UCD CENTRE FOR ECONOMIC RESEARCH

WORKING PAPER SERIES

2005

Efficiency Wages and Bargaining

Frank Walsh, University College Dublin

WP05/23

November 2005

UCD SCHOOL OF ECONOMICS
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Efficiency Wages and Bargaining

Frank Walsh
Economics Department
University College Dublin
Belfield, Dublin 4
Frank.walsh@ucd.ie
Phone: 353-1-7168697

Abstract

I argue that in contrast to the literature to date efficiency wage and bargaining solutions will typically be independent. If the bargained wage satisfies the efficiency wage constraint efficiency wages are irrelevant. If it does not, typically we have the efficiency wage solution and bargaining is irrelevant.

Introduction

A number of papers that have modelled the interaction between the efficiency wage and bargaining models and find that efficiency wages weaken [Lindbeck and Snower (1991)] or strengthen [Sanfey (1993), Toulemonde (2003) or Strand (2003)][1] the workers payoff from the bargaining game In this paper I show that the models will be independent in most cases. A bargained wage that satisfies the efficiency wage constraint is unaffected by the constraint. If the constraint is not satisfied, typically we have the efficiency wage solution and bargaining is irrelevant[2].

I. The efficiency wage

A worker has the following utility at any point in time t :$u = w - g(x)$ where w is the wage, x is effort, and g(x) is a convex function of effort. The flow value of a job at any point in time (t) in a stationary equilibrium is:

$$rV(t) = w - g(x) + b[V^u(t) - V(t)] \qquad (1)$$

The Poisson arrival rate of exogenous firm shutdowns is b and the discount rate is r. Workers get the wage stream plus the expected capital gain/loss from moving to unemployment (V^u) times the exogenous arrival rate of separations. We focus on a stationary equilibrium. From (1) the value of a job or rent is:

$$V - V^u = \frac{w - g(x) - rV^u}{b + r} \qquad (2)$$

If F(.) is a well behaved production function and n is employment, the value of the firms expected profit stream is:

[1] Hoel (1988) looks at the impact of efficiency wages on local versus centralised wage bargaining.
[2] There is also an empirical literature examining whether worker rents are due to efficiency wages or rent sharing. See Konings and Walsh (1994) or Machin and Manning (1992).

$$p = \frac{F(x,n) - w + n}{b + r} \quad (3)$$

We assume that firms must pay a wage that satisfies the following inequality to satisfy the concave efficiency wage constraint illustrated in Figure 1.

$$w \geq w^e(x) \quad (4)$$

From (3), taking the number of workers as given, we draw isoprofit curves for the firm in x,w space. The firms preferred wage effort bundle is where the isoprofit curve Q* is tangent to the efficiency wage constraint in Figure 1.

We can solve explicitly for the Shapiro and Stiglitz (1984) efficiency wage model. Equation (1) is the value of not shirking and q is the arrival rate of supervisors. When we equate (1) with the value of shirking $rV^s(t) = w + (b + q)[V^u(t) - V^s(t)]$ the efficiency wage and rents for effort x are[3]:

$$w^e = g(x)\left(\frac{b + r + q}{q}\right) + rV^u = g(x)A + rV^u$$

$$V - V^u = \frac{g(x)}{q} \quad (5)$$

Yellen (1984), Katz (1986) or Weiss (1991) discuss the different efficiency wage models. Apart from the shirking model these include the turnover cost model [Salop (1979)], sociological models such as the fair wage hypothesis [Akerlof and Yellen (1990)] or adverse selection models [Weiss (1991)]. These models all predict that firms will offer a wage effort combination where rents [equation (2)] are positive, but only in the shirking model would we expect rents to increase with effort as in (5). For example the fair wage hypothesis is that firms pay higher wages to placate

[3] Malcolmson (1999) shows that even when the underlying assumptions of Shapiro and Stiglitz do not hold workers earn rents when monitoring is difficult as long as reputation effects are not too strong and there is some unemployment. Akerlof and Katz (1989) show workers will earn rents even if firms use upward sloping wage profiles.

disgruntled workers who perceive they are being treated unfairly or in the turnover cost model wage premiums prevent costly turnover. In these two models firms satisfy the efficiency wage constraint by putting workers on a higher indifference curve in wage effort space. In Figure 1 if the efficiency wage model is the shirking model worker utility is increasing with effort along the efficiency wage constraint. In other efficiency wage models the efficiency wage constraint in Figure 1. is an indifference curve.

