TA note 1 - Friday Jan 26th

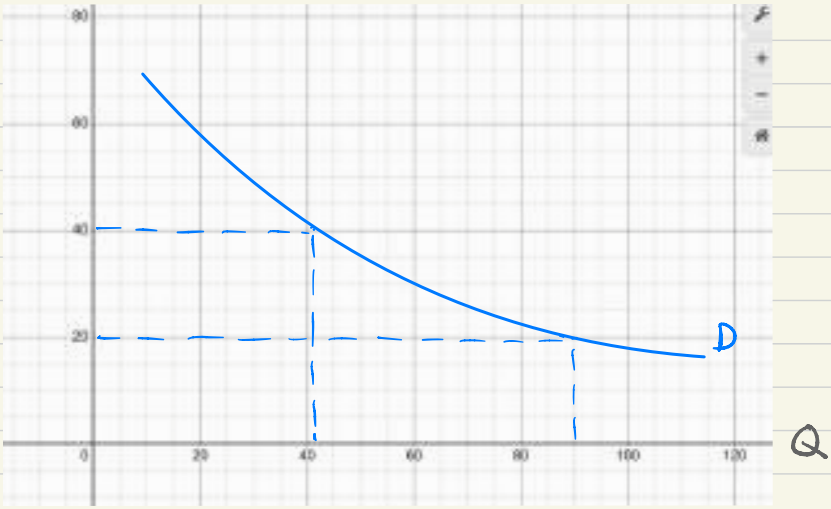
Misc

1. Introduction : Linh - OH: Thursday 10-12 (Uris 451), nn268@
2. Exam + quiz
3. Syllabus
4. Textbook
5. Math assesment

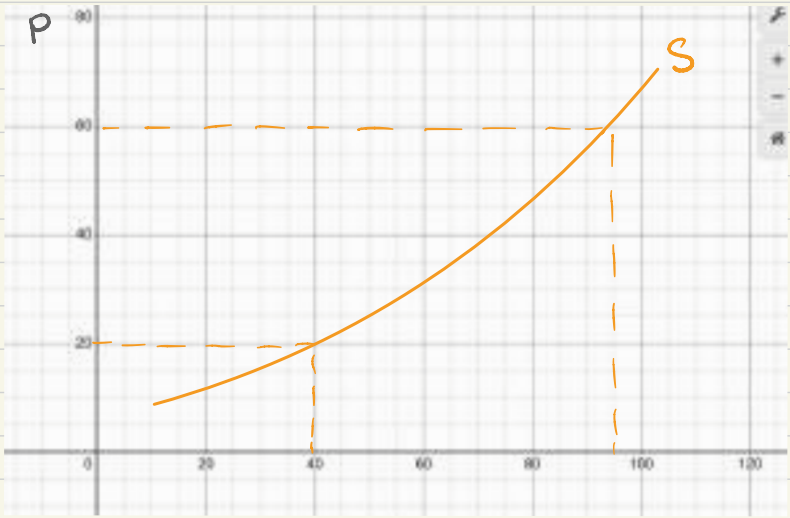
Review

1. Overview
   - Definition : Micro-economics : scarcity & choice
     Macro-economics : growth, inflation, unemployment
   - History : Adam Smith, John Maynard Keynes
     Great Depression, Great Recession, Pandemic Recession
2. Perfect competition
   Many small firms + buyers, homogeneous products, price takers, free entry & exit
3. Demand & Supply

