Econ 201: Introduction to Economic Analysis

September 30 Lecture: Profit Maximization and Supply in Perfect Competition

Jeffrey Parker
Reed College

Daily dose of The Far Side

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"You wanna have some fun, Fred? Watch. ... Growling and bristling, I'm gonna stand in front of the closet door and just stare."

Preview of this class session

- We define the characteristics of perfectly competitive market
- Firms are assumed to maximize economic profit = revenue minus economic cost
- Total revenue is price times quantity sold
- In competition, marginal revenue = price
- Firms maximize profit where MR = MC
- Competitive firm's supply curve is portion of MC curve above AVC
- We conclude by assembling the pieces of a perfectly competitive market in the short run

Competition, monopoly, and the real world

- **Perfect competition** and **pure monopoly** are "black and white" endpoints of spectrum
- Both are rarely seen in pure form
- Most of the world is "gray" in between
- Gray is hard to analyze, so we start with black and white and see if one of these is a reasonable approximation
  - Today we analyze perfect competition
  - After Monday's exam, we analyze pure monopoly
  - Then we consider market structures in the "gray area"

Perfect competition

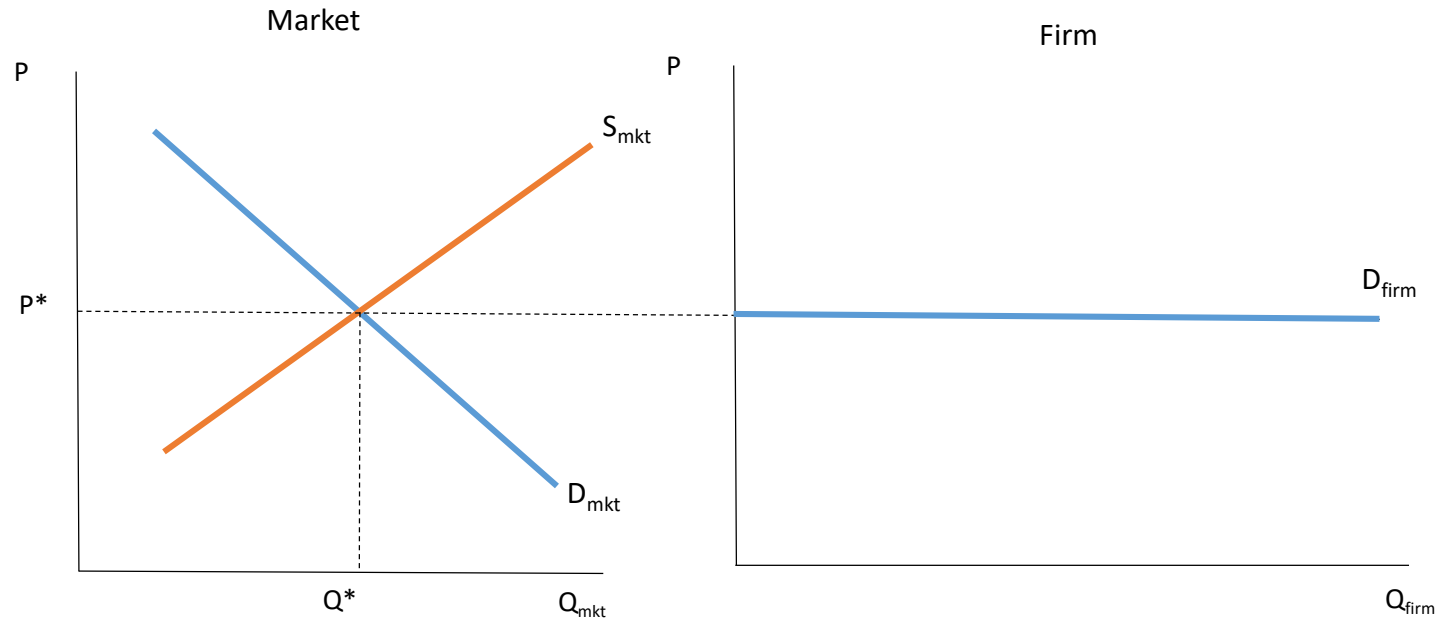
- Four **key assumptions of perfectly competitive market**
  1. Firms and consumers are price takers
  2. Product is homogeneous
  3. Entry and exit from market are free in long run
  4. Everyone has perfect information about price and product quality

- None of these is likely ever to be exactly satisfied in the real world
- Are they close enough?
- Does competitive market theory give reasonable picture?

