Economics 471

Practice Problem Set 3 (ANSWERS)

1. a) The market-determined wage of group B's labour is less than the market-determined wage of A's labour, or $w_B < w_{A.}$ a profit-maximizing firm will not hire any group A workers, and will hire group B workers up to the point where the group B's wage equals the value of their marginal product, or:

$$w_{B} = p * Mp_{N} = \frac{100(5)}{\sqrt{E_{B}}}$$

Which yields N_B=2,500.

The profits of this firm, are given by:

Profits=pq - w_B*N_B Profits = 100(10 $\sqrt{2500}$)-10(2500)=\$25,000

b) This employers acts as if group B's wage is not w_B , but is instead equal to $w_B(1+d)$, where d is the discrimination coefficient. The employer's hiring decision, therefore, is not based on a comparison of w_A and w_B , but on a comparison of w_A and $w_B(1+d)$. The employer will then hire whichever input has a lower utility-adjusted price. If d=0.3, the employer is comparing:

$$w_B(1+d)=13$$
 to $w_A = 15$

This firm will hire only group B workers. As before, the firm hires group B workers up to the point where the utility-adjusted price of a B worker equals the value of marginal product or

$$13 = \frac{100(5)}{\sqrt{N_B}}$$

So that $N_B=1479.2$ workers. The firm's profits are given by:

Profits= $100(10\sqrt{1479.17})$ -13(1479017)=\$19,230.79

c) In this case d=0.7 so the employer is comparing: $W_{B*}(1+d)=17$ to $w_A=15$

This firm will hire only group A workers. The firm hires "A" workers up to the point where the price of a group A worker equals the value of marginal product:

$$15 = \frac{100(5)}{\sqrt{N_A}}$$

So that the employer hires 1111.11 A workers, and the firm's profits equal: $Profits=100(10\sqrt{1111.11}-15(1111.11)=\16.6667 **2.** a) Set the absolute value of the slope of the indifference curve equal to the absolute value of the slope of the demand curve.

$$\frac{MU_E}{MU_W} = \frac{w}{E}$$
$$\frac{w}{E} = .01$$

We can also rewrite the firm's labour demand curve as:

$$\frac{20-w}{.01} = E$$

If we solve these last two equations simultaneously, we obtain w=10.

b) The employer will move along the demand curve. At the wage of \$10, the employer will then demand:

$$E = \frac{20 - 10}{.01} = 1,000 \text{ wor ker s}$$

c) We again equate the absolute value of the slope of the indifference curve equal to the absolute value of the slope of the demand curve.

$$\frac{MU_E}{MU_W} = \frac{w - w^*}{E}$$
$$\frac{w - w^*}{E} = .01$$

and the labour demand curve can be rewritten as:

$$\frac{20-w}{.01} = E$$

If we solve the last two equations simultaneously (and setting $w^*=10$), we obtain w=15

d) At a wage of \$15, the demand curve states that the employer hires:

$$E = \frac{20 - 15}{.01} = 500 \ \text{workers}$$

e) In a) and b) the union seeks to maximize the total wage bill. In c) and d) the utility function depends on the difference between the union wage and the competitive wage, and the union seeks to maximize "rent". Since the alternative employment pays \$10, the union will want a higher wage and is willing to suffer a cut in employment.

3. a) From Rees (1963) we are told that this efficiency loss as a percentage of national income (GDP) can be expressed:

$$\frac{1}{2} \bullet \Delta W_u \bullet \Delta E_u \bullet D_u \bullet \frac{L}{Y}$$

As defined in the question. Using this, first we find the percentage reduction of employment in the union sector by multiplying the percentage union wage impact (delta W_u) by the elasticity of demand for labour. This yields $(0.15)^*(0.5) = 0.075$. Once this is found all the other variables are know and are entered into the equation:

$$\frac{1}{2}(0.15)(0.075)(0.3)(0.75) = 0.127\%$$

This is the efficiency loss from the wage distortion imposed by unions in this case, as expressed as a percentage of national income.

b) Using the above technique:

$$\frac{1}{2}(0.10)(0.05)(0.3)(0.75) = 0.056\%$$

In this situation, union distortions account for an efficiency loss equivalent to 0.056% of GDP.

