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The Minimum Wage and the Job Package

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The Minimum Wage and The Job Package

Section 1

Since the classic statement of the economics of minimum wage legislation by Stigler [15], a number of attempts have been made to determine the extent to which minimum wages affect the employment of unskilled workers. The largest number of these studies have attempted to isolate identifiable low-skilled groups for which data exist, particularly teen-agers. Estimates were then made of how the unemployment rate among the group considered has been affected by imposition of the minimum wage. Among these are studies by Brozen [6], Moore [14], Lovell [13], Kaitz [10], Hashimoto and Mincer [9], Peterson and Stewart [15], and Feldstein [8]. The evidence from these studies is mixed, but suggests that disemployment effects do exist.

Other studies have attempted to discover how the minimum wage affects the pattern of employment. Among these are studies conducted by Brozen [4], Kaun [11], Kosters and Welch [12], and Welch [18]. Kosters and Welch suggest that teen-agers are shifted away from "normal" employment to "transitory" employment, where they are more subject to cyclical fluctuations. Welch cites data which tend to confirm a shift away from covered to non-covered industries on the part of teen-agers. Brozen's study suggests a shift in employment to

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Valuable comments and suggestions were made by Yoram Barzel and and Masanori Hashimoto. Of course, any remaining errors are mine.

household work, which is not covered. And Kaun's study suggests that substitution is made away from low-wage workers in the industries which he studies, and that further jobs were lost due to marginal producers going out of business.

In general, the studies cited have been attempts to determine the number of low-wage workers who lose their jobs or have to change jobs due to the imposition of the minimum wage. Exceptions are the studies by Feldstein and Welch, which look at non-wage characteristics of the job package. They do not, however, attempt to generalize their approach, limiting their comments largely to the effects on training. The present study explicitly recognizes the multi-dimensionality of the job package, and suggests some changes in the nature of the job package that allow individuals that on the surface seem unemployable under the new limitation to maintain their employment. The job package is specified by a multifaceted contract, largely implicit, between employer and employee.

Formally, we may consider that the firm sells a package to the potential employee. The package has a number of components, among them pleasant surroundings, safety, insurance, training, perhaps some consumption items (clothing, coffee), and work. For all items but the last, the price is positive; for work, the price is negative. That is, the employer pays for work, but the net pecuniary payment to the employee will include negative (to the employer) payment for amenities.

The succeeding sections of this study develop more precisely the theoretical implications of the minimum wage for the job contract, identify items in the contract which may be examined by statistical means, and determine whether there is statistical support for the theoretical relationships developed. Section I provides a general theoretical framework for subsequent analysis. Section II describes the data to be used. Section III develops the models to be tested. And section IV contains the results of the tests and the conclusions.

Section I

If workers and work were one dimensional, then the labor market would be in equilibrium when

$$(2\text{-}1) \quad MP_L = MC_L \quad .$$

That is equilibrium requires that the value of output resulting from employing an additional unit of labor equal the cost of the increment. But both the job and the employee are more accurately described by vectors of characteristics. Each of these characteristics will be provided in a quantity such that a condition similar to that described by (2-1) is satisfied.[1]

If the job is described by j-element vector $\underline{m}$, and the jobholder by a k-element vector $\underline{n}$, then a total of $j + k + 1$ conditions must hold for equilibrium. Condition (2-1) is just one element of this array. Any constraint which prohibits the attainment of any of the equilibrium conditions will have effects on many of the facets of the job package. The effect of the imposition of a minimum wage is to fix one element of the job package--the number of dollars paid for each hour worked.

Some workers may be earning a wage below the minimum wage prior to its imposition. Traditional analysis suggests that some of these workers will lose their jobs, and that the discovery of the number of these workers is of interest if one is to analyze the economic effects of the minimum wage. The second part of this proposition contains the implicit assumption that "job" is completely defined, so that by counting the number of "jobs" lost, one might discover the effect of the minimum wage on affected workers. However, if the "job" is a package defined by a contract, an effect of the minimum wage will be an implicit mutual agreement between employer and employee to reduce the amount of some components of the job package. Thus, contrary to accepted notions, some or all of those workers for whom the minimum wage is an effective constraint, may keep their jobs.[2] But in spite of the fact that they are still working, and receiving a higher wage, it is not correct to conclude that they are "better off," since other terms of the contract have worsened.

The empirical problem is to identify some subset of the j + k margins which change for workers who keep their jobs and to determine whether these are perceptibly affected by the minimum wage. Three elements are chosen for consideration: The hours worked per week, the security of the job, and the employee's liberty to leave his job at will. These elements are reflected in: The average number of regular hours and overtime hours worked per week, the layoff rate, and the quit

rate. The statistical model used for testing the statistical significance of each relationship hypothesized is

$$Y_i = e^{\beta_0} \; M^{\beta_1} \; W^{\beta_2} \; Q^{\beta_3} \; e^{\beta_4 T + \varepsilon}$$

Y_i is the dependent variable, as listed above. Estimation is in logs, so that response elasticities are estimated. The explanatory variables are: The "real" minimum wage (M)--the nominal minimum wage deflated by the CPI; the "real" wage rate in the industry (W); the index of output for the industry (Q); and time (T). The equations which estimate the effect of the minimum wage on the layoff rate will be adjusted by including an interaction term. The rationale for this term and its form will be discussed subsequently.

Section II

The data used to test the hypotheses to be developed consist of monthly observations on the appropriate variables for each of the twenty low wage industries for the year 1958-1969, chosen from seven low wage industry groups by a process which could be roughly characterized as stratified random sampling. The industries are listed in Table 1, which presents the Standard Industrial Classification (SIC) code number, a complete title, as found in the Employment and Earnings series of the Bureau of Labor Statistics, and a shorter title, to be used in subsequent tables.

The variables for which data are gathered fall into two major categories, those which take different values from industry to industry and those which have a common value among industries. In the present study only the minimum wage rate falls into the latter category. For all other variables, each industry generated a separate set of observations. There is one variable which does not fit neatly into either of the above categories. To control for cyclical business activity in each industry, a measure of industry output is needed. The Federal Reserve Index is used. This index is reported for industries at a 2 digit SIC level of aggregation, while the other data are at a 3 digit level. The index for the industry group is taken as an index for the industries within that group. All indices have 1957-1959 as the base. The data for monthly observations on the other variables either were available in the Bureau of Labor Statistics Volume Employment and Earnings 1939-1969, or could be generated from data from this source. The explanatory variable which was derived from Employment and Earnings is the wage rate. The actual values published are for average hourly earnings, a series which was unacceptable because of the inclusion of overtime earnings.

