EC 360: Industrial Organization
Lecture 1 - firms and profit maximization

Brett Garcia

What is IO?

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  - We care about all industries and markets
  - Each industry operates in a slightly different way

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- “Industrial organization is concerned with the workings of markets and industries, in particular the way firms compete with each other” - Luis Cabral
  - We care about all industries and markets
  - Each industry operates in a slightly different way
- Our main unit of observation will most commonly be the firm
  - We want to determine the legality of firm actions as it relates to welfare
  - We will develop a measure of **economic efficiency**
  - We’ll apply simple game theory when needed

This class

- We will focus on a subfield of industrial organization called **antitrust economics**
  - Antitrust economics is concerned with studying, measuring, and detecting **non-competitive** behavior
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  - Antitrust economics is concerned with studying, measuring, and detecting **non-competitive** behavior
  - Examples include monopoly behavior, collusion, price discrimination
- Antitrust behavior is generally illegal
  - We'll discuss why as well as exceptions to the laws

Market power

- Analyzing antitrust behavior relies on market power
  - **Market power** is the ability a firm has to set prices above marginal cost while still being able to sell goods
  - Varies greatly between industries
  - Varies greatly between products within the same industry

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  - **Market power** is the ability a firm has to set prices above marginal cost while still being able to sell goods
  - Varies greatly between industries
  - Varies greatly between products within the same industry
- Economists have methods to measure market power
  - We'll develop a quantitative measure of market power

Market power: example 1

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Drug Goes From $13.50 a Tablet to $750, Overnight

By ANDREW POLLACK SEPT. 20, 2015

Specialists in infectious disease are protesting a gigantic overnight increase in the price of a 62-year-old drug that is the standard of care for treating a life-threatening parasitic infection.

The drug, called Daraprim, was acquired in August by Turing Pharmaceuticals, a start-up run by a former hedge fund manager. Turing immediately raised the price to $750 a tablet from $13.50, bringing the annual cost of treatment for some patients to hundreds of thousands of dollars.

“What is it that they are doing differently that has led to this dramatic increase?” said Dr. Judith Aberg, the chief of the division of infectious

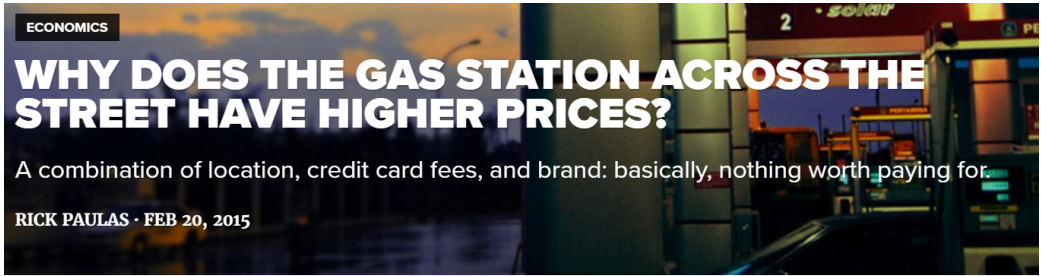
Market Power: example 1

Although some price increases have been caused by shortages, others have resulted from a business strategy of buying old neglected drugs and turning them into high-priced "specialty drugs."

Cycloserine, a drug used to treat dangerous multidrug-resistant tuberculosis, was just increased in price to $10,800 for 30 pills from $500 after its acquisition by Rodelis Therapeutics. Scott Spencer, general manager of Rodelis, said the company needed to invest to make sure the supply of the drug remained reliable. He said the company provided the drug free to certain needy patients.

In August, two members of Congress investigating generic drug price increases wrote to Valeant Pharmaceuticals after that company acquired two heart drugs, Isuprel and Nitropress, from Marathon Pharmaceuticals and promptly raised their prices by 525 percent and 212 percent respectively. Marathon had acquired the drugs from another company in 2013 and had quintupled their prices, according to the lawmakers, Senator Bernie Sanders, the Vermont independent who is seeking the Democratic

Market power: example 2



Market power: example 2

There are location issues to consider. The $3.19 price is from a Shell station positioned across from the newly opened Kaiser Permanente hospital and adjacent to the ritzy strip of Piedmont Avenue. That's solid real estate. But that $2.49 price from a Quik Stop? They have a lock on all the traffic coming down the heavily used MacArthur exit off I-580. The price difference between the two stations—even if you were looking through the location-location-location explanatory lens—shouldn't be 70 cents a gallon. What does Shell have to say about this?

