This section has shown how the minimum wage affects the wage distribution. The next section considers the impact on employment, an issue that has generated enormous controversy.

12.3 The Minimum Wage and Employment

Perhaps the most controversial aspect of the economics of the minimum wage is its effect on employment. The competitive model has the unambiguous prediction that employment should fall if a binding minimum wage is introduced or raised. There is an enormous empirical literature that seeks to provide estimates of the employment effect and there is little point in reviewing all the studies here (for a relatively recent review, see Brown 1999). Prior to the early 1990s, something of a consensus had been established about the impact of minimum wages on employment in the United States, namely that, while the minimum wage had no effect on the employment of adults (because it was set so low), it did have a modest but significantly negative effect on the employment rate of teenagers. This view was powerfully challenged by Card and Krueger (1995) who, in a series of studies, concluded that there was no evidence of a negative employment effect from the minimum wage. Perhaps their most celebrated study (Card and Krueger 1994) was the comparison of employment changes in fast food restaurants in New Jersey and eastern Pennsylvania when New Jersey raised its minimum wage above the federal minimum in April 1992. The debate about these claims was, at times, acrimonious primarily because the 1990s was a time in which the raising of the minimum wage was an active political issue. It has rumbled on for the best part of a decade: see Card and Krueger (2000) and Neumark and Wascher (2000) for the latest installments in the debate about the New Jersey study (with Card and Krueger coming off better).

Many labor economists have had problems in even conceiving of the possibility that the minimum wage does not destroy jobs, even likening (apparently with a straight face) the Card–Krueger and other similar findings to a reversal of the laws of gravity. But, if labor markets are monopsonistic, one should not really be surprised by or skeptical of such findings as it is well-known that minimum wages do not necessarily reduce employment under monopsony. Indeed, textbooks often only discuss monopsony in the context of this “contrary” prediction about the impact of the minimum wage.

In the textbook model of a single monopsonist, the relationship between employment and the minimum wage looks something like that drawn in figure 12.5. Employment is maximized by choosing a minimum wage that is the market-clearing level which, if the elasticity of the labor supply curve facing the employer is \(1/\rho\) and the elasticity of the marginal revenue product of labor curve is \(1/\eta\), implies a rise of \(\rho\ln(1 + \rho)/(\rho + \eta)\) in the log wage with an associated log employment gain of \(\ln(1 + \rho)/(\rho + \eta)\). In this textbook model of monopsony there is always some appropriately chosen minimum wage that can raise employment and the scope for minimum wages to do this is determined by the monopsony power of employers (as measured by the elasticity of the labor supply curve facing them). But, these conclusions are based on a partial equilibrium model of a single monopsonist and it is important to consider the extent to which they remain true in a general equilibrium model as the minimum wage is never a policy that affects a single employer.

There are two important distinctions between partial equilibrium models of monopsony and general equilibrium models of oligopsony. First, in general equilibrium, there is an important distinction between the elasticity of labor supply to the market as a whole and to individual employers. While the gap between the marginal product and the wage is determined by the elasticity of the labor supply curve facing an individual employer, any aggregate employment effect will be determined by the
elasticity of the labor supply curve to the labor market as a whole. There is no reason why these should be the same but it is exactly that assumption that is made by the model of a single monopsonist.

Secondly, it is important to take account of heterogeneity. There is no doubt that the minimum wage is a blunt instrument, applied across whole labor markets on employers who would otherwise choose very different wages. This means that it is almost certainly the case that the minimum wage will have different effects on employment in different employers and any measure of the impact on aggregate employment must take account of this heterogeneity.

To consider these issues, we will use a model based on that used by Dickens et al. (1999) and similar to that used in the discussion of the employer size-wage effect in section 4.1. Assume firm $i$ has a log marginal revenue product of labor curve given by

$$\text{mrpl}_i = a_i - \eta n_i$$

where $n$ is log employment and $a$ is a shock to the MRPL that reflects demand or productivity shocks. If the labor market is perfectly competitive then the elasticity of the labor demand curve would be $(1/\eta)$.

Turning to the labor supply curve to the firm, we will use a very simple model. Analogous to the Dixit and Stiglitz (1977) model of imperfectly competitive product demand curves, assume that the share of total employment, $N$, going to employer $i$, $N_i$, is given by its wage, $W_i$, relative to an average wage index $\bar{W}$ and an employer-specific shock, $B_i$, according to the following function:

$$\frac{N_i}{N} = \left( \frac{W_i}{\bar{W}} \right)^{1/\eta}$$

Also, assume that the labor supply to the whole market, is given by the following function:

$$N = N_0 \bar{W}^\phi$$

so that an increase in the average wage encourages more workers to enter the labor market. Combining (12.10) and (12.11), taking logs, and denoting logs of variables by lower case, we can write the labor supply curve facing the individual employer as

$$w_i = (1 - \phi)\bar{w} + \theta(n_i - n_0) + b_i$$

(12.12)

$B_i$ is a firm specific labor supply shock that could represent differences in the non-pecuniary attractiveness of work in different firms. An alternative, more general interpretation, is that it represents differences in the wages paid in different firms necessary to prevent shirking or differences in the bargaining power of workers in different firms. It is the existence of this shock that ensures that the model generates a distribution of wages even if the labor market is perfectly competitive.