II.The Nash Bargaining Solution

Holding employment fixed[4] and where (2) and (3) are the worker's and firm's objective functions we solve for the Nash bargain over x and w by maximising:

$$S(x,w) = [V(x,w) - V^u]^{1-m} p(x,w)^m = \frac{1}{b+r} P^{1-m} Q^m \qquad (6)$$

A crucial difference between this paper and the previous literature is that the efficiency wage constraint does not enter the workers objective function. Most previous studies imposed a binding parametric relationship between wages and effort whereas we see from Figure 1., bargaining solutions to the right of $w^e(x)$ are feasible. Strand (2003) used the efficiency wage constraint as the workers fallback utility in the bargaining game on the basis that firms must hire workers before bargaining with them in a matching framework. The assumption that workers would work at the efficiency wage while bargaining seems unreasonable. This will lead to a bargaining outcome that benefits either workers or firms and makes the other party worse off. Since working at the efficiency wage during bargaining must be by mutual agreement

[4] See Oswald (1993) for a model where insiders will not bargain over employment, while the norm in the matching literature is that bargaining is between the worker and firm.

this will not take place. We set the threat point equal to the exogenously given value of unemployment for the worker and to zero for the firm[5].

$$\frac{P_x}{P_w} = \frac{Q_x}{Q_w} \qquad (7)$$

This is the condition that the solution must be on the contract curve in w and x space where workers indifference curves are tangent to firms isoprofit curves. Differentiating P and Q the slopes of the indifference and isoprofit curves respectively are:

$$\frac{dx}{dw}|_P = \frac{1}{g_x(x)} \qquad \frac{dx}{dw}|_Q = \frac{n}{F_x(x,n)} \qquad (8)$$

From (8) we see that the indifference/isoprofit curves will have positive and diminishing/increasing slopes respectively as in Figure 2. The curves P0..P1 represent indifference curves for the workers while Q0..Q1 are isoprofit curves while Q* is the isoprofit curve where the firm chooses its efficiency wage optimally. The contract curve CC shows the various combinations that satisfy (7).[6]:

$$F_x(x,n) = ng_x \qquad (9)$$

This is the condition that the level of effort will be set such that its marginal product will equal the disutility of effort to workers[7]. A lower value of μ moves the bargaining solution to the right along the CC curve in Figure 2.

As we noted earlier in many models the efficiency wage constraint will be an indifference curve. It follows that the efficiency wage solution will be on the contract curve as in Figure 2a. High values of μ lead to bargaining solutions on the CC curve to the left of w^e that are not incentive compatible. Both parties are better off

[5] Following Binmore et al. (1986) we use the outside option as the threat point assuming the motivation for bargaining is the fear of a breakdown. If impatience was the motivation the threat point would be zero for both parties. This would not affect the qualitative results.
[6] This is horizontal because utility is separable in wages and effort.
[7] Strand (2003) notes that bargaining yields the efficient level of effort but this is conditional on employment which is possibly set inefficiently given the wage premium.

at the efficiency wage solution. Bargaining solutions to the right of w^e are incentive compatible and unaffected by the efficiency wage constraint.

The situation is more complicated for the shirking model. From (5) the slope of the efficiency wage constraint is $\frac{dx}{dw} = \frac{1}{g_x(x)A}$. Since A>1 this is flatter than the isoprofit curve [equation (8)] at the point where the CC curve and efficiency wage constraint intersect (w_b,x*) in Figure 2b. It follows that the isoprofit curve will be tangent to the efficiency wage constraint to the left of this point at (w_e, x_e). The following discussion will look at three regions of the CC curve in Figure 2b.

(1) From Figure 2b any solution on the CC curve where $w > w_b$ is incentive compatible and the efficiency wage constraint is irrelevant. Solutions where $w < w_b$ are not incentive compatible.

(2) Figure 3a draws an indifference curve labelled P** through the firm's preferred efficiency wage solution (w_e, x_e). This intersects the CC curve at w**. If bargaining yields a wage less than w** on the CC curve both workers and firms prefer (w_e, x_e) to any such solution, (w_e, x_e) is the solution and bargaining is irrelevant.

