
Lesson 6 - The Economic Way of Thinking: Three Activities to Demonstrate Marginal Analysis

INTRODUCTION

Economics

In economics, *marginal* refers to one more unit of something. Marginal analysis has many applications and is useful in both personal and social decision making. Should a firm produce a few more or a few less units of output in order to maximize its profits? Should a consumer buy a bit more of this and bit less of that to be as satisfied as possible with the expenditure? Is the marginal or additional value to a firm of hiring more workers greater than the marginal or additional cost of hiring those workers? These are examples of decisions applying marginal analysis.

Another common use of the term marginal in economics has to do with *diminishing marginal returns*. When capital resources are fixed, the law of diminishing marginal returns predicts that the productivity of labor will eventually fall as additional (marginal) workers are used in the production process. Similarly, the law of *diminishing marginal utility* predicts that marginal value or satisfaction will decrease as additional units of a good or service are consumed.

Reasoning

Comparing marginal benefits with marginal costs is an important part of the economic way of thinking and leads to rational decision making for consumers, firms and governments. Choices are rarely all-or-nothing propositions but usually concern marginal or incremental changes. Rational economic decision making says that if the marginal benefits of an action are greater than the marginal costs, the action should be undertaken. If the marginal costs are greater than the marginal benefits, the action should not be undertaken. Economists often state these rules by saying that actions should be undertaken until the marginal benefits are equal to the marginal costs.

CONCEPTS

Diminishing marginal returns
Diminishing marginal utility
Marginal analysis
Marginal benefits and marginal costs
Opportunity cost
Scarcity
Specialization and division of labor

CONTENT STANDARDS

2. 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.
6. When individuals, regions and nations specialize in what they can produce at the lowest cost and then trade with others, both production and consumption increase.
17. Costs of government policies sometimes exceed benefits. This may occur because of incentives facing voters, government officials and government employees, because of actions by special interest groups that can impose costs on the general public, or because social goals other than economic efficiency are being pursued.

OBJECTIVES

Students will

1. Participate in or observe a production activity to understand the law of diminishing marginal returns.
2. Participate in or observe a consumption activity to understand the law of diminishing marginal utility.
3. Participate in or observe an activity relating to environmental cleanup to understand the importance of comparing marginal benefits with marginal costs.

LESSON DESCRIPTION

This lesson consists of three activities that demonstrate different applications of marginal analysis. You may use the activities separately or do them together in one class period. In the first activity, the students produce a good and demonstrate the law of diminishing marginal returns. In the second activity, a student consumes a good and demonstrates the law of diminishing marginal utility. In the third activity, the students participate in an environmental-cleanup project that demonstrates the importance of comparing marginal benefits with marginal costs when making decisions.

TIME REQUIRED

Each of the three activities takes about 20 minutes.

MATERIALS

Fluffernutter Production Activity

1. Visuals 6.1 and 6.2
2. A large jar of peanut butter, a large jar of marshmallow cream, a large box of graham crackers, two sturdy knives, a package of paper plates and a roll of paper towels

Diminishing Marginal Utility Activity

1. Visual 6.3
2. A supply of water and a small paper cup (to hold about two or three ounces)

“How Clean Is Clean Enough?” Activity

1. Visuals 6.4 and 6.5
2. A very dirty small rug or carpet sample: Stain with grape juice or coffee. Grind in things such as dust, coffee grounds and sand. Cover with crushed leaves and confetti from a hole-punch. Sprinkle with items such as soda bottles and cans. Some items should be easy to clean and others difficult or impossible to clean.
3. A pile of play money or beans or some other item to represent money

4. Several plastic grocery bags
5. Plastic gloves

PROCEDURE

FLUFFERNUTTER PRODUCTION ACTIVITY

1. Announce that the class will observe an important economic law by watching or participating in a simple production activity. At a small desk or table at the front of the room, demonstrate how to produce a fluffernutter using the following steps:
 - A. Break a large graham cracker into smaller rectangles.
 - B. Spread one rectangle with peanut butter using one knife. Emphasize that the students must use knives to spread the peanut butter and marshmallow cream, i.e., they cannot use crackers to spread the materials on other crackers.
 - C. Spread another rectangle with marshmallow cream using another knife.
 - D. Stack the two rectangles together to make a fluffernutter and place it on a paper plate.

