Principles of Macroeconomics: International Trade 1

Class 11

Alex Houtz

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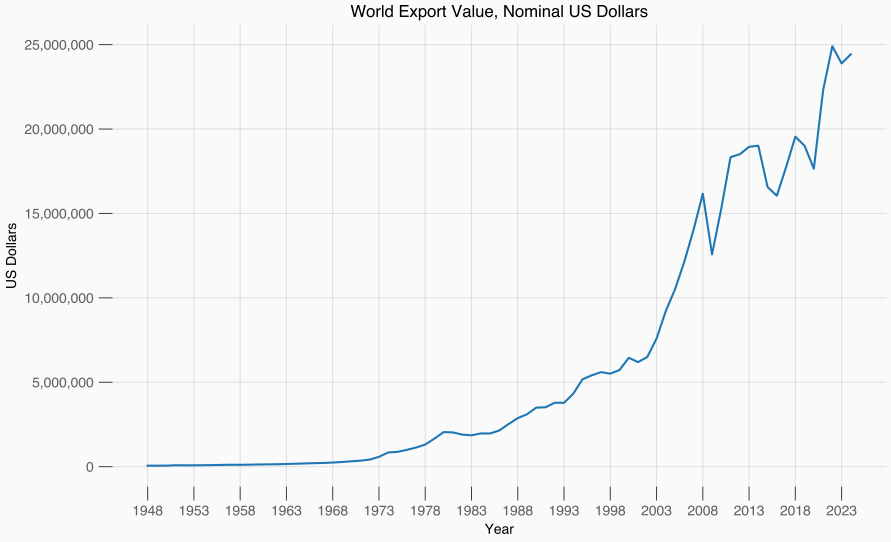
University of Notre Dame

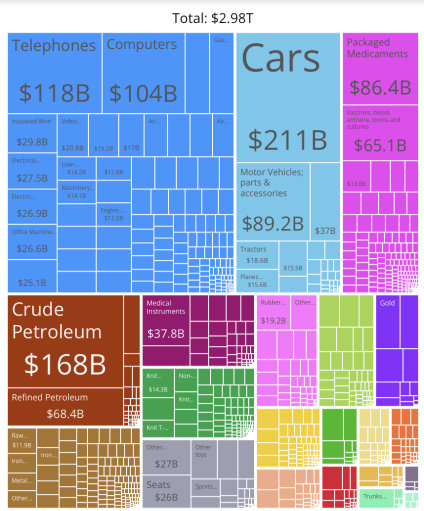
Overview

- Announcements:
  - LC 5, GH 5 due Friday at 11:59pm
  - Midterm: October 16 in class!
- Topics:
  - Production Possibilities Frontier
  - Comparative Advantage
- Readings:
  - Chapter 5.1, chapter 2.1
  - Chapters 5.3 - 5.4

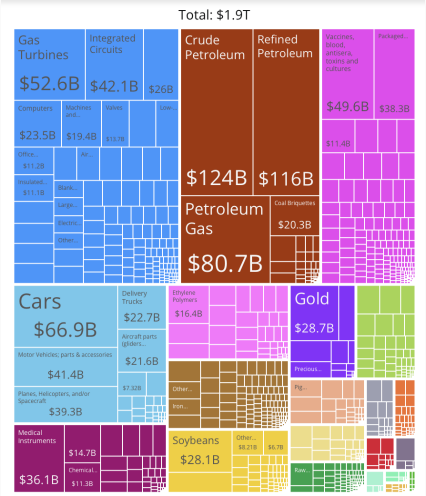
World Trade has Taken off



US Imports, 2023



US Exports, 2023



- International trade has exploded
- But why should countries trade? Why don't we just make everything ourselves?
- Key idea for today: comparative advantage
- We first need to analyze how countries make production decisions

What if we have two goods?

