MINIMUM WAGE LEGISLATION IN THE UNITED STATES

Finis Welch

December 1973

P-5145

The Rand Paper Series

Papers are issued by The Rand Corporation as a service to its professional staff. Their purpose is to facilitate the exchange of ideas among those who share the author's research interests; Papers are not reports prepared in fulfillment of Rand's contracts or grants. Views expressed in a Paper are the author's own, and are not necessarily shared by Rand or its research sponsors.

The Rand Corporation
Santa Monica, California 90406

Minimum Wage Legislation in the United States*

Finis Welch**

"A $3.50 industrial minimum wage would go a long way toward perpetuating the family farm....."

Robert Evenson
Oral Tradition

A legislated wage floor has existed for some sectors of the economy since the Fair Labor Standards Act of 1938. Aside from one major deviation in 1945, the legislation has been updated about every five years bringing the minimum wage to one-half of the average manufacturing wage. In the interim, the minimum is eroded by inflation and rising labor productivity. Table 1 lists nominal and relative minima before and after legislative changes. Recent proposals made in 1972 and 1973 but not effected have been congruent with historic trend. They recommended increases of the existing $1.60 minimum to a wage in the $2.00-$2.20 range and the 1973 average manufacturing wage was $4.07. Effective May 1, 1974, the minimum increased to $2.00; it will then rise to $2.10 on January 1, 1975; and again to $2.30 on January 1, 1976.

Coverage is incomplete and depends on industry and product line and, in some cases, gross sales of the firm. For twenty-three years subsequent to the initial legislation, coverage was unchanged.[1] Industries included were more "industrial" or machine intensive and slightly over one-half of total employment was in firms subject to the federal legislation. Extensions in 1961 and again in 1966 raised

---

*Iva Maclennan and Fran Selhorst provided assistance in this work. I am indebted to Dennis De Tray, Jim Heckman, Jim Smith, R.E.B. Lucas, and Bob Willis for numerous comments. Most of the mistakes made herein have been approved by them. Support for this research was provided to the author by ASPER, U.S. Department of Labor, and through basic research support funds from Grant No. 90088 D-73-01 from the Department of Health, Education, and Welfare to The Rand Corporation.

**U.C.L.A. and The Rand Corporation.

[1]The 1950 amendment clarified the language describing coverage provisions.

Table 1

Changes in Federal Minimum Wages,
1938-1968

Year		Minimum Wage		
		Nominal	Relative to Manufacturing Wage	
			Before Legislated Increase	After Legislated Increase
FLSA	1938	$0.25	----	.403
	1939[/a]	0.30	.398	.478
	1945[/a]	0.40	.295	.394
	1950[/b]	0.75	.278	.521
	1956[/b]	1.00	.385	.512
	1961[/b]	1.15	.431	.495
	1963[/a]	1.25	.467	.508
	1967[/b]	1.40	.441	.494
	1968[/a]	1.60	.465	.531

Source: Manufacturing Wage is average annual hourly wage published in Employment and Earnings: United States, 1909-71, U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 1312-8.

Notes:

[/a] Programmed increment contained in prior legislation.

[/b] Legislated Amendment to FLSA of 1938.

Table 2

Percent of Employed Persons in Firms Covered by Minimum Wage Legislation by Industry and for the Aggregate, Selected Years

Industry	Year		
	1947	1962	1968
Mining	99	99	99
Construction	44	80	99
Manufacturing	95	95	97
Transportation and Communication	88	95	98
Wholesale Trade	67	69	76
Retail Trade	3	33	58
Finance Insurance and Real Estate	74	74	74
Services	19	22	67
Aggregate	56	61	79

Source: Unpublished data obtained from the Bureau of Labor Statistics, U.S. Department of Labor.

the proportion of covered workers to 60 and then to 80 percent. Table 2 summarizes these coverage rates for 1947 and for years following the two subsequent adjustments. Agriculture (where coverage was extended to some large farms in 1966) and government (a candidate for inclusion in all current proposals) are excluded in these data. Among industries shown, the extension of coverage in retail trade and services is the most notable.

The Fair Labor Standards Act does not encompass all minimum wage legislation. For example, the U.S. Department of Agriculture has administered a minimum wage for sugar workers since 1934 and many states have their own wage regulations. In 1958,[1] thirty-two states had some form of minimum wage legislation. Twenty-one of these were restricted to women and minors, and in only three states (Alaska, Connecticut, and New York) did minima exceed the federal level. As is to be expected, coverage by the state legislation usually extends only to those industries (retail trade, laundry and dry cleaning, personal services, etc.) not covered by federal legislation. Current trends are to extend federal coverage and as a result, state minima which fall short of the federal level are becoming unimportant.

Recent Proposed Amendments. In 1972 the House of Representatives and the Senate approved amendments to the Fair Labor Standards Act but failed to reconcile differences when the House refused to send its bill to conference. The amendment approved by the House would have increased the existing $1.60/hour minimum to $2.00 in two steps. The unique feature of this bill was that it provided a lower minimum for youths. The Senate version had no youth differential and raised the minimum in two steps to $2.20. It also extended coverage to government employees and domestic workers and intensified coverage in retail sales and service industries.

---

[1] Women's Bureau of the U. S. Department of Labor, "State Minimum Wage Laws and Orders, 1942-58," Bulletin #267, 1963.

One year later (August 1973), the House and Senate reached a consensus when each approved a bill that is, in fact, remarkably similar to the earlier Senate version. It contains no youth differential and extends coverage to about 5 million federal, state, and local government employees. Coverage in the private non-agricultural sector was increased from 79 to 82 percent of the workforce by including domestic workers and adding some retail trade and service employees.

The nominal minimum specified by this amendment would increase to $2.20 by July 1974 (first rising to $2.00 within two months of enactment) for most workers. A slower rate of assent was allowed for sectors newly covered in 1966 and for covered agricultural workers. In the fall of 1973, President Nixon vetoed this bill and as a result the minumum wage fell to less than 40 percent of the average manufacturing wage for the first time since the mid-1950s.

The 1974 Amendment. On March 28 Congress cleared a bill which was promptly approved by the President that expanded coverage by 7 million workers. Of these, 5 million are federal, state and local government employees; about 1.3 million are domestic employees; 654 thousand work for chain stores where the $250,000 annual sales exemption is being phased out during the period to January 1, 1977; 200 thousand are employees of motion picture theaters and around 100 thousand are employed by miscellaneous small firms whose exemptions were eliminated. The new minima, $2/hour beginning May 1, 1974, $2.10 in January 1975 and $2.30 as of January 1, 1967, are roughly 45 percent of "guestimated" average manufacturing wage rates. Aggregate coverage in the private non-agricultural sector has increased to about 83 percent of all workers with retail sales (new coverage approximately 63 percent) and services (coverage rising to 83 percent) most affected.

The objective of this paper is to summarize evidence of employment effects of minimum wages. Section I spells out some of the analytical issues and describes available estimates of impact for the earlier legislation. Section II is really a separate paper. It tackles the question of incomplete coverage which has been ignored in all models designed for empirically estimating aggregate effects.

Based on a model which takes account of incomplete coverage, estimates are presented of minimum wage effects on the aggregate teenage/adult employment ratio and of effects on the industrial distribution of teenage employment. Presumably uneven industrial coverage would change employment patterns of low-wage workers. Section III is speculative. It considers a variety of problems of efficiency and equity surrounding minimum wage legislation to identify major unresolved questions both analytical and empirical.

I. The Issues and Evidence

The purpose of this section is to state as simply as possible some a priori implications of this legislation and to summarize that part of the empirical literature which in my opinion has increased our knowledge of minimum wage effects on employment and which has not been surplanted by more recent studies using either superior technique or data. Many very good studies are omitted in this summary, either because they have been surplanted by more recent evidence or because their scope is limited to effects on particular industries or to smaller areas of the country.[1] The emphasis here is upon employment effects for particular demographic groups for the country as a whole. A more complete survey is contained in the study of the U.S. Department of Labor, Youth Unemployment and Minimum Wages.[2] The empirical literature is largely restricted to effects on youth employments, not because older workers, especially the aged, or lower wage workers of intermediate age are less affected, but because the data are less complete for these workers.

It is my view that knowledge of the direction, i.e., qualitative dimensions, of effects is quite good but that empirical estimates lack precision. The distinction between our knowledge of direction and magnitude of effects is a distinction between the state of the theory and the state of the data. The theoretical implications are quite simple. On the other hand, the data are not very good. First, there have been only four legislative amendments with an additional four adjustments or step-increments prescribed by preceding legislation. This is in fact an overstatement because the data forming the basis of any reasonable analysis of distributional effects among demographic subgroups of the population are first available in 1954, originating with the household data of the Current Population Surveys. Since 1954, there have been only five legislative modifications, of which three increased the nominal minimum and another two extended coverage and

---

[1] For a recent analysis of effects of state minima, see Arnold Katz, "Teenage Employment Effects of State Minimum Wage," Journal of Human Resources 8(2), Spring 1973.

[2] U.S. Department of Labor, Bureau of Labor Statistics, 1970.

increased the minimum. Further, the CPS data are only for employment and labor force participation. Wage rates and wage distributions are not generally available. Finally, the last legislated amendment (September 1966) is empirically confounded by the federally sponsored youth employment programs that began a year earlier.[1] Virtually all of our evidence of minimum wage effects has been gleaned from implications of erosion of the nominal minimum as labor productivity has grown between the step-like increases in the minimum.

