Wage Floors and Unemployment: A Two-Sector Analysis

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Abstract

This paper analyzes the effect of a wage floor on unemployment. Using a model with covered and noncovered sectors, comparative static analysis is performed with respect to the size of the wage floor, the elasticity of demand for labor in the covered sector, and the elasticity of the wage in the noncovered sector with respect to the size of the noncovered sector labor force. It turns out, contrary to the existing literature, that for none of these parameters is the comparative static effect unidirectional.

Keywords: Wage floors; Unemployment; Minimum wage

1. Introduction

This paper examines the economic effects of wage floors. By definition, a wage floor is the lowest wage that any employer may pay or that any worker may receive. The wage floor may be caused by a minimum wage set by the government, public policy facilitating unions' engaging in collective bargaining aimed at raising the wages of their members, or some other public intervention.[1] I shall by the forces of supply and demand.

In the balance of this paper, I examine one consequence of wage floors, namely, the unemployment effect. I ask, when will the amount of unemployment resulting from a wage floor be large and when small?

I work with a two-sector model consisting of a covered and a noncovered sector.[2] The two-sector model is a stylized representation of differential applicability of minimum wages or compliance with them, larger union wage effects in some sectors of the economy than in others, etc. Comparative statics are performed with respect to three parameters of interest:

- the size of the wage floor;

- the elasticity of demand for labor in the covered sector;

- the elasticity of the wage in the noncovered sector with respect to the size of the noncovered sector labor force.

It turns out, contrary to the existing literature, that for *none* of these parameters is the comparative static effect unidirectional.

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[1] It may also be caused by efficiency wages, but that is a whole other story.
[2] This framework was developed by Harris and Todaro (1970) and Harberger (1971) in the context of rural-urban migration in developing countries. It was used subsequently by Mincer (1976, 1984) and Grämlich (1976) to analyze the economics of minimum wages in an economy with covered and noncovered sectors and extended by Fields (1975, 1989) to analyze the determinants of unemployment. For a more intuitive discussion of these models without the proofs, see Fields (1994).

2. The model

The model used here features wage dualism and open unemployment. Expected wage maximization is the central behavioral postulate on the supply side of the labor market.[3] Workers are assumed to be risk-neutral and to decide between supplying their labor to one sector or the other on the basis of the expected value of the wages to be earned in each, taking account of possible unemployment. Any temporary differential between expected wages in the two sectors will be eroded as migration brings expected wages into balance. Thus, expected wages, not nominal wages, are equalized across sectors in equilibrium:

$$E(W_C) = E(W_N).$$

Firms' demand for labor curves are assumed to be inverse functions of the wage in the sector in question. Following the established literature, labor demand in one sector is assumed to be independent of wages in the other sector.

Before the imposition of a wage floor, competition in the labor market is assumed to equalize wages in the two sectors at a level denoted by W_O. E_C^O workers are assumed to be employed in the covered sector and the remaining $L - E_C^O$ members of the labor force to be employed in the noncovered sector.

Suppose now that a wage floor is imposed on some sectors of the economy but not others. In the covered sector, the wage is raised by γ%:

$$W_C = W_O(1 + \gamma)$$

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[3] For ease of presentation, the model is a single-period one, hence uses expected wages instead of expected present values. The multi-period model found in Fields (1975), Mincer (1976), and Gramlich (1976) is more complicated than is needed for present purposes.

where $\gamma = (W_C - W_O)/W_O$. This lowers employment in the covered sector by $\eta\gamma$ percent, where

η is the (arc) wage elasticity of demand for labor in the covered sector evaluated between W_O

and W_C:

$$E_C = E_C^O(1 + \eta\gamma)$$

The reduction in employment in the covered sector and the higher wage there will affect the

expected wage in that sector. Workers will reallocate themselves such that the expected wages in

the two sectors are again equalized.