- So far, we have primarily thought about one good, GDP
- But if we want to think about countries trading, we need to think about two separate goods
  - Think about lunch in elementary school – I will trade my apple for your sandwich
  - In international trade – the US sells airplanes to China to buy iPhones
- Let's think about two goods (Ricardo, 1817)
  (1) Wine
  (2) Cloth

Production

- Let's assume a very simple production function:

$$Y_{wine} = A_{wine} M_{wine}$$
$$Y_{cloth} = A_{cloth} M_{cloth}$$

  where M_x denotes the quantity of inputs used to produce good x, with $x \in \{\text{wine},\ \text{cloth}\}$

- Next, we make sure we don't use more inputs than we have total:

$$M_{wine} + M_{cloth} \leq M$$

- And we can posit what M looks like:

$$M = K^{\alpha} L^{1-\alpha}$$

- Let's take total M as given

Production Possibilities

- How much wine and cloth can we produce?
  - If we only make wine: $Y_{wine}^{max} = A_{wine} M$
  - If we only make cloth: $Y_{cloth}^{max} = A_{cloth} M$
- But what if we produce both wine and cloth?

$$M = M_{wine} + M_{cloth}$$

$$M = \frac{Y_{wine}}{A_{wine}} + \frac{Y_{cloth}}{A_{cloth}}$$

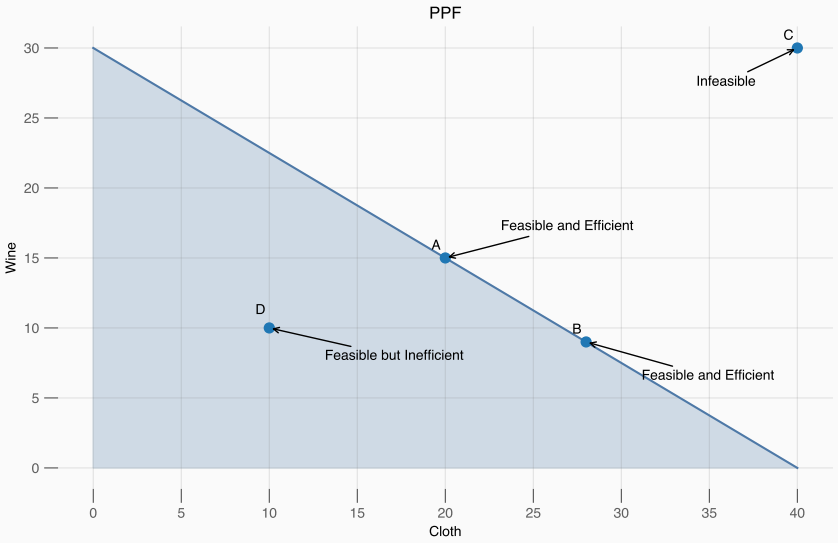
$$A_{wine} = Y_{wine} + \frac{A_{wine}}{A_{cloth}} Y_{cloth}$$

$$Y_{wine} = \underbrace{A_{wine} M}_{Y_{wine}^{max}} - \frac{A_{wine}}{A_{cloth}} Y_{cloth}$$

$$Y_{wine} = Y_{wine}^{max} - \frac{A_{wine}}{A_{cloth}} Y_{cloth}$$

- If you plot this, it's just a line ($y = mx + b$)
  - y-intercept: Y_{wine}^{max}
  - x-intercept: Y_{cloth}^{max}
  - The PPF connects these two points
    - Slope: $-\frac{A_{wine}}{A_{cloth}}$
- Key ideas:
  - Feasibility: Can we make this combination of wine and cloth?
  - Efficiency: Are resources being used to produce as much as possible
  - Opportunity Cost: How much wine do we give up for cloth
- Suppose $M = 1$ and $A_{wine} = 30$, $A_{cloth} = 40$

Visually


PPF
C
Infeasible
Feasible and Efficient
A
D
B
Feasible but Inefficient
Feasible and Efficient
Wine
Cloth
30
25
20
15
10
5
0
0
5
10
15
20
25
30
35
40

- Suppose we are at point A. Then $M_{wine} = \frac{Y_{wine}}{A_{wine}} = \frac{15}{30} = \frac{1}{2}$. $M_{cloth} = \frac{20}{40} = \frac{1}{2}$. So $\frac{1}{2} + \frac{1}{2} = 1$, we are using all of M
- At point B, $M_{wine} = \frac{9}{30}$, $M_{cloth} = \frac{28}{40}$. Then $\frac{9}{30} + \frac{28}{40} = 1$
- At point C, $M_{wine} = \frac{30}{30}$ and $M_{cloth} = \frac{40}{40}$. But, $\frac{30}{30} + \frac{40}{40} > 1$; we're using more than the amount of inputs we have!
- At point D, $M_{wine} = \frac{9}{30}$ and $M_{cloth} = \frac{20}{40}$. But then $\frac{9}{30} + \frac{20}{40} < 1$, so we aren't using all of our inputs!

