

NU Econ 101: Lecture 8

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Where are we now?

- 1 Market supply
- 2 Elasticity of supply
- 3 Long-run adjustments
- 4 The market for land
- 5 Capital and investment
- 6 Present values
- 7 Problems

Aggregating supply functions

We want to derive a market supply curve.

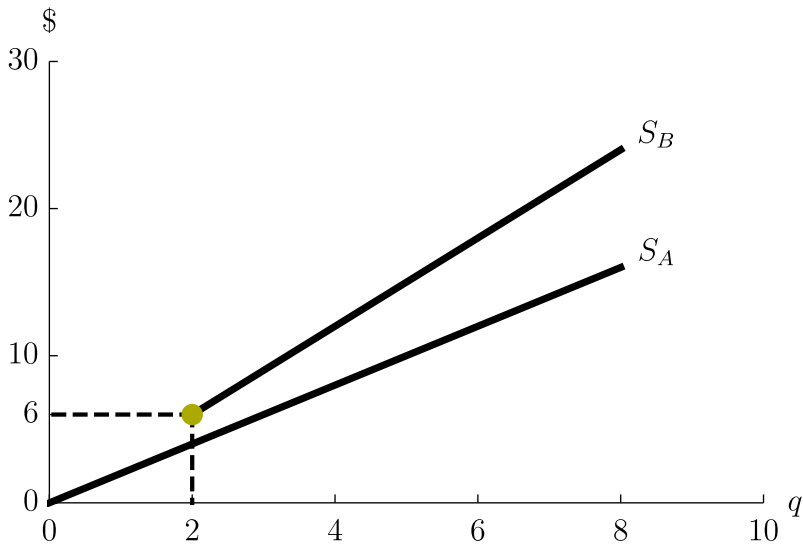
Again, it is a mistake to sum vertically.

- Correct to sum horizontally.

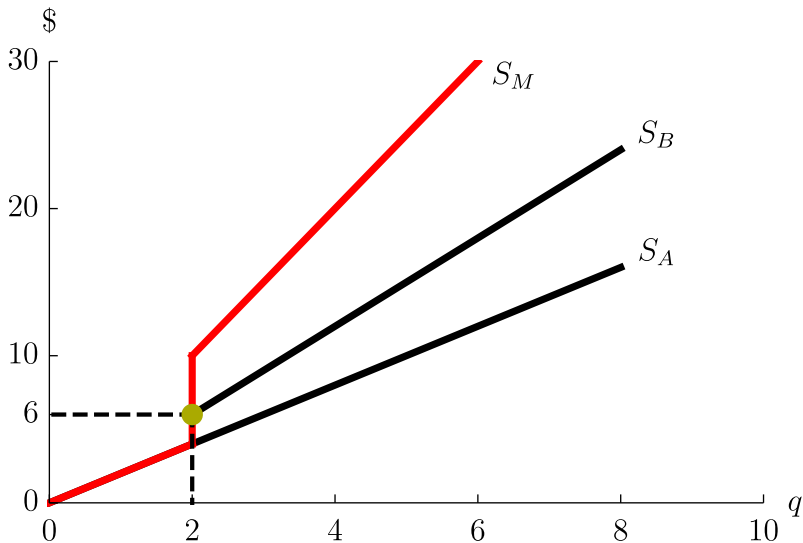
Let:

- $p = 2q$ be Firm A's inverse supply curve, S_A .
 - Shutdown price: $p_A^s = 0$
- $p = 3q$ be Firm B's inverse supply curve, S_B .
 - Shutdown price: $p_B^s = 6$

