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The Economic Impacts of Minimum Wage Laws: A New Look at an Old Question

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CENTER FOR THE STUDY OF THE ECONOMY AND THE STATE
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THE ECONOMIC IMPACTS OF MINIMUM WAGE LAWS:
A NEW LOOK AT AN OLD QUESTION

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A New Look at An Old Question

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*University of Pennsylvania. The author is indebted to John Abowd, Yale Brozen, Elisabeth Landes, Kathleen Linneman, Susan Perles, Rodney Smith and Harry Watson for helpful comments and suggestions. Valuable comments were also obtained from the participants of the Industrial Organization and Labor Economics Workshops at the University of Chicago and Industrial Organization Workshop at the University of Pennsylvania. The research was primarily funded by the Center for the Study of the Economy and the State at the University of Chicago with additional funding from the Rodney White Center, University of Pennsylvania.

I. Introduction

One of the most controversial regulatory policies implemented in this century are mandatory minimum wage laws. Since the passage of the federal Fair Labor Standards Act (FLSA) of 1938 advocates have argued that minimum wage laws enhance social welfare by guaranteeing that all workers receive a "fair" wage payment. This position has been vigorously attacked by opponents who posit that minimum wage laws only guarantee excessively low employment levels among the relatively low skilled population. The social importance of this debate has steadily increased over time due largely to the ever increasing coverage of these laws.¹

In the more than four decades since the initial adoption of a federal minimum wage law economists have repeatedly addressed questions concerning their economic impacts. At the theoretical level these efforts have been quite productive. Theory suggests that, with the exception of potential perverse effects induced by monopsony, binding minimum wage laws tend to reduce the demand for workers whose unconstrained wage is less than the legal minimum. This demand reduction will be reflected in both reduced employment probabilities and annual hours worked (conditional upon employment) among the sub-minimum population.² As Mincer (1976) indicates, theory fails to provide any unambiguous predictions about the impacts of minimum wage laws on measured unemployment rates as the labor force participation decision may also be influenced by the presence of a minimum wage statute. Economic theory, unfortunately also fails to provide unambiguous predictions concerning the important question

¹For example, in 1956 only about half of the U. S. workforce was in jobs covered by the federal minimum. By 1976 over 80 percent of the U. S. workforce were in the covered sector.

²The phrase "sub-minimum population" in this paper refers to the population for which the unconstrained wage is less than the legal minimum.

of the impact of minimum wage laws on the distribution of earnings. This is because it is an empirical issue whether the higher hourly wage payments received by at least some members of the low-skill population are offset by the earnings foregone via the reduced employment opportunities induced by minimum wage laws.

In view of existing theoretical work in the area the primary tasks for empirical investigation appear to be:

- 1) identify the sub-minimum population;
- 2) quantify the impacts of minimum wage laws on the employment opportunities of both the sub-minimum and above-minimum population;
- 3) decompose the employment impacts between conditional hours employed (say annually) and the probability of being employed; and
- 4) measure the effects of the minimum on the distribution of earnings.

Existing empirical studies have generally concluded that federally established minimum wage laws have:³

- 1) reduced employment levels among teens, especially non-whites;
- 2) increased unemployment rates for teens, especially among non-whites;
- and
- 3) had no significant impacts on adult population.

A common methodological shortcoming of these studies is that they fail to directly identify the sub-minimum population and measure the gap between the competitive and legal minimum wage rates for this population.⁴ Instead, these studies concentrate their attention on the behavior of broad socio-economic

³See, for example, Adie (1973), Brozen (1969), Kesters and Welch (1972), Mincer (1976), Moore (1971), Ragan (1977), Welch (1974, 1978), Welch and Cunningham (1978), and Zucker (1973).

⁴The best study in this respect is Welch and Cunningham (1978). They use strong distribution and proportionality assumptions in an attempt to infer the size of the wage gap and, in turn, the identity of the sub-minimum population.

groups which they expect to be disproportionately loaded with members of the sub-minimum population. For example, the aggregate unemployment rate of black teens is the most popular study population.

The use of aggregate population studies to evaluate the economic impacts of minimum wage laws greatly reduces one's ability to measure the influences actually exerted by minimum wage laws. This is because these groups are composed of members with competitive wages both above and below the minimum and the impacts on one sub-group may wash out the influence on the other. This problem is likely to be especially acute in the adult population. A further problem with the use of aggregate socio-economic groups is that it requires the researcher rather than the data to identify the socio-economic groups which are disproportionately populated with those with competitive wage rates less than the minimum.

This paper argues that to obtain accurate insights concerning the economic impacts of minimum wage laws one must move away from the use of broad socio-economic group data. The second section of the paper develops a radically different methodology for evaluating the economic impacts of minimum wage laws. The key element of this methodology is the statistical identification of the wage structure which the market would have generated in the absence of the minimum. This wage structure is compared to the legal minimum to determine the identity of the sub-minimum population. The probability of any individual being a member of the sub-minimum population is parameterized in Section III. Section IV presents estimates of the impacts of the minimum wage on the U. S. adult labor market. The estimated impacts of the minimum wage standard on the distribution of earnings are reported in Section V. The paper concludes with a brief summary of the germane results and a discussion of possible extensions of the general methodology.

II. Measurement Methodology, Data, and Period of Analysis

To a first approximation the introduction of a minimum wage statute raises the cost of employing a worker by the difference between the minimum and unconstrained wage rates.⁵ If a laborer's unconstrained wage is greater than the minimum the law does not present a binding constraint. In order to determine the wage gap on the population as a result of the law it is necessary to measure what the market wage (for the person in question) would have been in the absence of the minimum. Welch and Cunningham (1978, p. 141) correctly note that to quantify the economic consequences of minimum wage statutes "ideally, one would like to observe wages with and without the legislation for direct measures of the costs" imposed upon individuals. Unfortunately, the world fails to provide one with the wage structure which would have prevailed in the absence of the legislation. However, information on the wage structure prevailing prior to the statute can be utilized to construct a statistical wage structure which can predict the wage structure which would have prevailed in the absence of the law.