In principle, much information can be gained by focusing on implications of uneven industrial coverage, but few studies have acknowledged incomplete coverage and among those that have, attention is restricted to aggregate effects and effects on the industrial distribution of employment are not considered. Nonetheless, to my knowledge four studies of aggregate effects have explicitly introduced coverage in the empirical analysis and all have found statistically significant evidence of effects predicted by the straightforward theory. Namely, that minimum wages have reduced employment. In each of these studies incomplete coverage is introduced only as an empirical correction of the minimum wage variable, not as a distinct analytical phenomenon. Yet, the central theme of Section II is that the analytical mode for determining effects on, say, total employment is completely different in a world with universal coverage as opposed to a situation with partial coverage. The reasons are obvious. With full coverage employment effects of wage floors are demand determined in a competitive market. Supply is irrelvant because there is excess supply at above equilibrium wages. With partial coverage employment is demand determined only in the covered sector. As wages in that sector are constrained to above equilibrium levels, jobs are rationed and supply increases in the uncovered sector. Employment in sectors not covered is then determined jointly by demand and supply.

---

[1]The Neighborhood Youth Corp which accounted for 10 percent of total teenage employment in 1972 may be especially relevant.

What Does Theory Predict?

For persons who would have earned less than the minimum, legislated wage floors are at best a mixed blessing. There is the obvious potential to increase earnings, but with this is the burden that these workers must find an employer who perceives their labor to be at least worth the legal minimum, find jobs in uncovered sectors where owing to the legislation wages will be depressed, or be unemployed. It is always true that workers have incentives to find jobs offering the greatest satisfaction. That, without legislation, some earn less than the minimum is proof in and of itself that these workers are unable to find jobs paying as much as the minimum or that if such jobs are offered, those selected are preferred on consideration of changes for advancement, fringe benefits and convenience. The rub is that although wage laws can be established, productivity cannot be directly increased by legislative fiat.

In this section I consider implications of minimum wage legislation as predicted by fairly conventional theory, under the assumption of full coverage only. The distinction between full and partial coverage is important for analyses of total employment, unemployment and, of course, for industrial distributions of employment. It is not important for analyses of cyclic stability of employment nor for the classroom example of wage determination under monopsony.

Complete Coverage. We are concerned only with effective wage constraints so that if a minimum wage exists the presumption is that in the absence of the minimum at least one worker would have earned a lower wage. In a competitive labor market the implications of a minimum wage for at least some workers who would have earned less than the minimum are straightforward: Labor demand, i.e., hours of work, will fall. This requires only the assumption that demand functions for productive inputs are negatively inclined and they must be for there are no Giffin producer goods.[1]

---

[1]Unlike consumption theory in which income and substitution effects are contradictory for inferior goods, in production these effects are of the same direction.

The standard classroom example is depicted by the Marshallian cross in Figure 1 where the equilibrium wage and employment levels that would otherwise exist are denoted as w_o and E_o. The legislated

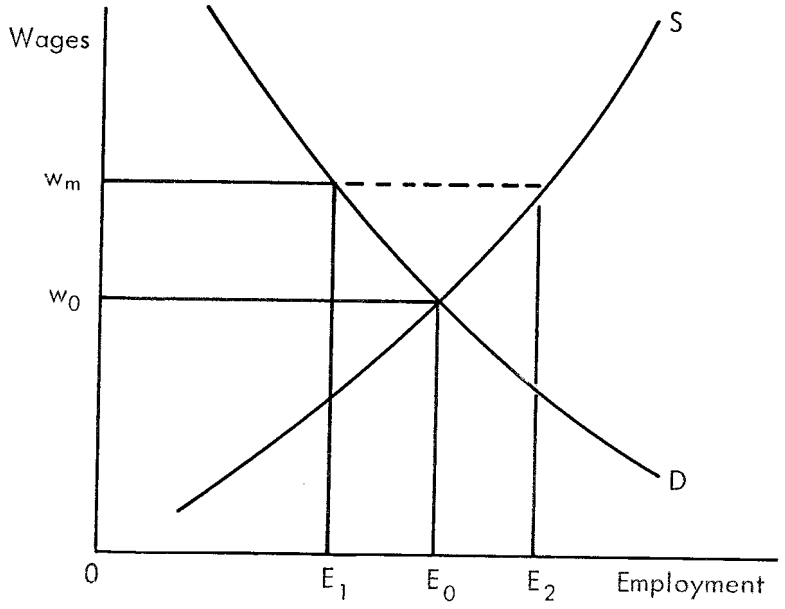

Fig. 1 — An illustration of employment effect for wages constrained to exceed equilibrium level

wage floor is w_m and under this constraint employment falls to E_1. This rarefied example tells us only two things: (1) If there is an effect, employment will fall and (2) if the supply is positively inclined (as drawn) the number of workers who would choose to work, at w_m, if jobs were available would exceed employment. This simple description glosses over questions of fringe benefits, non-pecuniary attributes of jobs and chances for on-the-job training. All substitute for current wages and these substitution possibilities are restricted by legislated wage minima. More importantly, this simple model makes no prediction of the effects of minimum wages on unemployment.

Note that available statistical measures of unemployment include only those persons who do not have a job and are actively searching for one. The presumption underlying labor supply functions, like the one depicted in Figure 1, is that at a specified wage all choosing to work can find a job. When legislated minima exceed equilibrium wages, jobs are rationed: Not all who choose to work at the minimum wage will find jobs. In this situation, the extent of job search can be determined only by reference to probabilistic models which take chances of successful search into account. It is not the purpose of this paper to derive a model of job search under rationing. The purpose is only to point out that there is no simple relationship between excess supply at above equilibrium wages as read from the Marshallian cross of Figure 1 and available measures of unemployment.

Because of the ambiguity of the standard model concerning effects of minimum wages on unemployment, it is surprising that the majority of empirical analyses of minimum wage effects have focused on unemployment rather than on employment where, at least for competitive labor markets, predictions are unambiguous. Empirical studies of effects of minimum wages on unemployment rates are not discussed here. In several cases the specified model is inadequate for probabilistic inference. In others (especially the Hashimoto-Mincer paper[1]) specifications are adequate but results are often inconclusive.

This result, that employment will fall if wage minima exceed equilibrium wages, does not extend to all who would have earned less than the minimum. With a single legislated wage floor it is clear that the greatest proportionate increase in wages is imposed on those who in the absence of legislation would have earned least. Barring

---

[1]Masanori Hashimoto and Jacob Mincer, "Employment and Unemployment Effects of Minimum Wages" (unpublished manuscript, NBER) April 1970, include an excellent discussion of probabilistic phenomena but their specification does not allow for interaction between turnover and job vacancy rates and the minimum. One would expect that since with the existence of a minimum, jobs that pay the minimum are at a premium and turnover would be reduced.

correlations between demand elasticities and fractional wage increases, it follows that effects on employment will be most adverse for those whose proportionate wage increase is greatest. For those who would have earned less but not much less than the minimum, effects on employment are uncertain. If all those who would earn less than the minimum are substitutes, then employers will substitute in favor of those workers whose relative costs have increased least and these (indirect) effects may dominate. This is the presumption underlying the "ripple effect" which holds that for workers above the minimum labor demand increases and the effect declines with distance from the minimum. For workers who would have been below the minimum the converse holds and adverse employment effects increase with distance from the minimum.

The necessary assumption for this monotone effect to hold is that all workers are substitutes and that the degree of substitutability is larger the smaller the wage discrepancy that would have existed in the absence of legislation. And in this case, it is possible that employment of some who would have earned less than the minimum will rise simply because with the legislation, costs of employing them have fallen relative to others with lower wage potential.

Alongside this competitive model there is the well known classroom example of the monopsonist who in maximizing profits equates marginal factor cost with marginal factor revenue. Since he is a monopsonist, i.e., the market wage is presumed an increasing function of the quantity of labor he hires, marginal factor cost exceeds the wage rate. In principle, a legislated wage floor that lies between the existing wage rate and marginal factor cost will increase his employment of labor and his output. In an early article, George Stigler[1], in discussing employer wage determination noted,

> "If an employer has a significant degree of control over the wage rate he pays for a given quality of labor, a skillfully-set minimum wage may increase his employment and wage rate and, because the wage is brought closer to

---

[1]"The Economies of Minimum Wage Legislation," American Economic Review, June 1946.

> the value of the marginal product, at the same time increase aggregate output...The minimum which achieves these desirable ends has several requisites:
>
> 1. It must be chosen correctly: too high a wage will decrease employment. The accounting records describe, very imperfectly, existing employment and wages; the optimum wage can be set only if the demand and supply schedules are known over a considerable range. At present there is no tolerably accurate method of deriving these schedules, and one is entitled to doubt that a legislative mandate is all that is necessary to bring forth such a method.
>
> 2. The optimum wage varies with occupation (and, within an occupation, with the quality of worker).
>
> 3. The optimum wage varies among firms (and plants).
>
> 4. The optimum wage varies, often rapidly, through time.
>
> A uniform national minimum wage, infrequently changed, is wholly unsuited to these diversities of conditions." (pp. 360-1)

Stigler's comments surrounding the difficulty of determining an optimum wage floor are modified by the phrase "If an employer has a significant degree of control over the wage he pays..." i.e., if he is a monopsonist. To my knowledge we have no evidence of the extent of this phenomenon, but there is the clear impression that in this economy the number of workers employed under situations in which their employer accounts for an appreciable share of employment in a given market is small as employment in monopsonistic markets is viewed relative to aggregate employment.

What do the data show?

