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THE CONSEQUENCES OF MINIMUM WAGE LAWS: SOME NEW THEORETICAL IDEAS

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ABSTRACT

Economists generally agree that the immediate and direct effect of a binding minimum wage law is to move firms backward along the demand curve for low skill workers. However, this prediction of worker displacement depends critically on a model of firm behavior that abstracts from problems of work incentives.

In this paper we re-examine the theoretical basis for the consensus view of minimum wage laws. The central finding is that when firms use the threat of dismissal to elicit high levels of work effort, an increase in the minimum wage may have the immediate and direct effect of increasing the level of employment in low wage jobs. The formal logic of our model is similar to that found in the model of labor demand under monopsony. However, unlike the monopsony model, the positive employment effect of the minimum wage emerges in a labor market comprised of a large number of firms competing for the labor services of identical workers.

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No public policy debate entails as simple and direct an application of economic theory as minimum wage legislation. Setting a minimum wage above the prevailing wage in competitive labor markets increases both the average and marginal cost of labor. These cost increases will, all else equal, cause firms to reduce the quantity of labor demanded.

Economists have known for many decades that the effect of minimum wage laws hinges critically on the assumption that markets are competitive (see, e.g. Stigler, 1946). In monopsonistic labor markets, for example, individual firms face upwardly sloping labor supply and marginal cost of labor curves — with the marginal cost of labor curve lying above the labor supply curve. Under these conditions, the imposition of a minimum wage can have the paradoxical effect of reducing the marginal cost of labor and increasing employment while at the same time increasing the average cost of labor.

Monopsony, however, is the exception that proves the rule. Low wage labor markets are typically characterized by a large number of relatively small employers. In these markets it is clear that imposing (or increasing) minimum wages will have the effect of reducing employment of low wage workers. With the theoretical issue decisively settled, most of the research on minimum wages has focused on the difficult empirical problem of estimating the size of the disemployment effect of minimum wage laws holding "all else equal."[1] The common finding that minimum wage laws have a weak displacement effect on low wage workers is generally understood to be the result of difficulties in identifying those workers who are directly affected by the minimum wage (what Brown, 1988, calls the "fallacy of the inflated denominator"). Studies reporting positive employment effects or the failure of firms to make use of sub-minimum wage exemptions are simply anomalous (see Card, 1991, and Katz and Krueger, 1991).

In this paper, we re-examine the theoretical basis for the consensus view of minimum wage laws. We argue that the divergence between average and marginal costs observed in monopsonistic labor markets can also appear in competitive markets if one enriches the model of labor demand to consider the problem of eliciting work effort from employees. As a result, minimum wage laws can have the effect of increasing employment while at the same time increasing the average cost of labor.

Other studies have identified potentially beneficial consequences of increasing minimum wages (see for example Lang, 1986; Drazen, 1986; and Jones, 1987). However, our results are distinct in that they emerge in a model where large numbers of identical, profit maximizing firms hire homogeneous unskilled workers in a single labor market.[2]

The paper proceeds in three parts. In Section 1 we set up a simple efficiency wage model in which employers maintain high levels of work effort by dismissing workers found to be shirking. Our approach closely parallels the efficiency wage models of Shapiro and Stiglitz (1984) and Bowles (1985). In Section 2 we study the effect of minimum wage laws under the assumption that the supervisory resources of firms are fixed (as might be the case in small, family owned businesses), so that increasing the number of employees reduces the ability of employers to closely supervise the activities of individuals. In order to assure high levels of work effort, employers will have to raise the cost of job loss for dismissal by increasing the wages of all workers when hiring an additional employee. Thus both the marginal cost of labor curve and the effective labor supply curve are an increasing function of employment and the marginal cost curve lies above the effective labor supply curve. We demonstrate that under these circumstances an increase in the minimum wage can have the effect of increasing employment.