Specifically, assume that prior to the introduction (or amendment) of the minimum wage laws the wage structure is described by:

$$1) \quad \ln W_{ij} = b_j X_{ij} + e_{ij}$$

where W_{ij} is the hourly wage earned by the i^{th} member of the j^{th} race/sex category (e.g., $j = 1$ implies white male, $j = 2$ implies white female, etc.);

⁵Adjustments in non-monetary payments may also occur. Therefore, this monetary wage gap represents an upper bound estimate of the true labor cost increase imposed by the minimum payment standard.

X_{ij} is a vector of typical skill variables (such as education and experience) possessed by the i^{th} member of the j^{th} classification; b_j is the vector of skill payoffs for the j^{th} population; and, e_{ij} is the error term. This wage structure can be estimated using data prior to FLSA (or its amendment). If it is assumed that this structure (in real terms) would have continued to prevail in the absence of the minimum, the estimated structure can be used to predict the wage structure which would have existed in the absence of the statute.⁶

The base, or "pre-minimum," period used in this paper is 1973 while the changes in the minimum wage rates caused by the FLSA amendment of 1974 are employed to identify the economic consequences of minimum wage laws.⁷ Following Welch and Cunningham (1978) this paper concentrates solely on federally established minimum wage laws.⁸ The use of 1973 as the base period of analysis for the estimation of (1) is problematic because behavior in 1973 was affected by the presence of a \$1.60 an hour minimum wage. However, given data availability, 1973 is a logical base period to examine the 1974 FLSA amendment. This is both because of its closeness in time and because as a result of the high inflation rates in the late 60's and early 70's the real value of the legal minimum in 1973 was at its lowest in 15 years.

The data used in this study are drawn from the random portion of the Michigan Panel Study of Income Dynamics. Only complete observations with the

⁶One could design a dynamic version of this model where the entire wage structure follows a time path which is determined by, for example, an ARIMA process. Such a model is beyond the scope of the current paper.

⁷In future work it is anticipated that a cross-section/time-series variant of the model developed in this paper will allow for a more complete analysis of the impacts of minimum wage laws.

⁸Welch and Cunningham (1978, p. 144) conclude that "although there exists a variety of state minimum wage laws . . . coverage empirically swamps variations in state laws. For practical purposes, 1970 minimum wage structure could be characterized as . . . a single minimum for all age groups."

same head in 1973, 1974, and 1975 are employed. The observations are all either household heads or spouses (when present). Since this sample contains very few observations under 20 years old it is clear that, unlike previous studies, the primary concern in this paper is with minimum wage impacts on the U. S. adult population.⁹ The reason this study concentrates on the adult population is that the members of this more mature population are the primary wage earners for most U. S. families and it therefore seems reasonable to believe that any significant labor market or earnings distribution effects will only be revealed in this population.¹⁰

Table 1 reports the race/sex specific means for the base period for some of the variables used in this study.

Since sample selection bias may exist with respect to the decision to work in the base period the 1973 wage structure is estimated via Heckman's (1976, 1979) selection bias correction procedure. Table 2 reports the estimates of the four race/sex payoff vectors in the base period. The wage structure in the base period is generally consistent with expectations. For example, the 1973 wage structure provided positive education and experience payoffs as well as a sizable union/non-union differential. The city size and regional impacts are in the anticipated directions, however, the latter are generally not statistically significant at standard confidence levels. The explanatory power

⁹The general methodology of this paper could also be applied to analyze the impacts on teens. This remains for future work.

¹⁰The main economic concerns of impacts on teens would seem to be: 1) foregone training opportunities; and 2) increased anti-social behavior resulting from not working. Since the first impact is probably small due to the nature of jobs available to teens, the primary concern seems to derive the "idle hands/devil's workshop" concept. The impact of minimum wage laws in this latter context is difficult to determine as not only must one establish the impacts on youth labor markets but also the substitutability of time spent in legal and illegal markets.

TABLE 1: 1973 MEANS BY RACE AND SEX

	<u>White Males</u>	<u>White Females</u>	<u>Black Males</u>	<u>Black Females</u>
Education	12.2	11.9	10.1	10.1
Potential Experience	28.2	29.1	30.4	30.3
City Size	323,468	324,421	449,481	429,289
1 If Union Member	.25		.31	
1 If Restricted	.13	.16	.19	.23
Age of Youngest Child	3.2	3.4	3.6	4.0
Number of Children	1.0	1.0	1.4	1.6
1 If South	.28	.29	.55	.54
1 If Northeast	.21	.22	.08	.09
1 If North Central	.34	.33	.18	.19
Non-Wage Income	4,779	11,869	3,363	7,940
1 If Head	1.0	.20	1.0	.35
1 If Veteran	-.43		.31	
1 If Worked for Pay	.83	.53	.80	.57
ln (Hourly Wage) if Worked	1.54	1.05	1.35	0.84
Observations	1967	2201	212	285

TABLE 2: BASE PERIOD WAGE STRUCTURE

	<u>White Males</u>	<u>White Females</u>	<u>Black Males</u>	<u>Black Females</u>
Constant	.1408	.7981*	.8435*	.2356
Education	-.0056	-.1238*	-.0992*	-.0853
Education ²	.0031*	.0084*	.0092*	.0089
Potential Experience	.0632*	.0269*	.0219	.0191
Potential Experience ²	-.0010*	-.0004*	-.0002*	-.0003
City Size	2.79×10^{-7} *	1.57×10^{-7} *	-5.18×10^{-8}	5.65×10^{-8}
1 If Union Member	.2053*		.2320*	
1 If Restricted	-.0810	.0036	-.1184	-.0741
1 If South	-.0228	.0103	-.1141	-.1987
1 If Northeast	.0604	.0910	.1600	.3885*
1 If North Central	.0487	.0279	.0150	-.0118
1 If Head		.0571		.0872
1 If Veteran	.0540*		.0916	
HECKMAN LAMBDA	.1488	.0495	-.4230	.2965

*Indicates that the asymptotic absolute t-value exceeds 1.9.

of the estimated base period wage structure is also reasonably high (R^2 values for the regressions are around .15). None of the samples appear subject to any significant selection bias.

