

ECON 110, Prof. Hogendorn

Problem Set 7

1. *Campbell*. An article in *Business Week*, Nov. 24, 2010, describes how Campbell Soup works very hard to improve productivity at its factories.
 - (a) The article says that “Productivity gains come when hundreds of nitpicky efforts combine to save time, money, and effort.” Draw how these efforts change the production function $f(L)$.
 - (b) Suppose that Campbell is able to change its production function from $f(L) = 75L^{1/2}$ to $f(L) = 85L^{1/2}$. What is its labor demand curve for both cases?
 - (c) The article focuses on the Campbell factory in the town of Maxton, NC. Draw the labor market of Maxton. Justify the way you draw the labor supply curve and the labor demand curve for the town. (Note Campbell is not the only employer in Maxton.)
 - (d) The article says that “The efficiency gains make it less likely that recession-casualty jobs will come back.” Later in the article, it also mentions that “In the latest quarter, [Campbell’s] earnings fell 8.2 percent because of declining soup sales.” With reference to your labor market diagram, which statement more likely explains unemployment in Maxton?
 - (e) Suppose that Campbell has a near monopoly on the American soup market, with a demand curve of $p(q) = 5 - 0.011q$. Also suppose that Campbell must pay a wage of 10 and has the production function $f(L) = 85L^{1/2}$ mentioned above. What is the monopoly profit maximizing quantity and price?

- (f) Draw a diagram of the monopoly profit maximization problem. Add an average cost curve that shows Campbell making a *loss* at the monopoly profit maximum. How could this be? Should Campbell Soup shut down if this happens?
2. *Revolution.* After Wesleyan, you take a job with McCoy consulting. It was a tough decision because McCoy's big rival, Barn & Co., was also recruiting you. And now the pressure is on because you are making a big presentation to Dolty, an auto parts manufacturer which is a perfectly competitive firm.
- (a) The perfectly competitive price of a car bumper is \$500. Dolty uses steel to make bumpers according to the production function $f(S) = 1000S^{\frac{1}{2}}$ where S is tons of steel. The price of steel is \$800 per ton. What is Dolty's profit function $\Pi(q)$?
- (b) Describe the condition for profit maximization that shows how many bumpers Dolty should produce.
- (c) After you have shown the above, a team from Barn & Co. bursts into the room. Their young leader, known only by his initials A.G., says "Barn has a revolutionary new way to manage your firm. Don't think about bumpers, like these dinosaurs from McCoy! Instead, decide how much steel to buy!" He proceeds to write down a profit function $\Pi(S)$. Assuming he does this correctly, what does he write down? Show the condition for profit maximization using this function.
- (d) Now it's up to you to save McCoy's reputation. Argue (in words) that the profit maximization condition for A.G.'s method is exactly the same as the profit maximization condition in your method, and that Barn & Co. has no revolutionary management technique.
3. *UncleKarl.* Your Uncle Karl gives you 20,000 dollars of capital.

- (a) For \$1000, you can buy a risk-free government bond with a coupon of \$50 (payable at the end of the year), a face value of \$1050, and a maturity of one year. What is the yield on this bond?
- (b) Alternatively, you can invest some of the capital in a business venture providing downloadable music. For each dollar of capital invested over the course of one year, do you think it is more reasonable to let your cost of that capital be \$0.05, \$0.10, or \$0.15? Discuss your answer with reference to part (a), assuming you can buy fractional amounts of the bonds.
- (c) To simplify, assume no labor is involved in this business; the only factor is capital. Your production function is $f(K) = 100K^{9/10}$, where output is measured in the number of downloads. You must also use \$5,000 more of capital to pay a fixed cost to get started. What are the equations for your total, average, and marginal cost curves, using your answer to (b)? Graph the AC and MC curves.
- (d) If each download brings you revenue of \$0.04, how much capital should you invest in this business? Show this on your graph. Do you earn a competitive rate of return on your capital, or do you receive rents?

Review Problems only, not to turn in:

4. *MBAs*. The last recession was very hard on the strategic consulting industry. Firms like McKinsey, Bain, and Booz Allen & Hamilton laid off 30% of their workforce.

There were two components to the downturn. First, demand fell dramatically, in large part because of the demise of the dot-coms. Second, more executives began to have business school degrees and/or experience with the consulting firms. This made the "sage advice" of the consultants themselves less useful and effectively

reduced the marginal product of laborers with MBA (Master of Business Administration) degrees (see *The Economist*, 11/2/02, pg. 61).

For this problem, assume that the wage of MBAs is \$100. (Note: for more realism, you can think of all money amounts in this problem in thousands.)

- (a) Let a typical consulting firm have production function $f(L) = 10000L^{1/2}$ and the firm also incurs a fixed cost of 1000. What is this firm's total cost function, average cost function, average variable cost function, and marginal cost function?
- (b) Graph these curves.
- (c) If the price of consulting is $p = 2$ and there are 5 consulting firms, how many MBAs are hired?
- (d) Suppose that p falls to 1.60 and also the production function changes to $f(L) = 10000L^{149/300}$. Now how many MBAs are hired?

5. *Lula*. Suppose there is a Brazilian government bond with a face value of R\$100 (i.e. 100 reals, the currency of Brazil). The bond has a coupon of R\$5 and matures in 1 year.

- (a) If the bond's current price is R\$80, what is its yield?
- (b) Many investors thought that if Lula da Silva were elected president of Brazil, Brazilian debt would become more risky. Explain what probably happened to the price of Brazilian government bonds when Lula won.

Answer to Review Problems:

4. *MBA_s_a*.

(a) Since $y = 10000L^{1/2}$, $L(y) = \left(\frac{y}{10000}\right)^2$. Thus,

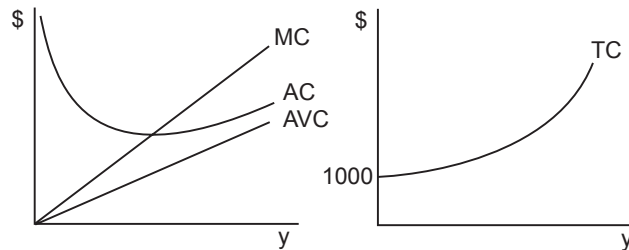
$$TC(y) = 1000 + wL = 1000 + 100 \left(\frac{y}{10000}\right)^2$$

$$AC(y) = \frac{1000}{y} + \frac{y}{1000^2}$$

$$AVC(y) = \frac{y}{1000^2}$$

$$MC(y) = \frac{y}{500000}$$

(b)



(c) We know that a profit-maximizing, perfectly competitive firm sets $p = MC(y)$. Here, that implies

$$\frac{y}{500000} = 2$$

Solving this for y , we find that $y = 1,000,000$. Then $L(1,000,000) = 10,000$. Since there are 5 such firms, the total number hired is 50,000.

(d) Now the labor needed is:

$$L(y) = \left(\frac{y}{10000}\right)^{300/149}$$

and the optimal output solve:

$$MC(y) = 100 \frac{1}{10000} \frac{300}{149} y^{151/149} = 1.60$$

Now the solution is $y = 750,000$ and $L(750,000) = 5,959$, for a total market employment of 29,795.

5. *Lula*.

(a) The formula to use here is

$$P = \frac{A}{1+i} \quad R\$80 = \frac{R\$5 + R\$100}{1+i} \Rightarrow 1+i = 1.3125 \Rightarrow i = 31.25\%$$

(b) Investors perceived Lula as risky, and they demanded a higher risk premium on Brazilian government bonds. For an existing bond, the coupon and face value have already been set, so the only way for the yield to rise was for the present value to fall, as shown in the formula above.