Profit maximization

- **Economic profit** = revenue minus economic cost (opportunity cost)
  - Opportunity cost includes being in another industry
  - Zero economic profit = "**normal profit**" = same accounting profit that could be made in another industry
- Owners of firm want to **maximize profit**
  - This is fine as long as laws and competition channel this goal to positive outcome
  - Managers might have conflicting interest: principal/agent problems
- Evolution: In competition profit-maximizing firms make zero economic profit in long run
  - Firms not maximizing make economic losses and leave industry

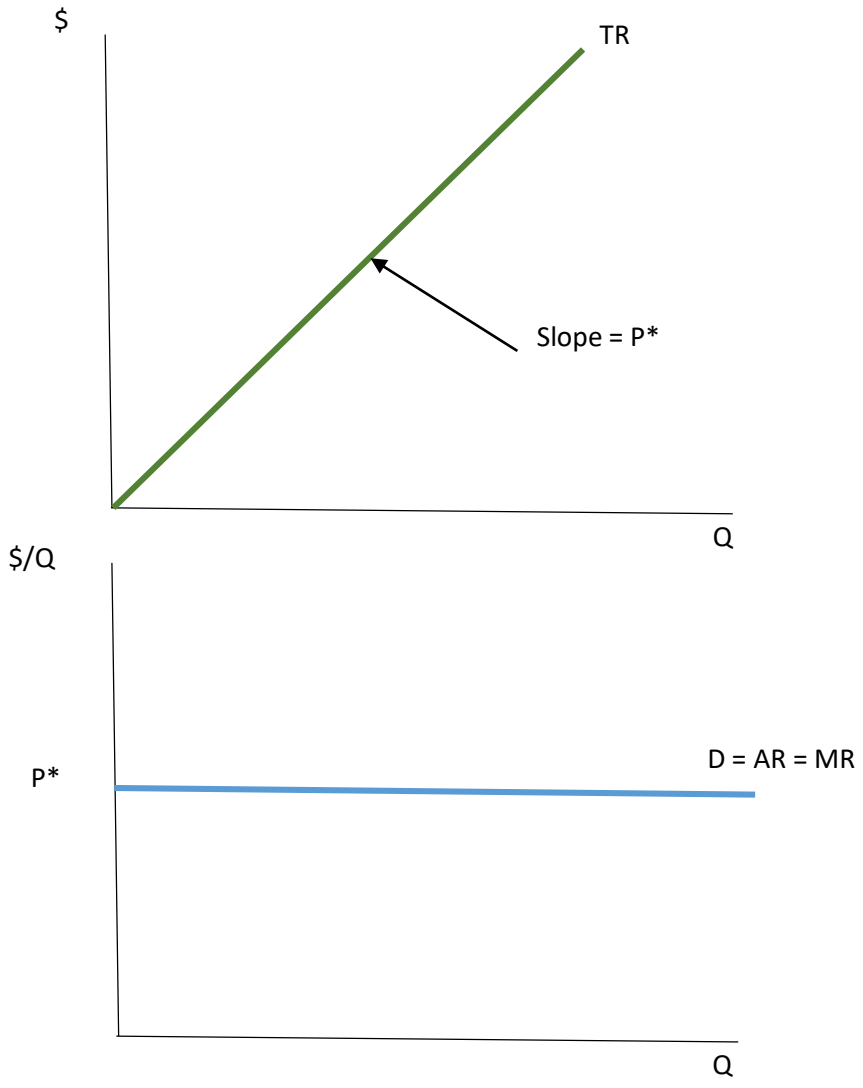
Competitive firm as price taker



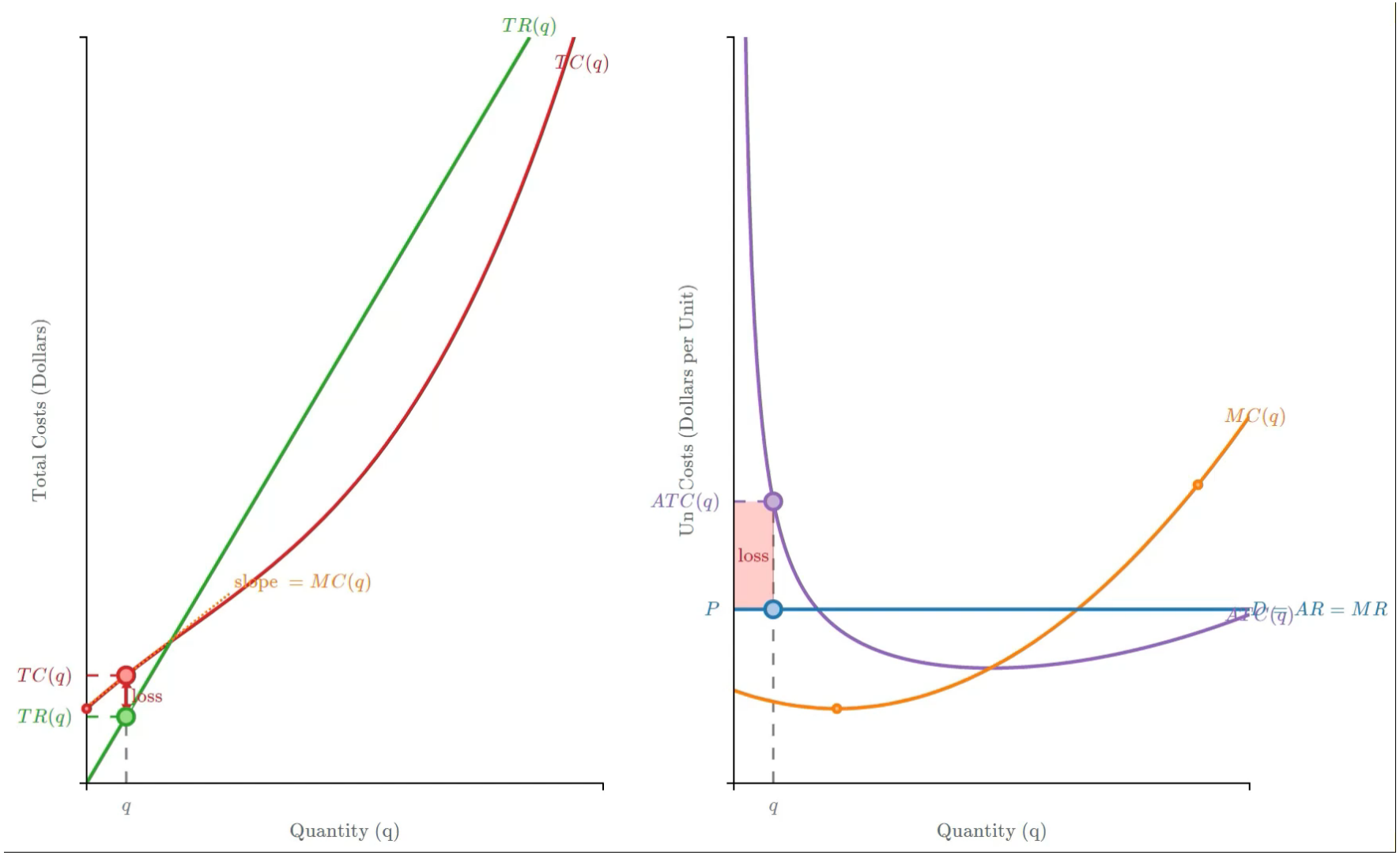
- As price taker, firm can sell as much as it wants at market equilibrium P^* but nothing at higher price
- **Firm's demand curve** is horizontal (perfectly elastic) at P^*