Express the probability of employment in the covered sector as the ratio of covered sector

employment (E_C) to covered sector labor force (L_C) including both employed and unemployed;

this is a special case of a formulation initiated by Todaro (1969) and used subsequently by

Mincer (1976) and Grämlich (1976). Thus

$$E(W_C) = W_C(E_C/L_C)$$

The equilibrium condition (1) becomes

$$W_C(E_C/L_C) = W_N$$

The wage in the noncovered sector, W_N, adjusts to clear the market, so that the supply of

noncovered sector workers and the number demanded in that sector are equal. The total labor

force is the sum of the covered and noncovered sector labor forces:

$$L_C + L_N = L$$

Unemployment (U) is defined as

$$U = L_C - E_C$$

It remains now to close the model by specifying W_N. Because our purpose is to show that

comparative static results are ambiguous, it suffices to present conditions consistent with the

general model under which opposite effects obtain. This can be done using two special cases.

Model I makes a special simplifying assumption: that the wage in the noncovered sector is invariant with respect to the size of that sector's labor force. This simplifying assumption has been made by a number of authors who have extended the Harris-Todaro model including Fields (1975), Anand and Joshi (1979), Heady (1981), Stiglitz (1982), Sah and Stiglitz (1985), and Bell (1991), among others.

Thus, Model I is closed by assuming that the wage in the noncovered sector is constant and given by

$$W_N(L_N) = W_N^O = W_O$$

Model II makes a different simplifying assumption: that total wages in the noncovered sector do not change with the size of that sector's labor force. This could arise under two circumstances. One is in a classic labor surplus situation of the type modeled by Lewis (1954) and Fei and Ranis (1964), wherein labor in the noncovered sector has zero marginal product, and instead is paid its average product.

$$W_N = Q/L_N$$

Alternatively, suppose labor is not in surplus and the production function is given by $Q_N = \Phi(K_N) \ln L_N$. If K_N and P_N, the price of the product, are fixed over the relevant range, then the value of the marginal product of labor in the noncovered sector equals $P_N \Phi(K_N)/L_N$. Denoting $P_N \Phi(K_N)$ by Q and equating the value of marginal product to the wage, we obtain

$$W_N = Q/L_N$$

which is of the same form as Eq. (9) but derived under alternative circumstances.

Model I thus consists of Eqs. (l)-(7) and Eq. (8), Model II of Eqs. (l)-(7) and Eq. (9). We turn now to the comparative static results in these two models.

3. Unemployment in the two-sector model: Comparative static results

3.1. Ambiguous effect of the size of the wage floor (γ)

To see the ambiguity, consider Model I. The unemployment rate can be solved for explicitly in this model as

$$U^I = \gamma E_C^O (1 + \eta\gamma)$$

A higher wage floor means higher γ. This lowers unemployment if and only if $\eta < -\frac{1}{2}\gamma$. Thus, although a higher wage floor may result in *more* unemployment, an extremely elastic demand for labor in the covered sector produces the surprising result that a higher wage floor may result in *less* unemployment.

3.2. Ambiguous effect of the elasticity of demand for labor in the covered sector (η)

Write unemployment in Model I explicitly as

$$U^I = \big((W_C/W_O) - 1\big)E_C^I = \gamma E_C^O (1 + \eta\gamma)$$

where E_C^O and E_C^I are, respectively, initial and final employment in the covered sector, γ is the wage increment due to the wage floor, and η is the elasticity of demand for labor in the covered sector. Eq. (11) shows that given γ and E_C^O, the more negative is η in this model, the *less* unemployment there will be.

The opposite possibility—that a more elastic demand for labor might result in *more* unemployment—may be demonstrated using Model II, in which $W_N = Q/L_N$. Denote the results for the less elastic demand curve by prime superscripts and the results for the more elastic

demand by double-primes; W_C^O denotes the common covered sector wage floor. For the less elastic demand, the equilibrium condition (5) becomes

$$W_C^O(E_C'/L_C') = Q/L_N' \Leftrightarrow L_C'/L_N' = K', \quad \text{where} \quad K' = W_C^O E_C'/Q$$