Teenage Employment. There are by now many studies of either employment effects or of effects on unemployment rates of minimum wages. I report results of only two which consider effects on the employed fraction of persons in age-based demographic groups. These studies are (1) the paper by Hyman Kaitz which constitutes the major empirical part of the study

on youth employment conducted within the U.S. Department of Labor[1] and (2) the paper by Masanori Hashimoto and Jacob Mincer.[2]

The important feature of the Kaitz and Hashimoto-Mincer studies is that they explicitly recognize incomplete coverage and introduce a correction for this into the empirical measure of the minimum wage. This is in sharp contrast to the majority of studies which simply ignore partial coverage even though, until the 1961 amendments, the fraction of teenagers working in covered firms was surely less than one-half of all employed teenagers.[3]

The variable used for the minimum wage is the same in both studies and is the ratio of the minimum to an industrial average wage multiplied (i.e., weighted) by the coverage rate. This variable combines the impact of coverage and minimum wage level in a simple and intuitively appealing way. The key assumptions underlying its construction are (1) in the absence of a legislated minimum the relative wage of persons earning less than the minimum would be a constant fraction of the industrial average wage, and (2) wages of persons in uncovered sectors are unaffected by the minimum. The first assumption seems reasonable but, if the legislation shifts workers from covered to uncovered sectors, the second assumption does not. In any case, the constructed wage variable is likely to be highly correlated with a true index of changes in cost of workers who otherwise would earn less than the minimum and is a marked improvement over indexes that ignore partial coverage.

In the Kaitz study, the employed proportion of teenagers is regressed upon the minimum wage variable, the adult male unemployment

---

[1]Hyman B. Kaitz, "Experience of the Past: The National Minimum" in Youth Unemployment and Minimum Wages, Bulletin 1657, U.S. Department of Labor, Bureau of Labor Statistics, 1970.

[2]"Employment and Unemployment Effects of Minimum Wages," unpublished manuscript, NBER, April 1970.

[3]An important exception is the paper by Thomas Moore, "The Effects of Minimum Wages on Teenage Unemployment Rates," Journal of Political Economy, Vol. 79, No. 4, July/August 1971. Even though this study was published after the one by the Department of Labor, I believe that it was the first to incorporate coverage data in an empirical analysis.

rate, the fraction of males 16-19 years old who are in the armed forces, the ratio of agricultural employment to the white 16-19 year-old population, the school enrollment ratio for each teenage group, the ratio of the teenage to the adult population for each group and dummy variables for each of the final four years of the data. Observations are quarterly for the 1954-68 period. The dummy variables for the final years are introduced for federally sponsored youth employment programs (principally, the Neighborhood Youth Corps), since teenagers in these programs are counted as employed.

In separate regressions by sex (male; female), age (16-17; 18-19), and race (white; Negroes and other races), statistically significant disemployment effects were found for teenager white males and for white females 16-17 years old. No minimum wage effects were found for white females 18-19 years old or for any of the groups considered among Negroes and other races. When all persons 16-19 years old were combined, there was "statistically significant" evidence of teenage employment reductions associated with increments in either coverage or the minimum wage level.

The Hashimoto-Mincer study is similar in design to the Kaitz work. The data are the same except that Hashimoto-Mincer observations extend through one additional year, 1969. In this study employed fractions of group population are regressed upon minimum wage variables, adult male unemployment rates, quarterly dummy variables, and a quadratic trend component. The minimum wage variables form a distributed lag over a two-year period with lag parameters conforming to an Almon-quadratic.[1]

Separate regressions are calculated for teenagers (16-19, white; nonwhite), white and nonwhite males (20-24; 25-64; 65+), and females (20+). Statistically significant disemployment effects are found for white teenagers, for males 20-24 (white and nonwhite, separately), for

---

[1]The cumulative wage effect is described as $\sum_{i=0}^{7} b_i X_{t-i}$ where X_{t-i} is the minimum wage variable in the i-th period and $b_i = a_0 + a_1 i + a_2 i^2$.

white males 65+ and for white females (20+).

It is surprising that neither study finds consistent disemployment effects for nonwhites when the data are separated by color, even though the theory predicts that adverse effects should be most extreme for persons who, in the absence of the legislation, would earn the lowest wage. My own impression is that the problem of statistical significance lies in sampling errors in the data. For example, in May 1973, the CPS household survey reports employment of males 16-19 years old in the Negroes and other races group as 339,000 with a standard error of this estimate reported at between 17,000 and 25,000.[1] From this and the implied serial correlation in reported employment standard errors for month-to-month changes, I infer that a quarter-to-quarter change of between 6.2 and 9.1 percent lies within two standard errors of no change at all.[2] At the same time employment of white teenage (16-19) males was 3,451,000 with sampling standard errors of between 75,000 and 90,000. This translates into a proportionate two-standard-error range of 2.7 to 3.2 percent for quarterly changes. Clearly, reasonably subtle effects can be more precisely identified with data from the larger white sample.

Employment Stability. Another straightforward prediction of minimum wages is that for persons whose wages would otherwise be near the minimum, cyclical variations in labor demand result in exaggerated variations in employment. The rationale is simple. To a profit maximizing competitive firm, a rigorously enforced minimum wage law is quite simply a law that excludes hiring persons with productivity below the legislated floor. Consider two workers, one with average

---

[1] Employment and Earning Statistics, Vol. 19, No. 12, June 1973.

[2] The implied serial correlation coefficient that reconciles error variance for monthly employment levels with reported errors in month-to-month change is p = 0.68. Assuming a first-order Markov process with the correlation between variable n-months apart being p^n, the implied error variance for quarter-to-quarter changes is 0.378 of monthly variance (the quarter is the simple average of three consecutive months).

productivity of $1 per hour, the other with productivity of $2 per hour. Suppose that in an expansionary business phase labor's product is ten percent higher than in a recession so that the low productivity worker's offered wage would be $1.05 and $0.95 in respective phases of the business cycle and the high productivity worker's wages would be $2.10 and $1.90. A $1 minimum wage rules out employment of the low productivity worker during recessions.

Empirical analysis is confounded by several interrelated phenomena but the central idea is unchanged: minimum wage legislation exacerbates cyclic employment instability for low-wage workers. In a study of these effects, Marvin Kosters and I[1] found strong evidence that minimum wages had heightened the vulnerability of teenage employment to cyclic vagaries. Even without wage legislation, we estimated that teenagers would be peculiarly affected by swings in aggregate employment. On average, over the period of our observations, 1954-68, teenagers (16-19 years old) accounted for 6.3 percent of employment, but when total employment varied about its longer-term trend, teenagers accounted for 22 percent of cyclic-related variance. The role of minimum wages was to shift the composition of normal employment, increasing shares for adults, particularly white adults, and reducing teenage shares. Symmetrically, shares of transitional employment -- that part vulnerable to swings in the level of economic activity -- were reduced for adults (again, white adults) and increased for teenagers. Among teenagers, the effects were more adverse for nonwhites and for females. The ratio of a group's share of transitional to its share of normal employment is taken as an index of vulnerability to business cycles. In fact, this measure corresponds to the percent change in group employment associated with a one-percent deviation in aggregate employment from its trend. We estimated this ratio to be less than unity for adult groups except nonwhite males and to exceed unity for

---

[1]"The Effects of Minimum Wages on the Distribution of Changes in Aggregate Employment," American Economic Review, Vol. 62, No. 3, June 1972. The minimum wage variable used in this study is analytically equivalent to the one used by Kaitz and Hashimoto-Mincer. It is the aggregate coverage rate multiplied by the ratio of the nominal minimum to the average manufacturing wage.

all teenage groups. Our estimate is that changes in minimum wage legislation, especially increased coverage, during the 1954-68 period more than doubled this index of cyclic vulnerability for all teenage groups. (There are four: male-female; white-nonwhite.)

II. Incomplete Coverage

Earlier, I noted that the history of minimum wage legislation has been that of periodic updating of the minimum to maintain its level relative to wage rates above the minimum. Further, coverage has been extended progressively toward industrial sectors with larger proportions of low-wage workers. In this section, I consider analytical issues surrounding incomplete coverage. Estimates are provided both of the effects of minimum wages on the aggregate teenage/adult employment ratio and on the effects of uneven coverage on the industrial distribution of teenage employment.

Table 3 demonstrates changes in the industrial distribution of teenage employment by contrasting the 1930 and 1940 data, years before and after the initial 1938 legislation. The data reported are teenage shares of employment and the 1940/1930 ratio of these shares in each industry relative to the U.S. aggregate ratio. Panel A gives data for all teenagers 14-19 years, while panel B includes only those 18 to 19, and panel C refers to persons 14 to 17 years. For comparative purposes, changes in teenage shares are matched with industrial coverage rates.