"While the name on the sign reflects the brand of the motor fuel being sold on the premises," says Shell spokesperson Kimberly Windon, "the convenience store and the day-to-day site operations are the legal responsibility of the wholesaler, site owner, and/or operator who make their own operating decisions including setting gasoline prices as they believe appropriate."

"YOU BUY CHEVRON, AND THEY SAY THEY PUT TECH-SOMETHING IN THERE, THEY PUT IT IN ALL OF THEIR ADVERTISING. BUT THERE'S VERY LITTLE DIFFERENCE BETWEEN GASOLINES."

Market power: example 3

The New York Times

The U.S. Tried to Build a New Fleet of Ventilators. The Mission Failed.

As the coronavirus spreads, the collapse of the project helps explain America's acute shortage.

Market power: example 3

- The government funded a small firm, Newport Medical Instruments, to create an inexpensive ventilator
  - A big company, Covidien, produced more expensive ventilators
  - Fearing competition from the inexpensive ventilators, Covidien purchased Newport Medical Instruments and shut down the project

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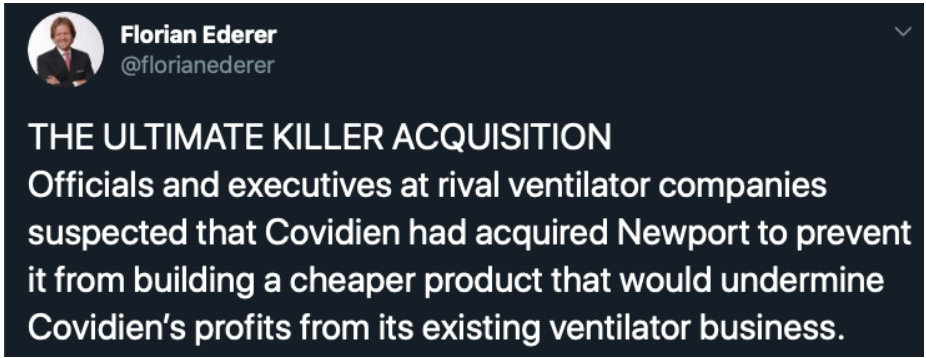
- "Firms have incentives to acquire innovative targets to discontinue the development of the targets' innovation projects and preempt future competition"
  Cunningham, Ederer, and Ma (2019)
  - These types of acquisitions have been termed "killer acquisitions"
  - As a society, should we be concerned about these types of acquisitions?

Market power: example 3



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- Policy creation
  - Subsidies for startups
  - Price ceilings

Market power: regulation

- Industry regulation
  - Laws against monopolization
  - Merger laws

Market power: how does it happen?

- **Predatory pricing**
  - Pricing below costs in order to drive out competition, with the intent of raising prices above costs once the market is less concentrated

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  - Pricing below costs in order to drive out competition, with the intent of raising prices above costs once the market is less concentrated
- Example: American Airlines in the Dallas-Fort Worth hub
  - American Airlines cut their prices until they drove out three smaller airlines
  - Raised prices once all other airlines were gone

Market power: how does it happen?

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  - All of these railroads have some ability to set their own prices

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- Example: the US ski industry
  - Building chairlifts is very expensive
  - A handful of firms and lack of competition results in market power

Market power: how does it happen?

- **Legal protection**
  - Patents are awarded to firms that innovate and create new products
  - Patents have a 20-year lifespan
  - After 20 years, the patent expires and the technology becomes available to the public

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- Example: the US pharmaceutical industry
  - Drugs are expensive when they are new
  - Once the patent expires, generic options become available
  - Competition leads to a decrease in price

The firm

What is a firm?

