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A NOTE ON THE IMPACTS OF PRICE SHOCKS ON WAGES IN UNIONIZED ECONOMIES

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This paper shows that in the short run, following an exogenous price shock, the union wage always increases, while the competitive wage may decrease, which contrasts the case in which labor is not unionized.

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1. Introduction

In the long run, in which all factors of production are mobile between sectors, the effects of price shocks on factor returns are best described by the Stolper–Samuelson theorem. In the short run, in which some of the factors are sector–specific, such effects are analyzed by a number of economists, notably Jones (1971), Mayer (1974), Mussa (1974) and Neary (1978). However, these models assume perfect competition in the product market and that labor is not unionized.

In searching for answers to the decline of real wage earnings in the U.S. and the rise in unemployment in Europe of the less–skilled workers for the past two decades, there is a recent surge of interest by economists in the connection between labor income and international trade (see Bhagwati and Costers, 1994). The purpose of this paper is to examine the short run impacts of exogenous price shocks on the determination of wages in the presence of unions, hoping to shed light on the effects of trade protection in unionized economies. By applying Nash bargaining to model labour–management negotiations, we show that the negotiated union wage always increases, while the competitive wage may increase or decrease.

2. The Basic Model

Consider an economy producing two goods x and y, with y chosen as the numeraire good. While perfect competition prevails in sector y, a monopoly firm exists in sector x. Good x is produced with labor only and labor in this sector is unionized, while good y is produced with non–unionized labor and a sector specific factor, k. Both x and y are produced with constant returns to scale technology, such that the x sector has an input–output ratio of one by choice of units.

2.1 Consumers

All consumers are assumed to be identical and maximize an identical homothetic utility function, i.e.

$$\max \mu(x,y) \qquad \text{s.t.} \quad px+y=wx+w_y l_y+\pi$$

where p is the price of x relative to y, defined below; w and w_y are respectively the negotiated and the competitive wages; x and l_y are respectively equal to the levels of employment in the x and y sectors; and π is the monopoly firm's profit.

Since the assumption of homothetic utility removes distributional and income effects, we obtain the inverse demand as

$$p=\mathbf{p}(x/y(x)) \qquad \text{where} \quad \mathbf{p}_x<0,\ \mathbf{p}_y>0 \tag{1}$$

In fact, p can be written as a function of x alone since the assumption of a specific factor ensures production on the efficient production possibility frontier, in which x and y are uniquely related.

2.2 The Determination of Employment and Wages

Profit of the monopoly firm in the x sector is

$$\pi(x,y,w) = p(x)x - wx \tag{2}$$

We assume the union has a Stone-Geary type utility function

$$u = (w-w_y)^{\theta}x^{\gamma} \tag{3}$$

where $\theta,\gamma\in[0,1]$ are the elasticities of union utility with respect to wage differentials $(w-w_y)$ and employment x respectively. Hence they denote union preference for wages and employment. Following Mezzetti and Dinopoulos (1991), we call the union wage (employment) oriented if $\theta>(<)\gamma$.

The wage and employment in the x sector are determined through a Nash bargaining process between the firm and the union. As is usual to model labor–management negotiations, contracts in the present model are binding. If bargaining is successful, the union workers receive the negotiated wage. The residual workers are left to the non–unionized sector. However, if bargaining breaks down, the union strikes, and wage and employment of the union workers go to zero. The conflict payoffs at the threat point are zero to both the union and the firm.[1] Nash bargaining has been applied in international trade by Brander and Spencer (1988), and Mezzetti and Dinopoulos (1991).

The union and the firm bargain to solve (Nash, 1953)

$$\max_{w,x} \; G(x,w) = u(w,x)\,\pi(x,y,w) \tag{4}$$

Eq. (4) is called the 'Nash product', which is a product of the parties' gains net of threat point payoffs. This bargaining game satisfies Nash's (1953) four axioms: Pareto optimality, linear invariance, symmetry and independence of irrelevant alternatives.