The outcome described above does not hinge critically on the assumption that supervisory resources are fixed. In Section 3 we demonstrate that these "monopsony-like" effects also appear in efficiency wage models if one allows for uncertain product demand. Here again we find that the marginal cost of labor will be greater than the wage, and small increases in the minimum wage may therefore have the effect of increasing both wages and employment.

1. A Simple Labor Market Model

In this section we set out a model of a low wage labor market. This model has three features characteristic of many low wage labor markets. First, our model has a large number of small employers. Second, labor relations are characterized by the use of dismissal threats. Firms can only imperfectly monitor work performance, and to induce work effort, firms threaten with dismissal those workers found to be providing unsatisfactory work effort.[3] Third, employees cannot post employment bonds of sufficient size to assure high levels work effort.[4]

The market is composed of identical independent firms. Each of these firms makes use of a production process in which labor is the only variable input. In each period there is a flow of homogeneous workers into the market. Firms hire workers out of this pool of new entrants to the labor market. The jobs offered these workers persist until the worker either retires, is laid off (due to a reduction in the firm's demand for labor), or is dismissed. Dismissals occur when workers are found to be providing substandard effort ("shirking"). For simplicity of exposition, we assume that once individuals leave jobs, they do not seek to re-enter the labor force. No important results depend on this assumption.

Following Shapiro and Stiglitz (1984), we assume that an individual who is employed derives utility in any period as a function of the wage, w, and the disutility of effort expended on the job, ϵ:

$$u(w, \epsilon) = w - \epsilon. \tag{1}$$

Workers are presumed to work at two levels of intensity-high and low. The disutility of work effort, ϵ takes the value e if the intensity is high, and 0 if the intensity is low. We assume that employees are of value to firms only if they are working at the high level of intensity.

The utility of an individual who is not employed is $\bar{w}$. Thus the minimum wage necessary to induce any worker to accept employment is $\bar{w} + e$. If firms could costlessly enforce work rules specifying the high level of effort, $\bar{w} + e$ would typically be the market-clearing wage. Point A on Figure 1 illustrates this outcome. As shown, there can be some individuals who are unemployed in equilibrium, but this unemployment is voluntary in the sense that workers who are not placed in jobs find the utility of full-time leisure to be as high as from employment.

The outcome is slightly more complex if we assume that firms' ability to monitor work intensity is imperfect. In this paper we proceed under this assumption. Specifically, we suppose that firms can detect shirking only with probability $D < 1$ in each period. Workers who are caught shirking are dismissed, while undetected shirkers continue employment with the firm. In this case, the wage $\bar{w} + e$ will not induce workers to provide the high level of effort, since firing a worker cannot reduce the worker's well-being. The wage needed to prevent shirking must be high enough so that from the perspective of workers, the cost of shirking exceeds the benefits of shirking.

In deriving the minimum no-shirking wage, we adopt the assumption that infinitely lived workers face a fixed probability of retiring (q) in each period. Non-shirking workers who do not retire in any period may nonetheless face the prospect of job loss as firms lay off workers in response to external shocks to the firm. We suppose that in each period workers who do not retire face the probability $\lambda \leq 1$ of being retained in the subsequent