A wage series was constructed from an average hourly earnings series, assuming that the rate of compensation for overtime is 1.5 times that for regular hours.[4]

The other variables for which observations are from Employment and Earnings are: The length of the workweek, the average amount of

Table 1: Industries Used in Study

SIC Code	SIC Title	Short Title
242	Sawmills and planing mills	Sawmills
244	Wooden containers	Containers
249	Miscellaneous wood products	Misc. wood products
251	Household furniture	Furniture
394	Toys, amusement, and sporting goods	Toys
395	Pens, pencils, office and art materials	Pens
396	Costume jewelry, buttons, and notions	Jewelry
205	Bakery products	Bakery
207	Confectionary and related products	Confectionary
212	Cigars	Cigars
221	Weaving mills, cotton	Weaving
224	Narrow fabrics and smallware	Fabrics
225	Knitting mills	Knitting
228	Yarn and thread mills	Yarn
232	Men's and boys' furnishings	Furnishings
233	Women's and misses' outerwear	Outerwear
234	Women's and children's undergarments	Undergarments
236	Children's outerwear	Children's Outerwear
311	Leather tanning and finishing	Tanning
314	Footwear, except rubber	Footwear

overtime, and the quit and layoff rates. All of these serve as dependent variables.

Section III

A. Workweek length

Typically text-book presentations of the choice facing a potential laborer is phrased in terms of the labor-leisure model. The individual faces a wage line and chooses the number of hours which provides him maximum possible satisfaction. The wage rate is invariant with the number of hours chosen. This stylization is likely to be only approximately correct.

Barzel [3] has suggested an alternative configuration for the wage line faced by the worker, and suggested some of the implications of a non-linear wage curve. Specifically it is suggested that the presence of fixed (per day or per week) costs of employing a worker will result in a wage line which increases as more hours per day (or week) are offered to the employer.

The present section explores the implications of this configuration for the availability of part-time work in low-wage industries, in the presence of a legal minimum wage. It is suggested that some of the effect of the higher wage can be offset by requiring longer hours of work. The implication for part time workers is clear: to the extent the per hour wage can be increased by increasing the number of hours worked, the minimum wage will result in a increase in the minimum number of hours for which a part-time worker will be employed.[5]

Graphically the effect of the minimum wage may be depicted in Figure 1. The curve VWP--value of weekly product--is the worker's

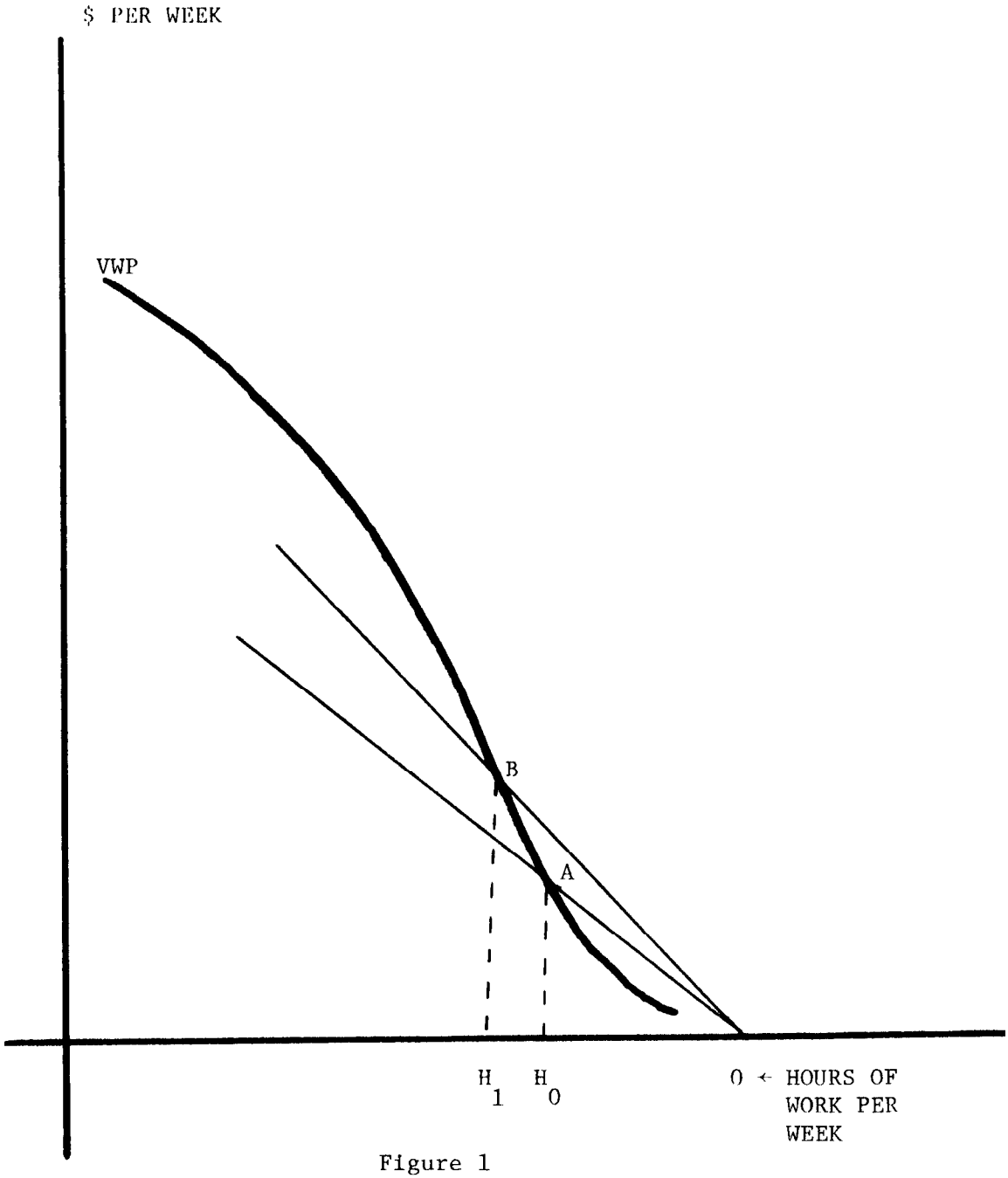


Figure 1

wage line. The initial increasing slope is due to the existence of a number of factors. First, the worker requires some "start-up" time each day. Secondly there are per employee, rather than per manhour, costs. These will include, but not be limited to, accounting costs, costs of providing locker or parking space, perhaps theft by employees if this does not increase in proportion to hours worked.

