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Economics 152 – Wage Theory and Policy

Problem set #6 - Solutions

1. *Suppose a worker's skill is captured by his efficiency units of labor. The distribution of efficiency units in the population is such that worker 1 has 1 efficiency unit, worker 2 has 2 efficiency units, and so on. There are 100 workers in the population. In deciding whether to migrate to the United States, these workers compare their weekly earnings at home (w_0) with their potential earnings in the United States (w_1). The wage-skills relationship in each of the two countries is given by:*

$$w_0 = 700 + 0.5s,$$

and

$$w_1 = 670 + s,$$

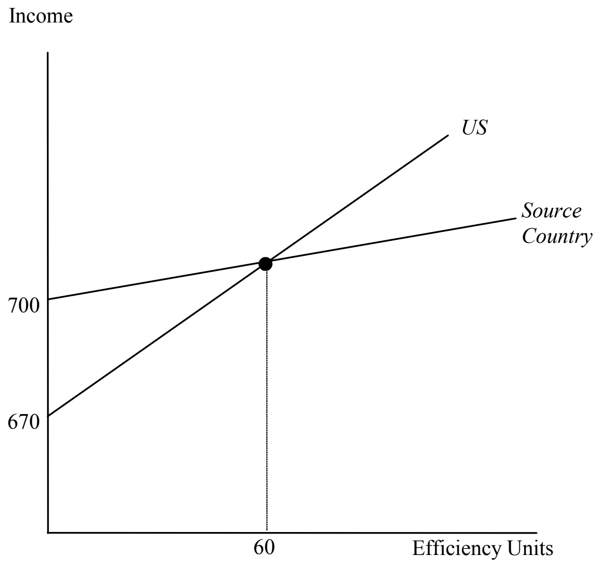
where s is the number of efficiency units the worker possesses.
(a) Give a definition of "positive selection" and "negative selection" in migration flows.
(b) Assume there are no migration costs. What is the average number of efficiency units among immigrants? Is the immigrant flow positively or negatively selected? Why? Support your argument with a graph. Is this consistent with the hypothesis of a "brain drain" from the source country to the US?
(c) Suppose it costs $10 to migrate to the United States. What is the average number of efficiency units among immigrants? Is the immigrant flow positively or negatively selected?

(a) The migration flow which is composed of workers in the upper tail of the skill distribution in the source country is called positive selection, whereas the immigrant flow which is composed of the least skilled workers in the source country is called negative selection.

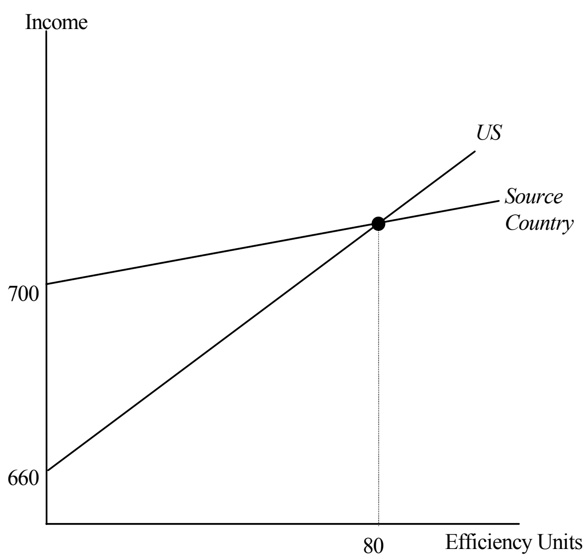
(b) The earnings-skills relationship in each country is illustrated in the figure below. The US line is steeper because the payoff to a unit of skills is higher in the United States. All workers who have at least 60 efficiency units will migrate to the United States. This is found by:

$$700 + 0.5s = 670 + s$$
$$30 = 0.5s$$
$$s^* = 60$$

Therefore, there is positive selection and the average number of efficiency units in the immigrant flow is approximately 80 (the exact answer depends on whether the person with 60 efficiency units, who is indifferent between moving or not, moves to the United States). The migration flow from the source country to the US is consistent with the hypothesis of a "brain drain", because it is the high skilled workers who leave their country and enter the US.



(c) If everyone incurs a cost of $10 to migrate to the United States, the U.S. wage-skill line drops by $10, and only those persons with more than 80 efficiency units will find it worthwhile to migrate. The immigrant flow is still positively selected and has, on average, about 90 efficiency units.