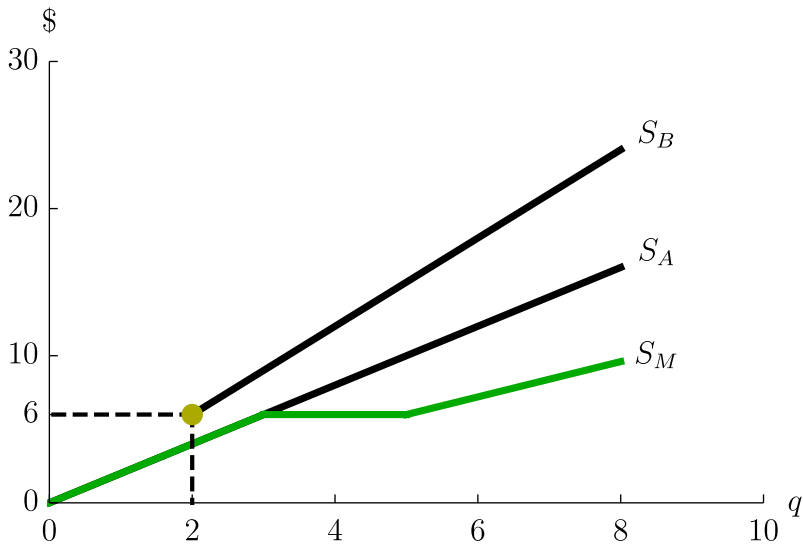
Supply curves



WRONG: Summing vertically



RIGHT: Summing horizontally



Adding supply curves mathematically (1)

Step 1: Convert inverse supplies to supplies:

- Firm A: $p = 2q_A \Rightarrow q_A = \frac{p}{2}$
- Firm B: $p = 3q_B \Rightarrow q_B = \frac{p}{3}$

Step 2: Add the supplies:

$$q_M = \frac{p}{2} + \frac{p}{3} = \frac{5p}{6}$$

Step 3: Invert for the inverse market supply:

$$q_M = \frac{5p}{6} \Rightarrow p = \frac{6}{5}q$$

Adding supply curves mathematically (2)

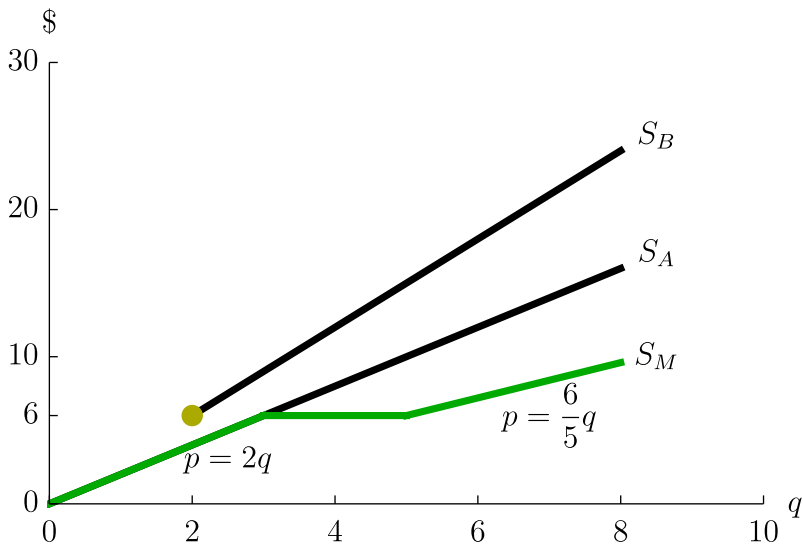
Step 4: Consider the shutdown points:

- For $p < 6$, only Firm A produces, so we just plot $p = 2q$.
- For $p \geq 6$, both firms produce, so we plot $p = \frac{5}{6}q$

Step 5: Connect the curves:

- At $p = 2q$ with $p = 6$, $q = 3$.
- At $p = \frac{6}{5}q$ with $p = 6$, $q = 5$.
- Connect $(3, 6)$ with $(5, 6)$.

Market supply curve



Change in supply vs. change in quantity supplied

When we were looking at the demand of x , we said a change in p_x yielded a change in quantity demanded.

- It was a movement along the demand curve, not a new demand curve.

Now, looking at the supply of a good, q , we say that a change in p yields a change in quantity supplied.

- It is a movement along the supply curve.

A change in anything other than p yields a new supply curve, i.e., a change in supply. Could include:

- Input prices change, new firms enter, technologies change, etc.

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Elasticity of supply (1)

Elasticity of demand is how much demand changes as prices change. We also want to know how supply changes as prices do.

Price elasticity of supply

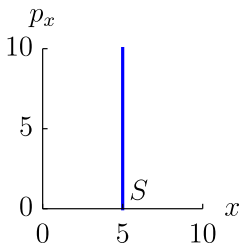
$$\text{Price elasticity of supply} = \frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}}$$

There was a negative in the definition for demand. Why not here?