Total and marginal revenue

- TR = $R(Q) = P^* \times Q$
- TR curve is linear in Q with slope = P^*
- MR = $\Delta TR / \Delta Q = P^*$
- **Marginal revenue curve** for competitive firm coincides with horizontal demand curve (average revenue curve) at P^*
- To analyze firm's production decision, we compare revenue with cost using cost curves from last class
- **Profit = TR – TC**



Profit maximization in graphs



https://www.econgraphs.org/graphs/micro/market_structures/competitive_profit_max?textbook=varian

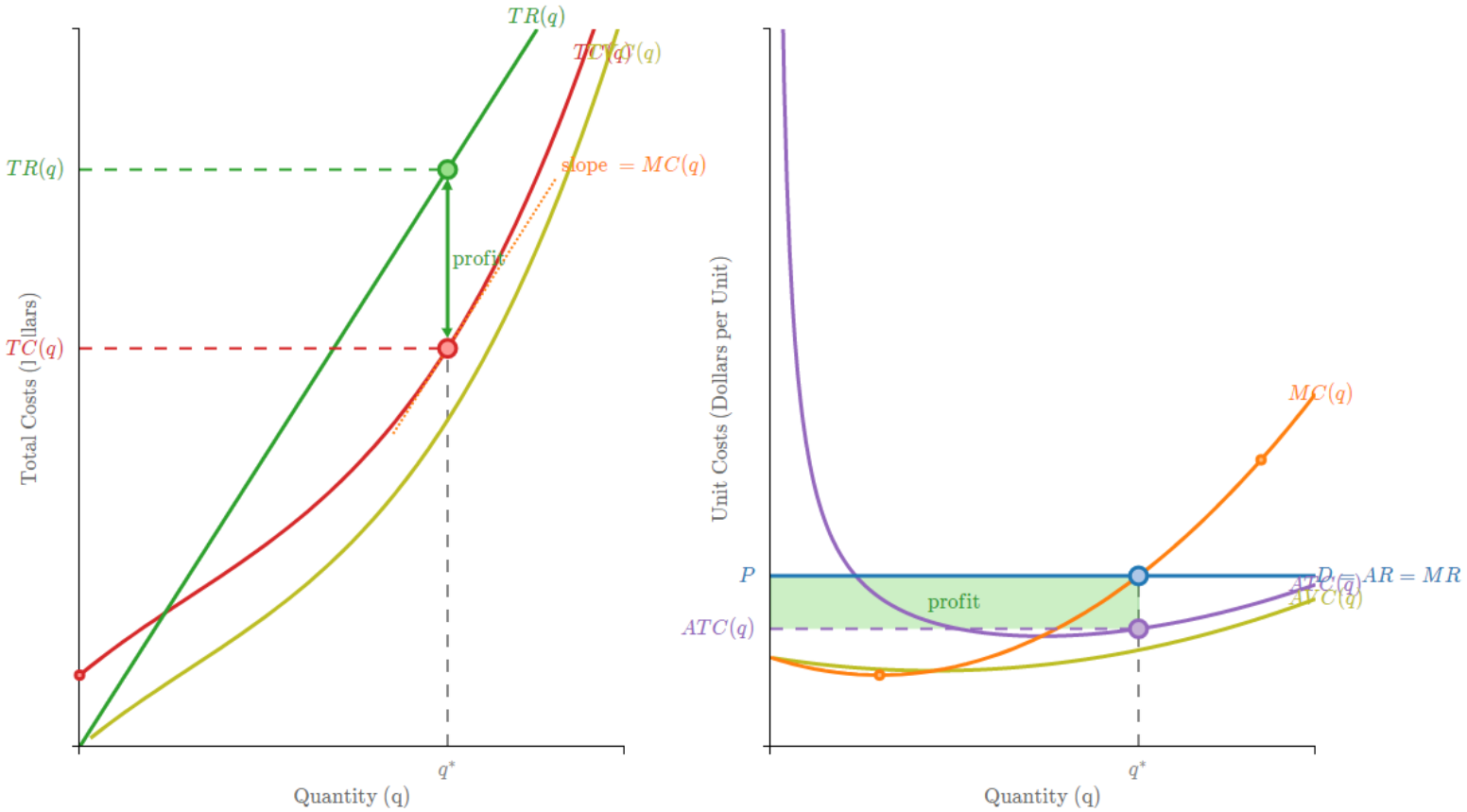
Profit maximization in words

- Firm maximizes profit (or minimizes loss) where **MR = MC**
  - This is general proposition that also applies to monopoly firms
- For competitive firm, MR = P^* so produce where ***P**** **= MC**
- If MR > MC at current output, producing an additional unit increases profit → increase Q to increase profit