There are numerous problems associated with this comparison. First, the economy was more depressed in 1940 than in 1930 and the effects of recession are greater for teenage than for adult employment. Second, unionism spread rapidly throughout the 1930's and industries most affected were the same as industries with greater proportions of workers in firms covered by the Fair Labor Standards Act. Finally, the 1938 legislation contained provisions other than the minimum wage. Employment of persons 10-13 was essentially precluded, and employment of persons 14 and 15 years old was restricted. In occupations deemed "hazardous" by the Secretary of Labor, employment was restricted to ages 18 and above. Thus, it is not surprising that the teenage (14-19 years) share of total employment fell from 9.2 to 5.9 percent between 1930 and 1940. And, given this 36 percent reduction in the teenage share of employment, it may not be surprising that the greatest proportionate reductions occured in industries

Table 3

Minimum Wage Coverage and Changes in Teenage Shares of Industrial Employment Between 1930 and 1940

Industry	Teenagers as A Percent of All Employed Persons 14 or Over		Change in Teenage Share (1940/1930) Relative to National Average	Coverage Percent of Workers in Covered Firms
	1930	1940		
A. All Teenagers (14-19 years)				
1. Industries with Coverage above National Average				
Mining	5.3	2.3	0.66	99
Manufacturing	9.6	4.8	0.78	95
Transportation. and Communication	5.5	2.1	0.78	88
Finance, Insurance and Real Estate	7.1	2.9	0.64	74
2. Industries with Coverage below National average				
Construction	3.2	2.5	1.19	44
Services	7.5	6.0	1.23	19
Wholesale & Retail Trade	8.8	6.0	1.05	13
Agriculture, Forestry, and Fishing	14.2	10.6	1.16	--
Governments	3.2	3.4	1.63	--
Miscellaneous	11.2	10.5	1.45	--
United States Total	9.2	5.9	1.00	56
B. Teenagers 18-19 years				
1. Industries with coverage above National average				
Mining	3.9	2.0	0.67	99
Manufacturing	6.1	3.8	0.82	95
Transportation and Communications	4.0	1.8	0.58	88
Finance, Insurance and Real Estate	5.6	2.7	0.62	74

Table 3 concluded.

Industry	Teenagers as a Percent of All Employed Persons 14 or Over		Change in Teenage Share (1940/1930) Relative to National Average	Coverage Percent of Workers in Covered Firms
	1930	1940		
B. Teenagers 18-19 years (continued)				
2. Industries with coverage below National average				
Construction	2.4	2.0	1.08	44
Services	4.9	4.3	1.15	19
Wholesale & Retail Trade	5.5	4.5	1.07	13
Agriculture, Forestry, and Fishing	5.7	5.2	1.19	--
Governments	2.8	3.3	1.54	--
Miscellaneous	7.6	6.8	1.17	--
United States Total	5.2	4.0	1.00	56
C. Teenagers 14-17 years				
1. Industries with coverage above National average				
Mining	1.5	0.3	0.41	99
Manufacturing	3.5	1.0	0.58	95
Transportation and and Communication	1.5	0.4	0.53	88
Finance, Insurance and Real Estate	1.5	0.3	0.35	74
2. Industries with coverage below National average				
Construction	0.8	0.5	1.24	44
Service	2.6	1.7	1.29	19
Wholesale and Retail Trade	3.3	1.5	0.89	13
Agriculture, Forestry, and Fishing	8.5	5.4	1.31	--
Governments	0.4	0.1	0.51	--
Miscellaneous	3.6	3.7	2.10	--
United States Total	3.9	1.9	1.00	56

Source: U.S. Census of Population, for 1930 and 1940. Data for 1930 are from Volume V, General Report on Occupations, and 1940 data from Volume III, The Labor Force, Pt.1, "U.S. Summary".

Notes to Table 3. Data for 1930 include persons 10-13 years in industrial distribution of teenage employment. For U.S. Aggregate, persons 10-13 employed accounted for 5 percent of all teenage employment. This average is assumed for all industries. There are a number of inconsistencies in the 1930 data. For example, the U.S. Summary indicates that teenagers 14-19 years account for 11.8 percent of all employment 14 and over. Yet, the aggregated industrial data show employment of persons 10-19 years as 9.6 percent of total employment, 10 years and over.

with above average coverage. Nonethless, teenagers 18 and 19 years old were not affected by age-based provisions of the legislation and yet they experienced the same pattern of changes in employment as did the teenage aggregate: Without exception, the teenage share of employment fell by more than the average in industries with minimum wage coverage above the national average and the teenage share increased relative to the average in industries with below average coverage.

Consider now the purely theoretical implications of minimum wage legislation with incomplete coverage distributed unevenly among industries. At the outset, note that so long as coverage is not selective in the sense that coverage rates are not correlated with factor ratios, the effects of the legislation are generally similar qualitatively but differ quantitatively from effects with complete coverage. The main distinction is that for workers displaced from covered sectors, there are residual employment opportunities in the uncovered sector. Thus, instead of the distributional effects being between workers securing wage increments and those losing jobs, effects are between those securing wage increments in covered sectors and those either withdrawing from the workforce or securing jobs at reduced wages in the uncovered sector.

If coverage is correlated with factor ratios, the analytical structure changes. As an example, consider a two-sector general equilibrium model with two inputs of fixed supply. Assume that production functions are linearly homogeneous and that factor intensities differ between sectors. Call the inputs capital and labor. Suppose that a minimum wage is imposed on one sector. If the wage restraint is imposed on the labor intensive sector, the first-order effects are unambiguous: Labor use in the covered sector will fall. If the substitution effect (substituting capital for labor in the covered sector) dominates the production effect, capital will flow from the uncovered to the covered sector and labor will flow from the covered to the uncovered sector. The reduced capital/labor ratio in the uncovered sector will lower the productivity of labor in that

sector and the wage will fall. If the production effect[1] dominates the substitution effect in the covered sector, the results are qualitatively the same, for in either case, the capital/labor ratio and, therefore, wages will fall in the uncovered sector. Laborers in the covered sector gain at the expense of laborers in the uncovered sector. If substitution effects in the covered sector outweigh production effects, owners of capital also gain.

On the other, if the minimum wage is imposed only on the capital intensive sector, effects are ambiguous, since production and substitution effects are contradictory. If production effects prevail, so that the ratio of capital to labor displaced in the covered sector exceeds the capital/labor ratio in the uncovered sector, the marginal productivity of labor will rise in both sectors and the gain to labor will be at the expense of capital.

In general, when coverage is correlated with factor ratios, the distributional effects of minimum wages are uncertain. Winners are undoubtedly those who, in the absence of a minimum, earn wages below the minimum and are able to secure jobs at the higher wage. Losers are either other laborers or owners of capital or both.

Consider now, in greater detail, the case in which the incidence of coverage is independent of factor ratios. In fact, the simplifying assumption is made that all sectors have the same factor ratios (in the absence of minimum wage legislation) and the same structure of input demand. The analysis is further restricted to competitive markets.

For analyzing total effects of employment of a single class of workers or for analyzing the cross-effect on the demand for one group with respect to legislated wage increments for another group, only average wages are relevant. That the change in the average wage consists of two parts, 1) an increase in the covered sector and 2) a decrease in the uncovered sector, is relevant only for distributional questions. Consider the aggregate quantity of an input demanded as

---

[1]The legislatively imposed cost increase in the covered sector will result in reduced output and a proportionate reduction in demand for both labor and capital.

the sum of the quantities demanded in the covered and uncovered sectors.

$$D_j = D_{cj} + D_{uj} \tag{1}$$

where D denotes demand. The subscript, j, refers to an input with c and u indicating the covered and uncovered sectors. Suppose that in the absence of legislation, $D_{cj}/D_j = c$ (for all j) where c is the proportion of each input used in the covered sector. Suppose also that,

$$\eta_{ji} = \frac{w_i}{D_j}\frac{\partial D_j}{\partial w_i} = \frac{w_i}{D_{cj}}\frac{\partial D_{cj}}{\partial w_i} = \frac{w_i}{D_{uj}}\frac{\partial D_{uj}}{\partial w_i} \quad , \tag{2}$$

i.e., that demand elasticities are the same in the covered and uncovered sectors and are therefore equal to the aggregate elasticities.

A legislated wage increment for some workers (the i-th class) in the covered sector will, as a first-order effect, result in a portion of workers being displaced to seek employment in uncovered sectors, and there will be an equilibrating wage movement in the uncovered sector. Although the nature of the wage change in the uncovered sector is the subject of much of the ensuing discussion, assume temporarily that for the i-th class of workers, a legislated increment of $100\tilde{w}_i$ percent in the covered sector is associated with an equilibrating change of $100\,\dot{w}_i$ percent in the uncovered sector. The proportional change in demand for the j-th input following this legislation is

$$\frac{dD_j}{D_j}\Bigg|_{\text{all wages other than } w_i} = \frac{D_{cj}}{D_j}\,\eta_{ji}\tilde{w}_i + \frac{D_{uj}}{D_j}\,\eta_{ji}\dot{w}_i \tag{3}$$

$$= \eta_{ji}\{c\tilde{w}_i + (1 - c)\,\dot{w}_i\}$$

$$= \eta_{ji}\,\bar{\dot{w}}_i$$

where $\dot{\bar{w}}_i = c\tilde{w}_i + (1-c)w_i$ is the proportional change in the average wage of workers in class i.

The question of the equilibrating wage adjustment in the uncovered sector is central to analysis of either total effects on demand for a class of workers or of the distribution of this effect between covered and uncovered sectors. Unfortunately there is no simple solution, for it involves the simultaneous solution of a system of equations representing adjustments in employment of each of the inputs. There is an alternative, however, which is sufficient for determining first-order magnitudes so that an intuitive notion of the nature of the solution can be obtained. Equation (3) provides the basis for this approximation. Notice that at the market aggregate, cross-demand effects depend upon the movement in the average wage, $\dot{\bar{w}}_i$. By solving for $\dot{\bar{w}}_i$ as though all other wages remain constant we derive a measure of the resulting pressure for equilibrating movement via interactions between demand functions and associated supply responses. In the simplest case, if $\dot{w}_i = -\frac{c}{1-c}\tilde{w}_i$, $\dot{\bar{w}}_i = 0$ and there are no net effects on demand for input j steming from wage movement in class i.

Briefly stated, the movement, $\dot{w}_i$, can be considered as consisting of two parts. The first refers to the adjustment within class i and can be obtained simply as the solution to two equations, demand and supply within the market for class i workers. The second refers to the demand interactions between input markets and is obtained from a more complex system. But this second effect is derivative of the first, so that by solving only for the first effect, we can at least get an impression of the nature of the full solution.