Feasibility: only points inside the PPF can be produced

Efficiency: Only points on the PPF make full use of economic resources

Opportunity Cost

- If an economy is operating on the PPF, then producing more wine requires producing less cloth
  - For clarity: if we only produce wine, we can make 30
  - If we only produce cloth, we can make 40
  - So we give up 30 wine to make 40 cloth
- Opportunity cost is the absolute value of the slope of the PPF. For our linear PPF: $\left|-\frac{A_{wine}}{A_{cloth}}\right| = \frac{3}{4}$
  - How much Y do we give up to get X?

(1) Growth from Inputs
- Suppose that inputs (K, L) increase, then $M' > M$
- This shifts the PPF shifts out
  - Y_{wine}^{max} and Y_{cloth}^{max} both increase by the same % amount
  - Slope of PPF is the same, but we can do more production

(2) Growth from Improvements in Productivity

(a) Neutral productivity growth: $\%\Delta A_{wine} = \%\Delta A_{cloth}$
- $Y_{wine}^{max} = Y_{cloth}^{max}$ both increase by the same %
- Then the slope of the PPF remains the same

(b) Biased productivity growth: $\%\Delta A_{wine} \neq \%\Delta A_{cloth}$
- Suppose $\%\Delta A_{wine} > \%\Delta A_{cloth}$
- Then Y_{wine}^{max} increase, but Y_{cloth}^{max} doesn't
- So the PPF slope increases, as the opportunity cost of X increases

So What Should We Produce?

- PPF tells us what we *can* produce, not what we will produce
- Let's assume that a competitive producer makes production decisions
  - Price of wine: p_{wine}
  - Price of cloth: p_{cloth}
  - Cost of buying/hiring factor inputs is the same for all producers

Options:

(1) Hire 1 unit of inputs to produce cloth; get A_{cloth} units of output worth $p_{cloth}A_{cloth}$

(2) Hire 1 unit of inputs to produce wine; get A_{wine} units of output worth $p_{wine}A_{wine}$

What should the producer do?

- Well, the producer wants to make money, so if $p_{cloth}A_{cloth} > p_{wine}A_{wine}$, produce cloth. Rewrite this condition:

$$p_{cloth}A_{cloth} > p_{wine}A_{wine}$$
$$\frac{p_{cloth}}{p_{wine}} > \frac{A_{wine}}{A_{cloth}}$$

- Interpretation: Relative price of cloth is greater than the opportunity cost of cloth
- Then the producer should completely specialize in producing cloth

- Well, the producer wants to make money, so if $p_{cloth}A_{cloth} < p_{wine}A_{wine}$, produce cloth. Rewrite this condition:

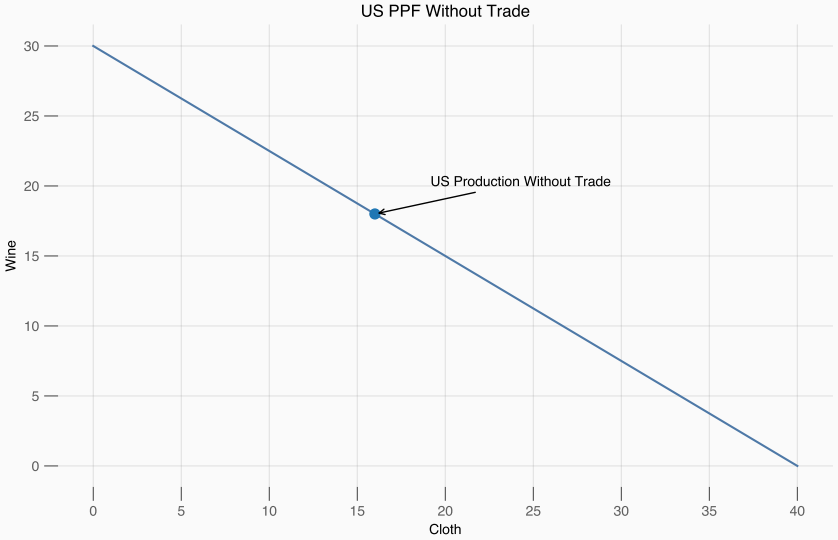
$$p_{cloth}A_{cloth} < p_{wine}A_{wine}$$
$$\frac{p_{cloth}}{p_{wine}} < \frac{A_{wine}}{A_{cloth}}$$

