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UNEMPLOYMENT EFFECTS OF MINIMUM WAGES

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*Columbia University and the National Bureau of Economic Research. Work on this problem was initially provoked by a discussion with William Bowen nearly a decade ago. A recent empirical effort with Nori Hashimoto, and subsequent discussions with Finis Welch and Philip Nelson, led to the current formulation.

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Jacob Mincer

PRELIMINARY
Incomplete

UNEMPLOYMENT EFFECTS OF MINIMUM WAGES

1. Introduction

Empirical investigation of employment effects of minimum wage legislation is a subject of continuing interest, judging by a growing number of studies. The older studies were concerned mainly with changes in employment in low-wage industries. In the more recent work attention has shifted to effects on unemployment in low-wage demographic groups, such as teenagers. Despite the statistical difference there is no apparent recognition of a conceptual as well as substantive distinction between minimum wage effects on employment and those on unemployment.

The purpose of this paper is to explore the analytical distinction between employment and unemployment effects in the hope of providing some understanding of the observations. Though related empirical work is far from being definitive the findings appear to be informative.

The distinction between employment and unemployment effects of minimum wages arises in one or both of the following cases: (a) when only part of the economy is "covered" by minimum wage legislation and (b) when the supply of labor to the market is not perfectly inelastic. Obviously, when all of the economy is "covered" and the labor force is fixed in number, there is no distinction (except for algebraic signs) between changes in employment and changes in unemployment. The conditions which create the distinction are important and must be treated explicitly in the analysis of minimum wage effects.[1] The upward movement

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[1] Both factors receive explicit attention in a current study by Finis Welch of effects of minimum wages on sectoral distribution of employment. His analysis omits the unemployment effects, which is the focus of this paper.

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along the demand curve in the covered sector and the corresponding reduction of employment there is only a beginning of the story: there are responses in movements of labor from the covered to the uncovered sector (or conversely), as well as from the market to the nonmarket (or conversely), and some amount of "permanent"[2] unemployment is generated as well. More

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[2] By "permanent" unemployment, I mean unemployment corresponding to a given coverage and minimum wage. Ceteris paribus, the mere passage of time would not change the volume of this unemployment.

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precisely, given similar labor in the two sectors (there is only one before the imposition of minimum wages) and a wage w_o, the imposition of an above equilibrium minimum wage in the covered sector $w_m > w_o$ will lead to two equilibrating adjustments: in the uncovered sector the wage will change from w_o to w_n in consequence of generated sectoral movements of labor, and with $w_m > w_n$ (as we shall prove) a certain amount of "waiting" for jobs in the covered sector becomes worthwhile, creating a fixed amount of unemployment.

A question of particular interest is the direction of labor mobility resulting from the minimum wage imposition (or increase). An outflow from the covered sector implies some withdrawals from the labor force and some reemployment in the uncovered sector as well as a decrease of the wage in that sector. In the opposite case, there are net inflows of labor into the covered sector both from the nonmarket and from the "free" sector, in turn raising the wage in the latter as well. I proceed to explore the conditions which distinguish these opposite movements, as well as the specific effects of increasing minimum wages and of coverage on (a) wages in the uncovered sector, (b) unemployment, and (c) labor force withdrawals. The qualitative conclusions hold regardless of whether coverage is partial or complete and whether the total labor force is fixed or responsive to wage changes. Also, similar results hold for a multi-period analysis as for the analysis collapsed into a single period, from which I start.

2. The Probability of Employment and Equilibrium Unemployment

A wage w_m exceeding the equilibrium wage w_o is imposed on a part of the economy (the "covered" sector), creating a differential $w_m - w_n$, where w_n is the resulting wage level in the "uncovered" sector. In order to abstract from other influences assume that the job searchers' probability of employment in the uncovered sector is unity within the period. With wages above equilibrium in the covered sector, jobs must be rationed. Chances of success in job search depend on the method of rationing. I shall assume probabilistic rationing,[3] one in which every job searcher

[3] Price rationing or discrimination would eliminate unemployment rather quickly. One form of "price" rationing is worker monetary investment in search. This would reduce waiting time, hence observed unemployment, by substituting direct costs for foregone earnings of job searchers.

has an equal chance of getting a job, and every employed worker an equal chance of keeping the job. This assumes that some vacancies arise periodically in the covered sector, due to turnover (Vacancies are also created by growth in demand, a factor I shall consider later.)

Abstracting from risk preferences and from search costs other than foregone earnings, equilibrium wages after imposition of w_m in the covered sector are given by:

$$p\ w_m = w_n, \text{ or } p = \frac{w_n}{w_m}, \text{ and } \frac{1-p}{p} = \dot{w} \qquad (1)$$

where $\dot{w} = \dfrac{w_m - w_n}{w_n}$, and p is the probability of employment in the covered sector.

