

BAYLOR UNIVERSITY
HANKAMER SCHOOL OF BUSINESS
DEPARTMENT OF ECONOMICS

ECO 5315 Chapter 4 Problem Set Solutions
Jim Garven
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Solutions for assigned problems from Chapter 4 (problems 3, 5, 8 on pp. 121-123.)

3. The Ascot Corporation, which produces stationery, hires a consultant to estimate its production function. The consultant concludes that

$$Q = 0.9P + 0.06L$$

where Q is the number of pounds of stationery produced by Ascot per year, L is the number of hours of labor per year, and P is the number of pounds of paper used per year.

- a. Does this production function seem to include all the relevant inputs? Explain.

Solution: As a long-run production function, this seems to be lacking a variable for capital equipment.

- b. Does this production function seem reasonable if it is applied to all possible values of L ? Explain.

Solution: The production function says that without any labor, paper can transform itself into stationery. This production option may be specified over the range of P and L observed but it doesn't make sense in reality.

- c. Does this production function exhibit diminishing marginal returns?

Solution: No. The marginal returns to both P and to L are constant.

5. According to the chief engineer at the Zodiac Company, $Q = AL^\alpha K^\beta$, where Q is the output rate, L is the rate of labor input, and K is the rate of capital input. Statistical analysis indicates that $\alpha = 0.8$ and $\beta = 0.3$. The firm's owner claims the plant has increasing returns to scale.

- a. Is the owner correct?

Solution: Yes, increasing both L and K by 1 percent causes output to go up by more than 1 percent. This is because the output elasticity is equal to $\alpha + \beta = 1.1$.

- b. If β were 0.2 rather than 0.3, would she be correct?

Solution: No; in this case, increasing both L and K by 1 percent causes output to go up by 1 percent. This is because the output elasticity is equal to $\alpha + \beta = 1.0$.

- c. Does output per unit of labor depend only on α and β ? Why or why not?

Solution: $Q/L = AP_L = AL^{\alpha-1}K^\beta$, which also depends on A , K , and L . The average product of labor is a function of L because the marginal product of L is not constant. The average product depends on K because as K increases, Q increases, so holding L constant, Q/L increases. Finally, A scales the Q , and so if A goes up, Q/L goes up proportionately.

8. Volvo A.B., the Swedish auto firm, operated a car assembly plant at Uddevalla in 1988. The idea was to have a small team of highly skilled workers build an entire car. According to the proponents, this would reduce the tedium associated with the conventional assembly line and cut absenteeism and turnover among workers. In 1991 there were reports that it took 50 hours of labor to assemble a car at Uddevalla, in contrast to 25 hours at Volvo's conventional assembly plant at Ghent, Belgium. If you were Volvo's chief executive officer, what questions would you ask Uddevalla's managers, and what steps would you take?

Solution: That it requires more labor to produce a car in Uddevalla than in Ghent is a concern if there are not compensating reductions in the amount of other inputs required to produce a car in Uddevalla. I would want to know how much is spent on capital equipment at each plant and the difference in the wage rates of the skilled workers at Uddevalla and the presumably less- skilled workers at Ghent. Without this additional information, we cannot tell whether the technique chosen at Uddevalla is efficient.