Students may produce other products such as paper pizzas or greeting cards instead of fluffernutters. The important thing is to have one or more fixed factors of production, such as knives and table size in the fluffernutter example.
2. Select a student volunteer to come to the front of the room and be a fluffernutter-maker. Appoint a quality-control inspector and a timekeeper with a loud voice and a watch. Tell the student to make as many fluffernutters as possible in exactly one minute. When the minute is up, ask the quality-control inspector to quickly inspect the products and to separate finished, acceptable fluffernutters from those that are unacceptable or unfinished. (You may want to discuss acceptable quality-control standards, as sometimes inspectors have a tendency to be too picky.) Remove both finished and unfinished fluffernutters from the table.

3. Display Visual 6.1 and fill in the second row, which corresponds to one worker. Record in the second column the number of acceptable fluffernutters the student produced. Read the definition of marginal output, and fill in the marginal output in the third column. For example, if the student produced two acceptable fluffernutters, total output would be two and marginal output would also be two, since total output changed from zero to two.
4. Ask the fluffernutter-maker to select another student to join in the production process. Tell them to make as many fluffernutters as they can in one minute. When the minute is up, ask the quality-control inspector to determine how many acceptable fluffernutters the students produced. Fill in the next row on Visual 6.1. Set aside both finished and unfinished fluffernutters in another part of the room.
5. Repeat step four several more times, adding one worker at a time. Conduct enough rounds until diminishing marginal returns have clearly set in. (This occurs when the numbers in the third column begin to decrease.) During the additional rounds, do not give workers additional knives or allow them to change the size of the workspace. However, they should be allowed to wipe off their hands between rounds with the paper towels if they so request. (Making fluffernutters can be messy.) Be sure to remove finished and partially finished products between rounds.
6. **Increasing Marginal Returns:** When you have finished the desired number of rounds, pass around the fluffernutters for the students to sample. Ask how specialization and division of labor affected total output. *Probably as more students were added to the production process, at first they specialized and divided tasks to become more efficient. This most likely caused total output to increase and increasing returns to set in. Increasing returns occur when the numbers in the third column increase, indicating that a marginal or additional worker adds more to total output than the prior worker.*
7. **Diminishing Marginal Returns:** Ask the students to look at column three on Visual 6.1, showing marginal output. Ask why marginal output eventually decreased. *Answers will vary. Someone will eventually suggest that there weren't enough knives for additional students, and they were becoming crowded, so adding more workers didn't lead to as much additional (marginal) output.*
Note: If the numbers your class generated do not clearly show diminishing marginal returns, you may want to evaluate the following production numbers for zero to six workers from another class. Total product: 0, 2, 5, 9, 12, 13, 13. Marginal product: first worker 2, then 3, 4, 3, 1, 0. In this case, increasing returns occur with the second and third workers, and diminishing returns set in with the fourth worker.
8. Tell the students they have observed the law of diminishing marginal returns, which occurs with production processes when at least one resource is fixed. Display Visual 6.2 and discuss how the law was demonstrated with fluffernutter production. The variable resource was the number of workers. Fixed resources were the number of knives and the size of the workspace (the table or desk). As more and more workers were added, the additional fluffernutters produced per additional worker eventually declined, as shown in column three. In the example given in step seven where marginal output is 2, 3, 4, 3, 1, 0, diminishing marginal returns set in with the fourth worker (because three is less than four). This occurred because of the fixed resource – the knives – and not because the fourth worker was lazy or incompetent compared with the others.

9. **(Optional)** You may want to discuss how diminishing marginal returns relate to the number of workers a firm will hire. This depends on the selling price of the product and the wages and other costs of hiring workers, as well as the marginal product of labor. As long as hiring a marginal or additional worker brings in more benefits than costs to the firm, he or she will be hired, even though diminishing marginal returns have set in.