In the covered sector employment is E_m, the number of vacancies per period is δE_m. Abstracting from growth or cycles, the rate δ is simply a separation rate. The δE_m vacancies are filled as soon as they appear and a remaining pool of unemployed searchers of size U is observed. Since the number of vacancies (separations) is δE_m and the total number of job searchers is $U + \delta E_m$, the probability of employment is

$$p = \frac{\delta E_m}{U+\delta E_m} \tag{2}$$

Define the covered sector unemployment ratio $u'_m = \frac{U}{E_m}$, and the unemployment rate $u_m = \frac{U}{E_m + U}$

Then

$$p = \frac{\delta}{u'_m + \delta}$$

$$u'_m = \frac{\delta(1-p)}{p} = \delta . \dot{w} \tag{3}$$

and

$$u_m = \frac{\delta(1-p)}{p+\delta(1-p)} = \frac{\delta\dot{w}}{1+\delta\dot{w}}$$

Define the proportion of employment covered: $k = \frac{E_m}{E_m + E_n}$, and the aggregate unemployment ratio $u'_A = \frac{U}{E_m + E_n}$

Then

$$u'_A = k . u'_m = k\delta\dot{w} \tag{3a}$$

and the aggregate unemployment rate $u_A = \frac{k\delta\dot{w}}{1+k\delta\dot{w}}$

It appears that the unemployment rate induced by the imposition of minimum wages is proportional to the percent wage gap ($\dot{w}$) between the sectors, the separation rate (δ), and the coverage ratio (k). The separation rate δ has a maximum value of unity. This case of complete (100 percent) turnover provides the highest chance of success for job searchers, hence maximum unemployment, namely $u'_m = \dot{w}$, and $u'_A = k\,\dot{w}$. The opposite extreme, zero turnover implies no unemployment--all those without jobs having left the covered sector.[4]

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4 Even when turnover is zero, if demand for labor is growing, vacancy rates appear and by eq. (2) unemployment will arise, since $p = \frac{g.E}{u+g.E}$, when g is the growth rate of employment. This is the case discussed in the context of rural-urban migration in less developed countries by Todaro (1969) and Harberger (1971).

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3. Labor Mobility and the Equilibrium Wage Differential

Before the imposition of minimum wages, the market wage in both sectors was w_o. The minimum wage produces two adjustments: it generates an unemployment rate u and it changes the wage in the uncovered sector from w_o to w_n in consequence of the movement of labor between the sectors. Which way does labor flow? It is usually assumed in the minimum wage literature that disemployed labor flows out of the covered to the uncovered sector. The opposite assumption is made in the development literature--that labor will be attracted to the covered sector even at the cost of a substantial period of unemployment. Each may be right in their context, but this is not obvious. At a purely arithmetical level, it simply depends on whether generated unemployment U is less or greater than the reduction in employment $(E_o - E_m)$ in the covered sector. If $(E_o - E_m) > U$, there is an outflow from the covered sector and a depression of wages in the uncovered sector, while the opposite is true when $U > (E_o - E_m)$. In the latter case, wages rise in the uncovered sector as well, but never to the level of w_m.[5]

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[5] As is shown below, p. [illegible]. A similar result can arise in non-probabilistic models, without unemployment, when the covered sector is capital intensive, the other labor intensive. Cf. H. G. Johnson ([illegible]). I assume no such differences (or the opposite intensities if the reader prefers).

Now $(E_o - E_m) = E_m \eta \dot{w}_m$, where η is demand elasticity in the covered sector, and $\dot{w}_m$ the minimum wage hike (percent difference between w_m and w_o, the previous level). And, according to (3) $U = E_m \cdot \delta \dot{w}$

Therefore, $E_o - E_m \gtrless U$ depends on $\eta \dot{w}_m \gtrless \delta \dot{w}$

Expressing percent differences in logarithmic form:

$$\dot{w} = \ln w_m - \ln w_n = (\ln w_m - \ln w_o) + (\ln w_o - \ln w_n) = \dot{w}_m + \dot{w}_n$$

the condition for outflows from the covered sector is :

$$(\eta - \delta)\ w_m > \delta\dot{w}_n \tag{4}$$

We need to determine $\dot{w}_n$. It will simplify matters to assume first a zero elasticity of aggregate labor supply--a fixed labor force.

Let $L_m = E_m + U$ and E_o, employment in the covered sector before the minimum wage was imposed. If positive, $E_o - L_m$ is the number leaving the covered sector. If negative, it is the number attracted from the uncovered sector. If labor demand elasticity in the uncovered sector is e in absolute value, then $\dot{w}_n$, the percentage change in the "free" sector wage is given by:

$$e.\ \dot{w}_n = (\ln E_o - \ln L_m)\ .\ \frac{k}{1-k} \tag{5}$$

$(\ln E_o - \ln L_m)$ is the difference between E_o and L_m as a percent of employment in the covered sector. It is multiplied by $\frac{k}{1-k}$ to express it as a percent of employment in the uncovered sector.

Let the minimum wage hike $\dot{w}_m = \ln w_m - \ln w_o$, and η the demand elasticity in the covered sector. Then:

$$\frac{1-k}{k}\ .e.\ \dot{w}_n = \ln E_o - \ln L_m = (\ln E_o - \ln E_m) - (\ln L_m - \ln E_m) =$$

$$= \eta\dot{w}_m - u'_m = \eta\dot{w}_m - \delta\dot{w} = (\eta - \delta)\ w_m - \delta\dot{w}_n$$

From which:

$$\dot{w}_n = \frac{k(\eta - \delta)}{k\delta + (1-k)e}\ \dot{w}_m \tag{6}$$

A positive sign of $\dot{w}_n$ means a reduction in "free" sector wages and is due to an outflow of labor from the covered sector. From equation (6) this happens when $\eta > \delta$, and the converse, outflows of labor from the "free" sector and increased wages in it result when $\eta < \delta$.[6]

Now, the percent wage gap between sectors will be

$$\dot{w} = \dot{w}_m + \dot{w}_n = \left[1 + \frac{k(\eta - \delta)}{k\delta + (1-k)e}\right] \dot{w}_m = \frac{k\eta + (1-k)e}{k\delta + (1-k)e} \cdot \dot{w}_m \qquad (7)$$

when $\eta < \delta$, the wage in the uncovered sector rises, but the gap $\dot{w}$ remains positive, that is $w_m > w_n$.