The first order conditions to (4) are

$$w = \theta/(1+\theta)p + 1/(1+\theta)w_y \tag{5a}$$

$$w = \gamma/(1+\gamma)p + 1/(1+\gamma)MRP_x \tag{5b}$$

where $MRP_x=p+xp'$ is the marginal revenue product of the monopoly firm.

In the competitive y sector, firms maximize profits choosing the level of labor such that the competitive wage is equal to the value marginal product (VMP) of labor:

$$y_1(l_y,k) = w_y \tag{6}$$

where y_1 is the VMP_y of labor, l_y is the level of employment in the y sector, and

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[1] However, Nash bargaining implies that the threat point, which is Pareto inefficient, is not realized.

k is the fixed supply of the specific factor.

In the labor market, full employment yields

$$x + l_y = l \tag{7}$$

where l is the fixed endowment of labor. Thus we have a complete system of five unknowns x, w, l_y, w_y and p in five equations (5a), (5b), (6), (7) and (1).

2.3 The Equilibrium

Equation (7) gives the total endowment of labor, which is represented by the horizontal axis in figure 1. The vertical axes denote the wages. The VMP_y and VMP_x curves are determined by eqs. (6) and (1). The intersection of these two curves, E_c, denotes the equilibrium in which both x and y are produced competitively and labor is not unionized. In this equilibrium ol_c and l_cl of labor are employed in sectors x and y respectively, and wage is equalized in both sectors at w_c.

In the presence of the monopoly firm and the labor union, condition (5a) determines a curve which is a convex combination of VMP_y and VMP_x, while (5b) determines a curve which is a convex combination of MRP_x and VMP_x (These two curves are not drawn for clarity). The equilibrium is determined by their intersection, which can have one of three cases,[2] all starting from point E_m: (i) If $\theta=\gamma$, the equilibrium is located on a vertical line; (ii) If $\theta>\gamma$, it is located on a negatively sloped locus; (iii) If $\theta<\gamma$, it is located on a positively sloped locus.

Note that (I). if $\theta=\gamma=0$, the equilibrium is denoted by point E_m in figure 1, where MRP_x cuts VMP_y; (II). if $\gamma=0$, the equilibrium is situated at a point on the curve segment of MRP_x above E_m. The competitive wage is found on the curve VMP_y by dropping a vertical line to VMP_y from any corresponding equilibrium point on MRP_x; (III). if $\theta=0$, the equilibrium is located on the curve segment of

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[2] Given the specific values for each pair of γ and θ, the equilibrium is determined by one point. But with different values for γ and θ, one can trace three types of loci.

VMP_y between VMP_x and MRP_x and the wage is equalized across sectors.

3. The Impacts of Price Shocks

With a positive exogenous price shock, the curves VMP_x and MRP_x would both shift up, which affects the equilibrium. This can be seen as follows.

Substituting (7) into (6) and totally differentiating eqs. (5) and (6), holding k and l constant, we obtain

$$dw/dp = y_{l_y l_y} A/[(1+\theta)\Delta] = A > 0 \tag{8a}$$

$$dw_y/dp = y_{l_y l_y}[A-\theta/(1+\theta)]/\Delta = (1+\theta)A-\theta \tag{8b}$$

where $\Delta = y_{l_y l_y}/(1+\theta) < 0$, and $A = (\gamma+\partial MRP_x/\partial p)/(1+\gamma) > 0$, since the MRP_x curve shifts up if p increases.

Rearranging, we see that condition (8b) is positive (negative) if $\partial MRP_x/\partial p$ is bigger or smaller than $(\theta-\gamma)/(1+\theta)$. Thus the competitive wage decreases if the union is very wage oriented (large θ) and the shift of MRP_x is small, and it increases if the union is employment oriented or equally concerned about wage and employment.

This result contrasts the classical literature, which shows that in the short run an increase in price will raise the common wage rate in both sectors in the absence of labor unions. In contrast, the reason that the competitive wage may decrease in the present model lies in that a very wage oriented union does not care much about employment. It forces the negotiated wage to rise higher than when labor is not unionized. Consequently union employment will decrease. The released labor is thus pushed to the competitive sector, forcing the competitive wage to go down.