- If MR < MC at current output, firm made a loss on last unit → reduce Q to increase profit
- Only where MR = MC will the firm not make more profit by raising or lowering Q, so this is the condition for profit maximization
- Profit/loss per unit = P^* – ATC at this output

Shut-down rule and firm's supply curve

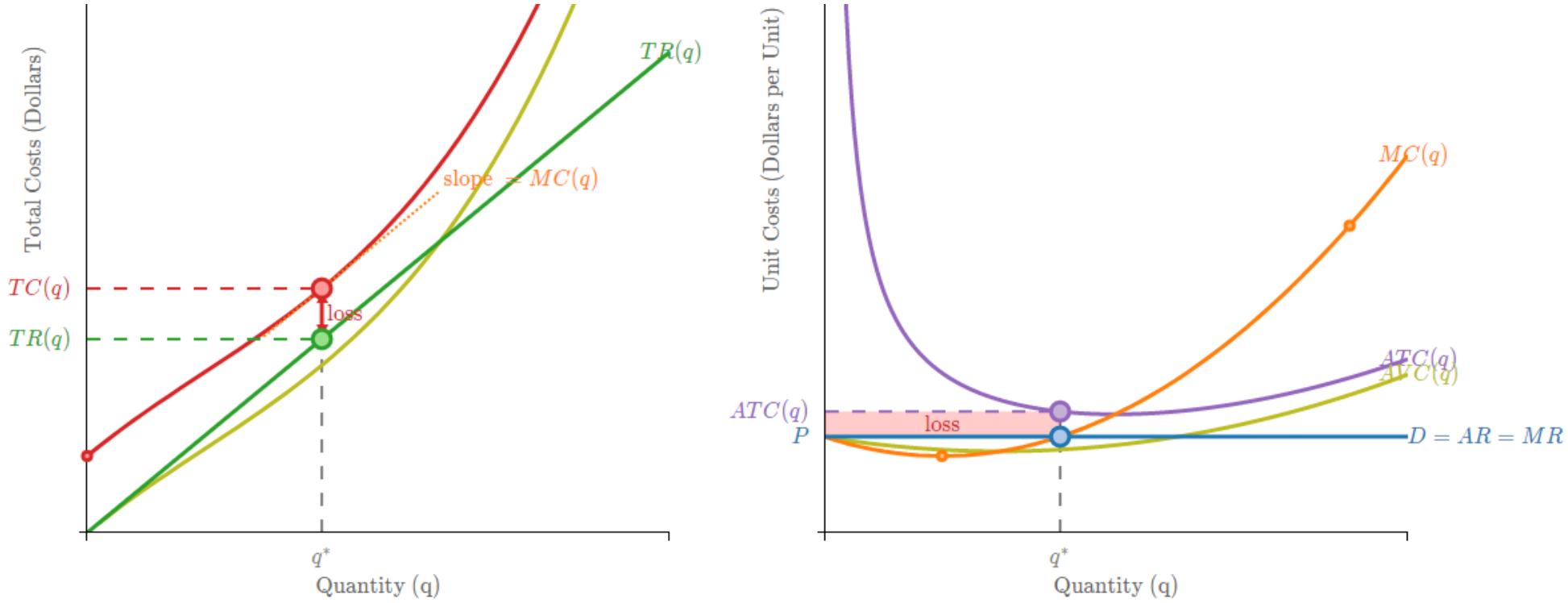
- What if firm makes a loss where MR = MC in short run?
- Firm cannot exit industry in short run to avoid its fixed cost
- It can shut down and avoid its variable cost
- **Shut-down rule**: Shut down (produce zero rather than producing where MR = MC) unless:
  - Total Revenue > Variable Cost
  - Price > Average Variable Cost
- Firm's supply decision: **Produce where *P** = MC as long as *P** > AVC**
- **Firm's supply curve**: Portion of MC curve above AVC