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[6] Note that $\eta > \delta$ implies $(E_o - L_m) > 0$

Since $\ln E_o - \ln L_m = (\eta - \delta)\dot{w}_m - \delta \dot{w}_n = [(\eta - \delta) - \delta . \frac{k(\eta - \delta)}{k\delta + (1-k)e}] \dot{w}_m =$

$$= (\eta - \delta)\left[1 - \frac{k\delta}{k\delta + (1-k)e}\right] \dot{w}_m > 0, \text{ when } \eta > \delta .$$

We can trace now the effects of policy variables ($\dot{w}_m$ and k) and of parameter sizes (δ, η, e) on unemployment and on the intersectoral movement of labor, assuming fixed total labor supply.

Since $u'_m = \delta . \dot{w}$

by (7) $$\frac{\partial u'_m}{\partial \dot{w}_m} = \delta \frac{k\eta + (1-k)e}{k\delta + (1-k)e} > 0 \qquad (8a)$$

That is, the ratio of generated unemployment to employment in the covered sector is a positive function of the minimum wage hike, but the effect is small when the vacancy rate δ is small, and when the demand elasticity in the covered sector η is small.

For the maximum value of $\delta = 1$, the highest value of

$$\frac{\partial u'_m}{\partial \dot{w}_m} = \frac{k\eta + (1-k)e}{k + (1-k)e}$$

The effect on the aggregate unemployment ratio:

$$\frac{\partial u'_A}{\partial \dot{w}_m} = \frac{\partial (k\, \dot{w}_m)}{\partial \dot{w}_m} = \frac{k\eta + (1-k)e}{1 + \frac{1-k}{k}\frac{e}{\delta}} > 0 \qquad \text{(8b)}$$

Again, the effect is positive, and is positively related to the size of δ and η. It is also positively related to the coverage proportion k. In the limit, when k = 1, $\frac{\partial u'_A}{\partial \dot{w}_m} = \eta$, a trivial result due to the assumption of a fixed labor force.

Similarly, the effect of increased coverage:

$$\frac{\partial u'_m}{\partial k} = \frac{\partial}{\partial k} \cdot \frac{k\eta + (1-k)e}{k + (1-k)\frac{e}{\delta}} \cdot \dot{w}_m > 0 \quad \text{when} \quad \eta > \delta \qquad (9)$$

The effect is positive, that is an increase in coverage increases unemployment in the covered sector, not only in the aggregate ($u'_A = k \cdot u'_m$). The effect also interacts positively with the size of the wage hike $\dot{w}_m$.

The effect of $\dot{w}_m$ on the amount of labor outflow from the covered sector (expressed as a fraction of employment in it) is:

$$\frac{\partial[(\frac{1-k}{k}) \cdot e \cdot \dot{w}_n]}{\partial \dot{w}_m} = \frac{\eta \quad \delta}{1 + \frac{k}{1-k} \cdot \frac{\delta}{e}} \begin{cases} > 0, & \text{when } \eta > \delta \\ < 0, & \text{when } \eta < \delta \end{cases} \qquad (10)$$

The outflow is greater the smaller the vacancy rate and the smaller the coverage, and the larger the demand elasticities (η, e). Similar conclusions hold for the effects of coverage, holding $\dot{w}_m$ constant, including the interaction effect and $\dot{w}_m$.

Figure 1 portrays the effects in a convenient fashion, assuming constant elasticity curves. Given movements along the demand curve from point 0 up to the left, the locus of resulting wages w_n in the uncovered sector and the supply of labor to the covered sector L_m is shown as a line L with positive slope $\frac{1-k}{k} \cdot e$ passing through point 0. For a given minimum wage (point M on the demand curve D), the values w_n and L_m are given by point K, the intersection of line L with line R, with negative slope δ, passing from M.

The "supply curve" L remains fixed for given e, k, and η. For $e = \eta$ and $k = \frac{1}{2}$, it is a mirror image of D with opposite slope, as drawn in Figure 1. A change in turnover δ rotates the line R around M, counter clockwise for increased turnover. It changes the intersection K, but leaves L fixed. Since the slope of R is δ and of D is η, the point K is to the left of 0 when $\eta > \delta$, and to the right, when $\eta < \delta$. In the