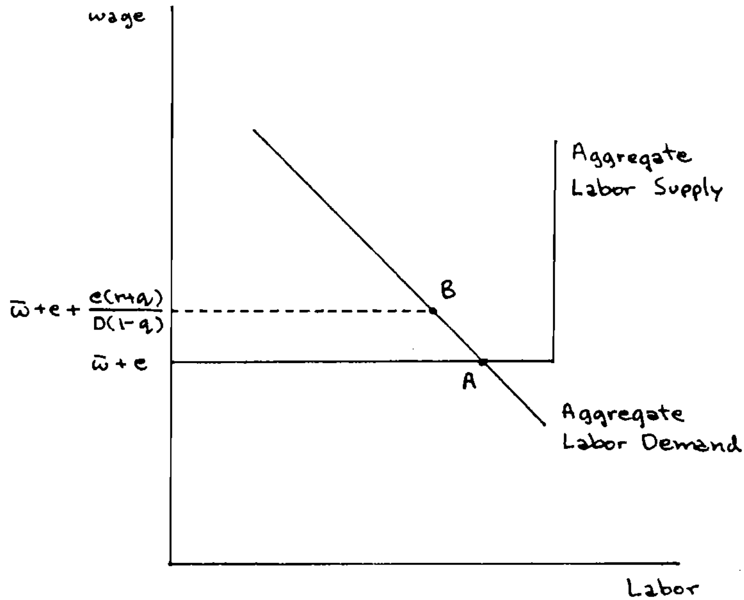

Figure 1

The Aggregate Labor Market

period. (The determination of λ is discussed later.) Thus, for a non-shirking worker with discount rate r, the expected discounted flow of utility, V^N, solves

$$V^N = w - e + \frac{\lambda(1-q)V^N}{(1+r)} + \frac{[1-\lambda(1-q)]V^A}{(1+r)}, \tag{2}$$

where V^A is the present value of the alternative to employment with the firm. Given the reservation utility of $\bar{w}$, $V^A = (1+r)\bar{w}/r$.

We assume that in each period workers are paid prior to the possible detection of shirking. Thus it is clear that for any level of compensation, workers will experience a utility gain in the current period from shirking. However, since shirking workers are detected and dismissed with probability D in each period, workers who provide the minimal effort reduce their probability of remaining in the job the next period from $\lambda(1-q)$ to $\lambda(1-q)(1-D)$. The present value of lifetime utility for a shirking worker therefore solves

$$V^S = w + \frac{\lambda(1-q)(1-D)V^S}{(1+r)} + \frac{[1-\lambda(1-q)(1-D)]V^A}{(1+r)}. \tag{3}$$

Employees who maximize the present value of expected utility will shirk unless $V^N - V^S \geq 0$. Firms choose the lowest wage sufficient to discourage shirking. Using equations (2) and (3), we find the no-shirking wage:

$$w = \bar{w} + e + \frac{e[1+r-\lambda(1-q)]}{D(1-q)\lambda}. \tag{4}$$

The no-shirking condition has three implications that are important for our analysis. First, the utility of employment exceeds the reservation level of utility (as in point B in Figure 1). Second, the higher the probability a shirking worker is detected, the lower is the wage needed to maintain the high level of work effort. Third, if firms use layoffs to adjust for variability in demand, the wage is an inverse function of the probability a firm retains its workers from one period to the next. All else equal, firms will prefer to reduce the probability that any worker is laid off, because this allows them to pay a lower wage to assure no shirking.[5]

2. *Increasing the Minimum Wage When Supervisory Inputs are Fixed*

We are interested in the employment effects of a minimum wage law when firms use dismissal threats to elicit high levels of work effort. In this section we examine the case where there is no stochastic element to firms' demand for labor, and firms can thus provide a credible promise of employment continuity. We will assume, however, that the supervisory resources available to the firm are fixed so that, all else equal, an increase in the size of a firm's work force increases the difficulty for the proprietor of monitoring employees. In terms of our model, we specify D to be a function of L, the number workers, with $D'(L) < 0$.

Suppose the firm's output is given by the concave production function $f(L)$ and the output price is one. In the absence of minimum wage laws, an optimizing firm will maximize

$$f(L) - wL,$$

subject to the constraint that the wage be high enough to assure no shirking, which in our case of $\lambda = 1$ is,

$$w = \bar{w} + e + \frac{e(r+q)}{D(1-q)}. \tag{5}$$

The first order conditions suggest that the firm will hire labor, L_o, so that the value of marginal product is equal to the marginal cost,

$$f'(L_o) = w + L_o w'(L_o), \tag{6}$$

where

$$w'(L_o) = -\frac{e(r+q)D'(L_o)}{D^2(1-q)} > 0.$$

Notice that the marginal cost of labor is greater than the wage. This follows from the binding no-shirking condition. Increasing employment reduces the probability of dismissal, inducing the firm to raise wages for intra-marginal workers.