DIMINISHING MARGINAL UTILITY ACTIVITY

1. Display a large bottle or pitcher of water and ask if anyone is thirsty. Select a student volunteer to come to the front of the room to both quench his or her thirst and demonstrate an important economic law.
 - A. Fill a small cup with water. The student may refill the cup and drink as much water as he or she wants.
 - B. On the board or overhead projector, quickly write one column of numbers from 1-15 for each cup of water the student chooses to consume. Then label another column for the student's satisfaction with each additional (marginal) cup of water consumed.
 - C. Each time the student finishes drinking a cup of water, have him or her state the overall satisfaction or utility received from drinking that water on a scale of one to 10. You or the student should record the number on the board or overhead projector. For example, if the student is very thirsty and the first cup of water is very satisfying, record a 10. If the second cup is very satisfying but not as satisfying as the first, record an eight and so on.
 - D. Continue to record the number that shows the satisfaction the student receives from consuming each subsequent cup of water. Encourage the student to drink enough water so his or her satisfaction level decreases, but allow him or her to stop whenever he or she wants.

2. When the student has finished, discuss what happened. Point out that the numbers recorded in the second column represent the marginal value (additional satisfaction or utility) from each marginal (additional) cup of water. No doubt the student's level of satisfaction will have decreased as he or she consumed more and more water. For example, the satisfaction levels may have been 10, 9, 6, 4, 2, 1. This demonstrates the law of diminishing marginal utility.

3. Display and discuss Visual 6.3, "The Law of Diminishing Marginal Value" (often called diminishing marginal utility). Discuss the definition with the students and explain how it relates to the activity. Ask the students to evaluate this statement: "You **can** have too much of a good thing." *Answers will vary. The idea is that because of diminishing marginal utility, eventually people will choose to consume more of another good rather than increasing amounts of the first good, even if they really like the first good a lot.*
4. **(Optional)** You may want to point out that diminishing marginal value is one of the reasons underlying the downward-sloping demand curve. Point out that the levels of satisfaction the student recorded may indicate his or her willingness to pay for additional glasses of water. Consumers generally receive less satisfaction from additional units of a good consumed and therefore are willing to pay less for additional units. This is what a downward-sloping demand curve reflects, with price on the vertical axis and quantity on the horizontal axis.

"HOW CLEAN IS CLEAN ENOUGH?" ACTIVITY

1. Before class begins, prepare a dirty rug as described under Materials. Place the rug where the students can see it when they enter the classroom.

2. Display Visual 6.4, “Environmental Statements.” Ask how many students agree with Statement 1 and how many agree with Statement 2. Ask a few students to explain their answers.
3. Remind the students that productive resources are scarce. Show the class the pile of play money (or beans) and say it represents the annual budget of a local government. Ask the students to suggest uses for the money, and write their suggestions on the board. *Answers will vary, but may include education, police and fire protection, salaries for those who work for the government and programs for the poor.*
If the students do not suggest “cleaning the environment” as an alternative, add this to the list.
4. Quickly divide the money into piles representing possible expenditures on the different categories suggested. Have about eight or 10 pieces of money in the pile for cleaning the environment.
5. Tell the students you will conduct a classroom experiment involving the use of scarce resources and cleaning the environment. Ask for two student volunteers to help clean the dirty rug, which represents a polluted lake. The students will have 20 seconds to make the rug as clean as they can. They must pick up the trash and deposit it into a bag. To make the experiment work, tell the students they cannot simply pick up the rug and pour off the trash into the bag. Also, they cannot use pieces of trash to sweep away, collect or pick up other pieces of trash. They are to use only their hands to pick up the trash. You may give them plastic gloves to wear if you want. Appoint a timekeeper with a watch that shows seconds. Have the rest of the class sit or stand so they can observe the cleanup. At the end of 20 seconds, look at the bag of trash the students collected and the trash that remains on the rug. Ask the class if they think the rug is clean. Most will say no. Pay the student volunteers for their work with some of the play money from the pile designated for cleaning the environment.
6. Conduct four or five more 20-second rounds, each time giving the student volunteers a new bag, paying them the same amount of play money as in the first round, and asking the class if they think the rug is clean. It will be clear that the bags of trash the student volunteers collect are decreasing with each round, although the cost in terms of the money spent is the same. When the play money in the clean-the-environment pile is gone, ask the students if they believe it is worth it to continue cleaning the rug. Ask what it would take to completely clean the rug. *Answers will vary. Some students will probably say the rug is clean enough, while others will say the environment should be perfectly clean.*
7. Point out that continuing to clean the rug (lake) means resources will have to be allocated from other uses the class listed earlier. Ask the students to identify the opportunity cost of cleaning the environment in terms of what they must give up.
8. Display Visual 6.5. Tell the students that the economic way of thinking requires measuring the marginal (additional) benefits of an action with the marginal (additional) costs. *Students may ask what to do if the marginal benefits are just equal to the marginal costs. Technically, the decision maker would be indifferent at this point. But economists often state the rule as doing something until the marginal benefits equal the marginal costs, because you wouldn't stop before this point or go beyond this point.*
9. In this experiment, the marginal benefits – reducing pollution – were measured by the amount of trash collected during each 20-second round. The marginal costs were