Figure 1 Covered Sector

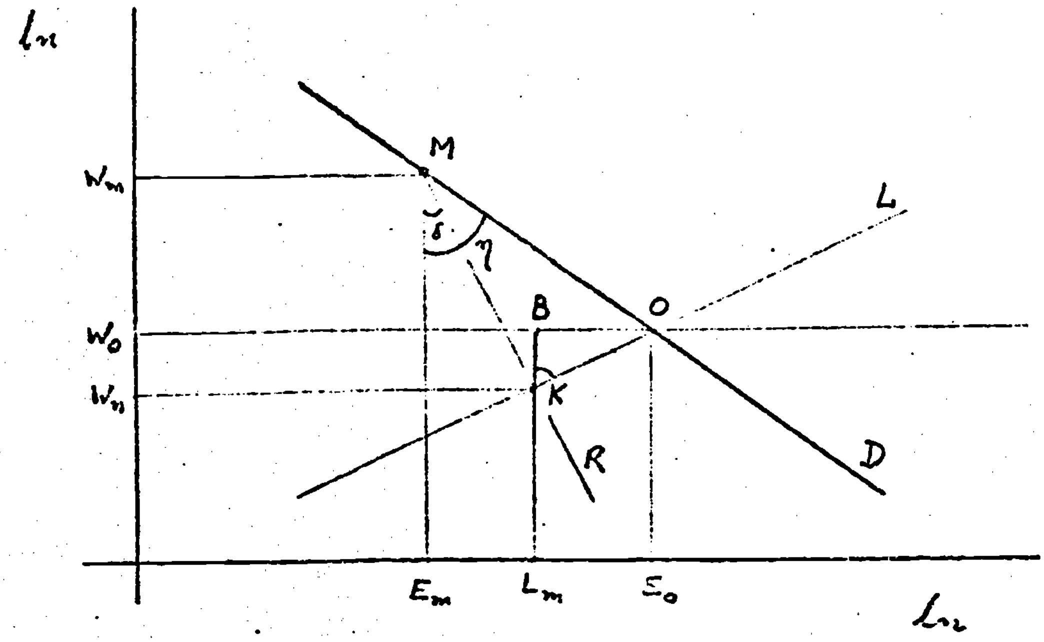
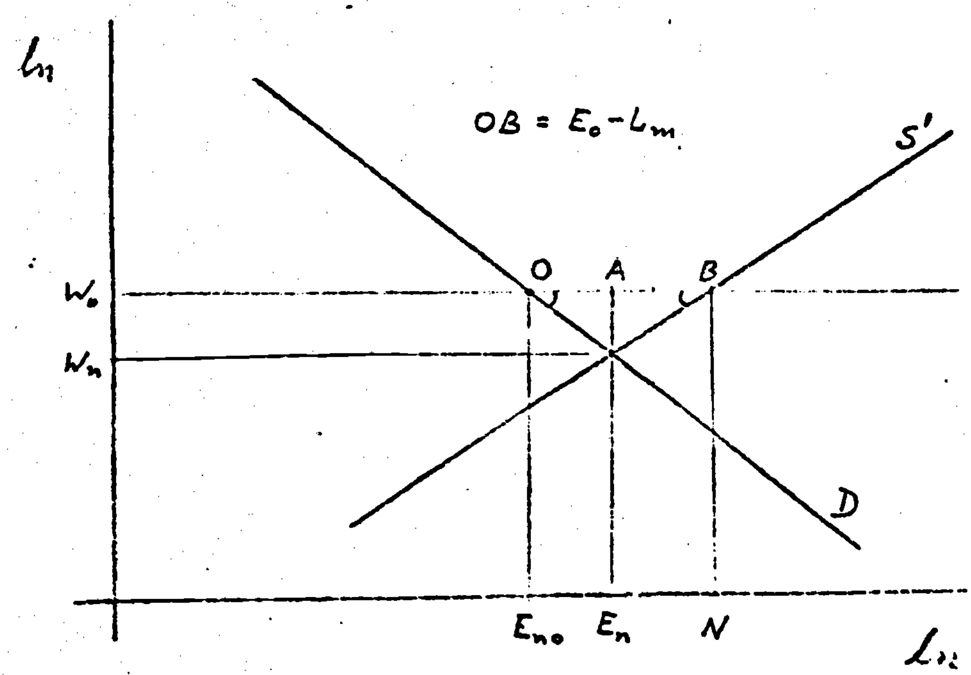


Figure 2 Not-covered Sector



first case an increase in w_m moves K further to the left, in the second further to the right of 0. The wage w_n exceeds w_o when K is to the right of 0. Since the slope δ of R cannot exceed unity, the highest value of w_n must be smaller than w_m.

An increase in demand elasticity e in the uncovered sector flattens L, while an increase in coverage makes L steeper. In the limit, when k = 1, L is vertical through 0.

The scales in Figure 1 are logarithmic. Hence $E_m L_m$ is the unemployment percentage u'_m, $E_o E_m$ is the disemployment ratio, and $w_m w_n$ the sectoral relative wage gap. Since $\eta > \delta$ in the figure, a shift of M to the left increases all three, induces outmigration from the covered sector. An increase in coverage steepens L, thereby increasing $E_m L_n$ (unemployment ratio in the covered sector), increasing the wage gap, and reducing the outflow of labor from the covered sector. When coverage is 100 percent, L is vertical and unemployment equals disemployment, only because of the assumption of zero elasticity of aggregate labor supply.

Labor Force Responses

The graphic solution in Figure 1 remains useful, mutatis mutandis, after the assumption of a fixed labor force is dropped. This more general case presents no particular complications. The only new development is the inclusion of the non-market along with the uncovered sector as the destination (when $\eta > \delta$) or origin (when $\eta < \delta$) of labor mobility.

With an upward sloping supply curve of labor some of the $E_o - L_m$ workers who leave the covered sector (when $\eta > \delta$) will drop out of the labor force rather than accept a wage below their shadow price in the uncovered sector.

Consequently the downward pressure on wages in the uncovered sector will be weaker than in the previous case. The L-curve in Figure 1 will be flatter the more elastic the supply curve, thereby reducing the sectoral wage gap and unemployment, while increasing outflows from the covered sector--as compared to the case of inelastic labor supply. If $\eta < \delta$, the flatter L-curve means that the wage gap and unemployment will be increased compared to the inelastic case, while inflows will also be larger and will come both from the uncovered sector and from persons out of the labor force whose shadow wages are less than w_n (which exceeds w_o).