The firm's employment decision is illustrated in Figure 2. At the optimal level of employment, the marginal cost of employment, MC_o, exceeds the no-shirking wage, w_o. The imposition of a binding wage floor (w_m) has the effect of equating the average and marginal cost of labor to the minimum wage. While the average cost of labor always increases under a binding minimum wage, the marginal cost of labor will fall so long as $w_m < MC_o$. Such a decline in marginal cost leads optimizing firms to increase employment. As shown in Figure 2, the introduction of a minimum wage such that $w_m < MC_o$ results in an increase in employment from L_o to L_m.

The finding that employment levels rise subsequent to the passage of a minimum wage law is not as counter-intuitive as it first appears. Minimum wage laws increase the cost of job loss to workers currently employed in low wage jobs and therefore increase the effectiveness of the threat to dismiss shirking workers. Although employers would not have chosen to increase wages in the absence of the minimum wage law, once the decision is forced on them, they find that at the higher wage their existing work force no longer requires such intensive supervision to assure no shirking. This frees up supervisory resources and makes it possible to hire additional workers without increasing wages for intra-marginal workers. As a result, the marginal cost of labor falls, and firms hire more workers even though the average cost of these workers has increased.

Once the minimum wage is in place, it is possible that increases in the wage floor can lead to further increases employment levels. Consider again the case presented in Figure 2, where at the prevailing minimum wage, both the wage floor and the no-shirking condition are binding. The firm will, in this situation, hire the number of workers consistent with the constraint that the right hand side of equation (5) equals the minimum wage. The effect of a marginal shift in w_m is seen to be

$$\frac{dL_m}{dw_m} = -\frac{D^2(1-q)}{e(r+q)D'} > 0. \tag{7}$$

If the minimum wage is set high enough, so that the no-shirking constraint given by

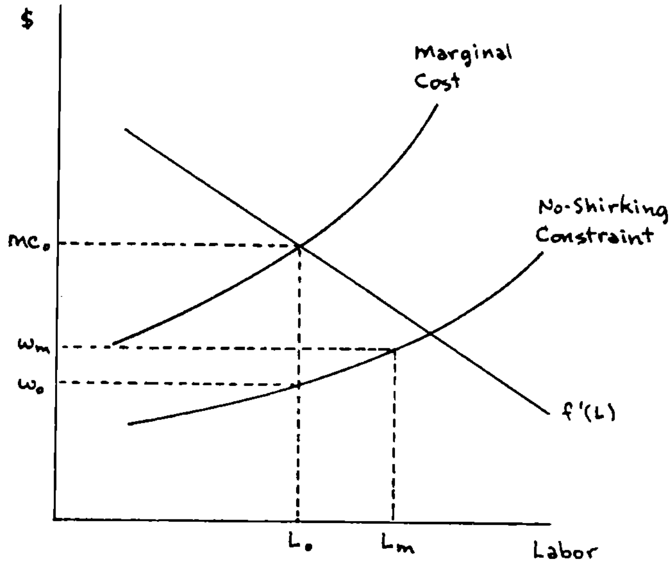

Figure 2

Determination of Wages and Employment
for a Single Firm when
Supervisory Resources are Fixed

equation (5) is no longer binding, further increases in the minimum wage will reduce employment even in cases where $L_m > L_0$.