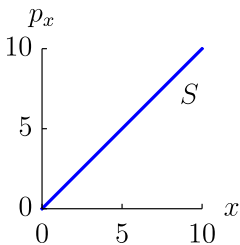
- Here the numerator is positive whenever the denominator is.
- So elasticities of supply are positive without negating.

Elasticity of supply (2)

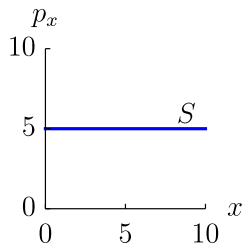
These are a few key elasticities, with their names and (values):



Perfectly inelastic (0)



Unit elastic (1)



Perfectly elastic (∞)

Supply for a good is said to be be:

- *elastic* if elasticity is greater than 1.
- *inelastic* if elasticity is less than 1.

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In the short-run . . .

So far, we have been mostly talking about the short-run.

In the short-run:

- Firms face a fixed set of technologies.
- Firms choose variable capital and labor, K and L .
- Firms may make profits or losses.

In the long-run . . .

What is different in the long-run?

In the long-run:

- Firms may choose their technologies (with associated costs).
 - Building a factory changes your technologies, but is costly!
- (Given perfect competition) Firms make no profits/losses.
 - If a firm is making profits in the short-run: other firms enter, increasing supply, decreasing price, until profits are gone.
 - We'll see this dynamic formally in a few lectures.
 - If a firm is making losses in the short-run: it exits in the long-run.

Long-run industry supply curve

Returns to scale were defined in the short-term for a particular firm.

We also want to know whether costs increase or decrease as an industry expands in the long-run:

Long-run industry supply (LRIS)

A curve that traces out price and total output over time as an industry expands.

If the the *LRIS* is _____ as the industry expands, we call it a _____.

- decreasing, **decreasing-cost industry**
- constant, **constant-cost industry**
- increasing, **increasing-cost industry**

Long-run industry supply curve

How does an industry expand?

Step 1: Demand increases.

Step 2: This leads to an increase in quantity supplied.

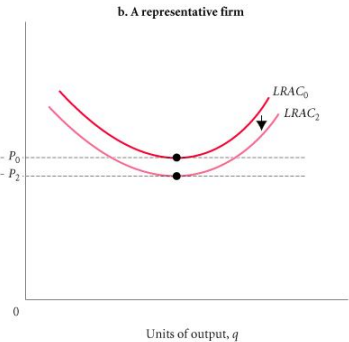
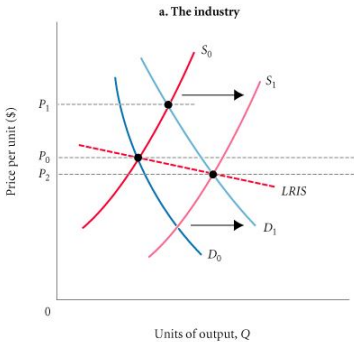
- Not an increase to supply, as we're moving along the curve!

Step 3: Now firms are making profits, so new firms enter.

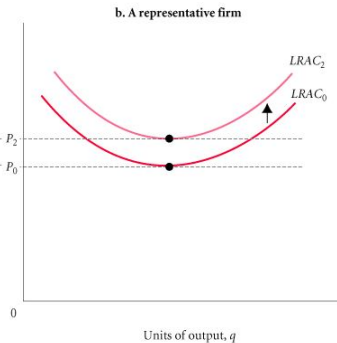
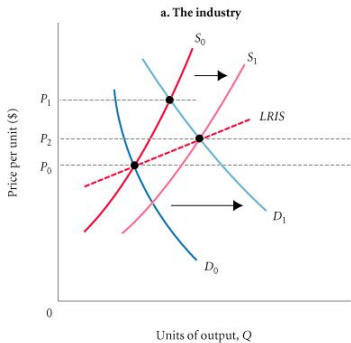
Step 4: The new entries lead to a change in supply.

- Not an increase to quantity supplied, as we get a new curve!

Decreasing-cost industry



Increasing-cost industry



Where are we now?

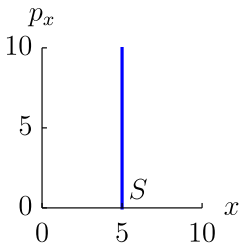
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Land (1)

The supply of land is generally considered fixed.