The division of outflows from the covered sector into reemployment in the uncovered sector and withdrawals from the labor force is determined by the relative sizes of demand and supply elasticities in the uncovered sector. As Figure 2 indicates out of $E_o - L_m$ workers leaving the covered sector (measured as a percentage of employed in the uncovered sector), the fraction $\frac{e}{e + s'}$, will be absorbed in the uncovered sector, and $\frac{s'}{e + s'}$ will leave the labor force. Here s' is the elasticity of supply to the uncovered sector, and e the elasticity of demand in it.

Observe, in Figure 2, that $OA = \dot{w}_n \cdot e$, while $AB = w_n \cdot s'$, and $OB = OA + AB = \dot{w}_n (e + s')$ and

$$\ln E_o - \ln L_m = (\ln B - \ln 0) . \frac{1-k}{k} = \dot{w}_n (e + s') . \frac{1-k}{k}$$

The proportion of workers leaving the covered sector to be employed in the uncovered sector is $\frac{1-k}{k} \cdot e\, \dot{w}_n$, the proportion dropping out is $\frac{1-k}{k} \cdot s'\, \dot{w}_n = \frac{1}{k} \cdot s \cdot \dot{w}_n$, where s is the elasticity of aggregate supply in the relevant range.

Since $\ln E_o - \ln L_m$ is the difference between the disemployment percentage $\eta \cdot \dot{w}_m$ and the unemployment ratio $\delta \cdot \dot{w}$, we have:

$$w_n \left(\delta + \frac{1-k}{k} \cdot e + \frac{1}{k}\, s\right) = (\eta - \delta)\, \dot{w}_m \tag{11}$$

Thus $$\dot{w}_n = \frac{k(\eta - \delta)}{k\delta + (1-k)\, e + s} \cdot \dot{w}_m$$

and $$\dot{w} = \frac{k\eta + (1-k)\, e + s}{k\delta + (1-k)\, e + s} \cdot \dot{w}_m \tag{12}$$

The qualitative conclusions about effects of changes in $\dot{w}_m$, k and other parameters hold in this general case as they did before, when $s = 0$

The effect of supply elasticity s is best seen in the limit: As $s \to \infty$, $\dot{w} \to \dot{w}_m$. In that case, unemployment in the covered sector becomes entirely independent of the demand elasticities e and η and of coverage. It is merely a function of the turnover rate δ and of the minimum wage hike $\dot{w}_m$. Disemployment is as before $\eta \cdot \dot{w}_m$ and the difference between disemployment and unemployment $\dot{w}_m\, (\eta - \delta)$ drops out into or enters from the non-market.

To the extent that welfare systems provide payments near w_o this extreme case is relevant. Wage hikes which create downward pressures on wages in the uncovered sector will result mainly in withdrawals from the labor force. Therefore, when $\eta > \delta$, the connection between minimum wage hikes, growth of coverage, and growth of welfare enrollments is strongly suggested.

Finally, an interesting case worth considering, in view of the high coverage proportion of the U.S. labor force, is the case of complete coverage, $k = 1$. In this case, the L-curve in Figure 1 is simply the supply curve S, and w_n is an unobserved shadow wage: All those not employed at the minimum wage w_m, drop out of the labor force, if their shadow wage exceeds w_n. Again, if $w_n > w_o$, which takes place when $\eta < \delta$, people move from the non-market into the labor market.

Substituting $k = 1$ in (11) and (12), we have:

$$\dot{w}_n = \frac{\eta - \delta}{\delta + s} \cdot \dot{w}_m, \qquad u = \delta \frac{\eta + s}{\delta + s} \cdot \dot{w}_m \tag{13}$$

and

$$\dot{w} = \frac{\eta + s}{\delta + s} \cdot \dot{w}_m, \qquad \ln E_o - \ln L_m = s \frac{\eta - \delta}{\delta + s} \cdot \dot{w}_m \tag{14}$$

Unemployment is a positive function of the turnover rate, wage hike and demand elasticity. It is a positive function of s, if $\eta < \delta$, negative if $\eta > \delta$.

Labor force withdrawal takes place when $\eta > \delta$, and is greater the greater the wage hike, the demand and supply elasticities, and the smaller the turnover rate. When $\eta < \delta$, the labor force increases, and the increase is larger, the larger the wage hike, the turnover rate, and the supply elasticity, and the smaller the demand elasticity.

In the very special case of perfect turnover $\delta = 1$ and complete coverage $k = 1$,[7] unemployment is maximal, for given $\dot{w}_m$ and elasticities η and s.

$$u = \frac{\eta + s}{1 + s} \cdot \dot{w}_m \tag{15}$$

and labor force change $\ln E_o - \ln L_m = \frac{s}{1 + s} (\eta - 1) \cdot \dot{w}_m$

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[7] This was the case considered by Hashimoto and Mincer (1971), and by A. King (1973).

The direction of labor force change now depends on whether demand elasticity is less than or greater than unity. If $\eta < 1$, the unemployment ratio cannot exceed the (percentage) size of the wage hike.

4. Multiperiod Analysis and Growth of Demand

In a multiperiod formulation workers search or wait for jobs in the covered sector, as long as the net discounted gain from doing so is positive. Abstracting from risk preferences, the net gain is zero at the margin:

$$G = \sum_{t=0}^{n} \frac{p_t w_m - w_n}{(1+i)^{t+1}} = 0 \tag{16}$$

p_t in the expression for G is the probability of having a job in period t. This is to be distinguished from the probability of getting a job $p_o = p = \frac{\delta}{u + \delta}$, and the probability of losing the job when employed, namely δ. The discount rate is i.

