

Unit 4 Lesson 21

Productivity, Diminishing Marginal Returns, and the Demand for Labor

INTRODUCTION

Economics *Productivity* is defined as the ratio of output per unit of input, for a given period of time. A high level of productivity is necessary for economic efficiency and economic growth. This lesson focuses on labor productivity, or the output per worker in a given time period. Many factors affect labor productivity, including the education, skills, and training of the workers, the availability of capital goods for workers to use, and the level of technology.

When capital resources are fixed, the law of diminishing marginal returns predicts that the productivity of labor will eventually fall as additional workers are used in the production process. Businesses rationally make decisions about how many workers to hire based on the value that an additional worker brings to the firm, compared to what the worker costs the firm.

Reasoning Marginal analysis is an important part of the economic way of thinking and economic decision making. Applying marginal analysis to the production process leads to the law of diminishing marginal returns. If the amount of capital goods is fixed, and more and more workers are added to a production process, eventually there is not enough capital to go around, so workers are less productive on average. “Thinking at the margin” requires weighing the additional benefits of doing something against the additional costs. Logically, the productivity of workers is taken into consideration when hiring decisions are made.

CONCEPTS

- Law of diminishing marginal returns
- Productivity
- Specialization

OBJECTIVES

Students will:

1. Participate in a production activity with fixed resources and variable resources.
2. Discuss factors affecting worker productivity.
3. Explain the law of diminishing marginal returns.
4. Apply marginal analysis to decide how many workers to hire.

CONTENT STANDARDS

- Productive resources are limited. Therefore, people cannot have all the goods and services they want; as a result, they must choose some things and give up others. (CEE Content Standard 1)
- Effective decision making requires comparing the additional costs of alternatives with the additional benefits. Most choices involve doing a little more or a little less of something; few choices are all-or-nothing decisions. (CEE Content Standard 2)

LESSON DESCRIPTION

Students produce greeting cards with a fixed number of scissors and markers, and a variable number of workers. They discuss factors affecting worker productivity and the law of diminishing marginal returns. With a partner, they use marginal analysis to solve a problem about how many workers a firm should hire.

Time Required: 60 minutes

MATERIALS

- A supply of 8.5 by 11-inch scrap paper
- A pair of scissors, or one for each group
- Two different-colored markers or pens (e.g., one red and one black), or two for each group
- One transparency of Visual 1, or one transparency and one copy per group
- Activity 1
- A transparency of Visual 2

PROCEDURE

1. Explain that in this lesson the students will gain a more complete understanding of the concept of labor productivity. Define labor productivity as the amount of output a worker produces during a certain time period.
2. Procedure steps 3-7 may be conducted in one of two ways. You may bring the students to the front of the room and have other students observe what is occurring, or you may divide the class into groups of eight to ten and have each group follow the instructions at the same time. The procedures are written assuming that one group of students will do the activity while the other students observe.
3. Remind students that Valentine's Day is fast approaching. To commemorate this important occasion, they will make greeting cards to give to family members and friends, or perhaps to sell.

Demonstrate how to make a greeting card:

- First fold and then cut a piece of 8.5 by 11-inch paper into quarters. It is important that the pieces are equal in size and cut evenly. Tearing the paper without using scissors is not acceptable for a Valentine's Day card.
- Take one of the quarters of paper and fold it in half to make a card. On the front of the card, write "Happy Valentine's Day!" with the black marker. Then draw a heart above the word "Happy," using the red marker. On the back of the card at the bottom center, write the current year in numbers, using the red marker. Now the card is finished. Admire your finished card, noting that the inside is left blank for personal messages. Ask if there are any questions about how to make a card.

4. Round 1: Select a volunteer card maker to come to the front of the room. (If the students are in groups, each group should choose one card maker.) Also move a small table or desk to the front, and place a supply of paper, a scissors, and two markers on the desk. Tell the student that he or she will have two minutes to finish as many high-quality cards as possible. Appoint a very reliable timekeeper, and tell the student to begin. Tell the timekeeper to say "STOP!" at the end of two minutes.

5. After two minutes, appoint a quality control inspector to look at the finished cards and count how many cards pass inspection. (She or he shouldn't be too picky, and should count all cards that are finished and accurate.) Display Visual 1 and record the numbers for Round 1 (or appoint a student record keeper to do this).

(For example, if the student made four cards, write the number 4 in the second column. The labor productivity or output per worker during the two minutes would be four cards divided by one worker $[4/1]$, or 4. Write the number 4 in the third column.)

6. Round 2: Announce that now you will observe what happens when there are two workers using the same resources (the scissors, markers, and the same small table). Choose a volunteer to be the second worker. Clear away any unfinished cards, and provide a supply of paper. Begin the second round. Have the timekeeper indicate when the round is over, and have the quality-control inspector count the number of cards that pass inspection. Have the record keeper fill in columns 2 and 3 on Visual 1 for two workers.

(For example, if 10 cards were finished, write the number 10 in column 2. The output per worker or labor productivity would be 5 ($10/2$), so you would write 5 in column 3.)

7. Repeat Procedure 6 for several more rounds, adding one person each round — until it is clear that crowding has set in and the workers are complaining about not having enough markers or scissors to go around. Be sure to clear away the unfinished cards after each round, and make sure that each round is two minutes long. Tell the students that you will now discuss what has occurred by inspecting the numbers on Visual 2.