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If the labor market is perfectly competitive then $\phi = 0$ but if $\phi > 0$ the market is, to some extent, monopsonistic. Note that the impact of the average wage on the labor supply curve to an individual employer is ambiguous in sign as there are two effects. On the one hand, a higher average wage means any individual employer needs to pay a higher wage to get the same fraction of employment as before. On the other hand, a higher average wage means that the overall supply of labor to the market increases which has the opposite effect. Note that in the model of (12.12) the only route for the minimum wage to affect the labor supply curve to individual employers is through the average wage and the effect will be the same for all employers.$^4$

For future use, let us rewrite (12.12) by subsuming $n_0$ into $b_i$ and writing the coefficient on the average wage as $\theta$. (12.12) then becomes

$$w_i = \theta \bar{w} + \eta n_i + b_i$$

(12.13)

To keep the mathematics simple, assume $\bar{w}$ is the average log wage across firms.

First, consider the equilibrium when there are no minimum wages. Each firm chooses the level of employment where the log MRPL equals the log marginal cost of labor which, from (12.13) is given by

$$\text{mcl}_i = \ln(1 + \phi) + w_i = \ln(1 + \phi) + \theta \bar{w} + \eta n_i + b_i$$

(12.14)

Equating (12.14) and (12.9) gives employment in firm $i$ as

$$n_i = \frac{-\theta \bar{w} - \ln(1 + \phi) + a_i - b_i}{\eta + \phi} = n(w, a_i, b_i)$$

(12.15)

and from (12.13) the wage is

$$w_i = \frac{\eta \theta \bar{w} - \phi \ln(1 + \phi) + \phi a_i + \eta b_i}{\eta + \phi}$$

(12.16)

(12.15) and (12.16) are easy to understand. Revenue shocks, $a$, have a positive effect on employment while supply shocks, $b$, have a negative effect. In contrast, both $a$ and $b$ are positively related to wages although, as we would expect, $a$ only has an effect to the extent that the labor market is not perfectly competitive (where $\phi > 0$)—these are the correlations between wages and employer characteristics described in chapter 8. For future use, define $v_i$ by

$$v_i = \frac{\phi a_i + \eta b_i}{\eta + \phi}$$

(12.17)

This goes against the evidence on spillovers presented in the previous section; one could make the elasticity depend on the minimum wage but this would complicate the model without altering the basic points that will be made.
If \( a_i \) and \( b_i \) are jointly normally distributed (the most convenient assumption for what follows), then will have a normal distribution \( \nu_i \). For future use denote the variance of \( \nu_i \) by \( \sigma_{\nu} \), where the notation reflects the fact that, from (12.16), this will be the variance of log wages in the absence of the minimum wage.

One can then solve the model by taking expectations of (12.16) and using the assumption that \( E(\nu_i) = \nu \). Normalize so that \( E(a_i) = E(b_i) = 0 \); this means that in a competitive equilibrium \( \nu \) and \( \eta \) will be zero. So all the derived equilibrium expressions for \( \nu \) and \( \eta \) derived below should be thought of as log deviations from the competitive equilibrium.

The free market equilibrium level of wages is given by

\[
\nu = \frac{-\nu \ln(1 + \nu)}{\nu + \eta(1 - \theta)} = \frac{-\ln(1 + \nu)}{1 + \phi \eta} \tag{12.18}
\]

and the equilibrium level of employment across firms is

\[
\eta = -\frac{(1 - \theta) \ln(1 + \nu)}{\nu + \eta(1 - \theta)} = -\phi \nu \tag{12.19}
\]

Both the free market level of wages and employment are below the perfectly competitive level (both expressions are negative): this is what we would expect from the textbook treatment of a single monopsonist. But, modeling interactions between firms does provide some insights that the model of a single monopsonist does not. Note that wages are always below the competitive level with the extent of the deviation depending on \( \nu \), the inverse of the elasticity of the labor supply curve to the individual employer. But, as (12.19) shows, the employment effect can be thought of as the wage effect multiplied by the aggregate labor supply elasticity. So, if aggregate labor supply is inelastic, wages will be below the competitive level but employment will not.

Now consider what happens if a minimum wage of \( w_m \) is introduced. A firm can be in one of three qualitatively distinct regimes. To understand the three regimes consider the special case where all firms face the same labor supply curve that, in the presence of a minimum wage, might be given by something like SS in figure 12.6 but they differ in the position of their MRPL curves.