III. Identification and Parameterization of the Sub-Minimum Population

The base period (1973) wage structure specified in Table 2 provides a consistent predictor from which one can infer the distribution of wages which would have existed in 1974 and 1975. Combining the estimates in Table 2 with an individual specific effect model indicates that in the absence of the FLSA amendment of 1974 the wage structure in year t would have been:

$$2) \quad \ln W_{ij}^t = b_j X_{ij}^t + \pi^t \quad \text{if observation did not work for pay in 1973;}$$

$$2') \quad \ln W_{ij}^t = \ln W_{ij}^{73} + b_j (X_{ij}^t - X_{ij}^{73}) + \pi^t \quad \text{if the observation worked for pay}$$

in 1973; where $t = 1974, 1975$; π^t is the natural log of the inflation rate between the base year and t ; b_j is the estimated wage payoff vector for the j^{th} population (Table 2); $\ln W_{ij}^t$ is the predicted natural log of the hourly wage rate for person i in group j in year t ; $\ln W_{ij}^{73}$ is the natural log of the actual hourly wage rate paid in 1973; X_{ij}^t is the actual data matrix for the j^{th} group in year t ; and, X_{ij}^{73} is the actual data matrix for the j^{th} population in 1973.¹¹ The inflator factor, π^t , converts the real wage structure in the base year to its nominal equivalent in year t . This is necessary because the legal minimum is always expressed in nominal terms.

The expected hourly employment cost imposed as the result of the imposition

¹¹The X_{ij}^t and X_{ij}^{73} matrices include the predicted and actual values respectively of the Heckman Lambda variable.

of the legal minimum, GAP, can be simply expressed (in natural logs) as:

$$3) \quad \text{GAP}_i^t = \ln M^t - \ln W_{ij}^t \quad \text{if } \ln M^t - \ln W_{ij}^t > 0;$$

$$3') \quad \text{GAP}_i^t = 0 \quad \text{if } \ln M^t - \ln W_{ij}^t < 0$$

where $\ln M^t$ is the natural log of the statutory minimum in t .¹²

This approach provides a simple rule which is used to construct a dichotomous index of whether an observation is a member of the sub-minimum population in year t , SUB,

$$4) \quad \text{SUB}_i^t = 1 \quad \text{if } \text{GAP}_i^t > 0$$

$$4') \quad \text{SUB}_i^t = 0 \quad \text{if } \text{GAP}_i^t < 0.¹³$$

It should be noted that this definition tends to understate the size of the sub-minimum population. This is because the wage variable used in obtaining this definition is the observation's average hourly wage (over a 12-month period) rather than the straight time rate specified by the FLSA. Since the

¹²The legal minimum for covered workers in 1974 was \$2 an hour while in 1975 it was \$2.10 for previously covered workers and \$2 for newly covered workers.

¹³An alternative classification scheme would be to require that GAP be positive and that the person is in the covered sector before they would be categorized as a member of the sub-minimum population. The primary difference between these alternative classification schemes is that the scheme developed in the text views industry and occupation as endogenous. Since the empirical results are not sensitive to which classification scheme is utilized, the paper will discuss only the results associated with the scheme described in the text.

The main empirical difference between these two schemes is that using the broader scheme in the text indicates that 10 percent of the adult population is in the sub-minimum population while only about 7 percent are in the sub-minimum population when the narrower scheme is applied.

average wage is always greater than or equal to the lowest straight time payment received an undercounting of the sub-minimum population occurs.

This methodology indicates that fully 9.9 percent of the U. S. adult population were members of the sub-minimum population in 1974! As expected the extent of the sub-minimum population fell, to 9 percent, in 1975 as inflation reduced the real value of the statutory minimum. The majority of those in the sub-minimum classification in 1974 remained in that category in 1975. In fact, 8.5 percent of the adult population were in the sub-minimum population in both years.

Table 3 displays the results of parameterizing the probability of an observation belonging to the sub-minimum population in year t ($t = 1974, 1975$), SUB_i^t , as a probit function of the relevant personal characteristics.¹⁴ Asymptotic absolute t-values are provided in parentheses.

The estimated results for the two years are qualitatively identical and approximately equal in magnitude. The results necessarily reflect the wage payment structure reported in Table 2. As expected, the probability of belonging to the sub-minimum population is greatest for those with very low education levels. The critical value of education for both years is approximately 5 years, that is, the change in the probability of being in the sub-minimum population as education changes is negative for all education levels beyond 5 years.

As potential experience rises the probability of being in the sub-minimum population in both years becomes less positive until after 37 to 39 years of potential experience (in 1975 and 1974, respectively) the change in this

¹⁴ Separate probit functions could have been estimated for each of the four race/sex categories. However since the goal of this paper is to obtain relatively simple estimators of minimum wage impacts it was decided to use four wage equations and a single probit function. Application of the more complex methodology remains for future work.

TABLE 3: PROBIT ESTIMATES OF THE PROBABILITY
IN THE SUB-MINIMUM POPULATION

	<u>For 1974</u>	<u>For 1975</u>
Constant	-.0642 (0.25)	-.2073 (0.79)
Education	.0828 (2.04)	.0598 (1.48)
Education ²	-.0074 (3.95)	-.0060 (2.99)
Potential Experience	-.0473 (8.22)	-.0415 (7.05)
Potential Experience ²	.0006 (1.82)	.0006 (6.98)
City Size	-2.91X10 ⁻⁷ (3.68)	-3.04X10 ⁻⁷ (3.71)
1 If Union Member	-.9371 (6.05)	-.7103 (4.85)
1 If Restricted	-.1319 (1.63)	-.0105 (0.13)
1 If South	-.0135 (0.16)	-.0329 (0.40)
1 If Northeast	-.2684 (2.68)	-.3351 (3.25)
1 If North Central	-.0845 (1.01)	-.1263 (1.49)
1 If Head	.0878 (1.01)	.0958 (1.09)
1 If Veteran	-.2481 (2.34)	-.2559 (2.31)
1 If White Male	-.6312 (5.10)	-.6766 (5.36)
1 If White Female	-.2511 (2.54)	-.2336 (2.32)
1 If Black Male	.4416 (2.95)	.5552 (3.71)
ln Likelihood	-1296	-1214

probability with respect to potential experience becomes positive. This suggests that the sub-minimum adult population is disproportionately populated by the relatively old.¹⁵

Table 3 indicates that the probability of being in the sub-minimum category declines with city size. This is due to the fact that for a given skill vector the compensating wage differentials associated with the net disamenities of city size lead to higher nominal wages in larger cities. The only notable regional difference (where the West is the base region) is that residents in the North Central states experience significantly lower probabilities of being sub-minimum than do residents of other areas. This finding is consistent with the hypothesis that net relative disamenities of living in the North Central states lead to higher nominal wage payments.

