



# A Note on Efficiency Wage of the Labor and Efficiency Price of the Product : Vanishing of Monopoly Profit

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# A Note on Efficiency Wage of the Labor and Efficiency Price of the Product —Vanishing of Monopoly Profit—

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**ABSTRACT:** A purpose of this note is to examine the generalized efficiency model where both efficiency wage and efficiency price are taken into consideration.

The efficiency of the laborers may not be kept constant but rather be decreased, even if the wage rate is kept constant, when the products produced by them can obtain higher valuation in the product market and can be sold at the higher price.

Hence, in this note it is assumed that the efficiency of the laborers will depend on the ratio between the wage rate and the price of the products produced by them.

In this note a case of monopoly and monopsony will be considered. From the analysis of this note the following results have been derived.

(i) If the supply of the labor at the efficiency wage is sufficiently large and the demand for the product at the efficiency price is sufficiently large, the wage rate, the price of the product, the amount of employment, and the supply of the product will not be changed. Hence in the above case, at the efficiency wage and at the efficiency price the price of the product will not be raised nor changed even if the excess demand for the product is positive, while the wage rate is not decreased nor changed even if the excess supply of the labor is positive. Therefore, in this situation the policy of the government to raise the demand for the products will have no effect on the wage rate, the price of the product, the employment level and the production level.

(ii) In this generalized efficiency model, the profit of the monopoly will vanish.

**Key Words:** Efficiency Wage, Efficiency Price, Sollow's condition, Monopoly, Monopsony

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## 1. Introduction

A purpose of this note is to examine the generalized efficiency model where both efficiency wage<sup>1</sup> and efficiency price are taken into consideration.

The efficiency of the laborers may not be kept constant but rather be decreased, even if the wage rate is kept constant, when the products produced by them can obtain higher valuation in the product market and can be sold at the higher price.

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(ii) In this generalized efficiency model, the profit of the monopoly will vanish.

In the next section a simple generalized model of the efficiency will be examined considering both the efficiency wage of labor and the efficiency price of product.

In the last section concluding remarks will be given.

## 2. A Simple Generalized Model of the Efficiency

In this section a simple generalized model of the efficiency will be analyzed considering a case of monopoly and monopsony.

The profit  $\pi$  of firm is denoted by the following equation.

$$\pi = pQ \left( e \left( \frac{w}{p} \right) l \right) - wl, \quad (1)$$

where  $p$  is the price of the product produced by the laborer,  $Q$  is the output level,  $e$  is the efficiency of the labor,  $w$  is the wage rate of the labor,  $l$  is the employment of the labor.

Maximizing (1) with respect to  $w$ ,  $p$ , and  $l$  yields the following first order conditions.

$$\frac{\partial \pi}{\partial w} = pQ'le' \frac{1}{p} - l = 0, \quad (2)$$

$$\frac{\partial \pi}{\partial p} = Q + pQ'le'w(-1)p^{-2} = 0, \quad (3)$$

$$\frac{\partial \pi}{\partial l} = pQ'e - w = 0. \quad (4)$$

Second order conditions are assumed to be satisfied.

From (2),(3) and (4)  $w^*$ ,  $p^*$  and  $l^*$  can be obtained.

Hence, even if the supply of the labor at the wage rate  $w^*$  is larger than the  $l^*$ , the wage rate  $w^*$ , as is well known, will not be decreased nor changed. In the same way, even if the demand for the product at the price  $p^*$  is larger than  $Q^*$  the price will not be increased nor changed.

Therefore, in this situation the policy of the government to raise the demand for the products will have no effect on the wage rate, the price of the product, the employment level and the production level.

As is shown in the following, from (2),(3) and (4) it can straightforwardly be obtained that the profit of the monopoly will vanish in this generalized efficiency model.

From (2) and (4) the Sollow's condition such that the elasticity of the efficiency with respect to  $w/p$  is equal to 1 can be obtained, though  $p$  in this case is not a price level in the sense that the market of the product is competitive. Substituting the relation shown by the equation (4) into the equation (3) using the Sollow's condition yields the above result that the profit of the monopoly will vanish in this generalized efficiency model.

From (4)

$$pQ' = \frac{w}{e}. \quad (5)$$

Substituting (5) into (3) yields the following equation.

$$pQ' = \frac{w/p}{e} e' wl. \quad (6)$$

Substituting the Sollow's condition into (6) yields the result (7) that the profit of the monopoly will vanish in this generalized efficiency model.

$$\pi^* = 0. \quad (7)$$

### 3. Concluding Remarks

The efficiency of the laborers may not be kept constant but rather be decreased, even if the wage rate is kept constant, when the products produced by them can obtain higher valuation in the product market and can be sold at the higher price.

Hence, in this note it is assumed that the efficiency of the laborers will depend on the ratio between the wage rate and the price of the products produced by them.

In this note a case of monopoly and monopsony will be considered. From the analysis of this note the following results have been derived.

(i) If the supply of the labor at the efficiency wage is sufficiently large and the demand for the product at the efficiency price is sufficiently large, the wage rate, the price of the product, the amount of employment, and the supply of the product will not be changed. Hence in the above case, at the efficiency wage and at the efficiency price the price of the product will not be raised nor changed even if the excess demand for the product is positive, while the wage rate is not decreased nor changed even if the excess supply of the labor is positive. Therefore, in this situation the policy of the government to raise the demand for the products will have no effect on the wage rate, the price of the product, the employment level and the production level.

(ii) In this generalized efficiency model, the profit of the monopoly will vanish.

Hence, even if the supply of the labor at the efficiency wage rate is larger than the demand for the labor, the wage rate, as is well known, will not be decreased nor changed. In the same way, even if the demand for the product at the efficiency price is larger than the supply of the product, the price will not be increased nor changed.

Therefore, in this situation the policy of the government to raise the demand for the

products will have no effect on the wage rate, the price of the product, the employment level and the production level.

Further, the profit of the monopoly will vanish in this generalized efficiency model.

## Notes

- 1 For efficiency wages, see Leibenstein (1957), Stiglitz (1976), Solow (1979), Yellen (1984), Watanabe (1996a), Chang and Ching (1996), Watanabe (1996 b) and Laszlo (2004).

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