The probability p_t grows with time, according to the recursive relation:

$$p_t = p_{t-1} (1-\delta) + [1-p_{t-1} (1-\delta) \quad p = p \sum_{j=0}^{t} [q(1-\delta)]^t \tag{17}$$

where $q = 1 - p$

Substituting into (16), and solving we get:

$$\frac{w_n}{w_m} = \frac{P(1+i)}{(1+i)-(1-p)\ (1-\delta)} \tag{18}$$

Substituting $p = \frac{\delta}{u + \delta}$, and solving for the unemployment ratio:

$$u = \frac{(1+i)\delta}{i + \delta} \cdot \dot{w} = \alpha \cdot \dot{w} \tag{19}$$

The coefficient α now plays the same role as the separation rate δ in the single-period analysis.

According to (19), $\alpha > \delta$ so long as $\delta < 1$. Only when $i = \infty$, is $\alpha = \delta$ which is the single-period case, while $t = 0$ or $\delta = 1$ makes $\alpha = 1$ its highest value. Thus when discount rates are extremely high or turnover complete there is no distinction between the single and multiperiod analysis. The lower the discount rates the higher α, the greater unemployment (cf.) because of the greater willingness to wait. Since $\alpha > \delta$, the likelihood of $\eta < \alpha$, hence of labor mobility toward the covered sector is greater than suggested in the single period analysis, where the comparison was between η and δ.

This likelihood becomes even greater when growth of demand in the covered sector is taken into account. Even if turnover were zero, and demand grows at the rate g creating a vacancy rate of g percent,

$$p = \frac{g}{u + g}\text{, and } u = \frac{1 + i}{i} \cdot g \cdot \dot{w}\text{, so } \alpha = \frac{1 + i}{i} \cdot g \qquad (20)$$

In the more general case when $g > 0$ and $\delta > 0$.

$$u = \frac{1 + i}{i + \delta} (g + \delta) \cdot \dot{w} \qquad (21)$$

Thus the coefficient of $\dot{w}$, $\alpha = \frac{1 + i}{i + \delta} (g + \delta)$ is expressed most generally in (21). (19) holds for $g = 0$, and (20) for $\delta = 0$. Also, when $g > 0$, α can be sizeable and unity is no longer its upper limit. It is plausible therefore, that promotion of rapid employment growth in "protected" high wage sectors, as described in the development literature, stimulates movement to these sectors creating high levels of equilibrium unemployment, while the opposite movements, disemployment and labor force withdrawals are the major consequences of minimum wages in the U.S. and in other developed economies.

5. Some Conclusions

Do minimum wage hikes represent a redistribution of income toward low wage labor? Total income is, of course, reduced. Does a larger share of the smaller product go to low wage labor? A demand elasticity $\eta < 1$ increases the wage bill of labor in the covered sector, but only the employed pocket the gains, at the expense, in part, of those disemployed. However, if labor turnover is complete ($\delta = 1$), the employed and unemployed are the same people and each of them is working less but earning more, at least nominally.

The analysis in this paper suggests that this conclusion would be correct if $\delta = 1$. Otherwise, a less than unitary demand elasticity $\eta < 1$ is not a sufficient condition. Not only must $\eta < 1$, it must be true that $\eta < \delta$. Only then will those employed in the not-covered sector have a wage $w_n > w_o$, and those unemployed in the covered sector an expected wage $w_n > w_o$.

Since an implication of $\eta < \delta$ is the flow of labor from the uncovered sector and from the non-market to the covered sector, such a hypothesis is subject to empirical tests, even without estimation of parameters η and δ. The empirical work to be reported rejects the hypothesis. The labor force diminishes in consequence of minimum wage hikes. This finding supports the alternative hypothesis that $\eta > \alpha > \delta$. It follows that unemployment arising in consequence of minimum wage hikes understates the disemployment being only a part of it, the other two parts being reemployment at wages lower than before, and labor force withdrawals. The inference that $\eta > \alpha$ further implies that growth of coverage aggravates unemployment even within the covered sector, and that the growth of numbers of welfare recipients may be induced by the growth in minimum wages. It is suggestive, in this connection, that labor force withdrawals appear to be rather substantial in the empirical analysis which relates employment and labor force changes to minimum wage hikes.

Empirical Analysis

Regressions of the form Y = f(MW, uc, AF, T, T^2) were run for ten age-sex-color population groups using quarterly data from 1954 to 1969 inclusive. The dependent variables are employment to population $(\frac{E}{P})$, and labor force to population $(\frac{L}{P})$. The independent variable MW is the ratio of the minimum wage to average hourly earnings multiplied by the coverage rate.[8] UC is the unemployment rate of adult males (age 45-54)

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[8] This variable was constructed by the BLS and published in Bulletin 1657, 1970. Coverage rates were estimated separately for teenagers (age 16-19) and for the adult labor force. The minimum wage variable was calculated as follows:

$$MW = \sum_i \frac{E_i}{E_t} \left[\left(\frac{MB_i}{AHE_i} \cdot CB_i \right) + \left(\frac{MN_i}{AHE_i} \cdot CN_i \right) \right]$$

where E is employment, AHE is average hourly earnings, MP is the basic minimum wage, MN is the minimum wage for newly covered sectors, CB is the proportion of non-supervisory employees covered by the basic minimum and CN is the proportion of non-supervisory employees covered by the rate applicable to newly covered workers. The index i indicates major industries and t is total private nonfarm economy.

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and serves as an index of the business cycle. AF is the fraction of population group (males 16-19 and 20-24) who were in the armed forces, and T is a time trend variable, which is an admittedly crude substitute for complete (?) specifications of employment and labor force functions. The MW variable enters the regression with an Almon unconstrained quadratic distributed lag. Experiments showed that a lag pattern of 6-8 quarters was significant for most groups.