The worker is assumed to maximize his utility at point A. Accordingly, he receives an hourly wage rate equal to (minus) the slope of line OA. But if the worker were willing to work H_1 hours, his hourly wage will rise to (minus) the slope of OB. In either case the job contract must be envisioned as specifying the wage rate, dependent on the number of hours to be worked.

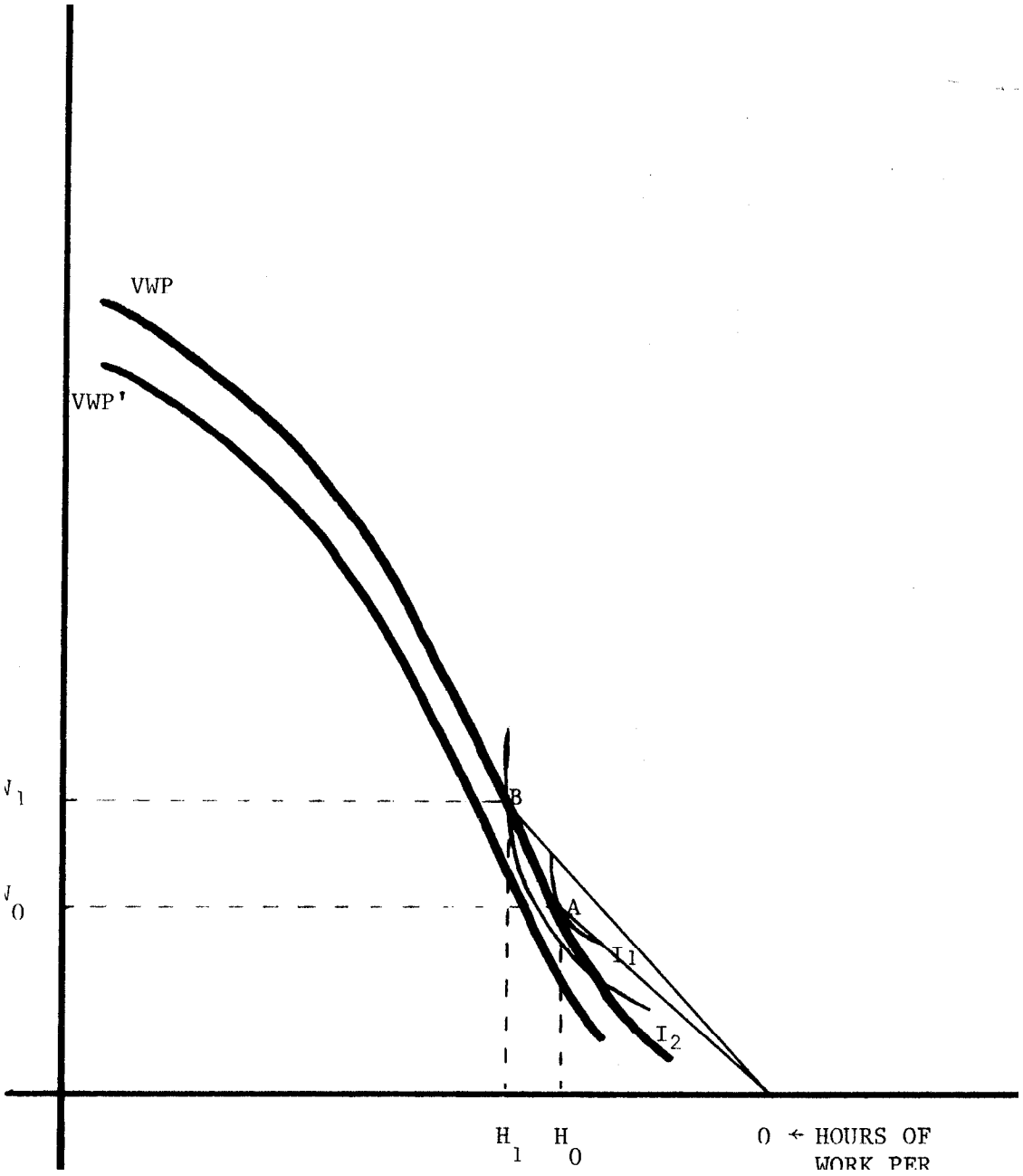
Returning to the choice of point A, consider the effect of a minimum wage equal to the slope of OB. The job will continue to be available to the individual if he will work H_1 hours rather than H_0 hours.[6] Given his preferences, as revealed in the choice of point A, the worker will work no more than H_1 hours; he may quit his job.

The available data on part-time work do not permit a direct test of the hypothesis that part-time work will be reduced as a result of the minimum wage. Part of the difficulty of available data, apart from aggregation problems, is that "part-time" is defined arbitrarily. As a result, no information is available on changes in the length of the part-time workweek. A measure that will be affected

by such changes is the length of the workweek of the average worker in a given industry. This measure is provided in the BLS Employment and Earnings series. This measure includes both regular and overtime work. However overtime work may be affected by the minimum wage quite independently of the relationship developed above. Therefore, a measure of the average length of the regular workweek, referred to as REGULAR HOURS, is generated by subtracting average overtime hours. It is regular hours which will serve as the dependent variable in attempting to detect the effect of the minimum wage on part-time work.

Of course it is possible that a relationship between the minimum wage and the length of the workweek may derive from a source other than that developed. If affected workers choose to offer more hours, this will depress the wage rate among this group of workers, causing the VMP schedule to shift inward, as from VMP to VMP' in Figure 2.[7] This curve will intersect line OB at a point to the left of H_1. This indicates that the increase in the minimum length of the workweek derives both from the slope of VWP and its shift.