2. *Suppose Nick and Jane are married. They currently reside in Minnesota. Nick's present value of lifetime earnings in his current employment is $300,000, and Jane's present value is $200,000. They are contemplating moving to Texas, where each of them would earn a lifetime income of $260,000. The cost of moving is $5,000 per person.*

(a) Based on their joint well-being, should they move to Texas?Is Jane a tied mover or a tied stayer or neither? Is Nick a tied mover or a tied stayer or neither?

(b) Assume that in addition, Nick very much prefers the climate in Texas to that in Minnesota, and he figures that the change in climate is worth an additional $50,000 to him. Jane, on the other hand, prefers Minnesota's frigid winters, so she figures she would be $50,000 worse off because of Texas's blistering summers. Do their climatic preferences change the couple's migration decision?

(a) Yes, they should move to Texas. The sum of Nick's and Jane's lifetime present value of earnings in Minnesota is \$500,000. The corresponding amount in Texas will be \$520,000. The difference between the two (\$20,000) exceeds the cost of moving (\$10,000), so the move will make the couple jointly better off.

There can only be a tied-mover. (There cannot be a tied-stayer, because the couple is not staying.)
For Nick, staying in Minnesota is associated with a net present value of \$300,000, while moving to Texas would yield a net present value of \$260,000 – \$5,000 = \$255,000. So Nick, if he were single, would choose to stay in Minessota. Therefore, Nick is a tied-mover.
For Jane, staying in Minnesota is associated with a net present value of \$200,000, while moving to Atlanta would yield a net present value of \$260,000 –\$5,000 = \$255,000. So Jane would choose to move to Texas. Thus, Jane is not a tied-mover.

(b) The "climatic" aspects of the move exactly balance each other, so they do not change the decision.

<u>3.</u> *Suppose years of schooling, s, is the only variable that affects earnings. The equations for the weekly salaries of male and female workers are given by:*

$$w_m = 500 + 100s$$

and

$$w_f = 300 + 75s.$$

On average, men have 14 years of schooling and women have 12 years of schooling.
(a) What is the male-female wage differential in the labor market?
(b) Using the Oaxaca decomposition, calculate how much of this wage differential is due to discrimination?
(c) Can you think of an alternative Oaxaca decomposition that would lead to a different measure of discrimination? Which measure is better?

(a) The wage differential can be written as:

$$\begin{aligned}\Delta\overline{w} = \overline{w}_m - \overline{w}_f &= 500 + 100\,\overline{s}_m - (300 + 75\,\overline{s}_f) \\ &= 500 + 100(14) - 300 - 75(12) = \$700\end{aligned}$$

(b) The raw wage differential is

$$\Delta\overline{w} = \underbrace{(\alpha_m - \alpha_f) + (\beta_m - \beta_f)\overline{s}_f}_{\text{Differential Due to Discrimination}} + \underbrace{\beta_m(\overline{s}_m - \overline{s}_f)}_{\text{Differential Due to Difference in Skills}}$$

$$= \underbrace{(500-300) + (100-75)12}_{\text{Differential Due to Discrimination}} + \underbrace{100(14-12)}_{\text{Differential Due to Difference in Skills}} = \$500 + \$200 = \$700.$$

The wage differential that is due to discrimination equals \$500, or $5/7^{\text{ths}}$ of the raw differential.

(c) Suppose instead of adding and subtracting $\beta_m \overline{s}_f$ to the expression giving the raw wage differential, $\beta_f \overline{s}_m$ had been added and subtracted to the expression. The Oaxaca decomposition would then be given by

$$\Delta\overline{w} = \underbrace{(\alpha_m - \alpha_f) + (\beta_m - \beta_f)\overline{s}_m}_{\text{Differential Due to Discrimination}} + \underbrace{\beta_f(\overline{s}_m - \overline{s}_f)}_{\text{Differential Due to Difference in Skills}}$$

$$= \underbrace{(500-300)+(100-75)14}_{\text{Differential Due to Discrimination}} + \underbrace{75(14-12)}_{\text{Differential Due to Difference in Skills}} = \$550 + \$150 = 700.$$

Under this method, \$550 of the \$700 wage differential is due to discrimination. The difference between methods arises because of the way in which discrimination is defined. In one, discrimination is measured by calculating how much a woman would earn if she were treated like a man (as in the text), and in the second it is measured by calculating how much a man would earn if he were treated like a woman. On the surface, neither is a better measure. It can be shown, however, that the second approach (as in part c) attributes more variation to discrimination.