Profitable equilibrium



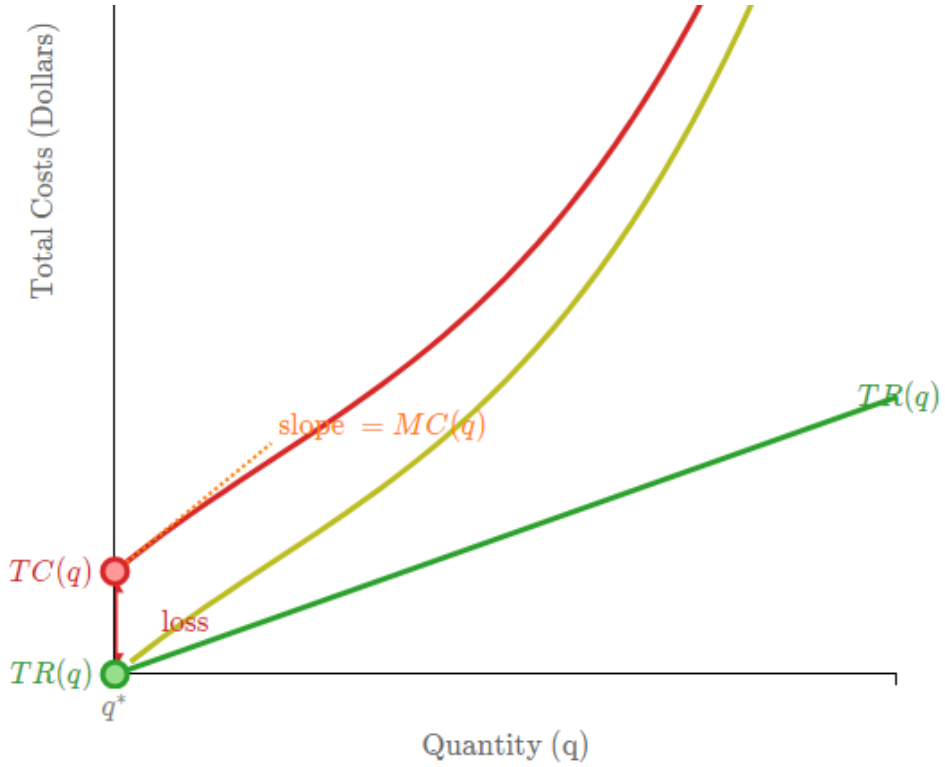
- MR intersects MC above ATC; firms should produce where P = MC
- Profit is TR – TC on left, area of green box on right