- But try telling that to China and Dubai...

This means that supply for land is perfectly inelastic:



Land (2)

We call the price of land a **demand-determined price**.

- Since supply is vertical, the intersection of supply and demand (which determines market price) is dictated solely by demand.

We call **pure rent** the return to any factor of production that is in fixed supply.

Why are property prices so volatile?

- The increase in price resulting from a change in demand cannot be dampened by an increase in supply.

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Types of capital

There are three key types of capital:

- **Tangible capital:** Structures, durable equipment, inventories.
- **Social capital/infrastructure:** Highways, transit systems, sewer and water, police, fire stations, all government services.
- **Intangible capital:** Goodwill, human capital, research.

Measuring capital

Capital is hard to measure.

Standard indirect measure: **current market value**

- Includes current market value of plant, equipment, inventories, and intangible assets.
 - What is the current market value of goodwill?
 - Depends on whom you ask? In an acquisition:
 - Buyer would suggest the value low.
 - Seller would suggest it is high.

A firm's **capital stock** is the current market value of its capital.

Investment and depreciation

Investment and **depreciation** are flows in to and out of, respectively, a firm's capital stock:

Investment

New capital additions to a firm's capital stock. The flow of investment increases the capital stock.

Depreciation

The decline in an asset's value over time.

Example: Nelson buys a new truck end of 2015, an investment of \$100,000. By end of 2016, its market value is only \$70,000:

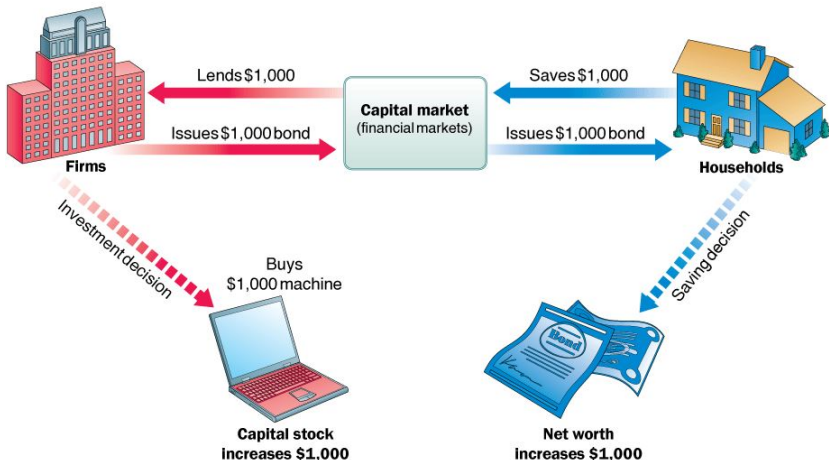
- Investment of \$100K in 2015, Depreciation of \$30K in 2016.

Capital/financial markets

How do firms fund investment?

- 1 Bonds.
- 2 Business loans.
- 3 Stock market.
- 4 Venture capital.
- 5 Retained earnings.

Bonds



A bond is an IOU. If you hold a bond, it gives you the right to collect the face amount on the bond on a specified date.

Business loans

You keep your savings at a bank.

A business goes to the bank to ask for a loan, and the bank lends them your money.

This is why you get interest on your savings.

- Currently, my bank gives me an interest rate of 1%. If I have \$100 at the beginning of this year, I will have \$101 by the end.

What happens if the business cannot pay back the loan?

- Bank takes a hit to their value, not you.
- Even if bank fails, in USA the FDIC guarantees deposits.

Stock market

When a firm issues shares, the current owners of the firm are diluting their ownership.

- You get to own a part of the firm in exchange for funds that the firm will invest.

As a shareholder, you are entitled to your share of the firm's profits.

If the firm goes out of business, the value of your stock is zero.

A note: In economics, a firm invests in capital.

- Individuals buy stocks/shares – they do not *invest* in firms.

Venture capital

A firm may sell shares/stocks to a venture capital firm.

The only difference between this and the stock market is who is buying the shares.

- Stock market: The general public may buy.
- Venture capital: Only the venture capitalists may buy.