Both union members and veterans experience significantly reduced probabilities of belonging to the sub-minimum population. Whites are also less likely to lie beneath the minimum than blacks. White males fare better than white females, however, black females are less likely to be in the sub-minimum population than black males (other factors held constant).

The estimates presented in this section represent the only parameterization of the probability of being in the sub-minimum population known to this author. As such it is impossible to directly compare them to any literature on the topic. However, with the possible exception of the finding that black females

¹⁵A possible avenue for further expansion of the general methodology developed in this paper is to specify the wage structure as a function of actual job experience rather than potential experience. The use of actual job experience would necessitate prediction of whether the observation would have accumulated additional actual job experience in the time spanned by the base year and the study year had there been no minimum wage law. The use of potential experience in this paper finesses this prediction problem.

experience lower probabilities than black males, the results are consistent with intuition. A surprising and important finding presented here is that the sub-minimum population is not composed strictly of teens. Instead, approximately one of every ten adults in the U. S. fell beneath the minimum in the mid-70's. This is important as it indicates that the labor market impacts of minimum wage laws might induce significant changes in the distribution of family earnings in the U. S.

IV. Labor Market Impacts

Classical minimum wage theory indicates that fewer total hours of sub-minimum labor will be hired in the presence of a binding minimum wage statute. Theory further suggests that the demand for above-minimum labor may rise as employers shift towards this relatively cheap source of labor. Two margins are available to employers desiring to adjust their labor utilization. First, they may use the hire/fire option to increase the number of above minimum workers while reducing the number of sub-minimum laborers. This form of labor adjustment will be reflected in changes in the probabilities of the members of these populations successfully finding employment. Alternatively, employers could maintain a constant number of each labor category, but alter the annual hours worked by these workers (upward for above-minimum workers, downward for sub-minimum employees). Labor utilization adjustments along this margin will be reflected in a reduction in the annual hours worked (conditional upon working) among members of the sub-minimum population and increases in the conditional annual hours worked for those in the above-minimum population.

Generally, employers will find it optimal to adjust both labor utilization margins. An examination of Table 4 clearly indicates that following the 1974 FLSA amendment significant adjustments occurred in the utilization of sub-minimum

TABLE 4: SUMMARY STATISTICS OF THE SUB- AND ABOVE-MINIMUM POPULATIONS

	Population With SUB ⁷⁴ =1	Population With SUB ⁷⁴ =0	Population With SUB ⁷⁵ =1	Population With SUB ⁷⁵ =0
% Working for Pay in 1973	.64	.72	.65	.72
% Working for Pay in 1974	.51	.72	.50	.72
% Working for Pay in 1975	.51	.72	.50	.72
Annual Hours Worked in 1973	1720	1862	1681	1826
Annual Hours Worked in 1974	1483	1859	1342	1826
Annual Hours Worked in 1975	1395	1780	1494	1824
Education in 1974	9.4	12.1	9.3	12.1
Age in 1974	55.9	43.2	57.1	43.1
City Size in 1974	185,769	347,380	186,273	346,042
1 If Union Member in 1974	.02	.15	.03	.15
1 If Restricted in 1974	.33	.14	.32	.14
Age of Youngest Child in 1974	2.3	4.0	2.2	4.0
Number of Children in 1974	0.8	1.2	0.8	1.2
1 If South in 1974	.46	.28	.45	.29
1 If Northeast in 1974	.09	.22	.09	.22
1 If North Central in 1974	.29	.32	.29	.32
Non-Wage Income in 1974	5866	8842	5966	8808
1 If Head in 1974	.66	.57	.67	.57
1 If Veteran in 1974	.10	.22	.11	.22
1 If White Male	.34	.44	.36	.44
1 If White Female	.45	.47	.45	.47
1 If Black Male	.09	.04	.08	.04
1 If Black Female	.11	.05	.11	.05

labor. For example, the percent of the sub-minimum population working fell drastically following the implementation of the 1974 amendment. The same general pattern is reflected in the conditional mean of annual hours worked.¹⁶

To estimate the impacts of the minimum wage law on the probability of working among the sub-minimum population, the variable GAP is included as an explanatory variable in the probit estimator for both 1974 and 1975.¹⁷ These probit estimators are displayed in the first and third columns of Table 5.¹⁸

In both years, other factors constant, the probability of working among the sub-minimum population is negatively related to the wage gap. Further, the negative effect diminishes incrementally as the gap increases. This suggests that those people whose marginal productivities are relatively close to

¹⁶Some of the adjustments in the usage of sub-minimum labor may reflect the economic downturn experienced in late 1974 and early 1975. The relative constancy of the above-minimum labor usage suggests that these impacts may not have been severe, however, one expects that the burden of economic downturns will be greatest among the low skilled population. The small adjustment occurring between 1974 and 1975 is consistent with the hypothesis that the primary factor in the reduced utilization of sub-minimum labor was the 1974 FLSA amendment and that its impact lessened slowly over time as a result of inflation.

Further work which expands the general methodology in a time series/cross sectional framework will permit one to distinguish economy wide disturbances from minimum wage induced adjustments.

¹⁷Including GAP is preferable to including the predicted wage for two reasons. The first is that the legal minimum is not the same for all industries and occupations and hence GAP will vary cross sectionally as the result of both different predicted wages and different relevant minimum wages. The second reason for using GAP is that it directly allows the predicting the impacts of different legal minimums.