Since the purpose of the statistics is not to estimate a VWP curve, this complication presents no difficulty. However suppose that VWP is in fact nearly linear. Then it might be that OB lies above VWP, so that workers lose their jobs. The demand for substitute workers will rise, as will their wages. If, in response, they choose to work longer hours, then the average length of the workweek will rise. The possibility introduces an identification problem which cannot be resolved with available data.


VWP
VWP'
B
A
I1
I2
H1
H0
0 ← HOURS OF

The minimum wage can affect the rate of overtime employment in two distinct ways. The net effect of the two is that no prediction as to the sign of a relationship between the minimum wage and overtime is possible. The first basis for a relationship between overtime and the minimum wage stems from the effect of the minimum wage on part-time work. For some part-time work, such as week-end work, the work done by the part-time employee may be done by a full-time employee working overtime. So, the imposition of a minimum wage may result in an increased amount of overtime.

However, where premium pay is required for overtime work, there is a second potential source af a relationship between overtime and the minimum wage. Consider Figure 3, similar to Figure 1. Assume that H_0 hours exceeds the legally defined regular workweek, H_R. Now if a legal workweek is enforced, it is possible to define a new wage equal to (minus) the slope of OC, such that the worker will still provide H_0, hours, H_0-H_R of which are overtime. Recall the contract will specify both wage rate and hours. Now if a minimum wage equal to the slope of OB is imposed, then the new wage line will be everywhere above OCA. Given this higher wage, and that point B lies to the right of H_R, the employee can still retain his job, but only by working less overtime. Of course of point B lies left of H_R, the effective constraint of the minimum wage will be above line OB, and the employee will lose his job. In either case the imposition of a minimum wage will result in less average overtime worked.

Since theory fails to predict the direction of response to the

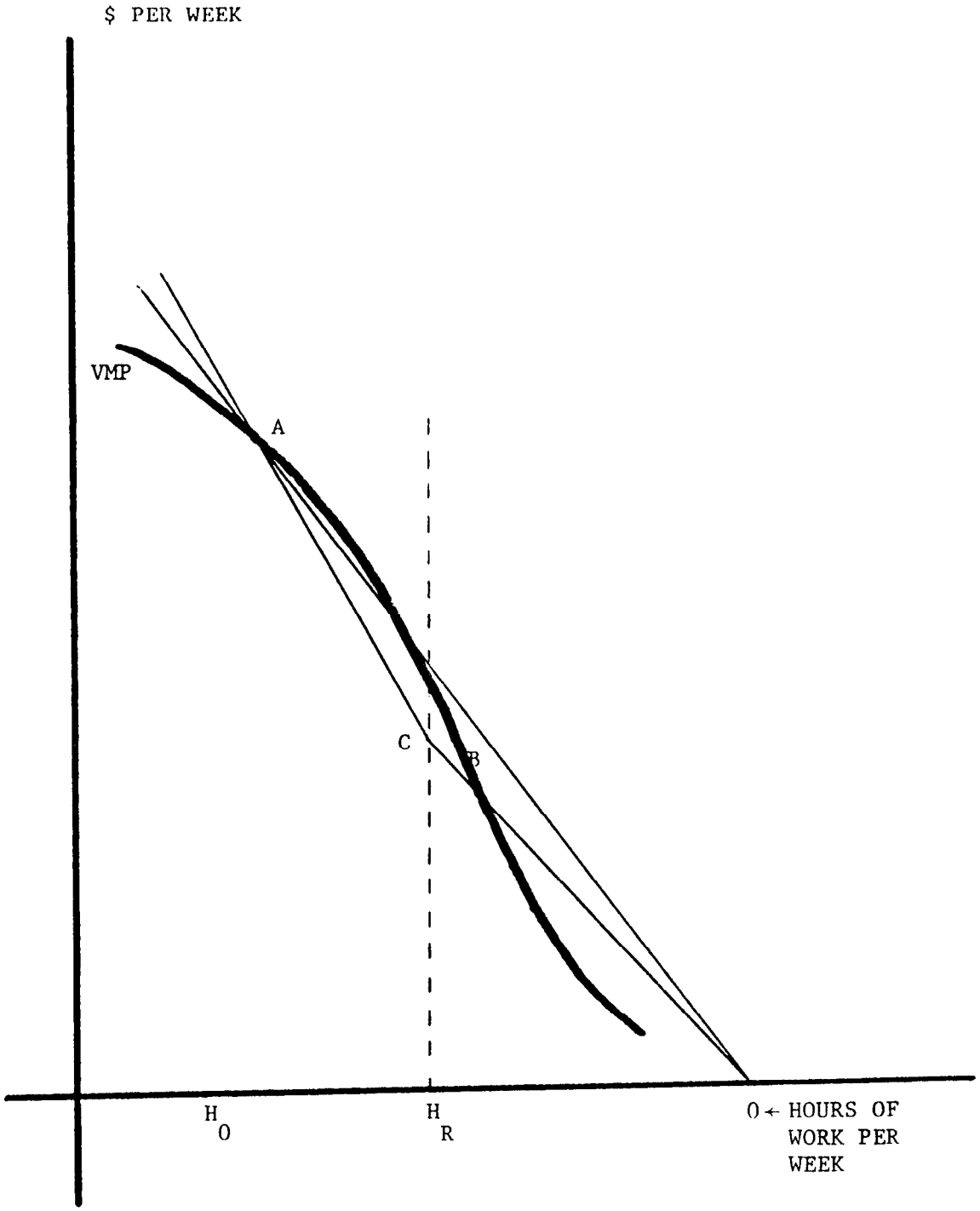


Figure 3

amount of overtime to the minimum wage, the purpose of the estimation is to determine whether one force will dominate the other in a given industry and generate an observable relationship. There is no reason to expect the same sign in each industry. Within a given industry, having obtained a significant estimate does not allow prediction, since one force may dominate in one range of values of the minimum wage and the other dominate in another range.

B. Turnover Rates

To specify a contract completely, one must include some statement of the period for which the contract is binding. An explicit specification of the duration of the contract is rare in the contracts of wage-earners. However, there probably is some understanding between employee and employer as to the expected duration of a given employment. Both gain from having the other party bound by a long-term contract, while being under no such restraint himself.