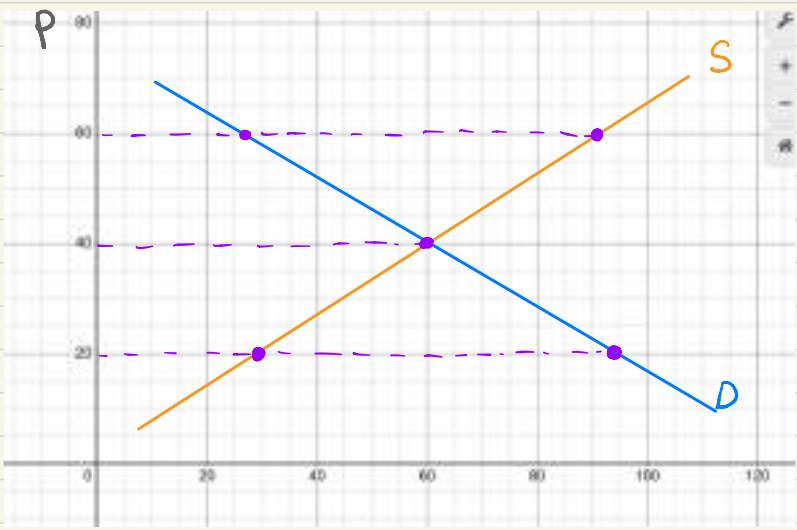
$$Q_D = f(P \mid P_{RA}, Y, t, A, \varepsilon, W, \ldots)$$



$Q_s = f(P \mid P_I, T, \#, \varepsilon, W, \ldots)$



4. Equilibrium



TA note 2 - Friday Feb 2nd

Review

Recall $Q_D = f(P \mid P_{RG}, Y, t, A, \varepsilon, W, \dots)$

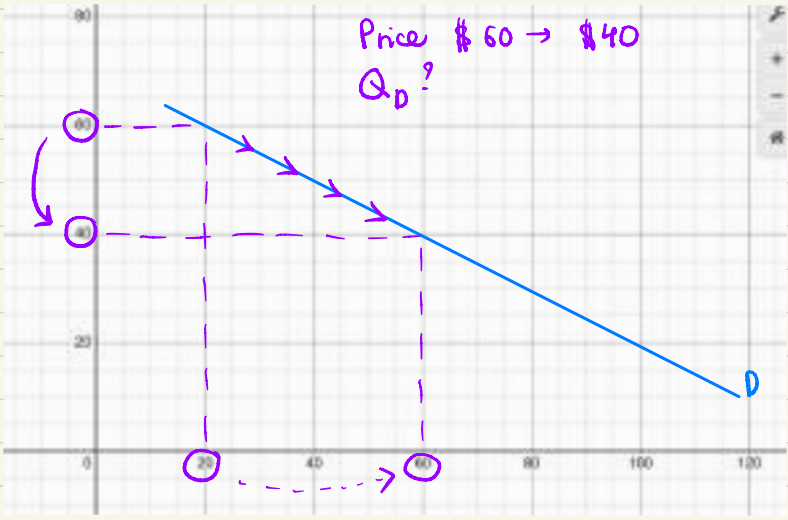
< P of related goods, income (normal / inferior), taste, advertising, expectation, weather, ... >

$Q_S = f(P \mid P_I, T, \#, \varepsilon, W, \dots)$

< P of inputs, technology, no. of firms in the market, expectation, weather, ... >

TWO (2) types of changes

① Price of good in question changes → Move along the curve, no shift



② Other changes: Change (or "shift") in Demand / Supply

Any change that's not in P will change D or S

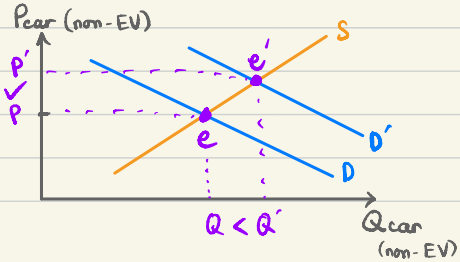
Consider a market for non-EV

eg: P_{RG} ↑ < EV price ↑ >

If substitutes → Demand changes

Now: Eq. Price ↑

Eq. Quantity ↑

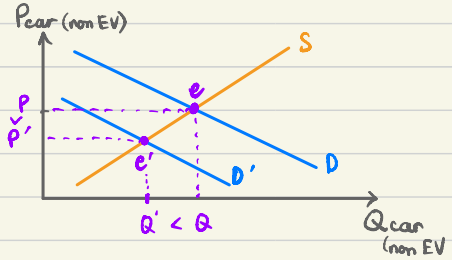


eg2: P_{RG} ↑ <Gas price ↑>

If complement → Less demand

Now: Eq. Price ↓

Eq. Quantity ↓



Overall:

