Chapter 18 Markets for Factors of Production

1. Intro
   a. First of Three Chapters on Income Distribution
   b. Next two: Discrimination, and Inequality and Poverty
   c. This chapter: Supply and Demand for Labor, Capital (Structures and Equipment) and Land
   d. Impacts of Technology, Immigration and the Black Death
   e. Postive Analysis: Labor as a commodity; Chapter 20 considers some Normative

2. Demand for Labor by Firms
   a. Note: Firms demand (i.e. rent) labor; people supply (i.e. sell) labor
   b. Labor demand is derived from its value in production
   c. Firms maximize profits by hiring labor which adds at least as much value as it costs
   d. The value of an additional worker is the marginal product of labor x output price

3. Suppose that labor is the only input used by a perfectly competitive firm. The firm's production function is as follows:

<table>
<thead>
<tr>
<th>Days of Labor</th>
<th>Units of Output</th>
<th>MPL</th>
<th>VMP P=10</th>
<th>VMP P=12</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 days</td>
<td>0 units</td>
<td>7</td>
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<td>1</td>
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a. Calculate the marginal product for each additional worker.

b. Each unit of output sells for $10. Calculate the value of the marginal product of each worker.

c. Compute the demand schedule showing the number of workers hired for all wages from zero to $100 a day.

d. On the next page, graph the firm's demand curve. Note: Price (wage rate) on the vertical axis; quantity of workers on horizontal.

e. What happens to this demand curve if the price of output rises from $10 to $12 per unit?
4. As with much else in this class, things are analytically easier with continuous functions. Try this:

5. The nation of Ectenia has 20 competitive apple orchards, which sell apples at the world price of $2. The following equations describe the production function and the marginal product of labor in each orchard:

\[ Q = 100L - L^2 \quad \text{ } MPL = 100 - 2L \]

where \( Q \) is the number of apples produced in a day, \( L \) is the number of workers, and \( MPL \) is the marginal product of labor.

a. What is each orchard's labor demand as a function of the daily wage \( W \)? What is the market's labor demand?

b. Ectenia has 200 workers who supply their labor inelastically. Solve for the wage \( W \). How many workers does each orchard hire? How much profit does each orchard owner make?
c. Calculate what happens to the income of workers and orchard owners if the world price of apples doubles to $4.

d. Now suppose the price of apples is back at $2, but a hurricane destroys half the orchards. Calculate how the hurricane affects the income of each worker and of each remaining orchard owner. What happens to the income of Ectenia as a whole?

6. Technology and capital equipment make workers more productive, typically raising the value of a worker to the firm.
   a. Yes, it takes fewer workers to produce a *given* amount of output,
   b. but lower costs drive prices down and expand quantity demanded of output
   c. Since 1900 productivity (output per worker) has increased 10 fold, real wages have risen nearly as much, and employment has increased. All of these add up to an *increased* demand for labor. See box on The Luddite Revolt.

7. *Immigration* increases the supply of labor, which may decrease wages of natives
   a. Which native wages would be affected by (legal or illegal) immigration of low educated Hispanics?
   b. Which native wages would be affected by (legal or illegal) immigration of highly educated Koreans, Chinese, and Indians?
   c. Although immigrants make up 12.5% of the population, researchers have found small impacts on native wages (down 1-3%). Not sure why …
   d. Fiscal impact: Highly educated, high wage immigrants (and natives) more than pay for government services received; not true for low wage immigrants (and natives) with kids in school.
8. Other factors of production
   a. The rental value of a machine is its marginal product times the output price
   b. The rental value of land is its marginal product times the output price
   c. The price of land is the capitalized value of the future rents

9. Linkages among the factors of production:
   a. An increase in the quantity of one factor typically makes other factors more productive
   b. A worker with a backhoe is more productive than a worker with a shovel.
   c. Machines are more productive with workers to operate and maintain them
   d. Land is more productive with workers to plow, sow, reap, etc
   e. Farmers are more productive with more land to work….

10. The Black Death
    a. 1/3 of the population of Europe died in the 1300s
    b. Basically, two factors of production at the time: Land and labor
    c. What happened to factor prices, i.e. land rents and wages?

11. What do income shares look like?

12. In recent years, some policymakers have proposed requiring firms to give workers certain fringe benefits, such as health insurance. Let's consider the effects of such a policy on the labor market.

   a. Suppose that a law required firms to give each worker $3 of fringe benefits for every hour that the worker is employed by the firm. How does this law affect the marginal profit that a firm earns from each worker? How does the law affect the demand curve for labor? Draw your answer on a graph with the cash wage on the vertical axis.

   b. If there is no change in upward-sloping labor supply, how would this law affect employment and wages?

   c. Why might the labor-supply curve shift in response to this law? Would this shift in labor supply raise or lower the impact of the law on wages and employment?

   d. As Chapter 6 discussed, the wages of some workers, particularly the unskilled and inexperienced, are kept above the equilibrium level by minimum-wage laws. What effect would a fringe-benefit mandate have for these workers?