Our model offers a simple explanation for the positive employment effects that Card (1991) observed in his study of California's recent increase in minimum wage laws. It also offers an explanation for findings by Katz and Krueger (1991) that fast food franchises in Texas did not make use of the sub-minimum wage provisions of the new minimum wage law. Suppose $w_m < MC_o$, with the no-shirking condition binding when the minimum wage law is introduced (or increased). At the margin, firms might not wish to hire youth at the sub-minimum because the sub-minimum would lie below the no-shirking condition. Firms could, in principle, benefit by replacing all current employees with youth paid at the sub-minimum wage. However the benefits of this strategy are limited by a provision of the current law that limits payment of a youth sub-minimum to less than 25 percent of an employer's work force hours (Katz and Krueger, 1991).[6]

The arguments developed in this section hinge critically on the assumption that monitoring difficulties increase with the size of the work force. While this assumption is common in the theoretical literature on the economics of the firm, it is also quite controversial.[7] The no-shirking condition (5) clearly implies that if monitoring difficulties increase with the number of employees, one should also observe that wage premia increase with employer size. In their comprehensive analysis of the effect of employer size on wages, Brown and Medoff (1989) conclude that there is overwhelming evidence that large employers do pay substantially higher wages then small employers.[8] They are skeptical, however, of interpretations linking employer size wage premia to monitoring difficulties. They base their skepticism in large measure on their finding that employer size wage premia can be found among piece rate workers — a group where monitoring difficulties should be minimal. However, this last observation is perhaps as controversial as the monitoring thesis itself. Case studies (Edwards, 1979; and Clawson, 1980) and theoretical analyses (Gibbons, 1987; Levine, 1991) suggest that important monitoring and incentive problems persist even with the introduction of piece rates.

3. Increasing the Minimum Wage When Firms Use Layoffs in Response to Uncertainty

In the preceding section we demonstrate that an increase in the minimum wage can have the effect of increasing employment. This result is derived for a labor market in which a large number of employers hire from a pool of homogeneous workers whose productive abilities are well known. Our results depend critically on the assumptions that (i) the work activities of workers are not perfectly monitored and (ii) the difficulty in monitoring increases with employer size. This latter assumption is controversial. In this section we derive the same results concerning the effects of a minimum wage law, but do so under the assumption that monitoring difficulties are invariant with respect to firm size. To do this we take a slightly different approach in setting up our model.

Our focus is on the implications for our model of firms' use of layoffs in response to product demand uncertainty. The case we study is very simple. We imagine that firms face an occasional negative "shock" which causes them to utilize layoffs. A shock occurs as a random draw from a known distribution. We suppose that when a shock occurs, firms do not sell any output. Firms must nonetheless retain some of the work force as a "skeleton crew." In order that this skeleton crew continues to work at the high level of intensity, the firm will continue to pay them the no-shirking wage.

The timing we have in mind is as follows: At the beginning of each period firms offer employment contracts to L employees. These contracts fix the wage rate and stipulate that workers who do not provide the high level of intensity risk dismissal. Firms then discover if they are subject to the negative shock. In the absence of a shock, firms retain all of their workers, production proceeds, and output is sold at price of one. If a firm has a bad random draw, however, the firm retains $\hat{L} < L$ of its workers, and revenue in the period is zero. For simplicity we assume that the number of workers retained subsequent to a negative demand shock, $\hat{L}$, is determined exogenously by the production technology.[9]

Suppose $(1-\phi)$ is the probability that a firm receives a negative shock. Then a firm that maximizes expected profit will make the employment decisions, L, so as to maximize

$$E(\pi) = \phi[f(L) - wL] + (1-\phi)[-w\hat{L}], \tag{8}$$

subject to the no-shirking constraint developed in Section 1,

$$w = \bar{w} + e + \frac{e[1+r-\lambda(1-q)]}{D(1-q)\lambda}.$$

Recall that the term λ in the no-shirking condition is the probability a worker is retained. Assuming that workers are laid off at random from the group hired *ex ante*, this rate of worker retention is

$$\lambda = \phi + (1-\phi)\frac{\hat{L}}{L}. \tag{9}$$

Substituting (9) into the no-shirking condition and then substituting the no-shirking constraint into the firm's profit function, equation (8), we find that

$$E(\pi) = \phi f(L) - \phi\left[\bar{w} + e + \frac{e[1+r-\phi(1-q)]}{D(1-q)\phi}\right]L - (1-\phi)\left[\bar{w} + \frac{e(D-1)}{D}\right]\hat{L}. \tag{10}$$