(3) A bargained wage between w** and w_b is not incentive compatible. Neither is (w_e, x_e) because workers prefer the bargaining solution to (w_e, x_e). The best outcome for firms that is incentive compatible and which workers will accept is illustrated in Figure 3b. Draw an indifference curve through the bargained wage labelled P***. The point where this intersects the efficiency wage constraint gives the profit maximising contract that is incentive compatible and which workers will accept over the bargaining

solution. In this region between w** and w^e the efficiency wage constraint does affect the bargaining outcome.

In summary, a bargained wage greater than w_b means the efficiency wage constraint is irrelevant. A bargained wage less than w** means bargaining is irrelevant. A bargained wage between w** and w_b means the wage effort combination will lie on the efficiency wage constraint between (w_e,x_e) and (w_b,x^*). In this last case the efficiency wage constraint does not change worker utility relative to the bargaining solution but leads to a lower wage effort combination which is incentive compatible.

IV. Conclusion

Efficiency wage and bargaining models are used widely and are not mutually exclusive. If wages are determined by bargaining it may be difficult to monitor workers or notions of how fairly they are being treated may affect worker's performance. This paper suggests that from the point of view of a researcher modelling the labour market in this situation life is simpler than the earlier literature suggests. This paper does not show which model should be used but suggests that once we make this choice we need not worry about interactions with the other model.

There may also be implications for modelling endogenous union membership. An increase in the importance of firms where efficiency wages are paid may undermine the role of unions other things equal.

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Figure 1: The Efficiency wage and level of effort

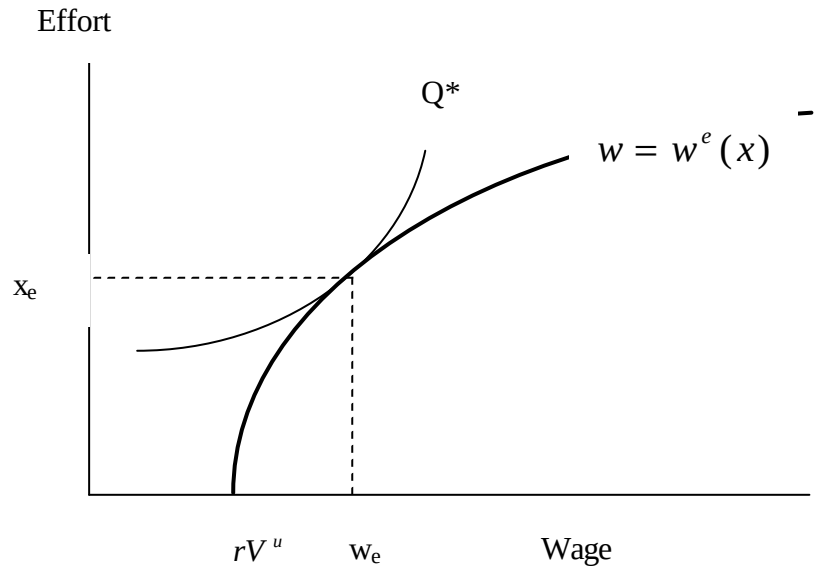
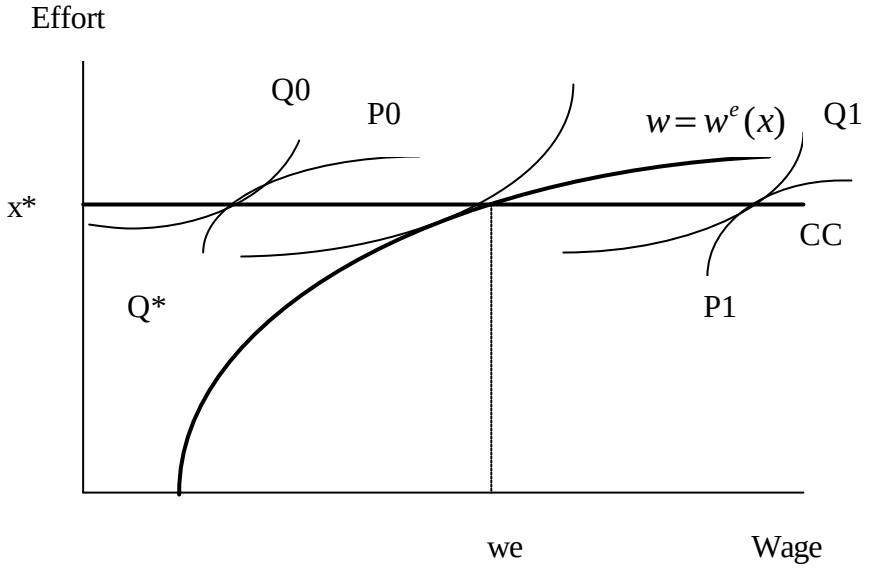