In the first, which we will call the unconstrained regime, the MRPL intersects the MCL at a wage above the minimum; employment will then be on the supply curve. A firm with MRPL1 in figure 12.6 will be in the unconstrained regime. As the MRPL curve is lowered, there eventually comes a point where the wage the firm would want to pay is the minimum wage. For slightly lower MRPL curves, the firm is constrained to pay the minimum wage but employment will still be determined by the supply curve. Refer to these as supply-constrained firms: such a firm could be represented by MRPL2 in figure 12.6. But if the MRPL curve is lowered further still, there comes a point where the marginal revenue product of the labor supply forthcoming at the minimum wage is less than the minimum wage. These firms will be constrained to pay the minimum but employment will be at the point where the MRPL equals the minimum. Refer to these firms as demand-constrained: such a firm could be represented by MRPL3 in figure 12.6. It should be obvious from this discussion that both the supply- and demand-constrained firms actually pay the minimum wage so that there will be a mass of firms paying the minimum wage.

Now consider the mathematics. A firm in the unconstrained regime pays a wage above the minimum and the employment and wage rates of (12.15) and (12.16) continue to be relevant. Note that if \( \theta \neq 0 \), the change in \( \nu \) caused by the minimum wage will mean that the set of firms initially paying above \( w_m \) will not be the same as the ones now paying above \( w_m \) and that although the unconstrained firms pay above the minimum they are still affected by it (from (12.15) \( \nu(m, a_i, b_i) \) is affected by the average level of wages). A firm will be in this regime if the desired wage as given by (12.16) is above \( w_m \) that is, if

\[
\nu_i = \frac{e a_i + \eta b_i}{e + \eta} \geq w_m - \frac{\eta \theta w - e \ln(1 + e)}{e + \eta} = \nu^* \tag{12.20}
\]
For a firm with \( u_i \) slightly below the right-hand side of (12.20), it is optimal to pay \( w_m \) and accept all workers forthcoming at this wage: these are the supply-constrained firms described earlier. Employment in these firms can be found by substituting \( w_i = w_m \) in (12.13). One can write this as

\[
n_i = \frac{w_m - \theta u - b_i}{s} = n(u, a_i, b_i) + \frac{1}{s} \left( w_m - \frac{\eta \theta u - \epsilon \ln(1 + \epsilon)}{s + \eta} - v_i \right)
\]

\[
= n(u, a_i, b_i) + \frac{1}{s} (u^* - v_i)
\]

(12.21)

where \( n(u, a_i, b_i) \) is defined in (12.15). (12.21) has a simple interpretation. It says that one can think of employment in these firms as being determined by what employment would be in the absence of the minimum wage \( (n(u, a, b)) \) plus a measure of how much the minimum wage raises the wage in this firm above what it would otherwise be (this is \( u^* - v_i \)) multiplied by \( (1/s) \) which is the elasticity of employment with respect to the wage along the supply curve. Employment in these farms will be higher with the minimum wage than without.

But if the MRPL curve is sufficiently low then the firm will be in a situation where it is not profitable for the firm to employ all the workers forthcoming at \( w_m \); these are the demand-constrained firms. They pay the minimum wage and choose employment so that \( mrpl_i = w_m \). Using (12.9) and (12.13), a firm will be in this regime if

\[
-\frac{\eta}{s}(w_m - \theta u - b_i) + a_i < w_m \quad \Rightarrow
\]

\[
v_i < w_m - \frac{\eta \theta u}{s + \eta} = v_i^* = u^* - \frac{s \ln(1 + \epsilon)}{s + \eta}
\]

(12.22)

After some re-arrangement, one can derive the following expression for employment in these firms:

\[
n_i = -\frac{1}{\eta}(w_m - a_i) = n(u, a_i, b_i) + \frac{\ln(1 + \epsilon)}{s + \eta} - \frac{1}{\eta} (v_i^* - v_i)
\]

(12.23)

has a simple interpretation as well. It says that employment will be what it would be in the absence of the minimum wage minus a measure of the bite of the minimum wage (this is given by the term \( v_i^* - v_i \)) times the elasticity of employment with respect to the wage along the MRPL curve. Note that the second term in the final expression is the standard monopoly formula for the maximal gain in employment; this implies that firms at the edge of this region will have higher employment than in the free market.

Now, analyze the effect of a rise in the minimum wage on the market as a whole. There is no closed-form analytical solution but Appendix 12A provides the requisite mathematics. Here, we concentrate on some simulations that give a flavor of the predictions of the model. The effect of the minimum wage on employment is a function of a relatively small number of parameters: the elasticity of the labor supply curve facing a firm, \( (1/\epsilon) \), the elasticity of the MRPL curve, \( (1/\eta) \), the underlying variance in the distribution of wages, \( \sigma_w \), and the size of the spillover effect, \( \theta \) (which also embodies the elasticity of the supply of labor to the market as a whole).