Equation (10) gives expected profit in terms of the firm's expected revenue, the cost of labor utilized (L) in the absence of a negative demand shock, and the cost of labor employed ($\hat{L}$) when demand is low. Notice that if parameters are such that $\bar{w} + e(D-1)/D < 0$, expected profit will be an *increasing* function of the number of workers a firm retains ($\hat{L}$) when there is low demand. In this situation firms will continue to employ all their workers rather than utilizing layoffs in the event of a negative demand shock. This labor hoarding occurs because firms finds that the wage savings resulting from offering continuity of employment exceed the expense of retaining non-productive workers. In this section, however, we are interested in the case where firms do wish to utilize layoffs in response to the external shock, so we will proceed under the assumption that $\bar{w} + e(D-1)/D > 0$. Essentially this assumption means that we are restricting our attention to cases where the probability of dismissal if shirking, D, is not "too low."

Given our set up, a firm that maximizes expected profit will choose the level of employment, L_o, such that

$$f'(L_o) = \bar{w} + e + \frac{e[1 + r - \phi(1 - q)]}{D(1 - q)\phi}. \tag{11}$$

Using the no-shirking constraint, this first order condition can be rewritten,

$$f'(L_o) = w + \frac{e(1 + r)}{D(1 - q)}\left[\frac{1}{\phi} - \frac{1}{\lambda}\right]. \tag{12}$$

The right-hand side of this expression is the expected marginal cost of labor. It includes both the wage, w, and the effect that hiring an additional worker has on the wage of intra-marginal workers. From equation (9), we know that the probability a worker is retained, λ, is greater than the probability that the firm receives a "high demand" random draw, ϕ. It follows that the value of marginal product, $f'(L)$, exceeds the no-shirking wage at the optimal level of employment. This is pictured in Figure 3. In this figure L_o shows the profit maximizing level of employment, while w_o gives the wage workers are offered at this level of employment.

As with the case presented in Section 2, the marginal cost of labor exceeds the average cost of labor. It follows that the effect of a binding minimum wage need not be a reduction in employment. For instance, the imposition of the binding wage floor shown in Figure 3, w_m, increases the firm's utilization of labor from L_o to L_m.

The underlying logic driving these results is the same as in the preceding section and the same as in the familiar monopsony model. Increases in the minimum wage increase the average cost of labor. Nonetheless, for both a monopsonist and a competitive firm paying efficiency wages, an increase in the wage floor can reduce the marginal cost of hiring labor. This occurs because when the wage floor shifts upward, the firm need not be concerned with the effect of any additional hires on wages paid intra-marginal workers. As long as the minimum wage is not "too high" — above the value of marginal product at the firm's level of employment — the imposition of a minimum wage increases the quantity of labor the firm demands.