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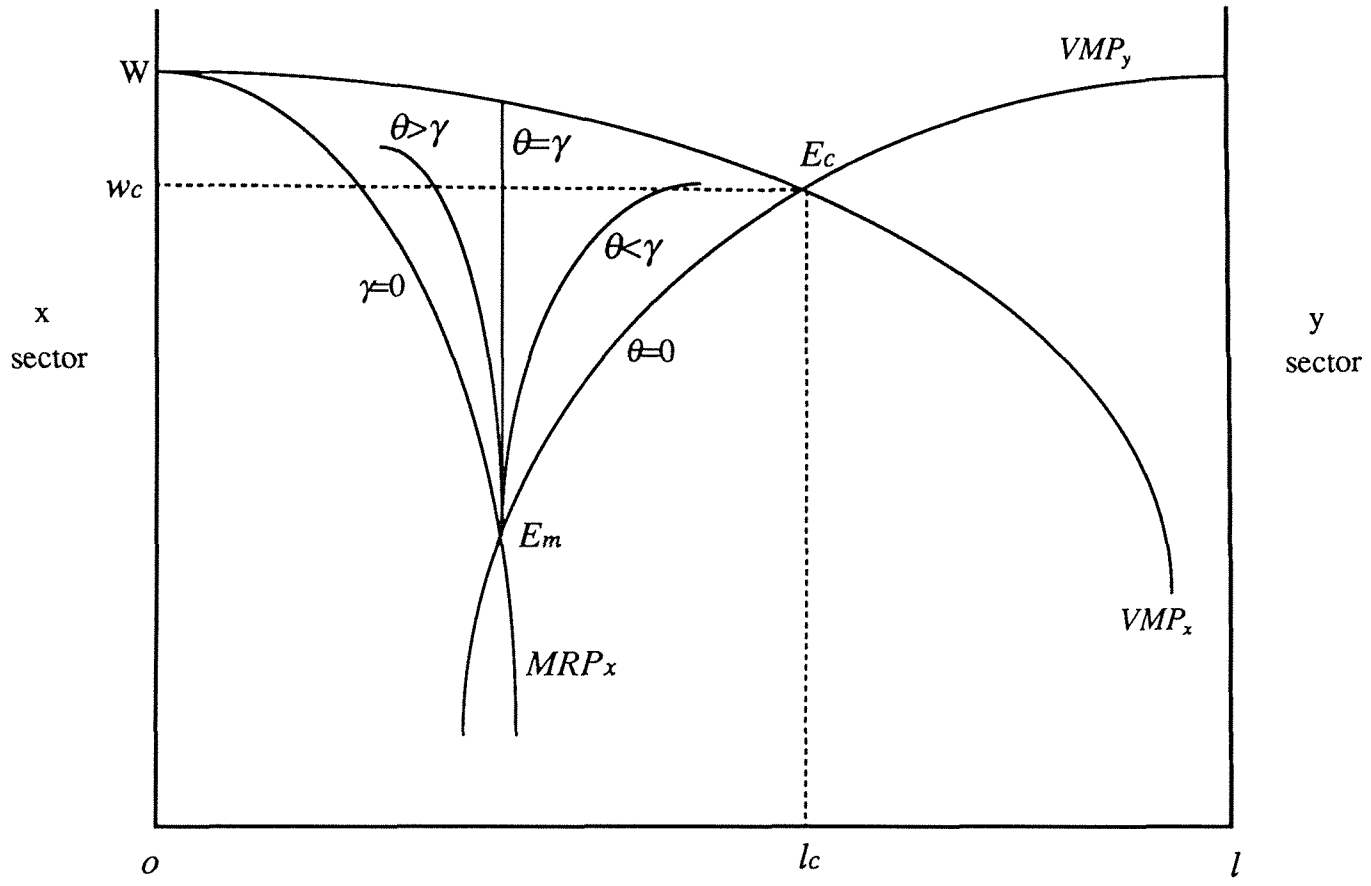

Figure 1: An Illustration of the Equilibrium

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