¹⁸The specifications reported in Table 5 do not allow for any intra-family dynamic impacts of minimum wage laws other than those reflected in non-wage income. A possible extension in future work would be to specify the labor force responses of one member of the household to also be a function of whether the spouse is a member of the sub-minimum population.

TABLE 5: MINIMUM WAGE LABOR MARKET IMPACTS
ON THE SUB-MINIMUM POPULATION

	Worked for Pay=1 1974	Annual Hours 1974	Worked for Pay=1 1975	Annual Hours 1975
Constant	.0884 (0.14)	728.1 (1.16)	.0263 (0.04)	1220.8 (1.83)
Education	-.0516 (0.51)	-27.83 (0.36)	.0278 (0.23)	34.43 (0.40)
Education ²	.0065 (1.31)	2.45 (0.69)	.0023 (0.39)	-1.77 (0.46)
Potential Experience	.0730 (4.55)	47.14 (2.28)	.1012 (5.25)	3.53 (0.15)
Potential Experience ²	-.0012 (5.00)	0.71 (2.12)	-.0016 (5.79)	-0.06 (0.17)
City Size	8.30X10 ⁻⁸ (0.40)	-5.51X10 ⁻⁵ (0.45)	-2.14X10 ⁻⁷ (0.96)	-3.52X10 ⁻⁵ (0.26)
1 If Union Member	1.1693 (1.77)	-334.87 (1.02)	.9531 (1.57)	-140.10 (0.52)
1 If Restricted	-8.459 (4.27)	-384.86 (1.47)	-.7597 (3.74)	94.88 (0.43)
Age of Youngest Child	.0420 (1.93)		.0064 (0.31)	
Number of Children	-.1097 (1.86)		-.1414 (2.23)	
1 If South	.1799 (0.87)	69.93 (0.53)	.0332 (0.15)	79.14 (0.61)
1 If Northeast	-.0478 (0.18)	-8.80 (0.05)	-.0125 (0.04)	-163.16 (0.97)
1 If North Central	.1373 (0.64)	306.50 (2.32)	-.0450 (0.19)	137.86 (1.04)
Non-Wage Income	-3.95X10 ⁻⁵ (2.55)	-0.014 (1.30)	-4.25X10 ⁻⁵ (3.08)	0.017 (1.33)
1 If Head	-.5212 (2.14)	586.38 (3.28)	-.3166 (1.21)	706.39 (4.05)
1 If Veteran	.1667 (0.51)	46.70 (0.27)	-.1190 (0.33)	158.89 (0.85)
GAP	-.3433 (1.75)	-520.21 (3.36)	-.1379 (0.64)	-257.50 (1.65)
GAP ²	.0588 (1.55)	121.58 (3.38)	.0205 (0.45)	64.75 (1.17)
1 If White Male	.4731 (1.51)	718.09 (3.28)	.4551 (1.29)	321.14 (1.42)
1 If White Female	.0483 (0.21)	-46.89 (0.35)	-.1016 (0.41)	-62.61 (0.46)
1 If Black Male	.1084 (0.29)	350.09 (1.48)	-.2052 (0.52)	268.20 (1.09)
HECKMAN LAMBDA		103.40 (0.21)		-1007.51 (1.91)
ln Likelihood	-220		-188	
R ²		.14		.16

that those people whose marginal productivities are relatively close to the minimum suffer relatively greater incremental and relatively small total reductions in the probability of working. The data clearly indicate that, as expected, the largest total impact is felt by those people with the lowest marginal products.

The impact of the minimum wage on the probability of sub-minimum employment is flatter and less significant (relative to a null hypothesis of no impact) in 1975. This is consistent with the fact that the real value of the legal minimum was lower in 1975 as the result of inflation.

Columns two and four in Table 5 report the selection bias corrected estimators of the conditional annual hours worked equations for the sub-minimum population. Once again the impact of the minimum wage is captured by the GAP variable. In both years the annual hours worked by sub-minimum workers (conditioned on employment) are negatively related to the size of the wage gap created by the minimum wage standard. As was found for the probability of employment, the largest total impact falls upon workers with the lowest marginal products, however, the incremental impact is greatest on those with marginal productivities near the minimum. Once again 1975 reveals flatter and less significant minimum wage impacts than existed in 1974.

As stated earlier, the imposition of a minimum wage law may also affect the labor market for above-minimum labor via substitution effects. Table 6 displays the estimated substitution effects on both measures of above-minimum labor market activity. The spillover effects of the minimum are captured by a series of dummy variables which reflect how far the predicted wage exceeds the legal minimum. The base population are people with a predicted wage more than \$5 in excess of the minimum. The conditional annual hours worked results are obtained using Heckman's selection bias correction procedure.