The solution for the first effect is not as simple as might appear at first blush. The difficulty stems from the necessity of determining which workers obtain jobs in the covered sector. Consider Figure 2 which denotes demand in the covered and uncovered sectors, parts (a) and (b) respectively, together with the combined market and its equilibrium, part (c), in the absence of minimum wage legislation. As drawn the initial equilibrium wage is w_o and proportion c of employed labor works in the covered sector. Legislation increased the wage in the covered sector to w_m ($\tilde{w} = \frac{w_m - w_o}{w_o}$) and employment falls. Prior

to the legislation, the supply of workers to the uncovered sector is aggregate supply less demand in the covered sector, prior

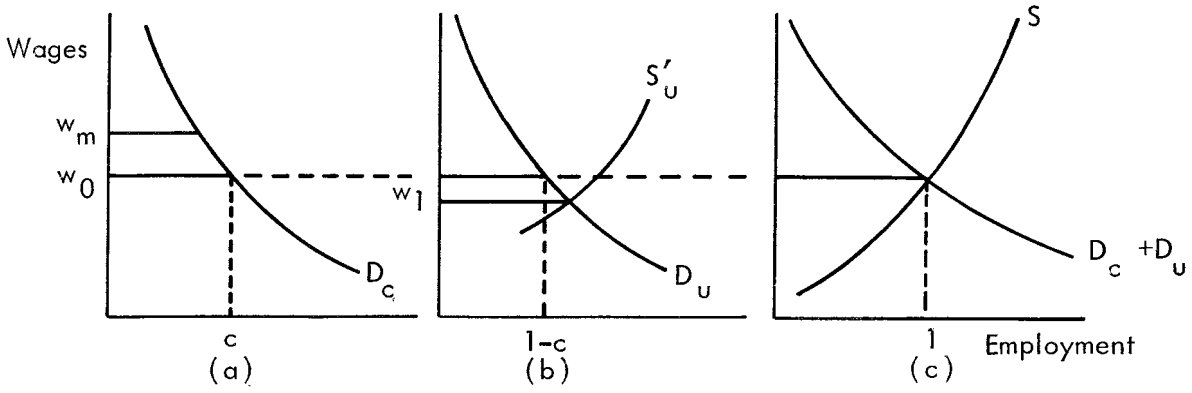

Fig. 2 — An illustration of effect of minimum wage with incomplete coverage

to the legislation, the supply of workers to the uncovered sector is aggregate supply less demand in the covered sector, i.e., $S_u = S - D_c$. But as workers are displaced from the covered sector with the imposition of the minimum wage, supply to the uncovered sector will increase. In Figure 1, the resultant supply to the uncovered sector is denoted as S'_u with the associated equilibrium wage being w_1 ($\dot{w} = \frac{w_1 - w_0}{w_0}$).

Clearly, determination of w_1 requires knowledge of the shift from S_u to S'_u. An economically efficient solution would be to distribute workers between the covered and uncovered sectors to maximize worker surplus, i.e., to award the premium jobs in the covered sector to workers having the lowest reservation wages. In this case, the residual supply to the uncovered sector is $S'_u = S - D_c(w_m)$. But this realization would require that workers in the covered sector be permitted to bid for jobs by bribing others not to compete. In the dynamics of a labor market with a steady stream of new entrants and

withdrawals, such a solution seems unlikely.[1] Possibly the most reasonable and certainly the simplest assumption is that workers are randomly assigned between employment in the covered sector and either employment in the uncovered sector or withdrawing from the workforce. Clearly jobs in the covered sector are preferred to jobs in the uncovered sector. If everyone seeking a job at the wage w_m could find employment, then labor supply would be $S(w_m)$. But, w_m prevails only in the covered sector and, at this wage, only $D_c(w_m)$ workers are employed. Assume then that each worker willing to work at w_m has probability $f = D_c(w_m)/S(w_m)$ of finding employment at that wage. Those not obtaining covered employment choose between work in the uncovered sector at lower wages and withdrawal from the market. In this case, the supply of workers to the uncovered sector is

$$S_u' = S(1-f) \quad . \tag{4}$$

with

$$\varepsilon = \frac{w}{S}\frac{dS}{dw}$$

and

$$\eta = \frac{w}{D_c}\frac{\partial D_c}{\partial w} \quad ,$$

$$f = c\,\frac{1+\eta\tilde{w}}{1+\varepsilon\tilde{w}} \tag{5}$$

---

[1] It may be tempting to assume that workers with lower reservation wages would implicitly bid higher prices by queueing longer for premium jobs, because they have more to gain. This argument is only partly correct. The gain associated with employment in the covered sector is $w_m - w_1$ (recall that w_1 is the wage in the uncovered sector) for all willing to work in the uncovered sector at wage w_1. For those with reservation wages above w_1, the gain from employment in the covered sector is less.

Since

$$\tilde{w};\varepsilon > 0$$

and $\eta<0$ it follows that $f < c$, i.e., that the proportion of workers willing to work at the minimum wage who find jobs in the covered sector is less than the proportion of workers who would have been in the covered sector in the absence of the legislation. Further, at the pre-legislative wage, w_o, the supply of workers to the uncovered sector in the absence of legislation is

$$S_u(w_o) = S(w_o) - D_c(w_o) = S(w_o)(1 - c) ,$$

and with legislation, supply becomes

$$S_u'(w_o) = S(w_o)(1 - f) .$$

Since $c>f$, $S_u'(w_o) > S_u(w_o)$ and pressure exists to reduce wages in the uncovered sector. Equilibrium within this market is re-established via a falling wage as numbers demanded rise and possibly as numbers supplied fall so that the combined adjustment is large enough to absorb the increased supply at w_o. At the new equilibrium wage, w_1, demand is given as

$$D_u(w_1) = D_u(w_o)(1 + \eta\dot{w})$$

where, η, the elasticity of demand is presumed the same as for the covered sector and $\dot{w} = \frac{w_1 - w_o}{w_o}$ is the proportionate wage reduction ($\dot{w}<0$). At w_1, supply,

$$S_u'(w_1) = S(w_o)(1 + \varepsilon\dot{w})(1 - f) .$$

Equating the sum of the supply and demand movements associated with a $\dot{w}$ proportional wage reduction with the supply shift induced by the legislated $\tilde{w}$ wage increase gives

$$\dot{w} = \frac{-c\tilde{w}}{(1-c) + \varepsilon\tilde{w}} \qquad (6)$$

as the equilibrating wage movement. The proportional effect on the mean wage is

$$(7) \qquad \dot{\bar{w}} = c\tilde{w} + (1 - c)\dot{w} = \frac{c\varepsilon\tilde{w}^2}{(1-c) + \varepsilon\tilde{w}}$$

Several points are relevant. First, the equilibrating wage movement is independent of the elasticity of demand. This because of the presumption of equality in the covered and uncovered sectors. The more elastic is demand, the greater is the displacement of workers from covered to uncovered sectors but the more easily are these workers absorbed in the uncovered sector as wages fall. Second, so long as $\varepsilon>0$, i.e., so long as the supply function is positively inclined, the average wage of those continuing to work following the legislation must rise. Wages will, of course, fall in the uncovered sector, but the increase in the covered sector will dominate so long as some labor force withdrawal accompanies downward wage pressure.

If supply does not respond to wage rates, $\varepsilon = 0$, the average wage is unaffected, i.e., $\dot{\bar{w}} = 0$. In this case, the wage decline in the uncovered sector fully compensates the increase in the covered sector. i.e., $\dot{w} = \frac{-c\tilde{w}}{1-c}$ and the legislation serves only as a tax from those working in the uncovered sector to those in the covered sector.

So long as $\dot{\bar{w}} \neq 0$ the effects described are exclusive of cross-effects, but it is doubtful that the cross-effects will substantially change qualitative conclusions.

Aggregate Employment of Teenagers

In this section, the effect of minimum wage legislation on teenage relative to adult employment is explored under assumptions contained in the earlier sections: namely, the structure of demand for labor is the same in the covered and uncovered sectors.

Consider two classes of workers. In the absence of minimum wage legislation, workers in class 1 would earn less than the minimum and workers in class 2 would earn more than the minimum. Suppose that legislation increases the average wage of class 1 workers by 100 $\dot{\bar{w}}$

percent and does not affect the wage of workers in class 2. What are the employment effects of this change?

