

# ECO364: International Trade Theory

## Lecture 2

Palermo Penano

University of Toronto, Department of Economics

May 10, 2016

- Last Class

- Facts
- Ricardian Model: Definitions, Autarky Equilibrium

- Last Class
  - Facts
  - Ricardian Model: Definitions, Autarky Equilibrium
- Today
  - Ricardian Model
    - Gains from Trade
    - Trade Equilibrium
    - Relative Wages

- Last Class
  - Facts
  - Ricardian Model: Definitions, Autarky Equilibrium
- Today
  - Ricardian Model
    - Gains from Trade
    - Trade Equilibrium
    - Relative Wages
- Readings
  - KMO Chapter 3
  - Economist “Trade Winds”
  - Krugman’s “In Praise of Cheap Labour”
  - Krugman’s “Ricardo’s Difficult Idea”

# Gains from Trade

- A key insight from the autarky equilibrium is that the PPF curve and the budget constraint overlap
- In autarky, a country consumes/buys what it produces (e.g. North Korea, to some extent)

Consumption, C = Production, Q

- This is not the case when countries are allowed to trade
  - In the trading equilibrium, the budget constraint and the PPF may lie on different lines
  - This is because prices are now set in the global market

- We'll use the same example from Lecture 1
  - Two Countries: Canada and Mexico
  - Two Goods: Computers and Textiles
  - One Factor of Production: Labour

- PPF is the same as before

$$a_C^N Q_C^N + a_T Q_T^N \leq L^N$$

- The budget constraint is now

$$P_C C_C^N + P_T C_T^N \leq w^N L^N$$

- Because goods can now freely move across countries, prices for a given good across countries have equalized (no more superscripts on prices)
  - Wages are still country-specific because we will continue to assume that immigration is not possible

- In autarky, relative prices is equal to relative unit labour requirements:

$$\frac{P_C^N}{P_T^N} = \frac{a_C^N}{a_T^N}$$

$$\frac{P_C^S}{P_T^S} = \frac{a_C^S}{a_T^S}$$

- We also set up our model so that Mexico has a comparative advantage in textiles

$$\frac{a_C^N}{a_T^N} < \frac{a_C^S}{a_T^S}$$

- In a state where countries are free to trade, relative price must be between the autarky prices  $\frac{a_C^N}{a_T^N}$  and  $\frac{a_C^S}{a_T^S}$

$$\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$$

- Slope of PPF no longer equals slope of budget constraint
  - Budget constraint will pivot
- With free trade (resulting in these prices), will there be gains from trade?
  - Gains represented by higher indifference curves

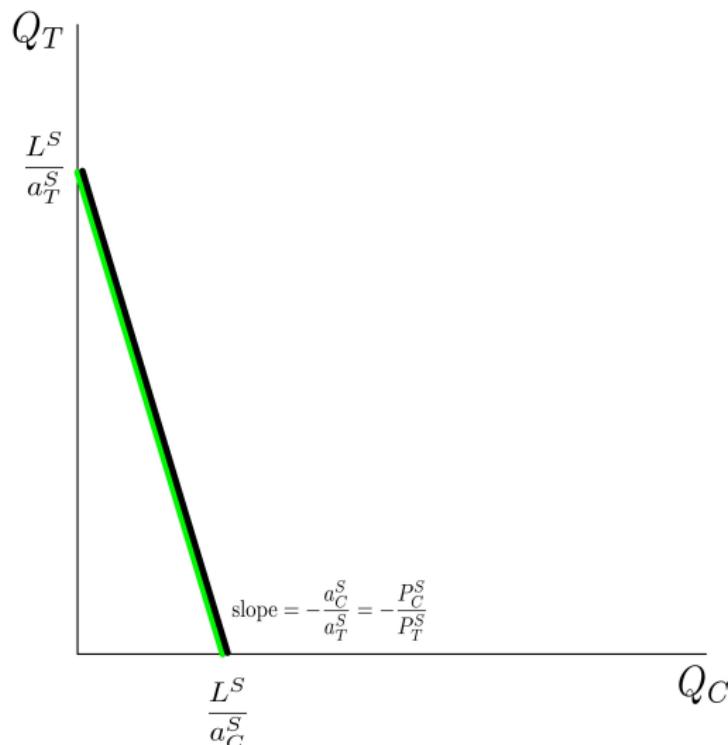
# Will there be gains from trade?