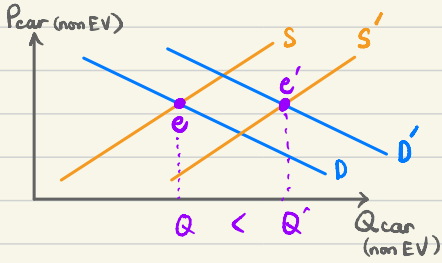
- Disturbance : 1st / 2nd
- Effects on D or S
- Pressure on price on the remaing side
- Overall effect → new equilibrium

eg3: $P_{input\ (non\ EV)}$ ↓

Consumer interest (non EV) ↑

Now: Eq. Quantity ↑

Eq. Price ? (unsure)

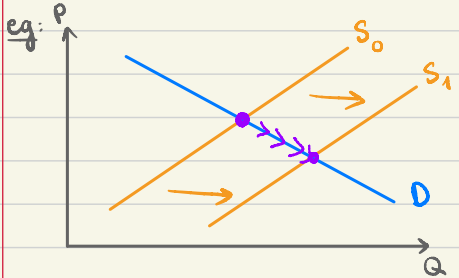


TA note 3 - Friday Feb 9

Review

1. Demand & Supply : 4-step analysis
   a. Disturbance
   b. Effect on 1 side of the market
   c. Part (b) puts pressure on the price to change, causing the other side of the market to respond.
   d. Overall effect of the disturbance on the market equilibrium (new price, new quantity at new equilibrium)

eg:



Macro

1. Growth, unemployment, inflation
   ↳ % change in the nation's output
2. GDP ~ Market value of all final goods and services produced domestically in one year

- Market value = $P \times Q$. If not transacted → not in GDP
- Final goods and services - to avoid "double" (triple ...) counting of goods. Can use value added to verify

eg: The economy produces 1 textbook per year.

Paper	$2	→ not final good
Ink	$5	→ not final good
Labor	$10	→ not final service / good
Textbook	$17	

GDP = $17, not GDP = $2 + $5 + $10 + $17

Value-added verification (loaf of bread example in class)

- Produced : do not count used goods sales, stocks & bonds, etc.
- Domestically : geographical bound

3. GNP ~ Total market value of all final goods and services produced by factors of production (labor + capital) owned by a country's citizens in a year.

What's the difference ? GDP (where) vs GNP (who)

4. GDP calculation : income vs expenditure approach

$$GDP = C + I + G + (EX - IM)$$

TA Note 4 - Friday Feb 16th

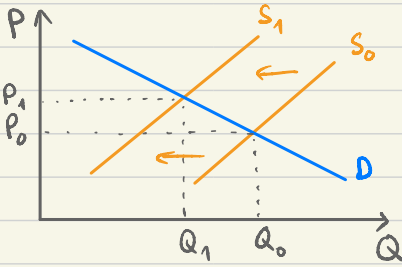
Misc

Prelim: Thursday Feb 22nd (Statler) 7:30-9pm
(6-9pm SDS)

Scope: Lecture content
Review Q&A: Monday 5-7 pm (Warren)

Quiz Ans

(a) Increase in price of an input (labor)
(b) Causes a decrease in supply
(c) Puts pressure on the price to increase, causing a decrease in quantity demanded
(d) New equilibrium: higher price and lower quantity exchanged



Review

Why so many different measurements? Each serves a different purpose.