Assume, for simplicity, that the aggregate production process can be described as a two-stage function in which laborers in class 1 and class 2 are first aggregated into an intermediate input, labor, which is then combined with other inputs. Assume, further, that the intermediate labor aggregation function is homothetic so that, when the relative wage of class 1 to class 2 workers is held constant, the labor mix (the shares of the respective inputs) is independent of the total quantity of labor. In this case, the effects of changes in wage rates can be partitioned into a substitution effect within the labor aggregate and a scale effect between the labor aggregate, total output, and the use of non-labor inputs. The assumed homothecity of the labor aggregate is an assumption that the scale effect is neutral with regard to the ratio of class 1 to class 2 laborers. That is,

$$\frac{dS_1}{S_1} = k_1\sigma_{11}\dot{\bar{w}} + \text{scale effects} \tag{8a}$$

and

$$\frac{dS_2}{S_2} = k_1\sigma_{12}\dot{\bar{w}} + \text{scale effects,} \tag{8b}$$

where S_i indicates quantity of class i workers demanded, k_i refers to the expenditure share and σ_{ij} to the Allen-Uzawa partial elasticity of substitution <u>within</u> the labor aggregate. As noted earlier, $\dot{\bar{w}}$ refers to the fractional change in the wage of class 1 workers (or, for these purposes what amounts to the same thing, the change in the relative wage of class 1 to class 2 workers). Since the scale effects are the same for the two types of labor, the proportionate effect on employment of class 1 relative to class 2 workers,

$$\frac{dS_1}{S_1} - \frac{dS_2}{S_2} = k_1(\sigma_{11} - \sigma_{12})\dot{\bar{w}} \quad . \tag{9a}$$

But,

$$k_1\sigma_{11} + k_2\sigma_{12} = 0$$

so that

$$\sigma_{11} = \frac{-k_2\sigma_{12}}{k_1} \; ; \; \sigma_{11}-\sigma_{12} = -\sigma_{12}\frac{(k_1+k_2)}{k_1}$$

and

$$\frac{dS_1}{S_1} - \frac{dS_2}{S_2} = -\sigma_{12}\dot{\bar{w}} \tag{9b}$$

If $\dot{\bar{w}}$ were known, equation (9b) were be estimatable. Here I have made two simplifing assumptions to obtain estimates of the effects of minimum wages on the teenage/adult employment ratio. Recall from equation (7) that a first-order estimate of $\dot{\bar{w}}$ is

$$\dot{\bar{w}} = \frac{c\varepsilon\tilde{w}^2}{(1-c) + \varepsilon\tilde{w}}$$

While c, the coverage rate, is observed and fairly direct estimates of $\tilde{w}$ can be obtained, we do not have direct evidence of ε, the supply elasticity.

In the formulations of Kosters-Welch, Kaitz, and Hashimoto-Mincer, the variable introduced for the "effective" minimum wage is the coverage rate multiplied by the minimum wage relative to industrial average(s) wage. Observe that the average wage of class 1 workers is $\bar{w} = w_o$ in the absence of legislation; and $\bar{w} = cw_m + (1 - c)w_1$ with the legislation where w_o is the wage that would otherwise exist, w_m is the minimum and w_1 is the wage in the uncovered sector. If the supply of class 1 laborers were perfectly elastic, then there would be no equilibrating wage movement in the uncovered sector. Workers displaced from the covered sector would withdraw from the labor force. In this case, the change in the average wage caused by the legislation would be only the change in the covered sector weighted by the coverage rate. If in the absence of legislation the wage of persons below the minimum would change in proportion to the industrial average(s), then under

these conditions, the variable commonly used would be appropriate.

Table 4 reports regression results for the effects of minimum wages on the ratio of teenage to adult employment. Two alternative minimum wage variables are used. The first, used in regression equations (1) and (2), is similar to the variable used in the studies by Kaitz, Hashimoto-Mincer, and Kosters-Welch. It is constructed on the assumption that wages in the uncovered sector are not affected by the legislation, i.e., that the supply of teenage labor to the uncovered sector is perfectly elastic. Operationally, the minimum wage variable is defined as $1 + c\tilde{w}$, where c is the average coverage rate in the private, non-agricultural sector. (Between 1954 and 1968 this average coverage rate increased from .38 to .72.) The proportion by which the minimum wage exceeds the wage teenagers otherwise would earn, $\tilde{w}$, is calculated on the assumption that the average teenage wage would be 29.4 percent of the average wage in manufacturing.[1]

Both the dependent variable and the minimum wage variables are expressed in logarithms (base e) so that the regression coefficient can be read as an elasticity. In the earlier discussion, this parameter is (minus) the partial elasticity of substitution between teenagers and adults. But, an important assumption of that model is that in the absence of the minimum, no class 1 workers would earn more and no class 2 workers would earn less than the minimum. It is likely that a larger proportion of teenagers than adults would otherwise earn less than the minimum, but surely both productivity distributions intersect the minimum wage. In this case, the employment elasticity of the minimum wage understates (in absolute value) the substitution elasticity, and the degree of understatement is greater the greater is the commonality in the productivity density functions of teenagers and adults.

---

[1]This number, .294, is selected on the presumption that so long as the "guesstimated" teenage wage did not exceed the minimum, a fairly wide range of such variables would be empirically equivalent. The .294 is in fact the lowest ratio of the minimum to the average manufacturing wage achieved since the 1938 FLSA. This ratio was realized in 1945 when the minimum was 30¢ and the manufacturing wage was $1.02. During 1945 the minimum was increased to 40¢ by provision of the original legislation, so that the .294 assumed relative wage is prior to this adjustment.

Table 4

Regression Estimates of Effects of Minimum Wages on Total Teenage (14-19 years old) Employment in the Private, Non-agricultural Sector, 1954-68

(Standard Errors are in Parentheses)

Independent Variables:	Regression # (1)	(2)	(3)	(4)
Minimum Wage	-0.294 (0.106)	-0.171 (0.134)	-0.344 (.104)	-0.244 (0.133)
Adult Unemployment Rate	-1.440 (0.560)	-1.690 (0.610)	-1.550 (0.540)	-1.710 (0.590)
Annual Growth Rate	.020 (.002)	.025 (.008)	.020 (.002)	.025 (.008)
School Enrollment Rate		-1.381 (0.649)		-1.388 (.638)
Proportion of 16-19 Population in Federal Youth Employment Programs		-1.057 (.598)		-0.662 (.606)
Proportion of 16-19 Male Population in Armed Forces		-0.040 (.247)		.020 (.238)
Quarter-				
1	-0.069 (.015)	-0.060 (0.015)	-0.069 (0.014)	-.059 (.015)
2	.025 (.015)	0.030 (.014)	0.025 (0.014)	.031 (.014)
3	.187 (.015)	.192 (.014)	0.188 (0.014)	.192 (.014)
Constant	-2.598	-1.749	-2.618	-1.769
R^2	.914	.925	.919	.928

In regression equation (1), the evidence is of a statistically significant reduction in the teenage/adult employment ratio associated with increased minimum wage level or coverage. The point estimate is that a one-percent increment in the effective minimum reduces the teenage share of employment by .3 of one percent. The coefficient estimate on the adult unemployment rate (expressed here as a proportion with 1954-68 mean of 0.04) indicates the well known phenomenon that teenagers are more-than-proportionately vulnerable to employment swings. The (log-linear) trend estimate is that the teenage/adult employment ratio is rising at an annual rate of 2 percent, independently of minimum wage legislation. In alternative specifications, the teenage share of total population was used in lieu of this trend variable, and the two were found to be operationally equivalent.

The employment data are not seasonally adjusted, so dummy variables are introduced for calendar quarters, with the omitted quarter being the fourth in each year. The estimate is that as compared to fourth quarters, the teenage/adult employment ratio falls (approximately) 6 percent in the winter, rises 2 to 3 percent in spring, and 20 percent in summer.

Regression equation (2) adds three variables that are simultaneously determined with employment. These variables are the proportion of the male 16-19 population enrolled in school, the number of persons enrolled in federally sponsored Neighborhood Youth Corps programs, and the proportion of the male 16-19 population in the armed forces. Although it is doubtful that these variables should be included because of the inherent simultaneity problem, they are included for comparative purposes with other studies. When these variables are introduced, the point estimate of the effect of minimum wages is reduced sharply and the parameter estimate is of marginal statistical significance only.

Although this equation is undoubtedly poorly specified for statistical inference, the point estimates may be of interest. For example, if the assumption is added that adult employment is unaffected, an increase in school enrollment of one person (male 16-19) reduces

employment by one person.[1] Similarly, an extra enrollee in a federal youth program reduces private employment by .65 to .80 persons. These estimates suggest that increasing total (private plus government) employment by one person requires an additional 3 to 5 slots in the Neighborhood Youth Corps.

Regression equations (3) and (4) are equivalent to equations (1) and (2), except that the minimum wage variable is defined differently. In equations (1) and (2), the presumption is that the supply of teenagers to the uncovered sector is unaffected by minimum wage legislation. In equations (3) and (4), the presumption is that the teenage labor supply function has unit elasticity. Accordingly, the minimum wage variable is defined as

$$1 + \frac{c\,\tilde{w}^2}{(1-c) + \tilde{w}}$$

Parameter estimates in equations (3) and (4) are essentially identical to those reported for equations (1) and (2). It is not surprising that these alternative measures give similar results because they are clearly highly correlated. Rather than impose the assumed unit elasticity of supply for teenage workers, alternative estimates can be obtained either by imposing a supply elasticity estimated from independent data or in this frame by resorting to maximum likelihood techniques for which the supply elasticity is treated as an unknown parameter to be estimated along with other parameters of this system. Nonetheless, it is true for these data that the estimated historic effects are insensitive to changes in the supply elasticity as it varies between an assumption of perfectly elastic supply and unit elasticity.

This does not say that predicted effects of legislative changes are invariant to specification. Clearly the alternative constructs can imply different changes in the average cost of teenage labor as

---

[1] This estimate is based on data for the Spring Quarter of 1968 where teenage employment was approximately three-quarters of the male 16-19 population.

alternative variations in coverage and the minimum wage level are considered and, presumably, the more valid construct will yield more accurate predictions. The most notable difference in the estimates reported in Table 4 is that for the specification of unit supply elasticity, equations (3) and (4), coefficients are larger relative to their standard errors than for the alternative specification. To contrast these estimates, I have simulated effects of the recently enacted amendment under the assumption that teenage coverage would have increased from 0.72 to 0.80 of the workforce and that the minimum wage would have increased from 0.40 to 0.50 of the average manufacturing wage. Using the specification of perfectly elastic supply assumed by Hashimoto-Mincer, Kaitz, and Kosters-Welch, the predicted effect is that the teenage/adult employment ratio would fall by 7 percent. The corresponding prediction that assumes unit supply elasticity is that this legislative change would reduce the teenage/adult employment ratio by 9 percent. Clearly these estimates are not statistically different.