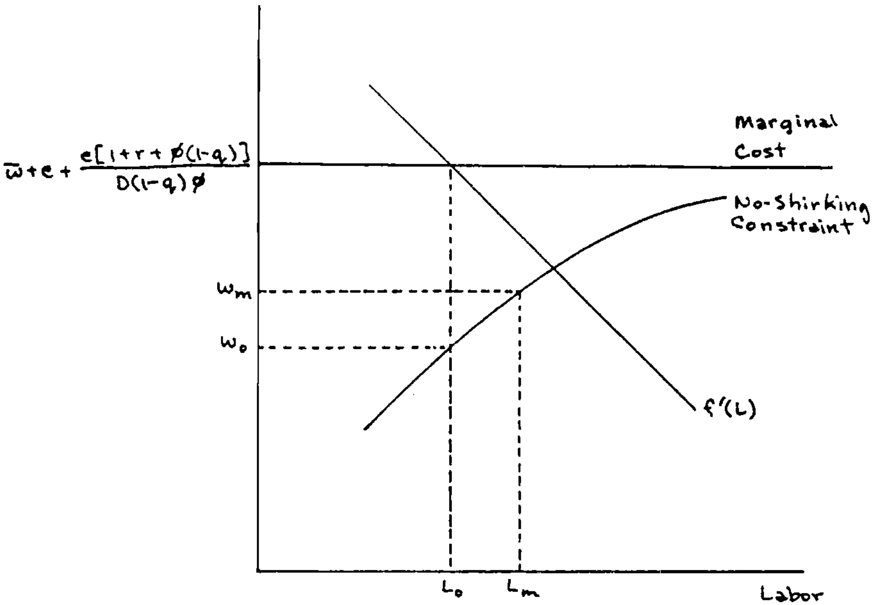

Figure 3

Determination of Wages and Employment
for a Single Firm when
Product Demand is Uncertain

Figure 3 illustrates the case where both the minimum wage law and the no-shirking condition (5) are binding. By substituting expression (9) into the no-shirking condition, we find that in this case the firm's level of employment (L) must be consistent with the equality:

$$w_m = \bar{w} + e + \frac{e[1 + r - \phi(1-q) - (1-\phi)(1-q)\hat{L}/L]}{D(1-q)[\phi + (1-\phi)\hat{L}/L]}. \tag{13}$$

Rearranging terms, we see that

$$\phi L + (1-\phi)\hat{L} = \frac{e(1+r)}{(1-q)[(w_m - \bar{w})D + e(1-D)]}L. \tag{14}$$

Substitution into the firm's profit function shows

$$E(\pi) = \phi f(L) - \left[\frac{e(1+r)w_m}{(1-q)[(w_m - \bar{w})D + e(1-D)]}\right]L. \tag{15}$$

The marginal cost of labor (MC) is given by the term in brackets. The derivative of this shadow price with respect to the minimum wage is

$$\frac{dMC}{dw_m} = \frac{-e(1+r)[\bar{w}D - e(1-D)]}{(1-q)[(w_m - \bar{w})D + e(1-D)]^2}. \tag{16}$$

From our preceding discussion of the firm's expected profit (equation (10)) above, we know that a firm will use layoffs rather than labor hoarding only if $\bar{w} + e(D-1)/D < 0$. This same condition also assures us that the derivative of the marginal cost of labor with respect to the minimum wage is negative (equation (16)). Thus, if the minimum wage is set such that both the no-shirking condition and the minimum wage constraint bind, small additional increases in the minimum wage will increase the level of employment of firms who respond to demand variation by using layoffs.

4. Conclusion

The textbook theory of labor demand predicts that the immediate and direct effect of a binding minimum wage law is to reduce employment in low wage jobs. However, this prediction depends critically on a model of firm behavior that abstracts from problems of work incentives. The central finding of our paper is that when firms use the threat of dismissal to elicit high levels of work effort, an increase in the minimum wage may have the immediate and direct effect of increasing both the wage and level of employment in low wage jobs.

The formal logic of our model is similar to that found in the well known monopsony model. In the monopsony model, minimum wages have a potentially positive effect on employment because individual firms employing heterogeneous labor face an upwardly sloping labor supply curve, where the marginal cost of labor exceeds the wage. We demonstrate that under plausible assumptions, firms using dismissal threats to elicit high levels of work effort also effectively face an upwardly sloping labor supply schedule (i.e., the no-shirking condition), and for these firms the marginal cost of labor exceeds the wage. In this situation, minimum wage laws can have the same positive employment effects predicted by the monopsony model. However, unlike the monopsony model, these positive employment effects emerge in a labor market comprised of large numbers of firms purchasing the labor services of identical, unskilled workers whose productive abilities are well known.