- Interpretation: Relative price of cloth is less than the opportunity cost of cloth
- Then the producer should completely specialize in producing wine

- If $p_{cloth}A_{cloth} = p_{wine}A_{wine}$, then the producer is indifferent between producing cloth and wine
- Production can be diversified

- Suppose that the US produces without trade and consumers want both wine and cloth.
- Production amounts depend on the exact demand from consumers, but let's suppose the US produces at $(16, 18)$

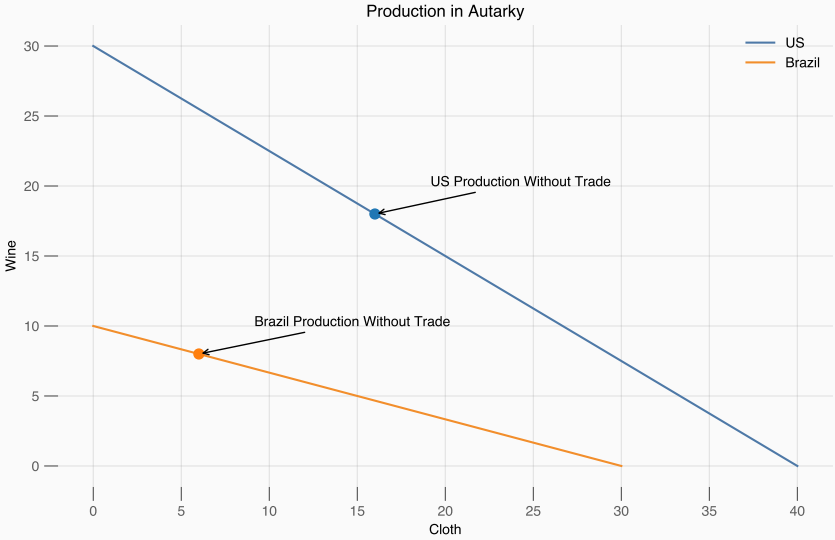
Autarky


US PPF Without Trade
US Production Without Trade
Wine
Cloth
30
25
20
15
10
5
0
0
5
10
15
20
25
30
35
40

- Without trade, prices reflect domestic opportunity costs
  - If a country has high productivity in cloth, then the relative price of cloth will be low
  - If a country has high productivity in wine, then the relative price of cloth will be high

- Now suppose another country, like Brazil, is also in autarky. Suppose they also have $M = 1$, $A_{wine}^{Brazil} = 10$, $A_{cloth}^{Brazil} = 30$

Autarky with Brazil



Prices in the US and Brazil

- Autarky relative price in US: $\left(\frac{p^{US}_{cloth}}{p^{US}_{wine}}\right)^{\text{autarky}} = \frac{A^{US}_{wine}}{A^{US}_{cloth}} = \frac{3}{4}$
- Autarky relative price in Brazil: $\left(\frac{p^{Brazil}_{cloth}}{p^{Brazil}_{wine}}\right)^{\text{autarky}} = \frac{A^{Brazil}_{wine}}{A^{Brazil}_{cloth}} = \frac{1}{3}$
- The relative price of cloth is high in the US, but low in Brazil
- Opportunity for Trade!!

- Since $\left(\frac{p^{US}_{cloth}}{p^{US}_{wine}}\right)^{\text{autarky}} > \left(\frac{p^{Brazil}_{cloth}}{p^{Brazil}_{wine}}\right)^{\text{autarky}}$, US has a comparative advantage in wine and Brazil has a comparative advantage in cloth
- Alternative definition, compare TFP:

$$\frac{A^{US}_{wine}}{A^{US}_{cloth}} > \frac{A^{Brazil}_{wine}}{A^{Brazil}_{cloth}}$$

US has comparative advantage in wine because its relative productivity for wine is higher than Brazil's

Comparative Advantage vs. Absolute Advantage

- US is better at everything: $A^{US}_{wine} > A^{Brazil}_{wine}$ and $A^{US}_{cloth} > A^{Brazil}_{cloth}$
- US has an absolute advantage in producing both wine and cloth
- But Brazil has a comparative advantage in cloth still

No one can ever have a comparative advantage in everything!!

Summary

- Production possibilities frontier
- Choosing to produce one good requires you to not produce a different good
- This opportunity cost gives us a relative price for goods
- Other countries will have different relative prices for good
- We could potentially exploit this difference in relative price to make everyone better off

- Remember: homework due Friday night
- Read chapter 5.3-5.4