The Industrial Distribution of Teenage Employment

Not only do teenage shares of total employment appear to be linked to minimum wages, but as evidenced in Table 3, the impact appears to have varied among industries as coverage rates have varied. For example, in 1930, 42 percent of all employed teenagers 14-17 years old worked in manufacturing establishments. Following the initial legislation, only 26 percent were employed in manufacturing by 1940, and by 1955 this number had fallen to 17 percent of teenage (14-17) employment. Approximately 95 percent of all manufacturing employees were covered by the initial legislation. In wholesale and retail trade, where the initial coverage rate was only 13 percent, the proportion of employed teenagers 14-17 years old increased from 21 percent in 1930 to 28 percent in 1940, and again to 45 percent in 1955. The experience of the service sector with coverage of 19 percent is similar where the share of 14-17 year old employment rose from 22 to 36 percent between 1930 and 1940, and then fell slightly to 33 percent in 1955. The same pattern holds for employment of persons 18-19 years old but the changes are less

exaggerated.[1]

In this section, regression results are presented for the effects of minimum wages upon the industrial distribution of teenage employment. The data used are from the Current Population Surveys of Households which began in 1954. This "late start" is unfortunate because the most dramatic changes followed the initial legislation. The model is the same as that underlying equation (9.b),

$$\frac{dS_1}{S_1} - \frac{dS_2}{S_2} = -\sigma_{12}\dot{w}$$

The distinction is that the employment ratio, S_1/S_2 is specific to the industry as is the substitution elasticity and the wage change. In this version, the assumption is made that the aggregate supply of teenagers is not responsive to wages ($\varepsilon = 0$), so that the minimum wage serves a distributional function only. To mitigate this rather extreme assumption, the industry specific teenage/adult employment ratio is normalized by the aggregate ratio. Thus, in the regression analysis, the dependent variable for the i-th industry is the ratio of the proportion of all employed teenagers who work in the industry to the proportion of employed adults in the industry.

Recall that if supply is perfectly inelastic, in the aggregate,

$$\dot{w} = 0$$

---

[1] Industrial Employment Shares of Teenagers 18-19 Years Old

Industry	Year		
	1930	1940	1955
Manufacturing	39	30	28
Wholesale and Retail Trade	18	26	31
Services	22	28	22

Source: Censuses of Population for 1930 and 1940. The 1955 data are for April from the CPS. They are unpublished, but were obtained privately from the Bureau of Labor Statistics, U.S. Department of Labor.

and

$$\dot{w} = \frac{\bar{c}\,\tilde{w}}{1-\bar{c}}$$

where $\bar{c}$ indicates the aggregate coverage rate. For the i-th industry the wage change,

$$\dot{w}_i = c_i\tilde{w} + (1 - c_i)\dot{w} = \frac{(c_i-\bar{c})\,\tilde{w}}{1-\bar{c}}$$

(c_i is the industry specific coverage rate). Here, $\dot{w}_i$ is the change in the average wage within the industry relative to the national average change.[1] Estimates are reported in Table 5 for four industry aggregates. The manufacturing aggregate combines durable and non-durable manufacturing, because separate coverage data are not available. On average, for the 1954-68 interval, 20 percent of employed teenagers worked in manufacturing establishments. Retail trade and service industries are separately identified, because the majority of teenagers work in these industries (an average of 33.5 percent in retail trade and 30.8 percent in services). All other industries which individually account for trivial proportions of teenage employment are combined, and regression results are presented here for comparative purposes.

Estimation follows a two-step approximate generalized least-squares (GLS) technique designed to give efficient estimates for cases such as this where residuals in the four industry employment

---

[1] If the assumption $\varepsilon = 0$ is relaxed,

$$\dot{w}_i = \frac{(c_i-\bar{c})\tilde{w} + c_i\varepsilon\tilde{w}^2}{(1-\bar{c}) + \varepsilon\tilde{w}} \quad \text{and} \quad \dot{w}_i - \dot{w} = \frac{(c_i-\bar{c})\tilde{w}}{(1-\bar{c}) + \varepsilon\tilde{w}}$$

where $\dot{w}$ is the average change over all industries. The limiting case ($\varepsilon \to \infty$) is obviously

$$\dot{w}_i - \dot{w} = (c_i - \bar{c})\tilde{w} \quad .$$

Table 5

Estimates of Effects of Minimum Wages on the Industrial Distribution of Teenage (14-19 years old) Employment in the Private Non-agricultural Sector, 1954-68. (Asymptotic standard errors are in parentheses.)

	Industry			
	Manufacturing	Retail Trade	Services	Others[a]
Proportion of Teenagers in Industry (1954-68 average)	.198	.335	.308	.159
Independent Variables:				
Minimum Wage	-0.444 (0.088)	-0.130 (0.031)	-0.112 (0.041)	0.224 (0.181)
Adult Unemployment Rate	-4.840 (0.665)	-1.460 (0.509)	4.660 (0.680)	-1.920 (0.902)
Annual Growth Rate	-0.011 (0.002)	0.005 (0.001)	0.007 (0.002)	-0.013 (0.003)
Dummy Variables for Quarters Included	+	+	+	+

Source: Data are unpublished and are obtained privately from the Bureau of Labor Statistics, U.S. Department of Labor. There are 60 quarterly observations for the 54-68 period.

[a]Includes: Mining, Construction, Wholesale Trade, Transportation and Communication, and Finance, Insurance and Real Estate.

equations are obviously contemporaneously correlated. The first step involves ordinary least squares (OLS) of the individual equations from which the residual covariance matrix is calculated. The second step is the GLS technique based on this estimated contemporaneous covariance structure of residuals.[1] The OLS coefficient estimates are very similar to those reported here, but standard errors for these estimates appear to be only about two-thirds as large as for OLS.[2] For both of these estimates, OLS and approximate GLS, the evidence is that an increased industry minimum wage "significantly" reduces the teenage share of employment in that industry. Recall that with an increased nominal minimum, the industry wage increases only in those industries with above average coverage and falls in industries with below average coverage. Statistically significant minimum wage effects are found for manufacturing, retail trade, and services. No effect is identified in the composite industry.

Both the dependent variable (the ratio of the proportion of employed teenagers to the proportion of employed adults working in the industry) and the minimum wage variable are expressed in logarithmns (base e), so that the estimated coefficient is interpreted as an elasticity. Again, the coefficient estimate is not an estimate of substitution elasticities, because of commonality or overlap in the

---

[1]The correlation matrix of residuals from the OLS estimates is:

	(1)	(2)	(3)	(4)
(1)	1.00	-0.43	-0.45	-0.06
(2)		1.00	-0.33	-0.09
(3)			1.00	-0.54
(4)				1.00

where the respective industries are (1) Manufacturing, (2) Retail Trade, (3) Services, and (4) the aggregate of other industries.

[2]Calculated R^2s for the OLS estimates are .67 for manufacturing, .68 for retail trade, .59 for services, and .44 for the aggregate of other industries.

productivity distributions of teenagers and adults. Not surprisingly, those industries employing the greatest teenage proportions in their workforce are also industries with the lowest average adult wage rates so that in these industries, the productivity distinction between teenagers and adults is least important. The observation that the teenage/adult employment ratio in service industries is less sensitive to minimum wage changes than in manufacturing is not a statement that adults are more easily substituted for teenagers in manufacturing than in services. The observation instead is that the increased minimum wage has increased the cost of teenagers relative to adults in service industries less than in manufacturing because a larger fraction of adults in services has had a legislated wage increase.[1] Evidently, uneven industrial coverage had changed the industrial pattern of teenage employment. Prior to 1961, the effect was to shift teenagers from the more extensively covered sectors to retail trade and services. The coverage extensions in retail trade of 1961 and in both retail trade and services in 1967 shifted teenagers away from these industries.

Additional variables introduced in the regression equations reported in Table 5 are to control for non-neutrality. For example, the estimates are that secular forces (the time trend) are increasing relative teenage shares in retail trade and services and reducing them in manufacturing and other industries. The significance of the adult unemployment rate indicates that, even though teenagers are more vulnerable than adults to fluctuations in employment, this effect is not uniform among industries. Increased adult unemployment results in a more-than-proportionate reduction in teenage employment. Of those

---

[1] Suppose that there are only two skill classes of workers who in the absence of legislation would earn respectively, w_1 and w_2. A minimum wage, w_m, is instituted such that $w_1 < w_m < w_2$. The cost of group 1 will increase by $\tilde{w} = (w_m - w_1)/w_1$, relative to group 2 workers. Assume that in manufacturing all adults fall in group 2 and all teenagers fall in group 1. In services assume that all teenagers fall in group 1 but that proportion p of adults fall in group 1 as well. The relative cost of teenagers to adults increases by $\tilde{w}$ in manufacturing and by $(1-p)\tilde{w}$ in services.

who remain employed, a disproportionate number are in services while relative shares are reduced in other industries. Quarterly dummy variables are also introduced in these regressions to allow for industrial differences in seasonal patterns. Although coefficient estimates are not reported in Table 5, the evidence is that the summer influx of teenagers is disproportionally directed to services and to the aggregate of other industries.