Table 1 presents summary statistics for the variables used for the regression analysis, and Table 2 summarizes results of the regressions. It presents regression coefficients of the minimum wage variable obtained by using the Almon distributed lag method. Since it is through labor demand and supply that minimum wage effects operate, it is the labor-force and employment regressions that are of immediate interest. Unemployment effects were estimated as the difference of labor-force and employment effects. Unemployment regressions, however, were also run to facilitate a comparison.

Except for males (25-64), nonwhite males (65+) and nonwhite females (20+), the minimum wage variable is significant in both labor-force and employment regressions. For most groups, therefore, unemployment effects are substantially smaller than disemployment. Unemployment effects estimated from labor-force and employment regressions are also shown in Table 2.

The net minimum wage effects on labor-force participation appear to be negative for most of the groups. The largest negative effects are observed for nonwhite teenagers, followed by nonwhite males (20-24), white males (20-24), white teenagers, and nonwhite males (25-64).

The net employment effects are negative with the exception of non-white females (20+), for whom the positive coefficient is statistically insignificant. The largest disemployment effects are observed for non-white males (20-24), followed by nonwhite teenagers, white males (20-24), and white teenagers.

Except for nonwhite teenagers and white males (65+), the magnitude of the employment effects are greater than those of the labor-force effects. The implication is that labor flows from the covered sector to the uncovered and out of the labor force. Also, both the labor-force and the employment effects are greater for nonwhite groups than for white groups in general. The largest increase in the unemployment rate is observed for nonwhite males (20-24) followed by nonwhite teenagers, white males (20-24) and white teenagers. This pattern is observed for both the direct regression results and the indirect results calculated from the labor-force and employment effects.

It is striking to observe that the labor-force effects of minimum wages are predominantly negative. According to the theoretical analysis, the labor force may increase or decrease, given a decrease in employment, depending on demand elasticities and turnover rates. Findings of negative labor-force effects indicate that the demand elasticities are not so small as to cause an increase in the labor force, and that low-wage workers who are not employed in the covered sector perceive the minimum wage hike as a deterioration of their wage prospects.

Table 1.5. Minimum wage and maximum hours levels under the Federal Fair Labor Standards Act

Effective date	Coverage %	Minimum wage: covered	Minimum wage: newly covered	Maximum hours: covered	Maximum hours: newly covered	Enactment date
October 24, 1938	%	$0.25		44		[1] June 1938
October 24, 1939		.30		42		
October 24, 1940				40		
October 24, 1945		.40				
January 25, 1950	50	.75				October 1949
March 1, 1956	54	1.00				August 1955
September 3, 1961	61	1.15	$1.00			May 1961
September 3, 1963		1.25			44	
September 3, 1964			1.15		42	
September 3, 1965			1.25		40	
February 1, 1967	79	1.40	1.00		[2] 44	September 1966
February 1, 1968		1.60	1.15		[2] 42	
February 1, 1969			1.30		[2] 40	
February 1, 1970			[2] 1.45			
February 1, 1971			[2] 1.60			

[1] An amendment enacted June 26, 1940, authorized special industry committees to recommend rates above the then 30-cent legal minimum, but not above 40 cents, permitting those industries to reach the 40-cent minimum rate before October 24, 1945, when that rate would become effective, generally, for all covered employment. The industry committees were predominantly in the apparel and textiles industries.
[2] Not applicable to newly covered farm workers.

Table 1.6. Proportion of earnings covered by the Federal minimum wage, 1947–68[1]

Year	Basic minimum wage as a percent of [2]: Average hourly earnings private nonfarm	Basic minimum wage as a percent of [2]: Total compensation per man-hour private nonfarm	Minimum wages as a percent of average hourly earnings weighted by industry total employment and proportion covered [3] private nonfarm	Minimum wages as a percent of average hourly earnings weighted by industry teenage employment and proportion of total employment covered [4] private nonfarm
1947	35.4	31.3	20.3	[5]
1948	32.7	28.7	19.1	[5]
1949	31.4	27.9	18.0	[5]
1950 [6]	56.2	49.6	32.3	[5]
1951	51.7	45.5	30.1	[5]
1952	49.3	43.1	28.4	[5]
1953	46.6	40.8	26.9	[5]
1954	45.5	39.5	25.8	18.2
1955	43.4	38.1	24.8	17.6
1956 [6]	53.2	46.0	30.7	21.0
1957	52.9	43.4	29.8	20.2
1958	51.3	41.9	28.3	18.4
1959	49.5	40.1	27.3	18.1
1960	47.8	38.5	26.2	17.8
1961 [6]	49.1	40.9	28.3	21.0
1962	51.8	43.1	32.8	27.7
1963 [6]	51.9	42.9	32.5	27.1
1964	53.0	43.3	33.4	27.7
1965	51.0	41.8	32.5	27.1
1966	48.8	39.5	31.5	26.7
1967 [6]	53.8	41.5	39.2	36.9
1968 [6]	55.6	44.0	42.6	40.1

[1] In years when the minimum wage changed, the rate used in the calculations was weighted by the number of months it was in effect. For example in 1968, $1.40 was in effect 1 month and $1.60 for 11 months, a weighted average rate of $1.58.
[2] The basic minimum refers to the single rate provided under law prior to 1961 and, since 1961, to the rate applicable to previously covered workers.
[3] Calculated, as follows:

$$\sum_i \left[\frac{E_i}{E_t} \left[\left(\frac{MP_i}{AHE_i} \bullet CB_i \right) + \left(\frac{MN_i}{AHE_i} \bullet CN_i \right) \right] \right]$$

where:
E=payroll employment.
AHE=average hourly earnings.
MP=basic minimum wage.
MN=minimum wage for newly covered workers.
CB=proportion of nonsupervisory employees covered by the basic minimum.
CN=proportion of nonsupervisory employees covered by the rate applicable to newly covered workers.
i=major industry division (wholesale and retail trade treated as separate divisions).
t=total private nonfarm economy.

