, we should expect to observe individuals with lower marginal utilities of leisure (higher α's) to be in the mandatory sector. As a result, the estimates of α which we obtain below from data on

Footnotes 30 continued:

individuals in the voluntary overtime sector will likely understate the
true values of α for individuals in the mandatory sector. Since one can
show that an increase in α will lead to a decrease in the magnitude of
the fully-compensating wage differential, the value of d* which we report
below may well overstate the true fully-compensating differential.

    31. Variants of (13) were also estimated in which α was specified
to be a function of an individual's sex, race, marital status, health
status, and number of dependents. When evaluated at the mean values of
these variables for individuals employed by firms that required mandatory
overtime, the resulting estimate of α was almost identical (.223) to the
value reported in the text.

    This estimate and the one in the text imply that the marginal propensity
to consume out of unearned income is less than one-quarter, a result that is
much smaller than other investigators have found. As noted in footnote 30,
however, larger values of α would lead to even smaller values of the fully-
compensating differential.

    32. The parameters used in this simulation are $T = 168$, $W_1 = \$6.026$,
$H_1 = 45.139$, $\bar{H} = 40$, and $M = \$80.615$; the latter represents all family
income except for the respondent's labor earnings including the labor
earnings of other family members. The QES data unfortunately did not permit
us to compute family nonlabor income which theoretically is the more appro-
priate variable to use, unless the respondent's labor supply is conditional
on other family members' labor supply decisions.