8. Discuss the definition of labor productivity from the bottom of Visual 1, and discuss reasons for the changes in productivity shown on Visual 1.

(Answers will vary. Most likely labor productivity at first increased as more workers were hired. For example, when there were two workers instead of one, workers could specialize in one task. Later, as more workers were hired but the amount of resources remained the same, productivity probably fell because there were not enough resources to go around.)

9. Ask the students what things would have made the workers more productive.

(Answers will vary, but the students should mention that the workers needed more capital — scissors and markers — to be more productive. Factors affecting labor productivity in general include having more and better resources to work with, having a more educated and skilled workforce, and better technology.)

10. Emphasize the point that improvements in productivity are important for economic growth, and lead to higher living standards in an economy.
11. Refer the students to Activity 1. Tell them to pick a partner and complete the activity together. Walk around the room to answer questions and check the answers. When pairs of students complete the assignment correctly, ask them to help other pairs of students.
12. When most of the students have finished, display Visual 2. Call on students to explain the answers, and write the correct answers on the transparency.

Answers to Activity 1 (and Visual 2): Marginal product of labor: 4, 5, 6, 5, 4, 2, 1, 0. Value of marginal product: \$8, \$10, \$12, \$10, \$8, \$4, \$2, \$0. Diminishing marginal returns first occur with the fourth worker (because the marginal product of the fourth worker is 5, which is less than 6, the marginal product of the third worker). If the wage rate were \$5, the business would hire 5 workers. The firm wouldn't hire a sixth worker because that worker would bring in only \$4 in revenue, but would cost the firm \$5 in wages. Note that the firm didn't stop hiring when it reached the point of diminishing marginal returns. The hiring decision is based on comparing marginal benefits and marginal costs. Also, the firm didn't hire only three workers, although the value of the marginal product was highest for the third worker. The fourth and fifth workers were also profitable for the firm.

CLOSURE

Review the factors affecting productivity including education and training, improved capital goods, and better technology. Explain that U.S. agriculture has been successful in terms of productivity growth. Ask the students to describe factors that might have influenced improvements in agricultural productivity.

(Factors that have improved agricultural productivity include better education and training for farmers, improved farm machinery and equipment, and new technology. These factors have led to higher yielding crop varieties, better practices for breeding livestock, and improved pesticides and fertilizers. Students may also mention that many farms are larger today than in the past, and that increased farm size may lead to more efficient production.)

MULTIPLE-CHOICE QUESTIONS

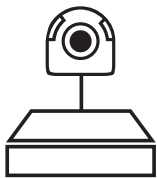
(CORRECT ANSWERS SHOWN IN BOLD)

1. Which of the following is an example of the law of diminishing marginal returns?
 - A. **The tenth worker hired to work on an assembly line contributes less to the total output of the assembly line than the ninth worker.**
 - B. When making lemonade, it is important to choose the correct amount of lemons and the correct amount of sugar in order to make the most profit.
 - C. A company should continue to hire workers as long as the workers are willing to work hard and don't call in sick too often.
 - D. When the margins on a piece of paper are diminishing in size, the paper should be returned to the store for a full refund.
2. Maria Sanchez is trying to decide whether or not to hire a new worker at her day care center. The salary, benefits, and other costs of hiring the worker are \$5,000 per month. Maria should hire the worker if:
 - A. Hiring the worker would allow Maria to bring in less than \$5,000 in extra revenues per month.
 - B. **Hiring the worker would allow Maria to bring in more than \$5,000 in extra revenues per month.**
 - C. The marginal costs of hiring the worker are greater than the marginal benefits.
 - D. The worker is willing to work at a job — such as staffing the day care cafeteria — located on the outside or margins of the day-care property.

ESSAY QUESTION

Define *labor productivity*. Describe factors that can make workers more productive.

(Labor productivity is the amount of output that a worker produces during a given time period, such as an hour or a year. Some factors affecting labor productivity [mentioned in the lesson] are education and training, more and better capital goods to work with, and better technology.)



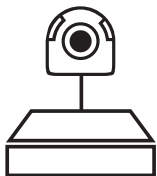
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Visual 1

VALENTINE'S DAY GREETING CARD
PRODUCTIVITY DATA

1. Number of Workers	2. Number of Cards Produced (in two minutes)	3. Labor Productivity (# of cards produced in two minutes divided by # of workers)
1		
2		
3		
4		
5		
6		
7		
8		

Labor Productivity: The amount of output per worker during a certain time period.

(In the example above, the output was greeting cards and the time period was two minutes.)



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Visual 2

DIMINISHING MARGINAL RETURNS AND THE DEMAND FOR LABOR

The law of diminishing marginal returns states that:

As more of a variable resource is added to a fixed resource, the marginal (additional) output from the variable resource will eventually decline.

Example: Output: greeting cards
 Variable resource: workers
 Fixed resources: 1 scissors, 2 markers

1. Number of Workers	2. Number of Cards Produced	3. Marginal Product of Labor	4. Value of Marginal Product (Price = \$2)
0	0	—	—
1	4	4	\$8
2	9	5	\$10
3	15		
4	20		
5	24		
6	26		
7	27		
8	27		

Diminishing marginal returns first occurs with the _____ worker.

The selling price of each card is \$2.00.

The only cost the business has is paying each worker \$5.

How many workers would the business be willing to hire? _____