TABLE 6: MINIMUM WAGE LABOR MARKET IMPACTS
ON THE ABOVE-MINIMUM POPULATION

	Worked for Pay=1 1974	Annual Hours 1974	Worked for Pay=1 1975	Annual Hours 1975
Constant	1.5162 (4.61)	1044.5 (5.41)	1.5475 (4.66)	1103.9 (5.31)
Education	-.1677 (3.55)	39.86 (1.50)	-.2005 (4.12)	56.92 (4.81)
Education ²	.0072 (3.56)	-1.24 (1.14)	.0096 (4.57)	-2.34 (1.96)
Potential Experience	.0833 (10.88)	10.86 (2.08)	.0787 (10.14)	7.94 (1.42)
Potential Experience ²	-.0019 (15.10)	-0.090 (0.90)	-.0018 (14.58)	-0.002 (0.01)
City Size	1.62X10 ⁻⁸ (0.25)	2.13X10 ⁻⁶ (0.07)	-6.13X10 ⁻⁸ (0.92)	-1.62X10 ⁻⁵ (0.49)
1 If Union Member	.2504 (2.77)	-219.07 (6.31)	.1812 (1.97)	-248.33 (6.73)
1 If Restricted	-.7371 (10.16)	44.15 (0.76)	-.8848 (12.30)	-22.18 (0.32)
Age of Youngest Child	-.0269 (4.45)		.0174 (2.88)	
Number of Children	-.2076 (9.27)		-.1685 (7.28)	
1 If South	.1396 (1.85)	-47.32 (1.23)	.0569 (0.74)	45.46 (1.17)
1 If Northeast	.0510 (0.63)	-34.51 (0.84)	-.0975 (1.20)	-4.07 (0.10)
1 If North Central	.0103 (0.14)	49.42 (1.34)	.0383 (0.51)	24.23 (0.64)
Non-Wage Income	-2.94X10 ⁻⁵ (9.11)	-1473.36 (0.67)	-2.52X10 ⁻⁵ (8.84)	-.0002 (0.11)
1 If Head	.1958 (2.05)	430.16 (7.68)	.1560 (1.63)	395.17 (6.92)
1 If Veteran	.0027 (0.03)	47.50 (1.44)	-.0477 (0.56)	-76.91 (2.24)
1 If W is \$1 Over	-.6752 (6.20)	95.51 (1.87)	-.5205 (5.01)	81.37 (1.55)
1 If W is \$1 to \$2 Over	-.6975 (6.93)	251.21 (5.22)	-.5653 (6.07)	98.97 (2.04)
1 If W is \$2 to \$3 Over	-.3180 (3.06)	149.12 (3.43)	-.2796 (2.94)	61.34 (1.42)
1 If W is \$3 to \$4 Over	-.2667 (2.38)	107.91 (2.40)	-.1344 (1.30)	78.48 (1.78)
1 If W is \$4 to \$5 Over	-.1061 (0.87)	50.21 (1.07)	-.0123 (0.11)	-5.73 (0.13)
1 If White Male	.5321 (4.17)	401.84 (5.14)	.6033 (4.66)	369.00 (4.50)
1 If White Female	.1828 (1.77)	6.89 (0.10)	.2325 (2.24)	-112.67 (1.62)
1 If Black Male	.4710 (2.60)	347.32 (3.77)	.8563 (4.29)	215.00 (2.20)
HECKMAN LAMBDA		-537.10 (5.63)		-505.60 (4.81)
ln Likelihood	-1747		-1687	
R ²		.09		.10

The data strongly indicate that, holding other factors constant, people whose expected marginal products are relatively close to the legal minimum experience significantly lower employment probabilities (columns 1 and 3) and higher conditional hours worked (columns 2 and 4). These labor market patterns are less pronounced in 1975, once again reflecting the lower real value of the minimum in 1975.

The finding that the two types of labor market adjustments work in conflicting directions is somewhat puzzling. A possible explanation is that this asymmetric adjustment is due to the legal minimum making downward wage adjustments difficult (i.e., illegal). Thus, for any distribution of deviations of actual from expected marginal product, the probability that the minimum will restrict downward wage adjustments (to equate the wage with actual marginal product) increases as the expected marginal product approaches the minimum. Since hiring and firing workers is a costly process, this asymmetric wage adjustment effect will induce lower employment probabilities among the population with expected marginal products relatively near the statutory minimum. Intuitively, the legal minimum creates an incentive for employers to hire relatively high skilled workers because it is unlikely that the minimum will constrain the wage adjustments required to equate actual and expected marginal products among high skilled workers.

Given that a person is actually hired, however, workers with marginal products relatively close to the minimum will experience greater increases in their annual hours worked as it is likely that these workers possess labor skills which are most highly substitutable with those of the sub-minimum population. This positive substitution effect on the conditional annual hours worked of relatively low skilled (but above-minimum) workers is reinforced by the fact that the asymmetric hiring/firing incentive created by the minimum will lead employers to be more

selective in hiring workers, particularly those workers with marginal products relatively near the minimum.¹⁹ Therefore, those workers with expected productivities near the minimum who are actually hired have probably survived a relatively intense screening process.

In summary, the findings presented in this section indicate that the FLSA amendment of 1974 led to reduced labor force activities among the sub-minimum population. The above-minimum labor market experienced asymmetric marginal adjustments in the wake of the amendment. It is important to note that the minimum wage structure exerts differential labor market impacts both within and across the two population categories. This suggests that federally mandated minimum wage laws lead to redistribution of earnings both within and across broad skill groups.

V. Impacts on the Distribution of Earnings

The previous section indicates that minimum wage laws alter the distribution of earnings in the U. S. by: 1) directly increasing the hourly compensation received by working members of the sub-minimum population; and, 2) changing the labor markets for both the sub-minimum and above-minimum populations. An interesting, and previously unanswered, policy question is whether the introduction of a minimum wage statute increases the earnings of the low skill population. The major contribution of this section is the measurement of the change in expected earnings resulting from the introduction of a federal minimum wage law.

¹⁹It is noteworthy in this context that the Heckman selection bias correction statistic is significantly different from zero in the conditional annual hours worked regressions (columns 2 and 4, Table 6).

Let I_i^t represent the i^{th} person's expected earnings in year t in the presence of a minimum wage law. Expected earnings are expressed as:

$$5) \quad I_i^t = \Pr(\text{SUB}_i^t = 1) \cdot \Pr(\text{HOURS}_i^t > 0 \mid \text{SUB}_i^t = 1) \cdot (\text{HOURS}_i^t \mid \text{SUB}_i^t = 1) \circ M^t \\ + \Pr(\text{SUB}_i^t = 0) \cdot \Pr(\text{HOURS}_i^t > 0 \mid \text{SUB}_i^t = 0) \cdot (\text{HOURS}_i^t \mid \text{SUB}_i^t = 0) \circ \hat{W}_i^t$$

where HOURS_i^t is the conditional annual number of hours worked by person i in year t and M^t is the statutory minimum in year t . Similarly the expected earnings of person i in year t in the absence of any minimum wage law, Y_i^t , is expressed as:

$$6) \quad Y_i^t = \Pr(\text{HOURS}_i^t > 0 \mid \text{No Minimum}) \cdot (\text{HOURS}_i^t \mid \text{No Minimum}) \cdot \hat{W}_i^t.$$