4. *Suppose the firm's production function is given by*

$$\boldsymbol{q = 10\sqrt{E_w + E_b}},$$

where E_w and E_b are the number of whites and blacks employed by the firm respectively. It can be shown that the marginal product of labor is then

$$\boldsymbol{MP_E = \frac{5}{\sqrt{E_w + E_b}}}.$$

Suppose the market wage for black workers is \$10, the market wage for whites is \$20, and the price of each unit of output is \$100.
(a) How many workers would a firm hire if it does not discriminate? How much profit does this non-discriminatory firm earn if there are no other costs?
(b) Consider a firm that discriminates against blacks with a discrimination coefficient of .25. How many workers does this firm hire? How much profit does it earn?
(c) Finally, consider a firm that has a discrimination coefficient equal to 1.25. How many workers does this firm hire? How much profit does it earn?

(a) There are no complementarities between the types of labor as the quantity of labor enters the production function as a sum, $E_w + E_b$. Further, the market-determined wage of black labor is less than the market-determined wage of white labor. Thus, a profit-maximizing firm will not hire any white workers and will hire black workers up to the point where the black wage equals the value of their marginal product:

$$w_b = p \times MP_E = \frac{100(5)}{\sqrt{E_b}}$$

which yields E_b = 2,500. The 2,500 black workers produce q = 10(sqrt(2,500)) = 500 units of output, and profits are:

$$\Pi = pq - w_b E_b = 100(500) - 10(2{,}500) = \$25{,}000.$$

(b) The firm acts as if the black wage is $w_b(1 + d)$, where d is the discrimination coefficient. The employer's hiring decision, therefore, is based on a comparison of w_w and $w_b(1 + d)$. The employer will then hire whichever input has a lower utility-adjusted price. As $d = 0.25$, the employer is comparing a white wage of \$20 to a black (adjusted) wage of \$12.50. As \$12.50 < \$20, the firm will hire only blacks.

As before, the firm hires black workers up to the point where the utility-adjusted price of a black worker equals the value of marginal product, or

$$12.50 = \frac{100(5)}{\sqrt{E_b}}$$

so that E_b= 1,600 workers. The 1,600 workers produces 400 units of output, and profits are

$$\Pi = 100(400) - 10(1{,}600) = \$24{,}000.$$

(c) As $d = 1.25$, the employer compares a white wage of $20 against a black wage of $22.50. Thus, the firm hires only whites. The firm hires white workers up to the point where the price of a white worker equals the value of marginal product:

$$20 = \frac{100(5)}{\sqrt{E_w}}$$

so the firm hires 625 whites, produces 250 units of output, and earns profits of

$$\Pi = 100(250) - 20(625) = \$12{,}500.$$

5. *Suppose that the country Wombasia has 10 million inhabitants and that its population can be divided in three groups: employed, unemployed, and individuals out of labor force (OLF). In any given month the transition probabilities between the three groups are given by*

		Moving to		
		Employed	*Unemployed*	*OLF*
Moving from	*Employed*	*0.93*	*0.03*	*0.04*
	Unemployed	*0.25*	*0.65*	*0.10*
	OLF	*0.06*	*0.04*	*0.90*

This means that in any month 3% of employed workers become unemployed, and 4% of employed workers leave the labor force, etc. Assume that the Wombasian economy is in equilibrium, which means the same fraction of the population is employed, unemployed or OLF in each month. What is the steady state unemployment rate in Wombasia?

Use E for the number of employed people, U for the number of unemployed, and N for the number not participating. The flows of people among the three categories can be found by multiplying these numbers with respective probabilities in the table. In the steady state, the flows into each category must exactly balance the outflows. This produces the following system of equations:

Employed E=0.93*E+0.25*U+0.06*N
Unemployed U=0.03*E+0.65*U+0.04*N
OLF N=0.04*E+0.10*U+0.90*N

Further we have the condition that E+U+N=10 mio.
The steady state solutions for E, U, and N can be found by algebraically solving the system of equation.
We get E=5.893,536 U=874,525 N=3.231,939.
The steady state unemployment rate is given by u=U/(U+E)*100=12.9%.