This section develops the implications of the minimum wage rate for the period of duration for which the job contract is binding, first for the employer, then for the employee.

First, the employee is assumed to prefer a secure position to a less secure one, cet. par. That is, with all other facets of the contract the same, the employee will choose the position which guarantees his employment for the longest period of time. Of course, such restraint on the duration of employment would be prohibitively costly for employees to enforce if the enforcement were a legal enforcement of explicit contract clauses. Such is not the case. Rather the

market provides both the incentive to provide job security and the mechanism for enforcing this (typically implicit) clause in the job contract. A firm can pay a lower nominal wage if it offers its potential employees assurance that they will keep their jobs during "hard times". Such assurance likely takes the form of a reputation as a secure employer. The enforcement mechanism involves the loss of such reputation, and of the attendant decrease in the wage bill, if the firm attempts to violate its agreement.[8]

Thus the market provides for transactions which involve the duration which a given worker can expect to work for a given employer. As it does with other elements of the job contract, the imposition of a minimum wage limits the exchange possibilities. Specifically if the minimum wage is above the wage paid to a given group of employees precisely because of costs involved in assuring employability through periods of relatively low demand, then such assurances will no longer be offered.

The empirical implications of this model for the layoff rate do not differ from those of received models of the labor market. That is, the minimum wage will result in increased layoffs, to the extent that workers marginal product remains below the minimum wage after all feasible adjustments in the package have been made. And the cyclical variation in the layoff rate will increase.

It is desirable to simultaneously test both of the above hypotheses. This requires some restructuring of the basic model.

Specifically, the model

$$\ln L = \beta_0 + \beta_1 \ln M + \beta_2 \ln W + \beta_3 \ln Q + \beta_4 T + \beta_5 (\ln M \cdot \ln Q) + \varepsilon$$

is used.

The difficulties arise in interpreting the results of such tests. Of course the choice of the form of the interaction term is arbitrary. The formula chosen allows for relatively simple interpretations of all terms. The term

$$\frac{\partial \ln L}{\partial \ln M} = b_1 + b_5 \ln Q ,$$

is an estimate of the elasticity of the response of the layoff rate to the minimum wage rate. This function will be evaluated at the point $\overline{\ln Q}$ for each industry. The term b_5 estimates the change in the elasticity of response of layoffs to the rate of output resulting from a one percent change in the minimum wage rate. Theory suggests that this term will be negative. That is as output falls, the proportionate increase in layoffs will be greater in the presence of a minimum wage. Conversely as output rises, the proportionate fall in layoffs will be less given a minimum wage.

It is costly for the worker when his employer lays him off. Also it is costly for the employer when a worker quits. This fact may be attributed to the acquisition of specific human capital in the employee, or due to costs of searching for a suitable replacement. In either case, an employer may be expected to be willing to pay a premium for a history of stability on the part of a potential employee.

More precisely, of two employees, who are otherwise identical, the one with the history of longer average employment per job will tend to receive a higher wage rate. Alternatively, given the choice of hiring either of the two workers at the same wage rate, the employer will choose the worker with a record of stability. The latter statement of the issue is the relevant one for determining the implication of the imposition of a minimum wage rate for the quit rate, because, for some groups of workers, the minimum wage effectively reduces the employer's decision to precisely the one stated.

Thus we may expect that the imposition of a minimum wage rate will reduce the quit rate. That is, the length for which a job contract will be binding on the employee will rise. This rise is not enforced (or even stated) explicitly. Rather, there is a selective process by which those workers who are not expected to abide by the new terms fail to find work. This mechanism has especially strong implications for young people who have not had time to establish a reputation for job stability. Thus the quit rate is inversely related to the minimum wage rate. To test the hypothesis, a set of regressions like those used to test the hypothesis, about the length of the workweek is used.

Section IV

The following tables contain the equations used to test the suggested relationships. The constant terms are excluded.

Generalized least squares estimation was used to correct for serial correlation. Almost certainly, much of the serial correlation is due

to excluded variables, including lagged variables. The approach taken was to avoid search for an appropriate lag structure and to approximate the effects with an estimated first order process. Comparisons of OLS and GLS estimates suggest that this technique yielded a good approximation. Specifically the statistics behaved as one would expect if a first order process were part of the true specification: The estimates do not differ substantially and the standard errors of the estimates increase with GLS.

Tables 2 through 5 contain estimates of the elasticities of the explanatory variable, and the rate of time change of the dependent variables. The R^2 is presented for each equation as is the estimate of serial correlation. With respect to the R^2's, it should be recalled that the equations estimated contain dummy variables to adjust from seasonal effects. Thus R^2 will overstate the explanatory power of the independent variables for which estimates are presented, so the R^2 is accompanied by an F statistic which is calculated for the explanatory variables exclusive of the dummy variable.

Mean values of variables are presented in Table 6. Table 7 summarizes the significance of the minimum wage on the various industries.

The estimates of the coefficients of lnM in Tables 2 through 5 indicate that the minimum wage is related to some aspect of the job package in most of the industries considered. The significance of the effects are summarized in Table 7, where significance at conventional