Notations:
- P^{2023}_{apple} : price of apple in year 2023
- Q^{2019}_{1} : quantity of good 1 in year 2019

A. Measurements of production: NGDP, RGDP, chained GDP

Note: below are not "formal" definition !!! (just intuition)

1. **Nominal GDP**: a measure of production each year for each country using price of that year (hence "nominal")

$$NGDP_{2023} = \text{Nominal GDP in 2023} = \sum_{i=1}^{n} P_i^{2023} \times Q_i^{2023}$$

$$= P_1^{2023} \times Q_1^{2023} + P_2^{2023} \times Q_2^{2023} + \dots$$

- P_1^{2023}: price of good 1 in year 2023
- Q_1^{2023}: quantity of good 1 in year 2023
- P_2^{2023}: price of good 2 in year 2023
- Q_2^{2023}: quantity of good 2 in year 2023
- (includes all n goods produced in 2023)

2. **Real GDP**: a measure of production with price adjusted

Why do we need RGDP instead of NGDP? Better comparison!

We want to compare production between different years, so we use a base price for all of them.

eg: 2023: 1 apple with price \$1 → $NGDP^{23} = \$1 \times 1 = \$1$

2024: 1 apple with price \$2 → $NGDP^{24} = \$2 \times 1 = \$2$

→ There is no change in production, but if we use NGDP, we will falsely conclude that we produce more in 2024 compared to 2023.

$$RGDP_{2023}^{\text{base year}} = \text{Real GDP in 2023 using base year price}$$

$$= \sum_{i=1}^{n} P_i^{base} \times Q_i^{2023}$$

$$= P_1^{base} \times Q_1^{2023} + P_2^{base} \times Q_2^{2023} + \dots \quad \text{(for all } n \text{ goods)}$$

- P_1^{base}: price of good 1 in year base
- Q_1^{2023}: quantity of good 1 in year 2023
- P_2^{base}: price of good 2 in year base
- Q_2^{2023}: quantity of good 2 in year 2023

3. **Chained RGDP**: a measure of production with multiple price bases.

Real GDP seems good enough. However, using only 1 base year price and ignore the other years' prices doesn't seem "enough". Thus, we want a measurement that consider multiple (2) price bases.

eg: If Chained $RGDP_{2023}$ uses an initial link that is 2017.

We need 2 years to include in our equation. One must be 2023, because that's what we're measuring. The other one? Either 2022 or 2024, depending on which is closer to "initial link year"

$$\text{Chained } RGDP_{2023} = \left(\frac{\sum_{i=1}^{n} P_i^{2023} \times Q_i^{2023}}{\sum_{i=1}^{n} \underbrace{P_i^{2023}}_{\text{2023 price}} \times Q_i^{2022}} \times \frac{\sum_{i=1}^{n} P_i^{2022} \times Q_i^{2023}}{\sum_{i=1}^{n} \underbrace{P_i^{2022}}_{\text{2022 price}} \times Q_i^{2022}} \right)^{1/2} \times RGDP_{2022}$$

here 2022 is closer to initial link 2017 so we'll use 2022 (instead of 2024)

Note that ⊛ $\sum_{i=1}^{n} P_i^{22} \times Q_i^{23} = P_1^{22} \times Q_1^{23} + P_2^{22} \times Q_2^{23} + \ldots$, etc.

↳ replace only the "i" by 1, 2, ..., n and add them all up

(you'll need to expand all four Σ terms in the chained RGDP formula above.)

