

OUTLINE — September 25, 2019

- Wrapping up Elasticity
- Firms' Supply Decisions
 - Accounting vs Economic Profit
 - Long Run and Short Run Decisions
 - Diminishing Marginal Returns
 - Costs of Production
 - Perfect Competition
 - Produce q where $MR=MC$ to maximize profit
 - Calculating Profit

Midterm #1: Wed 10/2, 7 pm. Read the old midterms yet?

PS2 due Thursday 9/26, gradescope & bcourses

Prep ahead: watch LR competitive equilibrium video b4 9/30

One handwritten 3x5 card allowed during exam

Total Revenue (TR) Effect

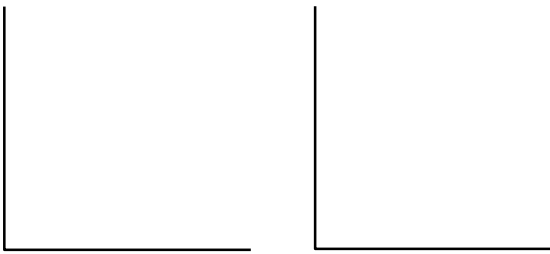
- What happens to total revenue when price rises?
 - TR (total revenue) = price * quantity
- *Price-Elastic Demand*
 - *very responsive, $\% \Delta Q > \% \Delta P$*
 - *Even a small $\uparrow P$ causes a big $\downarrow Q$, so TR falls*
- *Price-Inelastic Demand*
 - *not very responsive, $\% \Delta Q < \% \Delta P$*
 - *Even a big $\uparrow P$ causes just a small $\downarrow Q$, so TR rises*
- *Demand with Unitary Price Elasticity*
 - $\% \Delta Q = \% \Delta P$
 - Any $\% \Delta P$ causes same size $\% \Delta Q$, so TR doesn't change

Taxes & Deadweight Loss Elasticity Applications of Elasticity Profit

Surplus Depends on Price Elasticity

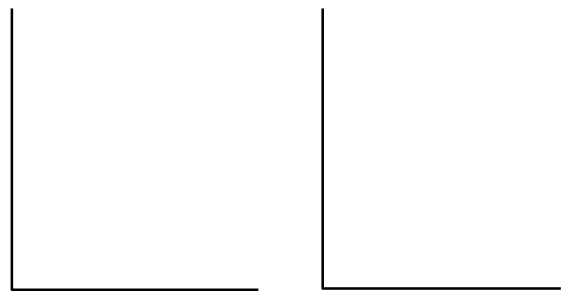
Price-Elastic demand
relatively little consumer surplus

Price-Inelastic demand
relatively much consumer surplus



Taxes & Deadweight Loss Elasticity Applications of Elasticity Profit

Burden of tax depends on Price-Elasticity



Taxes & Deadweight Loss Elasticity Applications of Elasticity Profit

Firms' Supply Decisions

- Question
 - Why does supply slope up?
- Assume
 - Goal of firms is to maximize profit

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Economic Profit

- Profit = **Total Revenue** — **Total Costs**
- Total Revenue (TR)
= Price * Quantity
- Total Costs (TC) include both
- 1) Out-of-pocket (explicit, accounting) costs
 - 2) **Opportunity (implicit) costs**

Keep in mind: there's a time frame, even if not stated explicitly. Per year, quarter, etc.

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Opportunity Cost of Capital

- Capital (machinery) costs you \$100,000
- What if your \$100,000 could earn 5 percent elsewhere
 - "Normal rate of return" = rate financial assets are earning
 - In this case, "normal rate of return" = 5 percent per year
- Here, Implicit cost of capital = 5% of \$100,000



Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Opportunity Cost of Labor

- You could earn \$60,000 per year working elsewhere
 - Opportunity cost of your labor = \$60,000 per year



©www.1231.com

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Accounting vs. Economic Profit

- Total annual revenue = \$100,000
- Annual accounting costs = \$45,000
- Your savings tied up in company = \$100,000
- Normal annual rate of return = 5 %
- Working elsewhere, you could earn \$60,000 per year

Accounting Profit =

Economic Profit =


Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

| Long Run | Short Run |
|--|--|
| <ul style="list-style-type: none"> ▪ Technique can be changed ▪ Entry & exit are possible <div style="margin-left: 40px;"> <p>Decision</p> <ul style="list-style-type: none"> Exit Stay in Industry </div> | <ul style="list-style-type: none"> ▪ Technique is fixed ▪ Entry & exit are impossible ▪ If planning to stay, or if not shutting down: Decision: how much to produce? ▪ If planning to exit: <div style="margin-left: 40px;"> <p>Decision</p> <ul style="list-style-type: none"> Produce Shut Down </div> |

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Production

- Yogurt Park's inputs?



Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Production

- Question
 - How does total output change when the variable input changes?
- Simplification
 - Two inputs: "capital" and "labor"
- Assume
 - "Capital" can't be changed in short run

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Total and Marginal Product

| # of workers | Total Product per day | Marginal Product |
|--------------|-----------------------|------------------|
| 0 | 0 | |
| 1 | 100 | |
| 2 | 220 | |
| 3 | 315 | |

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Law of Diminishing Returns


- As quantity of labor increases, *all else constant (that is, all **other inputs** held constant)*, marginal product decreases
- Better name might be
"Law of decreasing (but still positive) marginal product"
- Implication
To increase output by constant amount requires ever more labor (variable input)

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule


Diminishing Returns

- The point where diminishing returns "kicks in" depends upon the particular business

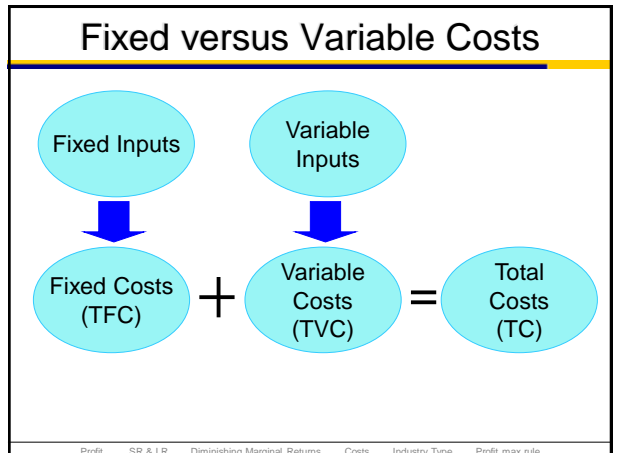
For Yogurt Park?
Maybe with the 3rd or 4th worker



For Costco?
Probably with the 50th or so worker




Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule




Short-Run: Produce how much?

- Depends upon



Costs of
Production



Price of
Output
- Assume: Goal = maximize profit

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

How much to produce?

- Already producing 1,000 units
- Should firm produce 1 more unit (to 1,001)?
 - For 1,001st unit Δ costs = \$1.00
 Δ revenue = \$1.10
- Already producing 2,000 units
- Should firm produce 1 more unit (to 2,001)?
 - For 2,001st unit Δ costs = \$1.15
 Δ revenue = \$1.10

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Marginal benefit vs marginal cost

- Compare marginal benefit & marginal cost
 - Ignore "sunk costs"
- MB > MC: do it**
- MB < MC: don't do it**
- MB = MC: that's the best you can do**

- Sleep one more hour?
- Change your major?

- Provide free vaccines?
- Produce more frozen yogurt?

- Profit Max: choose q where MR=MC**

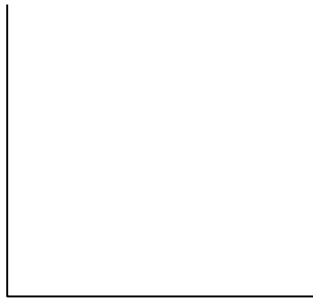
Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Marginal Cost

| q | TC | MC |
|---|-----|----|
| 0 | 70 | |
| 1 | 100 | |
| 2 | 120 | |
| 3 | 150 | |
| 4 | 190 | |

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Marginal Cost Curve



Marginal costs
increase
because
marginal returns
(product)
diminish

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Diminishing Returns & Marginal Cost

- Marginal Returns diminish
 - Because K is fixed, L must share a fixed amount of K
 - $\frac{\Delta \text{Output}}{\Delta \text{Variable input}}$ decreases as input increases
 - $\frac{\Delta \text{Variable Input}}{\Delta \text{Output}}$ therefore increases as output increases
- The marginal (additional) **cost** of producing 1 more unit of output is $\frac{\Delta \text{Variable Input} * \text{Cost of Variable Input}}{\Delta \text{Output}}$
 - Marginal cost increases as output increases because marginal returns diminish

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Costs: Marginal & Average

- ATC =
- MC =
- Marginal > Average?
- Marginal < Average?

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Marginal & Average Cost Curves



Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Type of industry?

- Until now, it doesn't matter
- Assume
 - **PERFECTLY COMPETITIVE** Industry
 - 1) Lots of firms
 - 2) Homogeneous product
 - 3) No barriers to entry or exit

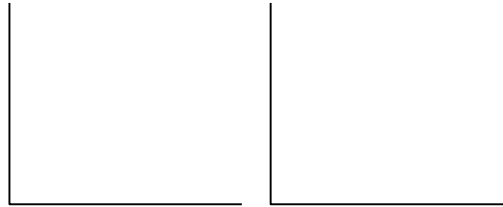
Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Perfectly Competitive Industry

- *Key idea:* Each firm faces a horizontal demand curve at the market equilibrium price

Market

Firm



Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Market determines the price



- Perfectly competitive firm can sell as much as it wants at market price
- Sell more? Additional revenue per unit = price
- Sell less? Lost revenue per unit = price

When price is constant, $MR = AR = p$

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Profit Max: choose q where $MR=MC$

- If $MR > MC$,
- If $MR < MC$,
- If $MR = MC$,



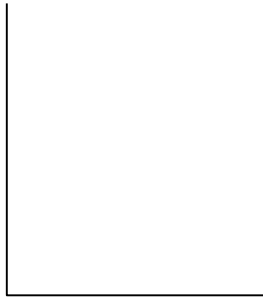
- *RULE:*
To maximize profit, produce q so that $MR = MC$

Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

How much Profit?

$$\pi = TR - TC$$

$$\pi = p \times q - ATC \times q$$



Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule

Economic Loss



Profit SR & LR Diminishing Marginal Returns Costs Industry Type Profit max rule