Estimated Equations with ln Regular Hours as the Dependent Variable

INDUSTRY	Estimated Coefficients of				R^2	$F(4,128)^1$	ρ
	lnM	lnW	lnQ	TIME			
Sawmills	0.112 (3.217)[2]	-0.388 (-4,416)	0.123 (5.198)	0.0003 (1.930)	.51719	12.92	.233
Containers	-0.050 (-1.405)	-0.024 (-0.992)	0.138 (5.164)	-0.0001 (-1.659)	.39079	8.53	.361
Misc. Wood Products	-0.020 (-0.935)	0.025 (4.959)	0.055 (3.029)	-0.0004 (-6.923)	.49521	25.65	.136
Furniture	0.103 (4.632)	-0.272 (-3.137)	0.157 (7.144)	-0.0008 (-4.591)	.67875	25.12	.385
Toys	0.012 (0.485)	0.072 (0.919)	0.088 (2.963)	0.001 (-3.952)	.54533	24.16	.240
Pencils	0.026 (0.893)	-0.018 (-0.233)	0.123 (3.181)	-0.001 (-2.653)	.36319	6.64	.125
Jewelry	0.062 (1.637)	-0.064 (-0.513)	0.188 (4.649)	-0.001 (-4.411)	.40813	16.43	.279
Bakery	0.034 (2.528)	0.174 (5.572)	0.058 (1.345)	-0.001 (-6.917)	.73423	71.67	.422
Confectionary	-0.010 (-0.506)	0.107 (1.513)	0.212 (2.722)	-0.001 (-4.256)	.46253	7.56	.192
Cigars	0.029 (0.490)	0.039 (0.214)	0.130 (2.870)	-0.0004 (-1.752)	.39823	3.49	.247
Weaving	0.064 (1.772)	0.233 (2.181)	0.065 (1.848)	-0.001 (-3.199)	.36648	3.93	.590
Fabrics	0.049 (2.015)	-0.217 (-3.073)	0.106 (4.497)	-0.0003 (-2.262)	.37243	8.92	.213
Knitting	0.093 (3.531)	-0.130 (-1.544)	0.105 (4.400)	-0.000 (-2.827)	.55513	8.25	.284
Yarn	-0.025 (-0.243)	-0.098 (-0.415)	0.136 (1.338)	0.0004 (0.081)	.17373	2.95	.011
Furnishings	0.040 (0.928)	-0.081 (-0.752)	0.091 (2.793)	-0.0002 (-0.982)	.36305	2.65	.558
Women's Outerwear	0.017 (0.419)	0.391 (3.304)	0.099 (3.844)	-0.001 (-3.563)	.55858	9.70	.131
Undergarments	0.002 (0.039)	-0.043 (-0.479)	0.049 (1.792)	0.00003 (-0.168)	.40667	1.92	.091
Children's Outerwear	-0.063 (-1.333)	-0.292 (-2.719)	0.021 (0.622)	0.0002 (1.003)	.31299	2.44	.182
Tanning	-0.020 (-0.557)	0.082 (0.530)	0.071 (2.536)	-0.0002 (-1.162)	.20670	3.03	.732
Footwear	0.061 (1.261)	-0.001 (-0.006)	0.291 (7.812)	-0.0003 (-1.512)	.66512	16.90	.375

[1] F is calculated by setting all coefficients except those of the constant and monthly dummies equal to zero.

[2] T-values are in parentheses.

Estimated Equations with ln Overtime as the Dependent Variable

INDUSTRY	Estimated Coefficients of				R^2	$F(4,128)$[1]	p
	lnM	lnW	lnQ	TIME			
Sawmills	0.350 (1.139)[2]	-3.296 (-4.963)	1.297 (6.278)	0.007 (5.610)	.61116	39.35	.617
Containers	-1.286 (-3.813)	-0.270 (-1.409)	1.304 (5.234)	0.005 (5.503)	.60329	33.91	.508
Misc. Wood Products	-0.318 (-1.474)	-0.044 (-0.124)	0.995 (5.880)	0.003 (4.154)	.70034	58.42	.481
Furniture	1.482 (6.415)	-3.351 (-3.722)	2.828 (12.228)	-0.011 (-6.212)	.85398	85.65	.468
Toys	-0.124 (-0.396)	-3.833 (-4.164)	1.638 (4.311)	-0.0003 (-0.131)	.70888	36.17	.424
Pencils	0.029 (0.074)	-2.621 (-2.445)	1.592 (2.775)	-0.001 (-0.271)	.51010	12.07	.406
Jewelry	0.658 (1.190)	-3.782 (-2.554)	1.812 (2.839)	-0.002 (-0.614)	.39577	6.46	.570
Bakery	-0.239 (-2.015)	-0.943 (-3.330)	0.012 (0.029)	0.004 (4.530)	.85079	6.61	.330
Confectionary	-0.149 (-0.553)	-2.298 (-2.365)	1.689 (1.758)	0.002 (0.677)	.66103	7.05	.422
Cigars	2.241 (2.551)	-13.291 (-4.910)	2.490 (3.697)	0.014 (4.322)	.45564	12.49	.295
Weaving	0.374 (1.529)	-0.867 (-1.204)	0.790 (3.263)	0.003 (1.717)	.42678	12.37	.813
Fabrics	-0.104 (-0.427)	-4.395 (-4.908)	1.155 (4.879)	0.004 (2.551)	.55839	21.47	.656
Knitting	0.087 (0.345)	0.324 (0.369)	1.057 (4.516)	-0.001 (-0.989)	.67360	24.90	.481
Yarn	-0.307 (-0.981)	-4.335 (-4.917)	2.159 (6.993)	0.005 (2.900)	.63971	44.33	.544
Furnishings	0.298 (0.752)	-1.329 (-1.202)	0.710 (2.121)	0.001 (0.581)	.53181	2.88	.691
Women's Outerwear	-0.204 (-0.575)	0.677 (0.651)	0.617 (2.527)	-0.002 (-1.213)	.42697	4.80	.346
Undergarments	0.403 (1.021)	-3.599 (-3.218)	0.671 (2.167)	0.004 (2.085)	.63488	12.38	.549
Children's Outerwear	0.010 (0.025)	-0.879 (-0.890)	0.666 (2.206)	0.0001 (0.074)	.62504	2.20	.457
Tanning	0.490 (1.747)	-3.009 (-1.744)	1.460 (5.857)	0.007 (3.433)	.76792	101.32	.419
Footwear	0.446 (1.133)	-2.853 (-2.404)	2.320 (7.768)	0.006 (4.484)	.78128	61.19	.472