- A **firm** is any entity that sells goods in order to make a profit
  - We assume that every firm's objective is to maximize profit
  - Can sell any type of product
  - Can have any form of organization: sole proprietorship, corporation, partnership

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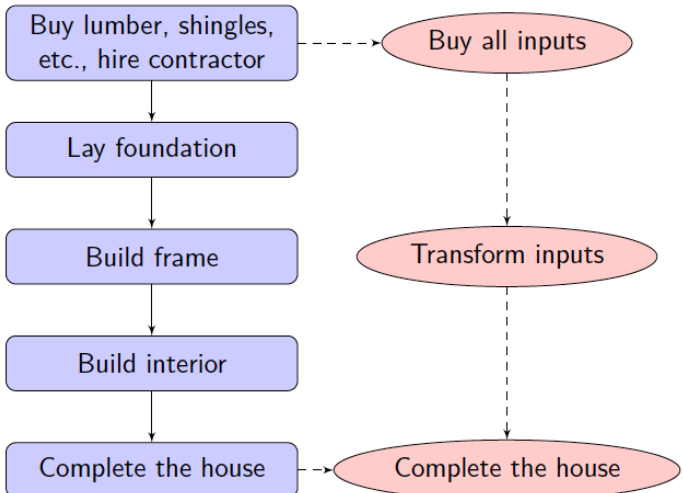
- Firms are considered a black box in industrial organization
  - Firms use input goods to produce final goods
  - We don't care about the in-between steps
  - We only care about what inputs are used, how much of the final good is created, and how much it costs to produce

The firm: a black box



Profit maximization

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- Firms solve the following problem:

$$\max_{q} \ \Pi(q) = TR(q) - TC(q)$$

  - $\Pi(q)$ denotes the profit of producing q units
  - $TR(q)$ denotes the total revenue of producing q units
  - $TC(q)$ denotes the total cost of producing q units

How to profit maximize

- Common assumptions:
  - Downward sloping demand
  - Non-decreasing marginal cost as $q \to \infty$
  - Production function $f(q)$ and demand function are continuous and differentiable

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  - Non-decreasing marginal cost as $q \to \infty$
  - Production function $f(q)$ and demand function are continuous and differentiable
- In this class, we will take these assumptions as given

How to profit maximize: intuition

- **Claim**: under the assumptions listed above, profit maximization implies that marginal revenue equals marginal costs at the optimal level of production

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  - Then, the firm could increase profit by producing a little more

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$$MR(q^*) = MC(q^*)$$

- *Thought exercise 1*: suppose that marginal revenue is greater than marginal cost
  - Then, the firm could increase profit by producing a little more
- *Thought exercise 2*: suppose that marginal revenue is less than marginal cost
  - Then, the firm could increase profit by producing a little less

How to profit maximize: marginal revenue and marginal cost functions

- The **marginal revenue function** $MR(q)$ is the additional revenue a firm gets from producing an additional unit of output, while it is currently producing q
  - Marginal revenue depends on the firm's individual production level, market demand, and market characteristics

How to profit maximize: marginal revenue and marginal cost functions

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  - Marginal revenue depends on the firm's individual production level, market demand, and market characteristics
- The **marginal cost function** $MC(q)$ is the additional cost a firm incurs from producing an additional unit of output, while it is currently producing q
  - We generally assume $MC(q)$ is positive and non-decreasing

How to profit maximize: price-taking firms

- The easiest marginal revenue example is a price-taking firm

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  - Firms are generally price-takers if there are a lot of other firms

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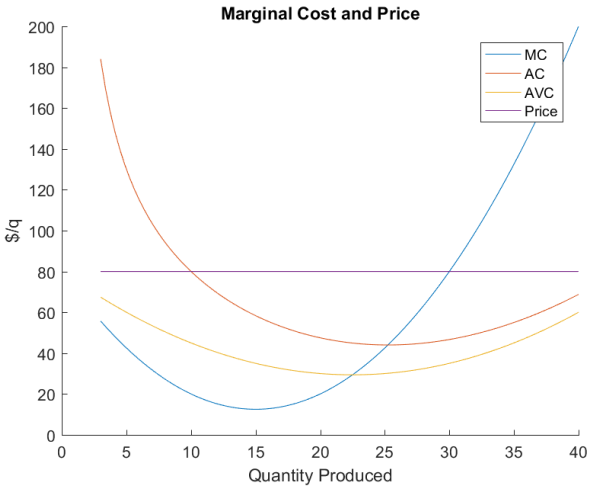
- A **price-taker** is an agent that has no control over the market price
  - Consumers are generally price-takers if there are a lot of consumers
  - Firms are generally price-takers if there are a lot of other firms
- If a firm is a price-taker, it means that marginal revenue is equal to the market price