Figure 2: The Contract curve and the efficiency wage constraint.

(a) Other efficiency wage models.



(b) The Shapiro and Stiglitz model

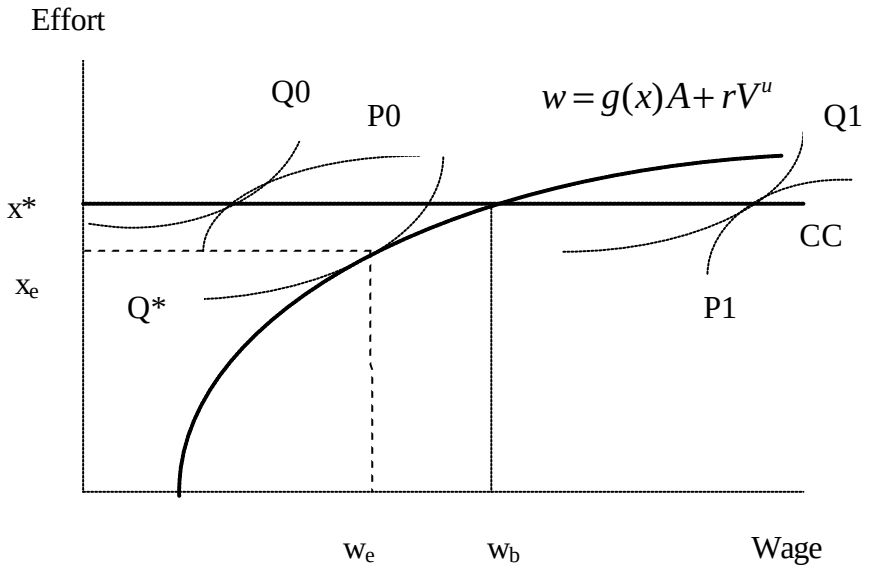


Figure 3a: Wage/effort combinations when the bargained wage violates the no-shirking condition

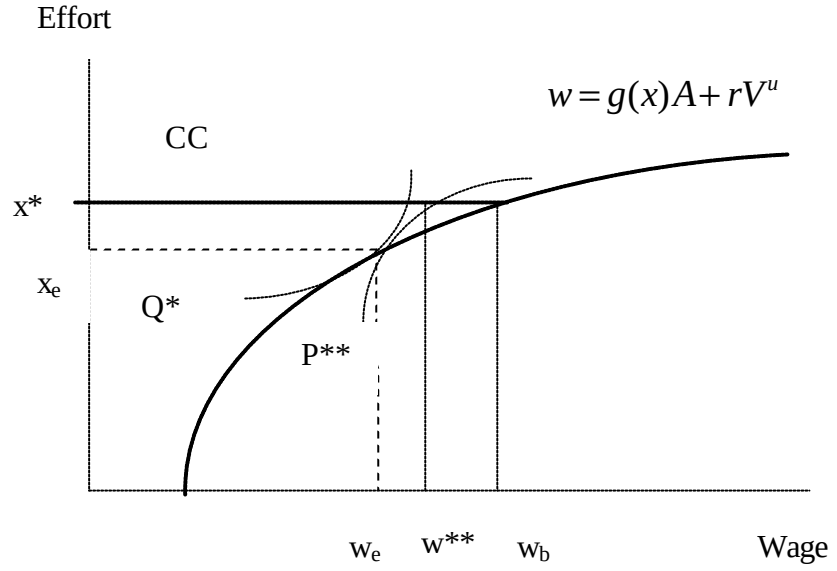


Figure 3b: Wage/effort combinations when the bargained wage violates the no-shirking condition