[1]See footnote 1, Table 2

[2]See Footnote 2, Table 2

Estimated Equations with ln Layoff as the Dependent Variable

Industry	Estimated Coefficients of					R^2	$F(5,127)$[1]	ρ
	lnM[3]	lnW	lnQ	TIME	lnQxlnM			
Sawmills	-0.214 (-0.381)[2]	-4.796 (-2.943)	-2.941 (-6.511)	0.005 (1.934)	-2.344 (-0.717)	.79048	56.98	.257
Containers	1.718 (1.704)	-0.809 (-1.028)	-1.532 (-1.950)	-0.007 (-2.861)	-3.085 (-0.547)	.46835	11.45	.253
Misc. Wood Products	0.389 (0.044)	2.188 (1.419)	-2.021 (-2.821)	-0.008 (-3.230)	5.034 (0.983)	.46505	19.45	.374
Furniture	-1.234 (-1.485)	-4.251 (-0.950)	-3.907 (-4.492)	0.016 (2.480)	-2.765 (-0.819)	.62958	36.33	.364
Toys	-0.735 (-0.833)	6.945 (2.582)	-1.788 (-1.003)	-0.003 (-0.474)	-7.399 (-2.603)	.79169	7.14	.012
Pencils	0.346 (0.332)	8.687 (2.386)	-4.061 (-2.872)	-0.003 (-0.289)	-7.140 (-1.512)	.48679	19.79	.048
Jewelry	-1.752 (-1.970)	8.704 (2.661)	-3.477 (-3.294)	-0.003 (-0.567)	-7.223 (-2.435)	.69909	45.99	.153
Bakery	0.361 (0.702)	2.513 (1.306)	0.913 (0.331)	-0.007 (-1.332)	-2.128 (-0.413)	.54500	2.53	.137
Confec-tionary	0.472 (0.651)	3.895 (1.150)	-1.328 (-0.640)	-0.007 (-0.849)	-7.921 (-1.308)	.76381	4.63	-.002
Cigars	-1.302 (-0.766)	3.867 (0.752)	-0.287 (-0.104)	-0.006 (-1.013)	-25.556 (-2.177)	.50279	1.28	.182
Weaving	-0.097 (-0.090)	-2.662 (-0.859)	-2.555 (-2.515)	-0.002 (-0.378)	8.116 (2.067)	.49298	21.98	.471
Fabrics	0.209 (0.250)	7.820 (2.549)	-4.119 (-5.528	-0.004 (-0.836)	-5.833 (-1.523)	.59470	25.30	.207
Knitting	-0.418 (-0.801)	-1.244 (-0.697)	-2.447 (-14.891)	0.005 (1.987)	-2.084 (-1.103)	.78639	36.03	.101
Yarn	-0.220 (-0.227)	1.630 (0.552)	-4.354 (-4.606)	-0.002 (-0.475)	-5.517 (-1.262)	.52609	27.01	.378
Furnish-ings	1.502 (1.528)	-2.747 (-1.085)	-2.103 (-3.132)	0.004 (0.931)	10.913 (2.382)	.40002	6.44	.299
Under-Garments	1.207 (2.229)	-4.246 (-2.621)	-1.352 (-3.583)	0.001 (0.351)	0.150 (0.050)	.78388	35.08	.097
Tanning	-0.868 (0.577)	-7.992 (-1.421)	-2.1331 (-2.7953)	0.008 (1.237)	-5.689 (-0.850)	.42368	8.63	.322
Footwear	-0.427 (.720)	-1.556 -(0.802)	-5.162 (-10.958)	-0.001 (-0.252)	-8.950 (-2.052)	.72480	44.69	.037

[1]See footnote 1, Table 2

[2]See footnote 2, Table 2

[3]These estimates equal $b_1 + b_5\overline{lnQ}$ (See text, p. 14)

Estimated Equations with ln Quit as the Dependent Variables

Industry	Estimated Coefficients of				R^2	$F(4,128)$[1]	ρ
	lnM	lnW	lnQ	TIME			
Sawmills	-0.401	0.613	1.164	0.006	.90880	70.63	.655
	(-1.111)[2]	(0.802)	(4.811)	(4.198)			
Containers	-0.511	-0.445	0.855	0.011	.76458	39.63	.658
	(-0.842)	(-1.587)	1.990)	(6.729)			
Misc. Wood Products	-1.023	-0.925	1.463	0.010	.86789	118.25	.481
	(-2.627)	-1.437)	4.789)	(9.063)			
Furniture	0.131	0.080	2.329	-0.002	.92402	133.34	.673
	(0.439)	(0.068)	(7.290)	(-0.986)			
Toys	-0.631	-2.449	2.331	0.002	.88033	75.31	.584
	(-1.468)	-2.100)	(4.294)	(0.819)			
Pencils	-0.079	3.175	3.417	-0.013	.84831	82.76	.212
	(-0.244)	(3.537)	(7.666)	(-4.505)			
Jewelry	-1.249	2.206	3.068	-0.009	.83839	49.59	.258
	(-3.204)	(1.706)	(7.444)	(-3.718)			
Bakery	0.001	-1.512	1.125	0.011	.88025	51.47	.687
	(0.003)	-2.069)	-1.574)	(5.584)			
Confectionary	-0.398	-3.527	-0.166	0.013	.82480	35.15	.580
	(-1.160)	-2.740)	-0.146)	(4.181)			
Cigars	-0.960	0.646	0.501	0.008	.70598	27.91	.571
	(-1.932)	(0.450)	(1.468)	(4.070)			
Weaving	-0.009	1.613	0.914	0.009	.90925	106.52	.697
	(-0.041)	(-2.514)	(4.276)	(6.273)			
Fabrics	-0.675	1.473	1.310	0.003	.85905	91.67	.451
	(-2.063)	(1.420	(4.153)	(1.939)			
Knitting	-0.450	0.276	1.143	0.002	.91066	122.89	.456
	(-2.092)	(0.372)	(5.719)	(1.937)			
Yarn	-0.335	0.311	1.296	0.007	.91560	226.05	.512
	(-1.308)	(-0.441)	(5.132)	(5.367)			
Furnishings	-0.090	-1.658	0.710	0.005	.86782	49.69	.498
	(-0.326)	(-2.503)	(3.538)	(4.120)			
Undergarments	-0.651	0.374	1.001	0.003	.86529	55.89	.515
	(-2.751)	(-0.581)	(5.491)	(2.923)			
Tanning	-0.132	-1.577	1.439	0.014	.82066	88.63	.558
	(-0.235)	(-0.531)	(3.036)	(4.010)			
Footwear	-0.970	0.704	1.479	0.006	.89310	132.73	.420
	(-3.232)	(0.777)	(6.455)	(5.945)			

[1]See footnote 1, Table 2.