- Put another way, can a country gain from producing only one good and importing the other?
  - Gains represented by attaining an indifference curve higher than what is attained in autarky
- Yes!

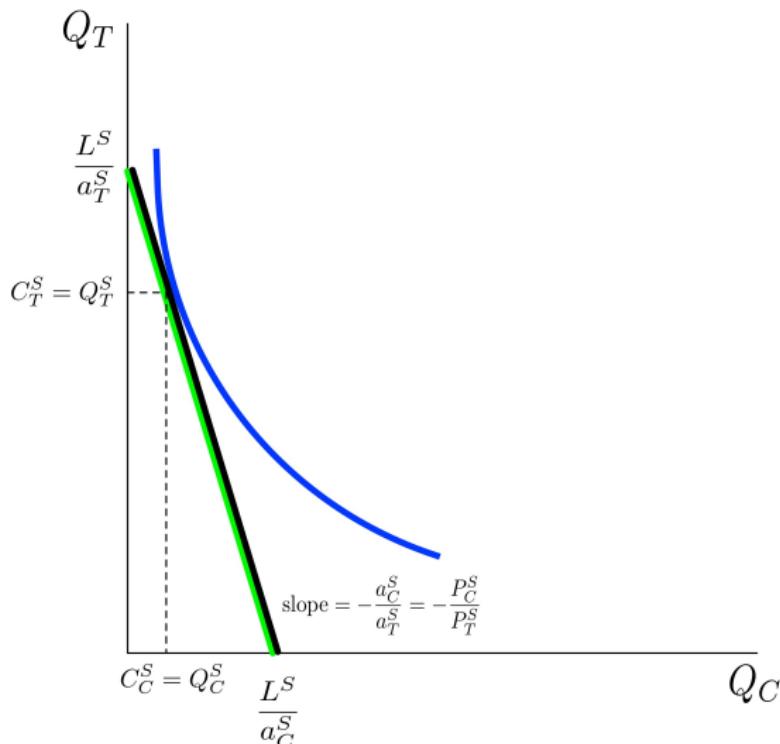
# Will there be gains from trade?

- Consider the Southern country
- Since  $\frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$ , budget constraint has a slope steeper than the PPF
  - Note that the slopes are the negative of these values

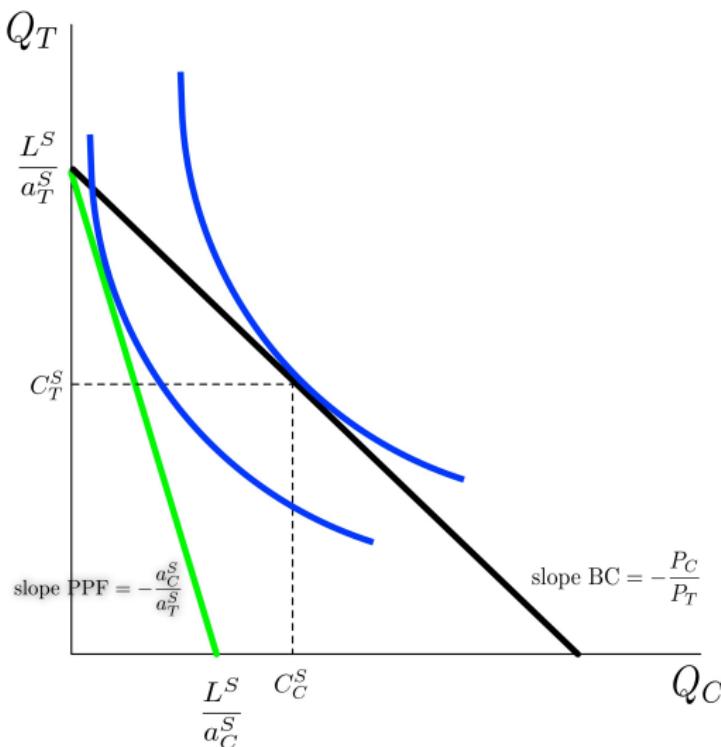
# Will there be gains from trade?



