Economics 450 Midterm Exam

John Kennan, October 16, 2008

Do **THREE** questions. Time allowed: 75 minutes

IMPORTANT: Explain your answers carefully. A good diagram is usually more effective than a lot of words (but you must explain what the diagram means). You get no credit for unsupported assertions or guesses. Write as if you are trying to convince an intelligent person who does not already know the answers. If your answers would not convince such a person, it will be assumed that you do not really understand the material.

1. A coal-mining company is the only employer in town, and faces this supply curve for labor:

$$w = 48 + \frac{72}{2000}L$$

where w is the daily wage, in dollars, and L is the number of workers employed. The company faces this demand curve for coal:

$$p = 60 - \frac{9}{4000}Q$$

where p is the price of coal, per ton, and Q is the number of tons sold per day. Each miner produces 8 tons of coal per day, regardless of the number hired. The company maximizes profit.

   (a) How many workers will be hired, and how much profit will be made?

   (b) Suppose a union is formed, which sets a wage of $120 per day. At this wage, according to the supply curve given above, 2000 miners are willing to work, and the company is free to hire as many of these as it wants. How many will be hired, and how much profit will be made?

2. Suppose that there are 60 million people in the labor force in Mexico and 120 million in the U.S. All workers prefer to work in their own country, but the extent of this preference varies across people, and it is uniformly distributed between 0 and 12, so that if the wage difference is above 12 everyone would choose to work in the country with the higher wage (and if the wage difference is 8, two-thirds of the workers in the low-wage country would move to the high-wage country, and so on). The hourly marginal product of labor in each country is given by

$$\begin{aligned} MPL_{US} &= 24 - \frac{1}{10}E_{US} \\ MPL_{MX} &= 10 - \frac{1}{10}E_{MX} \end{aligned}$$

where E_{US} is the number of people working in the U.S. and E_{MX} is the number of people working in Mexico (in millions). Assume that Mexican and U.S. workers are perfect substitutes (that is, they are equally productive when working in the same country), and assume that the same product is produced in both countries, and that the product price is 1.

   (a) What are the market-clearing wages if immigration is not allowed?

   (b) Now suppose that workers can freely migrate from one country to the other. How many people will migrate, and what will happen to wages in each country?

   (c) What happens to output in each country when immigration is allowed? What happens to total output (the sum of the outputs in the two countries)?

3. A person chooses between leisure and consumption. The utility derived from any combination of leisure and consumption is given by the formula:

$$u = LC - 88C$$

where u is utility, L is the number of leisure hours per week, and C is the number of dollars spent on consumption per week. This person can work as many hours as desired each week, at a wage of $4 per hour.

   (a) If there is no other source of income, how many hours does this person choose to work?

   (b) Now suppose there is a welfare program that gives a grant of $42 per week, with a 25% tax on earnings until the grant is paid back (that is, there is a 25% tax on earnings below $168 a week). How does this welfare program affect the quantity of labor supplied?

4. Pick TWO of the following assertions. Say whether they are true, false or uncertain, and explain why.

   (a) "If all workers were identical in every respect, the equilibrium wage would be the same in every job."

      i. False. Utility is equalized, but wages are higher for less desirable jobs.

(b) A movie theater which sets admission prices in such a way that many seats remain empty cannot be maximizing profits.

   i. False. If marginal revenue intersects marginal cost at a quantity below capacity, it is optimal to leave the rest of the seats empty.

(c) "If the prices of all consumer goods increase by 10%, while wages stay constant, the quantity of labor supplied will increase if the income effect is bigger than the substitution effect.

   i. This is a decrease in the real wage, so the substitution effect gives a reduction in the quantity of labor supplied, and the income effect gives an increase in quantity. So the statement is true.