$$MR = p$$

How to profit maximize: price-taking firms



- The market price is $80
- The profit maximizing point occurs where $MR = MC$

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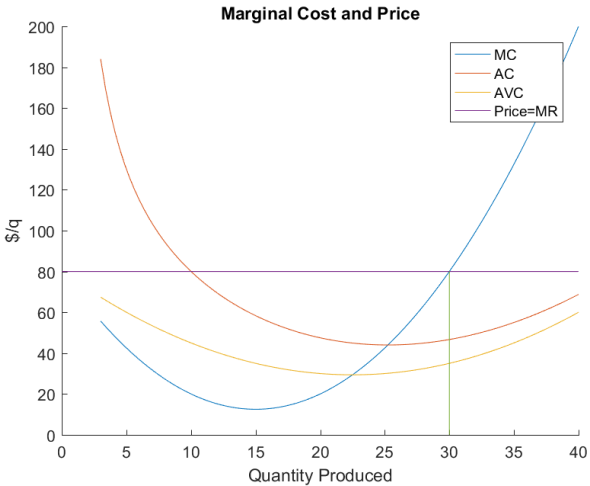

- The market price is \$80
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- In this example, $MR = MC$ when $q^* = 30$

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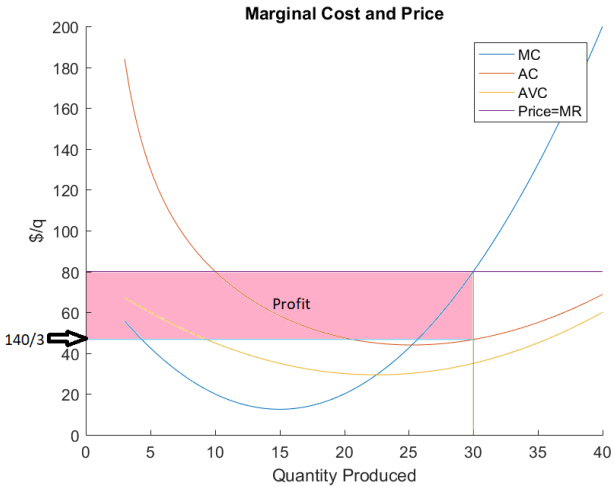

- Profit is the area between price and average cost, at the profit maximizing quantity

$$\begin{aligned}\Pi(30) &= (p - AC) \cdot q^* \\ &= \left(80 - \frac{140}{3}\right) \cdot 30 \\ &= 1000\end{aligned}$$

How to profit maximize mathematically: calculus

- We want to find the quantity that maximizes profit

$$\begin{aligned}\frac{\partial \Pi}{\partial q} &= \frac{\partial TR}{\partial q} - \frac{\partial TC}{\partial q} \\ &= MR - MC \\ &= 0 \\ &\Longrightarrow \\ MR &= MC\end{aligned}$$

  - MR denotes the **marginal** revenue of producing q units
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  - MR denotes the **marginal** revenue of producing q units
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- Thus, we need to find the quantity where marginal revenue equals marginal cost

How to profit maximize mathematically

- In this class, you will **NOT** be required to take derivatives
  - You will be given a marginal cost function
  - Based on the type of competition in the market, we'll learn shortcuts that allow us to calculate the marginal revenue function without calculus

How to profit maximize mathematically: price-taking firms

- The graphs have been generated using this cost function:

$$TC(q) = \frac{1}{10}q^3 - \frac{9}{2}q^2 + 80q + 350$$

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- As we did graphically, the profit maximizing level of production is the quantity that makes $MR = MC$

How to profit maximize mathematically: price-taking firms

$$
\begin{aligned}
MC &= MR \\
MR &= 80 \\
80 &= \frac{3}{10}q^2 - 9q + 80 \\
0 &= q \cdot \left(\frac{3}{10}q - 9 \right) \\
q^* &= 30
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How to profit maximize mathematically: price-taking firms

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- We have the total cost function and the price, hence the profit function is:

$$\Pi(30) = 80 \cdot 30 - \left(\frac{1}{10} \cdot 30^3 - \frac{9}{2} \cdot 30^2 + 80 \cdot 30 + 350 \right) = 1000$$

Threats to profit maximization

- Profit maximization is a strong assumption
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- There are many reasons we may not believe that firms profit maximize
  - **Principal-agent problem**: the person who earns the profit (agent) is not the same as the person who receives the profit (principal)
  - **Imperfect information**: firms may not know enough about the market to maximize profit
  - **Inefficiency**: firms may not know how to use their resources optimally

Threats to profit maximization

- Despite these problems, we still assume firms profit maximize
  - **Principal-agent problem**: most firms incentive their employees to do well
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