- c) $\frac{1}{2}(0.15)(0.075)(0.15)(0.75) = 0.063\%$
- **d)** $\frac{1}{2}(0.15)(0.15)(0.3)(0.75) = 0.253\%$
- e) $\frac{1}{2}(0.10)(0.025)(0.3)(0.75) = 0.028\%$

4. a) Disagree. In theory, male-female wage differentials for equally productive workers are inconsistent with competitive equilibrium. As long as females could be paid a wage lower than that of equally productive males, firms that do not have an aversion to hiring females would increase their profits by hiring females. The resulting increased demand for females would bid up their wages, and the process would continue until the male-female wage differential is eliminated. Firms that do not have an aversion to hiring females would be maximizing profits by employing large numbers of females; firms that have an aversion to hiring females would be foregoing profits by employing only males.

However, there are a number of economic mechanisms that allow discrimination to persist in the long-run. The first such mechanism is associated with labour force adjustment costs. According to the Arrow proposition, firms which have discriminated in the past are reluctant to undo the wage discrimination that occurred because it would involve firing a lot of their male workers and/or cutting their pay, both of which can wreak havoc on labour relations. A related story is the efficiency wage hypothesis, according to which firms pay super-competitive wages in order to reduce turnover and elicit effort. When super-competitive wages are paid, there will be workers queuing for these scarce jobs. Under such conditions, discrimination against women and minorities is more likely.

b) Agree. The business cycle effects the economic environment, which in turn affects both the supply and demand for union services. This will affect the rate of unionization in a country. Empirical evidence suggests that employer resistance to union formation is lowest when product demand is high and the labour market is tight. It also suggests that the ability of unions to secure wage and benefit increases (and thus the perceived net benefit of being represented by a union) is highest when there is excess labour demand. These reasons suggest that union growth will be pro-cyclical. When the economy is on an upswing, the aforementioned factors should raise both the demand and supply of unionization.

It is suggested however that severe contractions will raise worker discontent, which in turn will be a spur to unionization, perhaps with a lag. This hypothesis is supported by US, but not Canadian data. Unionization is also found to increase with the rate of price inflation.

Regardless of how the business cycle affects unionization, it is clear that the economic conditions, which change drastically over the business cycle, in a country are correlated with factors affecting both the supply of, and demand for unionization. Changes in the supply of, and demand for unionization will in turn have an effect on the growth and incidence of unionization.

c) Disagree. While the labour demand curve gives the profit maximizing levels of employment for any real wage, because of the shape of the firm's isoprofit curves and the union's indifference curves, at any agreed upon wage/employment contract on the demand curve gains from trade are possible implying that other Pareto efficient points exist that would increase the utility of either the union, firm or both without making the other party any worse off. These gains from negotiating would move the wage-employment choice off of the labour demand curve and would involve a slight decrease in wages for an increase of employment that would both maintain or improve the firm's profits while satisfying the union with increased employment (assuming that is a goal of the union).



This interplay of wants is illustrated in the above graph. The firm's demand curve for labour is given by D_L and their isoprofit line is given for a wage of W_1 and an employment at E₂. The union gains a utility level from this wage-endowment combination that results in an indifference curve of Utility₁, the blue indifference curve. Because of the shape of the indifference curves and the isoprofit lines, gains from trade are available in the "lens" between Utility₁ and Isoprofit₁. As drawn, a Pareto efficient wage and employment combination exists at W2 and E2 which will maximize union utility while mainiting firm profits at the initial level. It should be noted that this is only one such point that could be arrived at within the lens, and only illustrates the potential for gains from negotiating.

Such reasoning is used to explain firm actions such as "featherbedding" where the firm hires more labour than they would choose on their own, owing to the interplay with unions. Such firms are effectivley overstaffed, while achieving at least the same original revenue following a slight reduction in wages. At such a point the firm would rather pay a lower wage or hire fewer people, which would increase their revenues beyond the current amount. However, with such an arragement at least one party gains without the other losing. It should be noted that while points such as (W_2, E_2) are efficient in that neither party can gain without the other losing, from a resources point of view such points could be inefficient by misallocating labour within the firm or between union and non-union sectors.