It is important to emphasize that the imposition of wage floors is not Pareto improving. Firms may end up hiring more labor at a higher wage, but they will also experience a reduction in profits. In the long run, such a reduction in profits may lead to a reduction in employment if capital leaves the low wage sector. Such an outcome would depend on the characteristics of the larger economy in which the minimum wage labor market is embedded. Our model, like the simple textbook model, is explicitly short term and partial equilibrium. It therefore has little to say about the long run consequences of minimum wage laws.

Finally, one should not conclude from our discussion that imposing minimum wage laws (or increasing minimum wages) necessarily results in an increase in employment in the short run. Even when firms face upwardly sloping effective labor supply curves it is possible to set minimum wages high enough so that the negative employment effects predicted by the textbook model are realized. The analysis presented here leads us to conclude that the employment effect of minimum wage laws cannot ultimately be decided by appeals to economic theory. Rather the issue is best approached empirically through the careful study of the specifics of particular minimum wage laws and the operation of particular labor markets.

NOTES

1. For comprehensive reviews of the literature on the effects of minimum wage laws see Brown (1988) and Brown, Gilroy and Kohen (1982). For recent studies investigating the consequences of minimum wage laws in different regional labor markets see Card (1991) and Freeman and Freeman (1991).

2. Lang (1986) introduces minimum wages into a model in which heterogeneous workers invest in education as a signal of their ability. He finds that increasing the minimum wage reduces incentives to engage in wasteful signaling and may therefore be welfare improving. Drazen (1986) finds that if (unobservable) labor quality depends on the "average" market wage, then minimum wage legislation may be desirable. Jones (1987) develops a dual labor market in which monitoring difficulties lead to the payment of a wage premia in primary jobs — but not secondary jobs. Rising minimum wages have the effect of reducing employment in the secondary sector but this may be offset by an increase in employment in the high productivity, primary sector.

3. In their seminal paper on efficiency wages, Shaprio and Stiglitz (1984) suggest that dismissal based models are most applicable to low skill, low wage labor markets. An important subsequent paper on dual labor markets by Bulow and Summers (1986) is based on the notion that monitoring difficulties are most likely to occur in high wage primary jobs. Low wage secondary jobs, in contrast, are presumed to offer little in the way of monitoring problems and therefore pay market clearing wages (see also Jones, 1987). Economic theory has very little to say about monitoring issues, however. One could quite easily adapt the monitoring models of dual labor markets to allow for monitoring difficulties in both primary and secondary jobs.

4. The role of bonding in ameliorating incentive problems is discussed by Carmichael (1989); Dickens, Katz, Lang and Summers (1989); and Macleod and Malcomson (1989).

5. It is possible to generalize the no-shirking condition by allowing firms to make use of layoff and recall. The no-shirking condition that results is somewhat more complicated than equation (5) but it retains the fundamental properties discussed in the text.

6. The law also states that the sub-minimum cannot be paid if an employee was laid off to make room for new sub-minimum wage workers. Brown (1988), however, notes that the high rate of turnover of minimum wage workers may allow employers to install a substantial number of sub-minimum wage workers through attrition rather than layoff.

7. Theoretical analyses making use of different versions of this premise include Coase (1937), Williamson (1967), Calvo and Welisz (1978), and Oi (1983).

8. Rebitzer and Robinson (forthcoming) use a switching regression framework to estimate employer size wage effects in primary and secondary labor markets. They find positive employer size effects in both labor markets, although the size premia are substantially larger in primary than secondary jobs.

9. The assumptions that revenue in the low demand state is zero and $\hat{L}$ is fixed exogenously greatly simplify the analytics of the model. It is possible to derive a no-shirking condition when marginal revenue and $\hat{L}$ are endogenously determined by negative demand shocks. The no-shirking condition that results is somewhat more complicated than that presented in the text. Nevertheless it retains the features that are essential to our argument, i.e., that the no-shirking condition is an increasing function of L and that the marginal cost curve lies above the no-shirking condition. For a presentation of these results in the context of dual labor market models see Rebitzer and Taylor (1991) and Saint-Paul (1990).

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