The change in the expected earnings of person i resulting from the existence of the minimum wage is simply the difference between I_i^t and Y_i^t or

$$7) \quad \Delta I_i^t \equiv I_i^t - Y_i^t = \hat{W}_i^t [\Pr(\text{HOURS}_i^t > 0 \mid \text{SUB}_i^t = 0) \cdot (\text{HOURS}_i^t \mid \text{SUB}_i^t = 0) \\ \cdot \Pr(\text{SUB}_i^t = 1) \cdot \Pr(\text{HOURS}_i^t > 0 \mid \text{No Minimum}) \\ \cdot (\text{HOURS}_i^t \mid \text{No Minimum})] + \Pr(\text{SUB}_i^t = 1) \cdot \Pr(\text{HOURS}_i^t > 0 \mid \text{SUB}_i^t = 1) \\ \cdot (\text{HOURS}_i^t \mid \text{SUB}_i^t = 1) \cdot M^t.$$

Estimates for $\Pr(\text{HOURS}_i^t > 0 \mid \text{SUB}_i^t = 1)$ and $(\text{HOURS}_i^t \mid \text{SUB}_i^t = 1)$ are available using the results reported in Table 5; estimates of $\Pr(\text{HOURS}_i^t > 0 \mid \text{SUB}_i^t = 0)$ and $(\text{HOURS}_i^t \mid \text{SUB}_i^t = 0)$ are drawn from Table 6; the $\Pr(\text{SUB}_i^t = 1)$ is

available from the results reported in Table 3; and $\hat{W}_i^t$ is defined by (2) and (2') in conjunction with Table 2. Estimates for the probability of working in the absence of a minimum and the conditional annual hours worked in the absence of a minimum wage law are obtained from Tables 5 and 6 where the respective estimating equations are evaluated as if the minimum wage was zero.²⁰

Table 7 displays the average expected change in earnings attributable to the minimum in 1974 and 1975 obtained from applying (7) for selected populations. In general, the impacts on the distribution of earnings are sign consistent across years with greater changes occurring in 1974. The average ΔI^{74} for the entire population is \$53 (all estimates are in 1973 dollars) with 50 percent of the population expected to reap earnings increases. Closer inspection of this overall population effect reveals that males of both races gain approximately \$375 in 1974 while females lose an average of \$235. Further, 76 percent of white males and 62 percent of black males are expected to gain from the minimum in 1974 while only about 28% of the female population are expected to obtain increased earnings as the result of the minimum. These results suggest that in 1974 and 1975 the FLSA acted to the distinct disadvantage of the female adult population. This is ironic in view of the fact that during this period the "feminist movement" successfully obtained legislative support from Congress for the equal treatment of females in the labor force. A skeptical interpretation of these concurrent events suggests that what Congress gave with one hand (e.g., via EEOC) it took away with the other via FLSA.

²⁰Specifically, for those with $SUB^t = 1$ the regressions in Table 5 are evaluated at $GAP^t = 0$. For people with $SUB^t = 0$ the regressions reported in Table 6 are evaluated with the dummy variables measuring the impact of the minimum all set equal to zero. This assumes that had there been no minimum wage law all people would behave like the base population.

Economists have long felt that the strong support given to minimum wage law by labor unions is motivated more by the benefits these laws bestow upon their members than by the lofty social ideals often espoused by union leaders at congressional hearings. The results in Table 7 indicate that union members gain dramatically from minimum wage laws (approximately \$430 in 1974) at the expense of the non-union population. While 85 percent of the members of labor unions are expected to gain from minimum wage laws only 44 percent of the non-union population will experience higher earnings in 1974. While this does not provide insight as to their motives, it does strongly argue that union leaders adopt a stance which significantly benefits the preponderant majority of their membership.

Perhaps the bottom line question in the long controversy surrounding minimum wage statutes is whether these laws improve the economic status of the low skilled population. The trade-off comes down to whether the higher wage rate received when working offsets the reduced employment opportunities for the low skilled population. Previous research has been unable to address this critical issue as the use of aggregate data has not allowed the identification of the sub-minimum population. As had been demonstrated, the methodology developed here does allow one to shed light on this critical question. The results in Table 7 show that only 31 percent of the members of the sub-minimum population expect to experience earnings increases in 1974 while 52 percent of the above-minimum population gains in 1974. Further, an average member of the low skilled (i.e., sub-minimum) population in 1974 expected a \$78 loss in earnings while those above the minimum anticipate an almost equivalent average increase in earnings. The 1975 estimates simply reinforce the conclusion that minimum wage statutes weakened, not strengthened, the economic status of low skilled adults relative to their higher skilled brethren in the mid-1970's.

TABLE 7: POPULATION SPECIFIC MEAN IMPACTS OF MINIMUM WAGE LAWS

Population	ΔI^{74}	% With $\Delta I^{74} > 0$	ΔI^{75}	% With $\Delta I^{75} > 0$
Total Sample	+\$ 53 (812)	.50	+\$ 68 (594)	.62
White Males	+\$373 (871)	.76	+\$173 (597)	.79
Black Males	+\$375 (902)	.62	+\$135 (560)	.71
White Females	-\$238 (633)	.27	-\$ 12 (579)	.47
Black Females	-\$231 (522)	.28	-\$118 (568)	.43
1973 Union Members	+\$429 (785)	.85	+\$179 (540)	.85
1973 Non-Union Members	-\$ 8 (799)	.44	+\$ 50 (600)	.58
SUB ⁷⁴ =1	-\$ 78 (416)	.31	-\$ 48 (390)	.34
SUB ⁷⁴ =0	+\$ 69 (847)	.52	+\$ 83 (613)	.65
SUB ⁷⁵ =1	-\$ 72 (401)	.32	-\$ 83 (387)	.29
SUB ⁷⁵ =0	+\$ 67 (845)	.52	+\$ 86 (611)	.65

The standard deviation of ΔI^{74} is shown in parentheses. The range of ΔI^{74} is \$5,353 with a maximum expected fall in earnings of \$2439 and a maximum rise of \$2914. In 1975 the range was \$4535 with the largest expected reduction being \$2103 and the largest expected gain being \$2432. All figures are in 1973 dollars.