III. Summary and Unsettled Issues

The available empirical evidence refers almost exclusively to teenagers. For them the evidence can be summarized as:

(1) Minimum wage legislation has reduced employment. The extent of this reduction remains conjectural because a variety of estimates are available. Since teenage employment data became available in 1954 minimum wages probably had their least effect just prior to the 1956 increase from $0.75 to $1.00/hour when the minimum was 38.5 percent of the manufacturing wage and only 38 percent of teenagers worked in covered establishments. The greatest cumulative effect would have accompanied the 1968 increase to $1.60/hour by which time coverage had been raised to 72 percent of the teenage workforce. Based on coefficients reported in Table 4, equation (3), the estimated effect is that the teenage/adult employment ratio was only about 1.5 percent below what it would have been without minimum wage legislation just prior to the 1956 amendment. In 1968, the estimate is that minimum wages had reduced this ratio by 15 percent of what it otherwise would have been. Since then, this effect was eroded by rising wages to about one-half of the 1968 level, but the 1974 amendment should return the teenage/adult employment ratio to its 1968 origin.

(2) Minimum wage legislation has heightened the vulnerability of teenage employment to vagaries of the business cycle. On balance, over the 1954-68 period, teenagers accounted for 6 percent of employment but as employment varied about its trend teenagers accounted for 22 percent of this variation. The evidence is that a substantial part of the discrepancy between 22 and 6 percent is attributable to minimum wages.

(3) Minimum wages have had very large effects on the industrial distribution of teenage employment. The change between 1930 and 1940 in which teenage employment shifted to uncovered sectors contained through the 1945 and 1950 legislated adjustments when under constant coverage the minimum was first raised to 39 then to 52 percent of the manufacturing wage. The regression estimates of Table 5 offer clear evidence that throughout the 1954-68 period the industrial distribution of employment remained sensitive to uneven industrial coverage.

In addition to these effects on the level of teenage employment and its pattern of change over the business cycle and between industries, Hashimoto-Mincer report significant disemployment effects for non-white workers 20-24 years old and for workers above 65 years of age. Other empirical accounts of minimum wage effects have not addressed these groups but have focused on teenagers for whom the data are more easily accessed. For teenagers, the evidence of substantial employment effects are convincing, yet many questions of equity and efficiency remain unanswered. What is the effect of minimum wage legislation on school attendance? Should legislated minima vary by industry and by demographic group? Can wage and income policy be integrated to mitigate adverse effects?

School Enrollment and Part-time Work

One argument favoring minimum wage legislation is that although a major share of the adverse employment effect falls upon teenagers, they have good alternative uses for their time. Namely, school enrollment and attendance has offered and apparently continues to offer an attractive substitute to employment for the young. In fact, I know of no empirical study of the effect of minimum wage legislation on school enrollment. Such a study focusing especially upon traditionally economically disadvantaged demographic groups would be an important addition to our arsenal of knowledge of these effects.

Unlike employment, the *a priori* effects are not unambiguous, because of the role of part-time work in financing education. The traditionally disadvantaged are precisely the groups whose employment is most threatened by minimum wage legislation and they may well be the groups most dependent on part-time work for support while in school.

In a recently completed paper, Donald Parsons offers important new evidence on this score.[1] Reporting estimates based on the National Longitudinal Surveys, Parsons notes that students working

---

[1]"The Cost of School Time, Foregone Earnings and Human Capital Formulation," (published manuscript, Ohio State University) February 1973.

part-time earn sharply lower wages (about 25 percent lower) than their contemporaries who have dropped out of school for full time employment. The $1.60 minimum wage became effective in February 1968. Using earnings data for 1967 with Parson's estimates, my calculations are that an enrolled student working part-time would be in his fourteenth year of school (the second year of college) before his hourly wage would average $1.60. But, a drop-out would need only eleven years of schooling to earn $1.60 in his first year of employment. By precluding employment of persons whose part-time wage falls short of the minimum the student is confronted with a choice. He can continue in school if support from alternative sources is forthcoming or he can leave school to work full time. The dependence between this choice and family income is obvious. It may be that minimum wages increase school enrollment but the same legislation may force some to opt for full time work and those who do are likely to be those whose families can afford the least support for their children's education.

This is an empirical question that can be addressed with available data.

Distributional Effects and Meshing Wage Policy with Incomes Policy

Among policies designed to "improve the condition" of those who would otherwise receive low incomes, minimum wages are amazingly perverse. So long as demand curves are negatively inclined, those who gain, i.e., secure legislated wage increments, do so at the expense of others who in the absence of the legislation would have earned the lowest wages. With partial coverage, those who lose either work in sectors not covered at depressed wages or withdraw from the workforce. The propensity to withdraw from the workforce is signaled by the elasticity of labor supply, which is a summary statistic stating workers attitudes toward non-market alternatives.

In the second part of this paper, implications of partial coverage are considered and one result of the theoretical discussion is particularly relevant to distributional effects. If labor demand functions have equal elasticity in covered and uncovered sectors and if labor supply has zero elasticity, i.e., if the supply of labor does

not decline as the wage falls, then a legislated minimum will not affect average wages. Those retaining jobs in covered sectors gain and those working in the uncovered sector lose an equal amount. The legislation is only a tax, from some who would otherwise have earned less than the minimum to others whose earnings otherwise would have been the same. If the supply of labor shrinks as wages fall then those continuing to work following imposition of the minimum will, on average, receive an increased wage. Wages will be depressed in uncovered sectors so that in effect workers in these sectors will be taxed, but the taxes will be less than they would have been because some leave the workforce.

Supply elasticities are the key to distributional effects. If supply is highly elastic, then when faced with wage reductions, relatively large proportions will withdraw from the workforce rather than accept lower wages. This says simply that these workers view their non-market activities as superior to those afforded by the market at lower wages. Further, the larger the proportion of workers that leave the labor market as wages fall, the smaller is the resultant wage reduction experienced by those who remain. In the limiting case with perfectly elastic labor supply functions, no workers are adversely affected by minimum wage legislation. This because in the absence of legislation, all are indifferent between work in the market and non-market activities. Therefore, none are willing to endure adverse effects generated in the market.

The Thorny Question of Differentials. Youth differentials are currently much discussed. The idea is simply that since the most adverse employment effects are realized by persons who have the lowest productive capacity and who are therefore disproportionately young, these effects can be mitigated by introducing a differential minimum that is lower for young workers.

There are a number of problems associated with a simple differential of this sort. What of adults who would otherwise earn less than the minimum? To date we do not have sufficiently reliable estimates of substitution possibilities to make even remotely accurate estimates.

This issue of cross-effects with a differential is further confounded by the possibility that the level of the minimum set for adults may depend upon the existence of a youth differential. Historically, the minimum following legislative adjustments is one-half the average manufacturing wage. Would the minimum set for adults be raised if a youth differential exists?

It is quite probable that non-market alternatives are superior for teenagers to those of adults. These alternatives are expressed in labor supply elasticities and the more elastic the supply, the greater is the buffer offered by non-market activities to employment adversities generated by minimum wages. A youth differential has the potential of shifting the brunt of the adverse employment (and with incomplete coverage, wage) effects from youths whose alternatives outside the labor market offer insurance against market adversities to older workers with inferior alternatives.

Should the minimum wage vary among industries and if so, how? Aside from distributional issues, the answer seems obvious. Yes. So long as wage minima exist, on the basis of use efficiency for resources the objective should be to minimize distortions in patterns of resource allocation. As in the case of taxation when not all activities are taxable, the objective should be to impose the greatest marginal price distortions where response is most sluggish. This would correspond to imposing the highest wage minima on sectors with the least elastic demand for low-wage labor. Unfortunately, we have very scant evidence of industrial patterns of labor demand.

Incomes Policies. It is probably safe to presume that minimum wage legislation of some form will always be with us and the trend to complete coverage will very likely continue. Interaction between wage legislation and incomes policies is relevant. For example, negative-income-tax proposals operating through reinforcing income and substitution effects on labor supply have the effect of raising reservation wages, of increasing the wage level at which workers withdraw from the workforce rather than accept lower wages. Wage subsidy programs differ since the substitution effect is toward increased labor supply. With incomplete coverage, minimum wage legislation exacerbates

labor force withdrawal associated with negative-income taxes, but if the wage subsidy is counted as part of the minimum, then a program of this kind reduces adverse employment effects associated with minimum wage wage legislation. Whatever the relative merit of the two alternative incomes policies, the position of wage subsidy programs is improved with the existence of minimum wage legislation.

Further Research. What should be the focus of further research into minimum wage effects? My own prejudice is that there are three important types of information that would aid in evaluating these programs.

One is of own and cross-elasticities of demand between various groups of laborers. Not only for minimum wage legislation but for all simulations of effect of welfare-oriented policies these are key parameters.

A second type of information concerns labor supply functions of low-wage workers. Here our knowledge is better, but there remains the question of alternatives for those displaced by minimum wage legislation. In particular, how are school enrollment rates of teenagers affected and how are labor force participation rates of females, especially mothers of young children, affected?

The third type of information which should be an objective of future research is the question of effects of minimum wage legislation on wage distributions. At issue is the question of enforcement and compliance along with that of wage depression in uncovered sectors. The combined effects on wage (and hours) distributions and on participation rates are at the heart of any analysis of distributional effects of these programs.

In closing, I should note that no empirical study I am aware of has dealt with the simultaneous determination of minimum wage level and coverage with unionism. Yet, either casual empiricism consisting of correlations between coverage and unionism patterns or of the incidence of union representatives testifying before Congress in behalf of minimum wage legislation, suggests that the two are part of the same larger phenomenon.

MINIMUM WAGE LEGISLATION IN THE UNITED STATES