Substitution of Eq. (12) into the definition of unemployment yields

$$U' = L_C' - E_C' = \left(K'/(1 + K')\right)L - E_C'$$

By analogy,

$$U'' = L_C'' - E_C'' = \left(K''/(1 + K'')\right)L - E_C'' \quad \text{where} \quad K' = W_C^O E_C''/Q$$

The difference between the two unemployment amounts is

$$\begin{aligned}
U' - U'' &= (K'/(1 + K'))L - E_C' - (K''/(1 + K''))L + E_C'' \\
&= [(K' - K'')L/(1 + K'')(1 + K')] - (E_C' - E_C'') \\
&= \{[(W_C^o/Q)L]/[1 + (W_C^o/E_C'/Q) \\
&\quad + (W_C^o/E_C''/Q) + W_C^{o2}E_C'E_C''/Q^2] - 1\} \\
&\quad \times (E_C' - E_C'').
\end{aligned}$$

The term $(E_C' - E_C'')$ is positive, because the prime term corresponds to the less elastic labor demand curve, for which employment is greater. Suppose that for certain parameter values, the ratio of the two terms in square brackets in Eq. (13) is less than one. Then the term in curly braces will be negative. In this event, $U'' > U'$, i.e., unemployment is greater for the more elastic labor demand curve.

The requisite parameter values can be found by establishing conditions under which the denominator in square brackets exceeds the numerator. A sufficient condition for this to hold is simply that $E_C' + E_C'' > L$.

3.3. Ambiguity of the elasticity of the wage in the noncovered sector with respect to the size of

that sector's labor force (∈)

Eqs. (l)-(7) may be combined to yield

$$W_O E_C^O (1 + \gamma + \eta\gamma + \eta\gamma^2) = W_N L_C$$

If the term in parentheses is greater than 1, then $W_N L_C$ must increase as a result of the wage

floor. This requires that labor move into the covered sector, by the following reasoning. Suppose

L_C increases and hence L_N falls. When L_N falls, W_N rises. Therefore, $W_N L_C$ rises when labor

moves into the covered sector. Likewise, if the term in parentheses is less than one, labor must be

moving out of the covered sector. For a given wage floor, the term in parentheses will be greater

than one if $\eta > -1/(1 + \gamma)$ and negative otherwise. That is, any sufficiently elastic demand for

labor in the covered sector (where sufficiently elastic means elasticity $\eta > -1/(1 + \gamma)$ implies

that labor moves out of the covered sector, else labor moves in.

The ambiguity of the effects of the elasticity of the wage in the noncovered sector with

respect to the size of that sector's labor force may be demonstrated by comparing Models I and

II. Model I has constant per capita wage in the noncovered sector and Model II constant total

wage bill in the noncovered sector. For given covered sector wage W_C^O and covered sector

employment E_C^O, the amounts of unemployment are given by

$$U^I = \left((W_C^O / W_O) - 1 \right) E_C^O$$

in Model I and

$$U^{II} = L_C^{II} - E_C^O = \left((L_C^{II} / E_C^O) - 1 \right) E_C^O = \left((W_C^O / W_N^{II}) - 1 \right)$$

$$E_C^O = \left(\left(W_C^O / (Q / L_N^{II}) \right) - 1 \right) E_C^O$$

in Model II. From Eqs. (15) and (16), it is seen that $U^I >=< U^{II}$ as $W_C^O <=> W_N^{II}$, i.e., if in Model II, the wage in the noncovered sector is greater/same/lower than initially. And since, in Model II, the noncovered sector wage is greater/same/lower than initially as the noncovered sector labor force is smaller/same/greater than initially, and since the noncovered sector labor force is smaller/same/greater than initially as the demand for labor in the covered sector is sufficiently inelastic/knife-edge/sufficiently elastic, it follows that $U^I >=< U^{II}$ as the demand for labor in the covered sector is sufficiently inelastic/knife- edge/sufficiently elastic.

4. Conclusion

The reader should remember that the model used in this paper is a special case of the two-sector models of Mincer (1976) and Gramlich (1976). When ambiguous results are found in a special case of a model, the more general model is necessarily ambiguous as well. The ambiguity of these comparative static results has not been demonstrated previously.

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