

Problem Set 7

Due Lecture 8 in class on paper

1. GLS Chapter 7, Question 1

(a) What is Jenny's opportunity cost of starting a business?

Her opportunity cost are the benefits that would be foregone if she invested in the business. Jenny's foregone benefits are her salary for the year: \$70,000.

(b) If Jenny can make an accounting profit of \$50,000 per year selling the organic groceries, should she start the business?

Jenny would earn more money working at her current job (\$70,000) than at the new business. If there are no additional benefits to Jenny from the new business, she should stay at the old job.

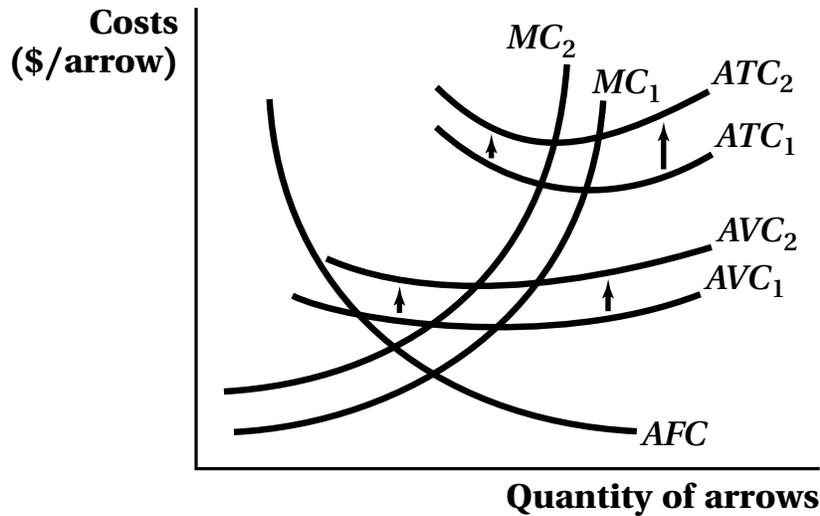
2. GLS Chapter 7, Question 10

See pictures below for original curves.

(a) Suppose that Congress imposes a 39-cent excise tax on each children's wooden practice arrow DMA sells. Illustrate the effects of this tax on the cost curves of DMA. Which curves shift upward and which do not?

Summary of effect on curves:

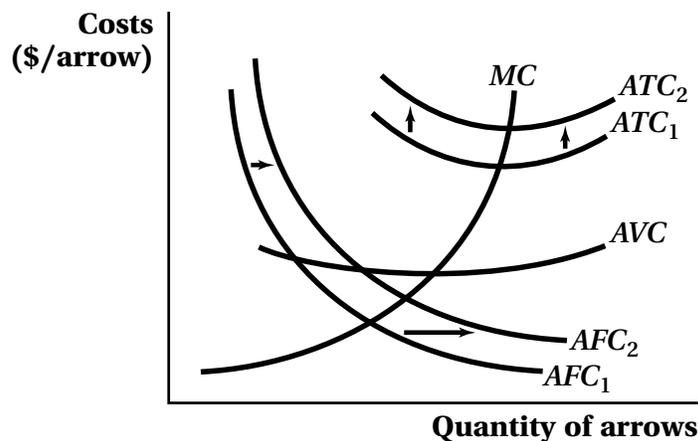
- Average variable cost: Shifts upward by 39 cents (per unit, so the whole curve shifts upward).
- Average fixed cost: Does not change.
- Average total cost: Shifts up by 39 cents per unit.
- Marginal cost: Shifts upward by 39 cents per unit.



(b) Suppose that the city where DMA produces arrows increases the annual property tax on DMA's factory from \$80,00 to \$150,000. Illustrate the effects of this tax on the cost curves of DMA. Which curves shift and which do not?

Summary of effect on curves:

- Average variable cost: Does not change.
- Average fixed cost: Increases by \$70,000.
- Average total cost: Increases by \$70,000 for any number of units produced.
- Marginal cost: Does not change.



The key to note about this problem is that the property tax is a fixed cost and the excise tax is a per-unit cost, which therefore affects variable and marginal costs. We should expect

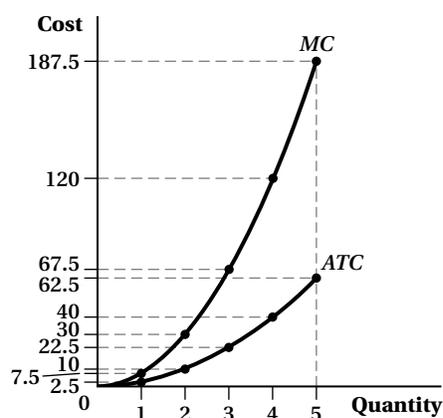
changes in fixed costs to have different impacts on firm choices than changes in variable costs.

3. GLS Chapter 7, Question 18

The cost function is $TC = 2.5Q^3$. Average total cost, ATC , is TC/Q , or $ATC = 2.5Q^3/Q$.

Unfortunately, I did not mean to assign this problem (I mean to assign number 13!) and you cannot find the marginal cost for this problem without knowing calculus. I apologize profusely for any trouble this caused. Knowing calculus, you can calculate $\frac{\partial TC}{\partial Q} = MC = 5Q^2$. You are not responsible for the MC portion of this problem.

The picture looks like this



(a) For which quantities does Mike's Bicycle Factory exhibit economies of scale?

A firm exhibits economies of scale if you double the costs of production and output more than doubles.

Suppose that we start with a total cost of 1. How much can you produce? If $TC = 1$, then we can write $1 = 2.5Q^3$, or $Q^3 = 1/2.5$, which implies $Q = (1/2.5)^{1/3} = 0.73$. At $TC = 2$, $2 = 2.5Q^3$, or $Q = (2/2.5)^{1/3} = 0.92$. That's surely not double! And as you keep increasing TC , this pattern holds.

Another way to see this is turn the picture above sideways in your head (or on paper, if you prefer), so that P is on the horizontal axis and Q is on the vertical axis. If you draw the picture this way (and to scale, not like the picture above), you can again see that if you double the horizontal axis value (P), you do not double the vertical axis quantity (Q).

(b) For which quantities does it exhibit diseconomies of scale?

A firm has diseconomies of scale if you double the cost of inputs, and the output less than doubles. You can see from the math above that this is the case for all values of $Q \leq 5$.

4. Fixed Costs and Variable Costs

Choose an industry.

(a) Over a 1-year period, which costs in that industry are generally fixed? Which are variable?

(b) Consider the marginal cost. Would the marginal cost be higher, lower, or the same if the production were increased slightly? Why do you think that?

One typed page should be more than sufficient to answer this question. To do a good job answering this question, you need to match the facts of the industry with the definitions we learned in class.