[4] Calculations are the same as in footnote 3 except that employment data refer to the 14-19 age group only. Employment data are not strictly comparable to that for all workers since it comes from household rather than payroll records and because government employment not classified as public administration is included in the other divisions; private households were excluded.
[5] Not available.
[6] Denotes years when basic minimum wage was changed. There were also changes for newly covered workers in 1964 and 1965.

Table 1.

Summary Statistics

1954 I – 1969 IV

	Means	S.D.
White Teens (16-19)		
L/P	48.26%	5.57%
E/P	42.28	5.36
U/L	12.45	2.51
Nonwhite Teens (16-19)		
L/P	43.32	6.00
E/P	32.96	5.50
U/L	23.94	4.57
White Males (20-24)		
L/P	85.82	3.09
E/P	79.65	3.48
U/L	7.17	2.56
Nonwhite Males (20-24)		
L/P	88.88	2.80
E/P	77.58	4.19
U/L	12.69	4.06
White Males (25-64)		
L/P	95.13	0.62
E/P	92.23	0.94
U/L	3.04	1.17
Nonwhite Males (25-64)		
L/P	92.05	1.70
E/P	85.29	2.52
U/L	7.33	2.99

	Means	S.D.
White Males (65+)		
L/P	32.27	4.95
E/P	31.07	4.68
U/L	3.68	0.99
Nonwhite Males (65+)		
L/P	31.44	5.42
E/P	29.26	5.12
U/L	6.93	2.89
White Females (20+)		
L/P	36.90	2.36
E/P	35.32	2.43
U/L	4.31	0.81
Nonwhite Females (20+)		
L/P	49.96	1.80
E/P	45.96	2.06
U/L	8.03	1.51
Minimum Wage		
Teens	25.81	7.86
Others	32.10	5.74
Armed Forces		
Teens	1.69	0.50
Males (20-24)	2.64	0.94
Cyclical Variable		
UC	3.23	1.16

TABLE 2

Net Effects of Minimum Wages on Labor Force, Employment, and Unemployment, U.S., 1954I - 1969IV

	(1) Wage Rate	(2) L/P	(3) E/P	(4) U/L	(5)
		(Elasticities)		(Rates)	(2)/(3)
Teens (16-19)					
White	$1.40	-0.158*	-0.205*	4.5 %	0.771
Nonwhite	1.14	-0.374*	-0.465	8.4	0.804
Males (20-24)					
White	1.90	-0.118*	-0.184*	6.2	0.641
Nonwhite	1.30	-0.226*	-0.354*	11.3	0.638
Males (25-64)					
White	2.99	-0.010	-0.020	1.0	0.500
Nonwhite	1.92	-0.077	-0.096	1.9	0.802
Males (65+)					
White	2.92	-0.050*	-0.036*	-1.4	1.389
Nonwhite	1.60	-0.033	-0.050	1.6	0.660
Females (20+)					
White	1.78	-0.023*	-0.035*	1.2	0.657
Nonwhite	1.19	-0.004	-0.002	-.2	-2.000

*Statistically significant at 1 percent level.

(Column (1) From the 1/1000 sample, 1960 Census of Population.

Column (4) $U/E \approx \ln L/P - \ln E/P$,

and

$$U/L = \frac{U/E}{1 + U/E}$$

INVESTIGATIONS

The law provides that authorized representatives of the Wage and Hour Division may investigate and gather data regarding the wages, hours, and other conditions, and practices of employment. They may enter establishments and inspect the premises and records, transcribe records and interview employees. They may investigate whatever facts, conditions, practices, or matters are considered necessary to find out whether any person has violated any provisions of the Act.

Wage-Hour compliance officers generally will make suggestions regarding any change necessary or desirable regarding payroll, recordkeeping, and other practices which will aid in achieving and maintaining compliance with the law. Complaints, records, and other information obtained from employers and employees are treated confidentially.

RECOVERY OF BACK PAY

Under the act, these methods of recovering unpaid minimum and/or overtime wages are provided:

1. The Division's Administrator may supervise payment of back wages, and in certain circumstances,
2. The Secretary of Labor may bring suit for back pay upon the written request of the employee.
3. An employee may sue for back wages and an additional sum, up to the amount of back pay, as liquidated damages, plus attorney's fees and court costs.
4. The Secretary of Labor may also obtain a court injunction to restrain any person from violating the law, including the unlawful withholding of proper minimum wage and overtime compensation.

(An employee may not bring suit if he has been paid back wages under supervision of the Administrator or if the Secretary has filed suit to enjoin the employer from retaining the wages due him.)

A 2-year statute of limitations applies to the recovery of back wages, except in the case of willful violations for which there is a 3-year statute of limitations.

OTHER ENFORCEMENT

It is a violation of the law to discharge an employee for filing a complaint or participating in a proceeding under the law.

Willful violations may be prosecuted criminally and the violator fined up to $10,000. A second conviction for such a violation may result in imprisonment.