First, consider what the model implies about the relationship between the minimum wage and employment. As a base case, assume that the sensitivity of wages to employer size is given by \( \epsilon = 0.2 \) so that the wage elasticity of the labor supply curve to the employer is \( 5 \). For the elasticity of the labor demand curve assume that \( \eta = 1 \). Finally, assume that the spillover effect is \( \theta = 0.25 \). For these parameter values, figure 12.7a plots the deviation in employment from the free market level as a function of the spike for a number of different values of the underlying standard deviation of log wages. For small standard deviations, the impact on employment is minuscule for all values of the spike below 10%. However, as the standard deviation rises, the employment losses become larger. The intuition is that the downside risk to employment in the worst affected farms is larger than the up-side potential in the farms where the employment impact is positive (think of labeling the horizontal axis in figure 12.4 as the difference between the minimum wage and the free market wage and then averaging across the horizontal axis to get an "average" effect on employment) so that a wider spread of outcomes leads to lower employment. If there is little dispersion in wages one can "fine-tune" the minimum wage to what is desirable for the small range of wages, whereas high underlying wage dispersion implies that a minimum wage that is good for employment in some farms will have undesirable effects for others. One implication of this is that it may be desirable to have different minimum wages for different groups of workers as, within specific groups, the variance in wages will be smaller and the minimum wage will be less of a blunt instrument.

Figure 12.7b is similar but now varies the extent of monopsony power in the hands of individual employers, \( \epsilon \), while fixing the standard deviation of wages in the absence of minimum wages at \( \sigma_w = 0.4 \). Unsurprisingly, the impact of the minimum wage is more beneficial when employers have more monopsony power. Finally, Figure 12.7c varies the spillover effect. As this rises, the minimum wages does more harm. In contrast to the textbook monopsony model, an increase in the minimum wage always reduces employment when \( \theta = 1 \) whatever the amount of monopsony power possessed by individual employers. In this case,
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labor supply to the individual employer depends only on relative wages (see (12.13)) and the supply of labor to the market as a whole is completely inelastic so that a minimum wage cannot raise total employment and can only crowd out employment in demand-constrained firms.

This discussion should have made it clear that, in contrast to textbook models of single monopsonists, a low enough level of the minimum wage does not necessarily raise employment in an oligopsonistic labor market. For what they are worth (and they are a very poor substitute for empirical research), the simulations suggest that there may be a relatively wide range of minimum wages over which the impact on employment is likely to be small but that the potential down-side from excessively high minimum wages exceeds the potential up-side for a well-chosen one. However, a well-chosen minimum wage is not beyond the reach of good policy. The impact of minimum wages on employment should primarily be an empirical issue and the results of these empirical studies should be used to inform policy.

12.4 Models of Trade Unions

The textbook analysis of trade unions primarily consists of two models (for a survey, see Booth 1995). In the labor demand curve model (sometimes also called the “right-to-manage” model), unions negotiate wages with employers but employers then unilaterally choose employment given this wage. The outcome is on the labor demand curve and, the higher the union-negotiated wage, the lower employment will be. This model lies behind the common argument that unions destroy jobs.

But, an outcome on the labor demand curve is not (as long as unions care about employment at all) efficient from the perspective of unions and employers. Both agents can be made better off by some other wage–employment deal. The assumption that wages and employment are negotiated jointly and the outcome is efficient is the efficient bargain model of McDonald and Solow (1981). In contrast to the labor demand curve model, it is now possible (it depends on union preferences) that an increase in union bargaining power leads to a rise in both wages and employment—although Layard and Nickell (1990) make the point that this conclusion often does not stand up in general equilibrium.

In both of these models, labor supply to the employer is not seen as an issue: the implicit assumption is that as soon the union wage goes above the prevailing market wage, there is a potentially infinite supply of workers wanting a job in the firm. The first change to the analysis of trade unions that needs to be made when one assumes the labor market is

Figure 12.7  The employment impact of the minimum wage as a function of the spike. (a) The effect of varying the standard deviation of wages. O, \(\sigma_w = 0.2; \Delta, \sigma_w = 0.3; \Box, \sigma_w = 0.4; \) solid line, \(\sigma_w = 0.5.\) (b) The effect of varying the degree of monopsony power. O, \(\varepsilon = 0.1; \Delta, \varepsilon = 0.2; \Box, \varepsilon = 0.3.\) (c) The effect of varying the degree of spillovers. O, \(\theta = 0.25; \Delta, \theta = 0.5; \Box, \theta = 0.75;\) solid line, \(\theta = 1.\)