⊛ chained RGDP uses geometric mean

B. Measurements of growth: %ΔNGDP , %ΔRGDP

1. %ΔNGDP (year 1 to year 2) $= \frac{NGDP_{year\,2} - NGDP_{year\,1}}{NGDP_{year\,1}} \times 100\%$

2. %ΔRGDP (year 1 to year 2) $= \frac{RGDP_{year\,2} - RGDP_{year\,1}}{RGDP_{year\,1}} \times 100\%$

~ growth

C. Measurements of price : IPD, %ΔIPD

1. $IPD_{year\,x}$ = "Implicit price deflator"

= Price level in year x given base year

$= \frac{NGDP_{year\,x}}{RGDP^{base\ year\,x}} \times 100$

%ΔIPD (year 1 to year 2) = % change in price level

$= \frac{IDP_{year\,2} - IDP_{year\,1}}{IDP_{year\,1}} \times 100\%$

Work in group! ☺

Practice An economy produces 3 goods : A, B, C

	P_A	Q_A	P_B	Q_B	P_C	Q_C
Year 1	$8	11	$4	10	$6	12
Year 2	$9	11	$4	12	$8	11
Year 3	$10	12	$5	13	$9	12

a. Calculate NGDP, $RGDP_{base = year\ 1}$, $IPD_{base = year\ 1}$, and their changes.

	NGDP	%ΔNGDP	$RGDP_{b=1}$	$\%\Delta RGDP_{b=1}$	$IPD_{b=1}$	$\%\Delta IPD_{b=1}$
Year 1	?	–	?	–	?	–
Year 2	?	?	?	?	?	?
Year 3	?	?	?	?	?	?

b. Now do the same calculation with base year = 2.

	NGDP	%ΔNGDP	$RGDP_{b=2}$	$\%\Delta RGDP_{b=2}$	$IPD_{b=2}$	$\%\Delta IPD_{b=2}$
Year 1	?	–	?	–	?	–
Year 2	?	?	?	?	?	?
Year 3	?	?	?	?	?	?

c. Compare growth rate under 2 bases.

Answer a.

	NGDP	%Δ	$RGDP_{b=1}$	%Δ	$IPD_{b=1}$	%Δ
Y_1	$200	–	$200	–	100	–
Y_2	$235	17.5 %	$202	1 %	116.34	16.3 %
Y_3	$293	24.68 %	$220	8.91 %	133.18	14.48%

b.

		$RGDP_{b=2}$	%Δ	$IPD_{b=2}$	%Δ
Y_1		$235	–	85.11	–
Y_2	〃	$235	0%	100	17.5%
Y_3		$256	8.94%	114.45	14.45%

Explaination: (examples for the colored numbers)

⊕ NGDP is price × quantity same year.

eg: $NGDP_{Y_1} = P_A^{Y_1} \times Q_A^{Y_1} + P_B^{Y_1} \times Q_B^{Y_1} + P_C^{Y_1} \times Q_C^{Y_1}$

$= \$8 \times 11 + \$4 \times 10 + \$6 \times 12 = \$200$

$NGDP_{Y_3} = P_A^{Y_3} \times Q_A^{Y_3} + P_B^{Y_3} \times Q_B^{Y_3} + P_C^{Y_3} \times Q_C^{Y_3}$

$= \$10 \times 12 + \$5 \times 13 + \$9 \times 12 = \$293$

⊕ RGDP is price of base year × quantity of year we'll calculating

eg. If base = Y_1:

$RGDP_{Y_2}^{base=Y_1} = P_A^{Y_1} \times Q_A^{Y_2} + P_B^{Y_1} \times Q_B^{Y_2} + P_C^{Y_1} \times Q_C^{Y_2}$

$= \$8 \times 11 + \$4 \times 12 + \$6 \times 11 = \$202$

If base = Y_2

$RGDP_{Y_3}^{base=Y_2} = P_A^{Y_2} \times Q_A^{Y_3} + P_B^{Y_2} \times Q_B^{Y_3} + P_C^{Y_2} \times Q_C^{Y_3}$