[2]See footnote 2, Table 2

Table 6

Average Values of Selected Variables

VARIABLE INDUSTRY	ln W	ln Q	lnM x enQ	ln Regular Hours	ln Overtime	ln Quit	ln Layoff
Sawmills	.548	4.703	.474	3.596	1.196	.943	.254
Containers	.439	4.703	.474	3.613	1.067	.941	.759
Misc. Wood Prod	.536	4.703	.474	3.622	1.146	.892	.363
Furniture	.550	4.929	.508	3.624	1.051	.954	.065
Toys	.538	4.873	.500	3.604	.745	1.038	1.217
Pencils	.597	4.877	.507	3.630	.649	.527	.010
Jewelry	.533	4.873	.500	3.610	.805	1.040	.789
Bakery	.736	4.766	.483	3.611	1.153	.622	-.152
Confectionary	.583	4.766	.474	3.613	.879	1.048	.916
Cigars	.390	4.737	.467	3.593	.079	.864	.069
Weaving	.441	4.810	.482	3.621	1.255	.801	-1.054
Fabrics	.473	4.810	.482	3.626	1.112	.685	.064
Knitting	.423	4.810	.482	3.586	.784	.859	.333
Yarn	.385	4.810	.482	3.617	1.174	1.052	-.051
Furnishings	.317	4.859	.484	3.579	.055	1.032	-.171
Women's Outerwear	.579	4.859		3.486	.198		
Under-garments	.380	4.859	.484	3.560	.239	.984	.415
Children's Outerwear	.390	4.859		3.539	.217		
Tanning	.719	4.642	.465	3.616	1.017	.398	.457
Footwear	.471	4.642	.465	3.581	.293	.988	.275

Table 7

Summary of the Significance of the Estimates of the Coefficients of lnM in Various Equations

INDUSTRY	SIGNIFICANCE OF THE EFFECTS ON				
	Regular Hours (1)	Overtime	Layoff	Layoff (3) Elasticity	Quit
Sawmills	**				
Containers		** (-)	*		
Misc. Wood Products					**
Furniture	**	** (+)			
Toys				**	
Pencils					
Jewelry			*(-)	**	**
Bakery	**	* (-)			
Confectionary					
Cigars		** (+)		*	*
Weaving	*			* (+)	
Fabrics	*				*
Knitting	**				*
Yarn					
Furnishings				** (+)	
Women's Outerwear			- (4)	- (4)	- (4)
Undergarments			*		**
Children's Outerwear			- (4)	- (4)	- (4)
Tanning		* (+)			
Footwear				*	**

Table 7 (continued)

1. * indicates significance at 95%; ** indicates significance at 99%

2. (+) indicates that the sign is positive; (-) indicates that the sign is negative; No sign is indicated where theory predicts a sign, and the sign is as predicted.

3. The rate of change of the elasticity of the layoff rate with respect to changes in output, due to the minimum wage $= \partial \eta_{LQ} / \partial \ln M$

4. DATA MISSING

levels is indicated. A total of 76 equations were estimated, with 94 possible effects of the minimum wage tested for. In 26 cases a statistically significant relationship is observed. The observed relationships between the minimum wage and job package components are spread rather evenly among the industries considered. No industry is affected at all margins. Only five of the twenty industries failed to have at least one element of the job package affected.

The estimates of elasticities in Tables 2 through 5 indicate a generally small degree of response to changes in the minimum wage. However, average values are used. Since the workers in a given industry who are affected by the minimum wage are a fraction of all employees, the degree to which these workers are affected is a multiple of the effect on the average value of a given variable. Adjusting for this understatement results in estimates of elasticities exceeding unity in some industries in the responses of overtime and the quit rate to the minimum wage.[9]

The evidence presented suggests that substantial alterations of the job package of low-wage workers result from the impositions of a minimum wage. Other margins surely exist which may be more sensitive to the minimum wage than are those suggested in this study.

These considerations indicate that any study which is limited to employment effects of the minimum wage will miss other potentially important economic effects of the legislation.

Footnotes

1. For a more detailed development of the determination of the quantities of various elements of the vectors describing job and jobholder, see Antos and Rosen [2].

2. In fact, depending on the relative responses of the supply and demand for labor--in terms of a measure such as manhours--to the non-pecuniary components of the job package, the total amount of labor may either rise or fall in response to the minimum wage.

3. A fourth variable, the ratio of females to total employees in each industry, was considered. However, the model failed to predict a relationship of this variable to the minimum wage, and few strong statistical relationships were observed. This variable exhibited a significant (at 95%) direct relationship with the minimum wage in the cigars and furnishings industries, and a significant inverse relationship in the furniture industry.

4. $$\text{WAGE} = \frac{\text{AVERAGE HOURLY EARNINGS x AVERAGE HOURS}}{\text{AVERAGE HOURS x 1/2 AVERAGE OVERTIME HOURS}}$$

   converts the average hourly earning series to a wage series.

5. See Barzel [3], pp. 230-232.

6. Implicit in the discussion is that there is only one type of worker. Actually minimum wages apply to broad categories of workers, so it is not entirely appropriate to assume that VWP will not shift as the minimum wage affects the wage structure. See Ibid p. 232 fn 1.

7. Notice that each VMP schedule corresponds to a point on the demand for labor schedule.

8. A necessary condition for this model to apply is that employees are risk averse and will accept a wage lower than their marginal product provided that the lower wage rate, and employment at that rate, are stable.

9. Write

   $$Y = (1-K)Y' + K\,Y'',$$

   where Y is the relevant dependent variable, Y' (Y'') is the same variable for those unaffected (affected) by the minimum wage, and K is the fraction of workers affected. Rewriting in terms of Y yields

   $$Y'' = \frac{1}{K}\,Y - \frac{1-K}{K}\,Y' ,$$

which is of the form:

$$Y''(M) = \alpha\, Y(M) - b$$

since Y' is unaffected by the minimum wage.

$$\frac{\partial Y''}{\partial M}\frac{M}{Y''} = \left[\frac{\alpha\, Y}{\alpha\, Y - b}\right]\frac{\partial Y}{\partial M}\frac{M}{Y} \quad .$$

(see R.G.D. Allen, Mathematical Analysis for Economists, p. 253.) The size of the multiplicative factor depends on K and Y', neither of which is known. Use of various hypothetical values suggested factors ranging from 2 to 10 or more. An exception was with layoffs where these factors were in the range 1.2 to 4.

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