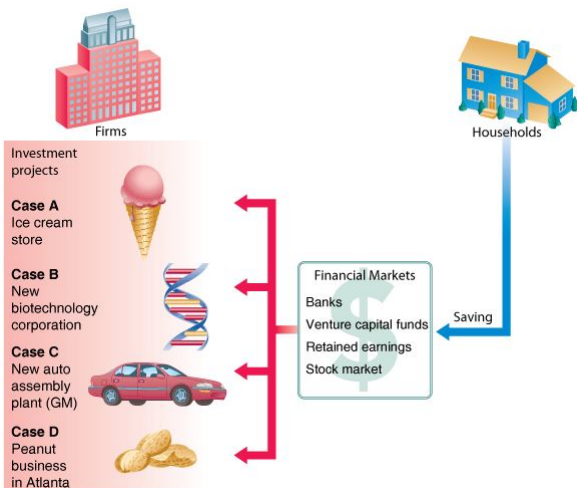
Retained earnings

When a firm makes profits, it pays out some of those profits as dividends to the shareholders.

- The rest it keeps as retained earnings (i.e. cash).

A firm can fund investment with its retained earnings.

A diagram of financial/capital markets



Financial markets link household savings and investment by firms.

Mortgages

Households lend to firms. Firms also lend to households:

- Credit card debt, student loans, mortgages, etc.

The mortgage industry in the US:

- A small local bank lends you the money to buy a home.
- That local bank sells the IOU to a big investment bank.
- Your mortgage is packaged with many others (i.e. securitized) and sold in a variety of different packages.

In 2007 in USA: Unemployment and falling house prices led to mass defaults. Lenders lost billions.

- For more, see *The Big Short*.

Capital accumulation and allocation

Capital flows to the best investment opportunities.

- When a bank considers business loans, it considers the merits of the firm's planned investment.
- When two companies issue shares/stocks, the one with the better investment options will get more for its shares/stocks.

But how do we know what investments are better?

Expected costs and expected benefits

Consider an investment in a new car factory.

Questions regarding expected benefits:

- How popular will the cars we're making be when it is completed?
- What will demand for cars be like?
 - What will the economy be like in the next few years?

Questions regarding expected costs:

- How will it cost to build the factory?
- What is the likelihood of cost overruns?

Expected rate of return

Firms estimate an expected rate of return (RoR) for each investment.

- The car factory costs a billion dollars, but we expect it to generate one hundred million in profits each year.
- Expected rate of return is $\frac{\text{hundred million}}{\text{billion}} = 10\%$.

Golden rule of investment

A firm undertakes all investments whose expected rate of return is above the interest rate.

Why?

- The interest rate is what the capital will cost every year.
- The rate of the return is the benefit of the capital each year.

Invest if benefits outweigh the costs!

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Calculating present values (1)

Suppose you have an asset that will pay off \$100 **in one year**.
How much is that worth in money today?

Well, to have \$100 in a year, you could put X in the bank now,
with an interest rate of r , where X solves:

$$X + rX = 100 \Rightarrow X = \frac{100}{1+r}$$

So your asset is worth $\frac{100}{1+r}$.

- For example, if $r = 0.1$, your asset is worth about \$91.

Calculating present values (2)

Suppose you have an asset that will pay off \$100 in **two years**.
How much is that worth in money today?

Well, to have \$100 in two years, you could put X in the bank now,
with an interest rate of r , where X solves:

$$X + rX + r(X + rX) = 100 \Rightarrow X = \frac{100}{(1+r)^2}$$

So your asset is worth $\frac{100}{(1+r)^2}$.

- For example, if $r = 0.1$, your asset is worth about \$83.

Calculating present values (3)

Suppose you have an asset that will pay off $\$R$ in t years. How much is that worth in money today?

$$\frac{R}{(1+r)^t}$$

If a project has a payoff stream over many years, work out present value by summing up the present values of each individual year.

Doing this gives us a new, equivalent, golden rule for investments. Undertake a project if:

$$\text{Expected return} > \text{Interest rate} \Leftrightarrow PV(\text{Project}) > \text{Total Cost}$$

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Useful problems

- In Chapter 9 Appendix: 1, 3
- *Note: Questions in chapter 10 are relevant to lecture 6, on cost minimization*
- In Chapter 11: 3, 4, 13, 15, 16,
- In Chapter 11 Appendix: 1, 2, 3, 5, 7,