

Human Resources
Homework 2
Suggested Answer

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Daiji Kawaguchi

College of International Studies
University of Tsukuba
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1. Borjas, 3rd edition, p. 160, Problem 1 (2pts)

Suppose there are two inputs in the production function, labor and capital, and these two inputs are perfect substitutes. The existing technology permits one machine to do the work of three persons. The firm wants to produce 100 units of output. Suppose the price of capital is \$750 per machine per week. What combination of inputs will the firm use if the weekly salary of each worker is \$300? What combination of inputs will the firm use if the weekly salary of each worker is \$225? What is the elasticity of labor demand as the wage falls from \$300 to \$225?

The technical rate of substitution between labor and capital is $1/3=0.333$. When the weekly salary is \$300, the relative price of labor to capital is $300/750=2/5=0.4$. Thus the relative price of labor to capital is higher than the relative productivity of labor to capital. Thus it is optimal for a firm to use only capital. When the weekly salary is \$225, the relative price of labor to capital is $225/750=3/10=0.3$. The relative productivity of labor to capital is higher than the relative price of labor to capital. Thus only using labor is optimal.

2. Borjas, 3rd edition, p. 160, Problem 4 (2pts each, 6pts in total)

Consider a firm for which production depends on two normal inputs, labor and capital, with prices w and r , respectively. Initially the firm faces market prices of $w=6$ and $r=4$. These prices then shift to $w=4$ and $r=2$.

a. In which direction will the substitution effect change the firm's employment and capital stock?

The relative price of labor to capital changed from 1.5 to 2. Thus the substitution effect

decreases employment while it increases capital stock.

b. In which direction will the scale effect change the firm's employment and capital stock.

Because both factor prices (labor and capital prices) fell, the marginal cost of production should have fallen. Thus the firm expands the production and the expansion of the production increases both employment and capital stock.

c. Can we say conclusively whether the firm will use more or less labor? More or less capital?

The substitution effect predicts decrease in employment while the scale effect predicts increase in employment, thus whether employment increases or decreases due to price changes is inconclusive. The direction of the move depends on the relative size of the substitution effect and the scale effect. The capital stock definitely increases.

3. Borjas 3rd edition, p. 161 Problem 7 (2pts)

Suppose a firm purchases labor in a competitive labor market and sells its product in a competitive product market. The firm's elasticity of labor demand is -0.4 . Suppose the wage increases by 5 percent. What will happen to the number of workers hired by the firm? What will happen to the marginal productivity of the last worker hired by the firm?

A 5 percent increase in wage rate decreases the number of workers by 2 percent ($= -0.4 * 5$). A profit maximizing firm sets its employment at the point where the value of marginal product equates to wage rate. Thus, higher wage implies higher value of marginal product of the last worker hired by the firm.