measured by the payout to the students who cleaned the rug. The costs are opportunity costs, as money used to clean the environment could also be used for other things. Discuss issues such as these:

A. Given that the marginal benefits (the amount of trash collected) decreased with each round, might there come a time when the marginal costs of cleaning the rug (or the environment) were greater than the marginal benefits?

B. In the extreme, what if the last bit of pollution in the lake were doing very little harm and it would be very, very expensive to locate and remove it? Could the money be better spent to improve schools or provide more police protection?

10. Display Visual 6.4 again and ask how many agree with Statement 1 and Statement 2. ***Probably more students will agree with Statement 2 than before.*** Emphasize that the point of the activity is to compare marginal benefits and marginal costs when deciding whether or not to do something. The point is *not* that a clean environment is not desirable.

CLOSURE

Review the idea with the students that the economic way of thinking requires *thinking at the margin*. Marginal analysis refers to evaluating what happens with one more unit of something. Ask the students to apply the concept to this example: Should they decide to sleep one additional hour tonight? ***Answers will vary. Responses should include comparing the benefits of the additional sleep to the costs. The costs are opportunity costs and reflect the next best use of the student's time. If the benefits of the additional sleep are greater than the costs, they should sleep. If the costs – for example studying for a test – are greater than the benefits, they should study instead.***

VISUAL 6.1
PRODUCTION TABLE FOR FLUFFERNUTTERS

Number of Workers	Total Output	Marginal Output of an Additional Worker*
0	0	--
1		
2		
3		
4		
5		
6		
7		
8		

*In economics, *marginal* refers to one more unit of something. The marginal output of an additional worker means the change in total output that occurs when one more worker is added to produce something. Economists often call this the *marginal product of labor*.

VISUAL 6.2

THE LAW OF DIMINISHING MARGINAL RETURNS

When more and more units of a variable resource such as labor are added to a fixed resource such as capital, eventually the additional (marginal) output associated with the variable resource declines.

The law of diminishing marginal returns is observed in production processes when at least one resource is fixed – that is, it can't change during the time period in question.

VISUAL 6.3

THE LAW OF DIMINISHING MARGINAL VALUE

In a given time period, consumers generally receive less satisfaction from additional (marginal) units of a good consumed.

In other words, the more you consume of something, the less you value one additional unit of it.

VISUAL 6.4
ENVIRONMENTAL STATEMENTS

Statement 1

Local Lake is a disaster. It was once a beautiful, clean lake where you could drink the water safely. Now it is dirty from overuse, soil runoff and overflow from septic tanks. The County Council should clean the lake completely: 100% clean. The technology and know-how are available. There is no excuse for not doing the job completely.

Statement 2

We can clean up most of the pollution in the lake for one-third of what it would cost to make it *completely* clean. It may be too costly to clean the lake completely. Resources are scarce. If the County Council overspends for the environment, it can accomplish less in other areas that are important, too.

VISUAL 6.5

MARGINAL BENEFIT/MARGINAL COST RULE

The Economic Way of Thinking

If the marginal (additional) **benefit** of an action is **greater than** the marginal (additional) **cost**,
DO IT!

If the marginal **cost** of an action is **greater than** the marginal **benefit**,
DON'T DO IT!