$= \$9 \times 12 + \$4 \times 13 + \$8 \times 12 = \$256$

⊕ %Δ of year $x = \frac{\text{year } x - \text{year right before } x}{\text{year right before } x} \times 100\%$

eg: $\%\Delta RGDP_{Y_3}^{b=Y_1} = \frac{RGDP_{Y_3}^{b=Y_1} - RGDP_{Y_2}^{b=Y_1}}{RGDP_{Y_2}^{b=Y_1}} \times 100\% = \frac{220-202}{202} \times 100\% = 8.91\%$

⊕ IPD = (NGDP / RGDP) × 100 (same row)

eg: $IPD_{Y_3}^{base=Y_1} = (293 / 220) \times 100 = 133.18$

$IPD_{Y_3}^{base=Y_2} = (293 / 256) \times 100 = 114.45$

TA note 5 - Friday, Mar 1st

(cont.)

C. Measure of price / inflation :

1. **IPD** : price index for all final goods & services produced domestically (hence "GDP deflator").

3. **CPI** = Consumer price index
   CPI uses a fixed basket (including imports).
   "Market basket" : monthly purchases by a typical urban consumer.
   (Substitutability ↓ → overestimate inflation)

   (Core inflation : CPI basket - food & energy)

4. **PCE** = Personal consumption expenditures price index
   Uses goods & services purchased by consumers in the US.

* Some examples

  IPD Q4 2023 : 123.226
  Q3 2023 : 122.762 > % = 1.52%

  CPI Jan 2023 : 229.17
  Jan 2024 : 308.417 > % Δ = 3.09%

  Core inflation Jan 23 → 24 : % Δ = 3.9%

  PCE deflator : % Δ = 1.66%

* Winners & losers from unexpected inflation
  Guess who ?
  - Lenders / borrowers ?
  - Holder of pension contracts / Individuals w/ fixed income ?
  - Workers / Employers at fixed wage contract ?

Winners	Losers
Borrowers (money paid back has lower purchasing power than money they borrowed)	Lenders (money they are repaid has lower purchasing power than money they lent)
Holders of pension contracts (pay a fixed nominal amount but have the pot of money invested at inflation adjusted rate)	Individuals on fixed income
Employers, fixed wage contract (pay a constant nominal amount in wages, but price of output increases at inflation adjusted rate)	Employees, fixed wage contract

* Solution to the inflation problem
  + COLA clause (Cost-of-living Clause):
    Contractual provisions in collective bargaining agreements that automatically tie wage changes to CPI.
  + Fisher equation:

$$i = r + \pi^e$$

i: nominal interest rate; r: real interest rate; π^e: inflation

eg: You go to the bank and see 5%. Inflation is at 2%. Real interest rate?

$$i = r + \pi^e$$
$$5\% = r + 2\%$$
$$\rightarrow \text{real interest rate} = r = 3\%$$

D. Measures of unemployment : U

1. U = number unemployed

(16+, available for work, searching during previous 4 weeks) → could be different (this is old textbook definition!!) (use Terry's definition!)

$$L = N + U$$

L ↑ labor force; N ↑ employed; U ↑ unemployed

Three types:

- Frictional : new entrants, re-entrants, job quitter
  - < normal turn-over; short-run job/skill matching >
  - < short-run problem, lasts a few weeks >
- Structural : inappropriate skills or wrong location for available jobs
  - < due to changes in structure of economy that results in significant job loss in certain industries >
  - < longer-run adjustment problem >
- Cyclical : due to downturns in economic activity

Q: ? Max decides to go to work and is spending time searching. → frictional

structural ← ? AI replaces some lower-level designing jobs. Lily can't get a job anywhere despites actively searching. There's 0 demand.

trick q. ← Not unemployed ? Ben is in middle school. Economic slowdown in his town made him close down his lemonade stall. He focuses on school now.

2. μ = unemployment rate

$$\mu = U/L$$

(Jan 2024, BLS: $\mu = 3.7\%$)

3. Natural rate of unemployment

When economy is at Y_F (only frictional + structural)

Full-employment output : level of production when economy is at full-employment. (~ Potential output)