To identify the determinants of the change in expected earnings one could directly differentiate (7) with respect to various personal characteristics (e.g., age, race, education) to determine how different types of people benefit or lose (in terms of expected earnings) from the presence of a minimum wage law. Given the complicated and highly non-linear form of these derivatives a simpler method to evaluate the characteristics of the winners and losers is to use (7) to generate ΔI_i^t which, in turn, is regressed on a vector of relevant personal characteristics, Z_i^t ,

$$8) \quad \Delta I_i^t = f(Z_i^t) .$$

The estimators of (8) for the entire sample are reported in Table 8.²¹ The R^2 values suggest that the simple linear estimators do not fully represent the highly non-linear dynamics inherent in the definition of ΔI^t .

In 1974 the change in expected earnings rose with education for all educational attainments beyond junior high while in 1975 the expected gain rose monotonically with education. These results indicate that adults with relatively low educational achievements are penalized, in terms of earnings, by minimum wage laws. This is because members of this population experience disproportionately low labor market opportunities as the result of the FLSA.

In both years, other factors constant, the burden of the minimum falls heavily on the relatively young. The partial impact of age is monotonically negative throughout the relevant range, however, the negative impact diminishes

²¹ Race/sex specific regressions were also estimated for both years. Since the results do not differ notably from the pooled sample, only the full sample results are provided in the text. The race/sex specific results are available upon request.

TABLE 8: THE EXPECTED CHANGE IN 1974 and 1975 EARNINGS ATTRIBUTABLE
TO THE FLSA AMENDMENT OF 1974

	<u>1974</u>	<u>1975</u>
Constant	557.89	718.29
Education	-18.90	2.43
Education ²	(1.15)	(0.19)
Education	1.06	0.19
	(1.47)	(0.34)
Age	-16.24	-24.37
Age ²	(3.84)	(7.43)
	0.017	0.140
	(0.39)	(4.67)
City Size	-1.22X10 ⁻⁴	-1.13X10 ⁻⁴
	(4.00)	(5.50)
1 If Union Member	66.71	-34.80
	(1.98)	(1.31)
1 If Restricted	-69.63	-184.93
	(2.24)	(7.83)
1 If South	117.70	20.59
	(3.61)	(0.82)
1 If Northeast	2.82	-61.29
	(0.08)	(2.28)
1 If North Central	-1.49	-16.76
	(0.05)	(0.69)
1 If Head	471.29	204.34
	(11.49)	(6.47)
1 If Veteran	-13.56	-3.38
	(0.43)	(0.14)
Age of Youngest Child	-2.36	16.64
	(0.95)	(8.85)
Number of Children	-81.27	-58.64
	(8.61)	(7.68)
Non-Wage Income	-0.005	-0.008
	(3.93)	(8.00)
1 If Black Male	253.69	101.01
	(3.50)	(1.80)
1 If White Male	220.75	100.99
	(3.89)	(2.31)
1 If White Female	46.89	133.59
	(0.96)	(3.57)
R ²	.26	.18

Absolute t-values shown in parentheses.

with age. Therefore, even among the U. S. adult population, the minimum penalizes those with relatively low skill levels in terms of potential labor market exposure.

The expected gain in earnings is higher among household heads in both years while veterans and non-veterans experience roughly comparable earnings changes. As non-wage income rises (largely due to spouses) the expected earnings gains fall. This suggests that minimum wage statutes work to the relative advantage of single worker families via labor market participation choices. Table 8 also demonstrates that via the non-linearity ΔI^t family composition is a significant determinant of the expected gain. In both years the expected gain is largest for those with relatively small families. The sign of the impact of the age of the youngest child varies across the two years.

The 1974 regression results indicate that the minimum wage laws about equally benefit similarly situated males of both races (\$220 to \$254) relative to females of either race. In 1975 white females appear to move into the winner's circle alongside their otherwise equivalent male counterparts of both races. In both years it is clear that black females are injured by FLSA standards even when one adjusts for the usual measurable skill characteristics.

The partial impact of being a union member is positive in 1974 and negative in 1975 (although the latter estimate does not differ significantly from zero at standard confidence levels). This author is unable to suggest why this pattern exists. However, it should be remembered that these union impact estimates are adjusted for related variables and do not contradict the strong growth in expected earnings due to the minimum found among union members in Table 7.

The final set of estimates of interest indicate that the expected earnings of residents of large cities are disproportionately diminished by the FLSA. This negative impact of city size is approximately equal in the North Central and Western regions. Residents of the South tend to fare better than residents of other areas, particularly in 1974 while families in the Northeast tend to fare poorly in 1975 compared to their statistically identical counterparts in other regions.

This section indicates that minimum wage laws are not neutral with respect to the distribution of earnings in the adult population. Instead, these statutes tend to improve the earnings status of the relatively skilled, union members, and males. These estimated impacts stand in stark contrast with the often stated purposes espoused by proponents of minimum wage standards, namely to improve the economic status of the low skilled population.

VI. Summary and Conclusions

This paper has utilized a methodology which is radically different from that employed in previous studies of minimum wage impacts. Combined with the use of micro observations this methodology allowed one to obtain, for the first time, parameterizations of: the probability of belonging to the sub-minimum population, the impacts of the minimum on the probability of working and the annual number of hours worked; and, most importantly, the expected change in earnings induced by the FLSA. A surprising and important finding is that approximately 10 percent of U. S. adults are members of the sub-minimum population. It was also found that the 1974 FLSA amendments worked to the distinct disadvantage in terms of both labor force opportunities and earnings of adults with relatively low skills, females, and non-union members. These findings

clearly suggest that whatever the intentions of the FLSA might be, their effect is to weaken the economic status of those at the bottom of the distribution of earnings.

It is useful in closing to point out that the methodology presented here requires further testing in order to determine the robustness of these results. The most obvious and useful extension of the methodology proposed here is to incorporate a cross sectional/time series approach. This would allow one to estimate minimum wage impacts with greater precision. It will also permit the identification of both minimum wage and general economic impacts on the distribution of earnings. However, despite the methodological shortcomings of this paper, it seems clear that the general approach outlined here opens a new and potentially fruitful direction for examining the economic impacts of the FLSA.

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