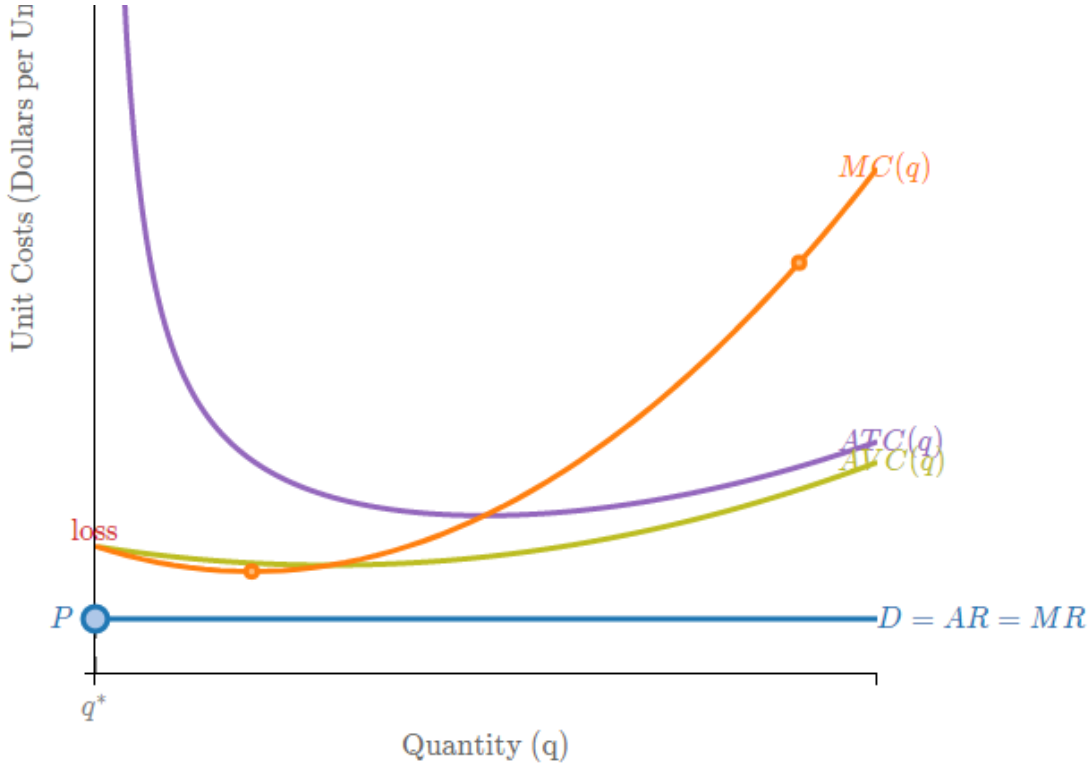
Loss-making equilibrium: stay open



- Lower price: Loss is TC – TR on left, red area on right
- Firm should **stay open** because P > AVC, so loss < FC

Shut-down equilibrium





- Even lower price: Loss is smallest on left at $Q = 0$
- Firm should **shut down** because P < AVC, so loss > FC

Firm supply, industry supply, producer surplus

- Each firm in competitive industry has supply curve = MC curve above AVC
- Aggregate all firms' supply curves (horizontally) to get **market supply curve**
- Market supply and market demand determine P^*, which determines each firm's production level on its MC
  - Because the market supply curve is horizontal sum of all the MC curves, the sum of all firms' production at P^* equals market equilibrium output Q^*
- **Producer surplus** in market = revenue – variable cost = profit + fixed cost

Overview of competitive market

- Demand-side givens: preferences, incomes, prices of other goods
  - Derive each consumer's demand curve
  - Aggregate to market demand curve
- Supply-side givens: production functions of firms, prices of inputs
  - Derive each producer's cost curves
  - Individual firm's supply is MC above AVC
  - Aggregate to market supply curve
- Equilibrium price is at intersection of market demand and supply
- Applying this price to each buyer and seller gives each one's quantity bought and sold

Comparative statics: Change in “givens”

- Increase in demand (preferences, incomes, other prices):
  - Market price rises
  - Firms increase output along their MC curves
  - New equilibrium at higher price and quantity
- Improvement in production technology
  - Less input needed to produce output
  - Cost curves (including MC) shift down; firms’ supply curves shift down and out to right
  - Industry supply increases, price falls, quantity demanded increases at new equilibrium
- Increase in input prices
  - Cost curves (including MC) shift up; industry supply shifts left as above

Review

- Economic profit
- Concept of profit maximization
- Total and marginal revenue curves for competitive firm: MR = market price
- Profit maximization: where MR = MC if P > AVC
- Shut down if P < minimum of AVC
- Supply curve is MC curve above AVC
- Interaction of demand and supply in competitive equilibrium

Daily diversion

What is the logic behind the following numerical sequence? (No fair using the Internet!)

8, 5, 4, 9, 1, 7, 6, 10, 3, 2

What comes next?

- Friday is final class before exam
- We extend this analysis to long run, when firms can
  - Enter or exit market
  - Vary fixed inputs
- We characterize long-run equilibrium in competitive market and long-run supply curve
- Case study on Washington sales tax for Friday