Learning Activity:
Westward Expansion and Marginal Productivity

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For a detailed description of this activity and a list of standards, please visit
stlouisfed.org/education/learning-activity-westward-expansion-marginal-productivity

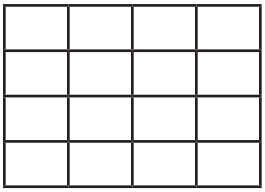
LEARNING Activity

Compelling Question

What economic incentives led Americans to move west in the nineteenth century?

Procedure

1. On the board, mark out the following grid. Or, if able, mark out the grid with tape using floor tiles as a guide. Place a sticky note labeled "100 bushels of apples" in each square. Distribute a copy of the handout to each student.



2. Ask for five volunteers. Instruct the rest of the class to follow along and fill in their handout. Explain that the grid represents a small eastern state with limited land. Invite the first volunteer to go the board or stand in the grid and explain that they were the first settler to farm, so they had the option and ability to use six squares for their orchard. Instruct "Farmer 1" to write their name in each of the six squares and take the sticky note showing how much they harvested. When Farmer 2 moves in, their ability is limited to farm only four squares. As more farmers move in, the total amount of land decreases, even if they can farm more. Farmer 3 will grow on three squares, Farmer 4 gets two squares, and Farmer 5 has one square to grow apples. Tell the class to fill in Table 1 for the eastern state like the one below:

Farmer 1	Farmer 1	Farmer 1	Farmer 3
Farmer 1	Farmer 1	Farmer 1	Farmer3
Farmer 2	Farmer 2	Farmer 4	Farmer 3
Farmer 2	Farmer 2	Farmer 4	Farmer 5

3. Ask each farmer how many bushels of apples they were able to grow. On the board, report how much each farmer harvested.

4. Explain that we can track production in three ways: the total amount produced by all farmers; the average amount each farmer produces; and the marginal amount, which is how many more bushels the last farmer contributed to the total crop for that state. On the board, fill in Table 2 for the eastern state and instruct the class to make their calculations on their handout. Remember, when calculating average productivity, divide the total bushels produced by the number of farmers. (Example: With the first two farmers, take the total bushels of apples—1,000 in this case—and divide by the total numbers of farmers: 1,000 ÷ 2 = 500.) To calculate marginal productivity, subtract the total amount from the last farmer from the one before. (Example: Farmer 2's marginal productivity is 1,000 – 600 = 400 bushels.)

	Total	Average Productivity	Marginal Productivity
Farmer 1	600	600	—
Farmer 2	1,000	500	400
Farmer 3	1,300	433 1/3	300
Farmer 4	1,500	375	200
Farmer 5	1,600	320	100
Farmer 6	1,600	266 2/3	0

5. Point out to the class that even though the total amount of bushels produced increases with each additional farmer, the average and, more importantly, the marginal production decreases. Ask students, "Why do both average and marginal production decrease?" (*Guide students to conclude that because land is limited in this state, there are fewer acres to grow apples as the population grows. Simply put, there is a problem of scarce land creating a limitation on production.*)

6. Ask students, "Could a sixth farmer make money in this state?" (*Students should respond that there is no land left for that potential farmer.*)

7. Invite students to imagine what might happen if there were more land available beyond the state we've previously created. Again, either on the board or using tape on the floor, outline a second state bordering the previous example. Place the same sticky note labeled "100 bushels of apples" in each square, as follows:

Farmer 7	Farmer 8	Farmer 9	Farmer 10
Farmer 7	Farmer 8	Farmer 9	Farmer 10
Farmer 7	Farmer 8	Farmer 9	Farmer 10
Farmer 11	Farmer 12	Farmer 13	Farmer 14
Farmer 11	Farmer 12	Farmer 13	Farmer 14
Farmer 11	Farmer 12	Farmer 13	Farmer 14

8. Ask for more student volunteers and explain to them that since land in this area is plentiful, each new potential farmer will get three squares to develop and that the land can still produce 100 bushels of apples per square. Repeat the process of having students sign up for or stand in the squares and collect sticky notes representing their production. Fill in Table 1 for the western state.

9. Tell students to fill in Table 2 for the western state on their handout and display the following calculations on the board:

	Total	Average Productivity	Marginal Productivity
Farmer 7	300	300	—
Farmer 8	600	300	300
Farmer 9	900	300	300
Farmer 10	1,200	300	300
Farmer 11	1,500	300	300
Farmer 12	1,800	300	300
Farmer 13	2,100	300	300
Farmer 14	2,400	300	300

10. Ask students, "Why are average and marginal productivity constant in the western state?" (*Students should respond that as each farmer settles, the amount of land and the bushels they produce stay constant.*)

11. Ask students, "If there were more land beyond the grid provided, what might potential workers do?" (*Students should say that for every new potential farmer, workers might continue to move further west where land is available.*)

12. Discuss with the class the situation of the sixth farmer who didn't have any land in the eastern state. Ask, "What could Farmer 6 do and what economic incentive will help them make their decision?" (*Farmer 6 could move west, as there is land to be developed and an economic opportunity to grow apples and make a living.*)

Assessment

1. "Do you think Farmer 5 in the original (eastern) state should stay where they are or move west?" (*Farmer 5 should move west, as they can produce only 100 bushels due to lack of land, whereas they could produce 300 bushels further west.*)

2. "Using evidence from the tables, which farmers in the eastern state would have an economic incentive to move west?" (*Farmers 4, 5, and 6 would have an incentive to move west, as their marginal productivity in the eastern state is below 300, which is how productive they could be after they move west.*)


Activity **MATERIALS**

Activity handout is on the following page.

Handout

Activity **MATERIALS**

Eastern State

Table 1: Land Distribution

NOTE: Each square can produce 100 bushels of apples.

Table 2: Agricultural Output

	Total	Average Productivity	Marginal Productivity
Farmer 1			
Farmer 2			
Farmer 3			
Farmer 4			
Farmer 5			
Farmer 6			

Western State

Table 1: Land Distribution

NOTE: Each square can produce 100 bushels of apples.

Table 2: Agricultural Output

	Total	Average Productivity	Marginal Productivity
Farmer 7			
Farmer 8			
Farmer 9			
Farmer 10			
Farmer 11			
Farmer 12			
Farmer 13			
Farmer 14			

Assessment

1. Do you think Farmer 5 in the original (eastern) state should stay where they are or move west? Explain.

2. Using evidence from the tables, which farmers in the eastern state would have an economic incentive to move west?