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Efficiency Wage in the Frictional Labour Market- A Theoretical Analysis

By

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Abstract: In this paper we introduce efficiency wage relation in the benchmark model of DMP where worker's efficiency depends on the wage rate and the labour market tightness. We also examine the parametric effects on the Nash-wage rate, market tightness and on the equilibrium unemployment rate. Our results show that all the results obtained in this paper are identical to those obtained in the original DMP model.

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Key words: efficiency wage, labour market friction.

1.Introduction:

The path-breaking work in the labour market is the DMP model. This model provides a useful framework where different labour market policies can be analyzed in the presence of matching friction. In the benchmark DMP model we find that a positive productivity shock raises Nash-wage rate and the labour market tightness but reduces unemployment rate at steady state equilibrium. A high discount rate reduces both the wage rate and the market tightness but raises the unemployment rate. Moreover, an increase in the unemployment benefit and / worker's bargaining power raises both wage rate and unemployment rate but lowers market tightness.

The existing literature shows that the DMP model has been extended by introducing cyclicality, endogenous job destruction and efficiency wage relation. These include the works of Albrecht et al. (1984), Cole and Rogerson (1989), Mortensen and Pissarides (1994), Abraham et al. (1995), Zenou and Smith (1995), Andolfatto (1996), Hagedron and Manovski (2005), Shimmer (2005) etc. The efficiency wage adjusted extension of the DMP model considers Shapiro and Stiglitz (1984) type efficiency wage relation where worker's efficiency depends on the wage paid to the worker.

In this paper we introduce efficiency wage relation in the DMP model where worker's efficiency depends on the wage rate and the market tightness. We also assume that the job destruction rate is exogenous. Our comparative static analysis shows that we get identical results in this efficiency wage induced DMP model and we also find that the traditional Solow elasticity condition does not hold in this frictional labour market.

This paper is organized as follows: In section 2 we describe the basic model. Section 3 embraces the comparative static exercises. Section 4 concludes.

2. The Model:

We assume that worker's efficiency (h) depends on the wage rate (w) and the market tightness (θ). Thus, the efficiency function of the worker is

$$h = h(w,\theta) \tag{1}$$

Where $h_w, h_\theta > 0; h_{ww}, h_{\theta\theta} < 0; h_{w\theta} = h_{\theta w} = 0.$

The Bellman equations for unemployment (U),employment (W), vacancy (V) and jobs filled in (J) are

$$rU = b + \theta q(\theta)(W - U) \tag{2}$$

$$rW = \frac{w}{h(w,\theta)} - \lambda(W - U) \tag{3}$$

$$rV = -C + q(\theta)(J - V) \tag{4}$$

$$rJ = y - \frac{w}{h(w,\theta)} - rk - \lambda J \tag{5}$$

Where r is the discount rate, b is the unemployment benefit, C is the cost of maintaining vacancy, y is the constant match productivity and q is the job offer rate, λ is the job destruction rate, w is the wage rate and k is the capital hired per labour.

A firm creates jobs up to the point where V=0. Using this condition, from (4) and (5) we get job creation condition as

$$y = \frac{w}{h(w,\theta)} + rk + \frac{(r+\lambda)}{q(\theta)} C \tag{6}$$

The Nash-wage can be derived from the following exercise:

$$\underset{w}{Max.}\Omega = (W - U)^{\beta} (J - V)^{1-\beta} \tag{7}$$

Where β is the bargaining strength of the worker and $1 > \beta > 0$.

The first order condition is

$$\left[\frac{w}{h(w,\theta)} - (1-\beta)b + \beta(y + C\theta - rk)\right]\left(1 - e_{hw}\right) = 0 \tag{8}$$

We assume that The Solow elasticity condition does not hold in this frictional labour market. Thus, from (8) we get the Nash –wage as

$$\frac{w}{h(w,\theta)} = (1-\beta)b + \beta\left(y + C\theta - rk\right) \tag{9}$$

Using Equations (6) and (9) we get equilibrium values of w,θ .

The equilibrium unemployment rate is

$$u = \frac{\lambda}{\lambda + \theta q(\theta)} \tag{10}$$

From (10) we get u and from (1) we get h .

3. Comparative Static Effects:

Taking total differentials of (6) ,(9) and (10) we get

$$\left.\begin{array}{l} \frac{\hat{W}}{\hat{y}} > 0, \frac{\hat{W}}{\hat{r}} < 0, \frac{\hat{W}}{\hat{\beta}} > 0, \frac{\hat{W}}{\hat{b}} > 0, \frac{\hat{W}}{\hat{\lambda}} < 0, \\ \frac{\hat{\theta}}{\hat{y}} > 0, \frac{\theta}{\hat{r}} < 0, \frac{\hat{\theta}}{\hat{\beta}} < 0, \frac{\hat{\theta}}{\hat{b}} < 0, \frac{\hat{\theta}}{\hat{\lambda}} < 0 \\ \frac{\hat{u}}{\hat{y}} < 0, \frac{\hat{u}}{\hat{r}} > 0, \frac{\hat{u}}{\hat{\beta}} > 0, \frac{\hat{u}}{\hat{b}} > 0, \frac{\hat{u}}{\hat{\lambda}} > 0 \end{array}\right\} \tag{11}$$

The above results lesd to the following propositions:

Proposition 1: In the presence of efficiency wage a positive productivity shock raises Nash-wage rate and labour market tightness but reduces unemployment rate.

Proposition 2: A high discount rate reduces wage rate and market tightness but raises unemployment rate even if worker is paid according to his efficiency.

Proposition 3: Labour market reforms (i.e. a lower β) reduces wage rate and unemployment rate but raises market tightness in the efficiency wage induced DMP model.

Proposotion 4: A rise in unemployment benefit raises wage rate and unemployment rate and lowers market tightness in the efficiency wage related frictional labour market.

Proposition 5: In the efficiency wage induced DMP model a higher job-destruction rate lowers wage rate and market tightness but raises unemployment rate.

4. Concluding Remarks:

In this paper we introduce efficiency wage in the DMP model. We find that the traditional Solow elasticity condition does not hold in this frictional labour market model. We also find that the presence of efficiency wage does not produce amplifications in the DMP model. Thus, we may conclude that even if the canonical form of the DMP model is extended by introducing the efficiency wage relation, the larger fluctuations in the economy can not be explained.

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