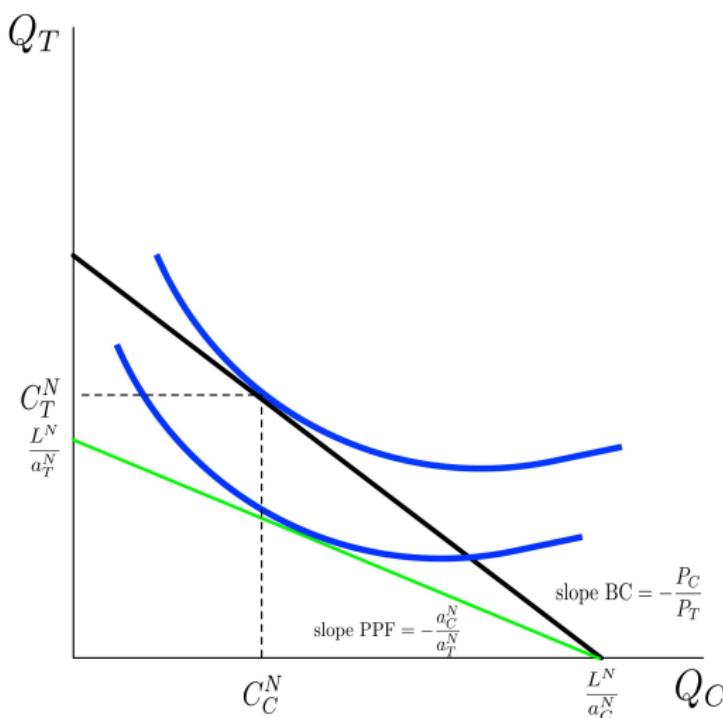
# Will there be gains from trade?



# Will there be gains from trade?



## North



## Gains from Trade: Conclusion

- If countries just specialized in the production of one type of good and traded their surplus with another country, they attain a higher indifference curve
  - Thus, there are gains from specialization (and, subsequently, trade)
- If, on the other hand,  $\frac{a_C^N}{a_T^N} = \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$ , then North does not gain from trade (since North's relative price is equal to that in autarky)
  - But the southern country gains from trade!
- If  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$ , both countries gain from trade
- The farther apart  $\frac{a_C^N}{a_T^N}$  and  $\frac{a_C^S}{a_T^S}$  are from world relative prices  $\frac{P_C}{P_T}$ , the greater the countries will gain from trade
  - i.e. the higher the indifference curve they will attain relative to autarky

# Trade Equilibrium

# Okay, but where do prices come from?

- We didn't have to worry about how prices are determined in autarky
  - They came from the relative unit labour requirements (e.g.  $\frac{P_C^N}{P_T^N} = \frac{a_C^N}{a_T^N}$ )
- Under trade, we assumed that relative prices fell somewhere between the autarky prices

$$\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$$

- But where do these prices come from?
  - There are infinitely many points in the continuum between  $\frac{a_C^N}{a_T^N}$  and  $\frac{a_C^S}{a_T^S}$
  - How do we fix prices?

# Okay, but where do prices come from?

- What do we *remember* from second-year micro theory about what determines prices?
  - ...

# Okay, but where do prices come from?

- What do we *remember* from second-year micro theory about what determines prices?
  - ...
- Supply and Demand!
- But since we're dealing with relative prices, we will focus on **Relative Demand (RD)** and **Relative Supply (RS)**
  - Ratio of prices and total quantities for both goods

# Relative Price and Total Quantity

$$\frac{P_C}{P_T}$$

$$\frac{Q_C^N + Q_C^S}{Q_T^N + Q_T^S}$$

# Relative Price and Total Quantity

- Vertical axis: relative price,  $\frac{P_C}{P_T}$
- Horizontal axis: relative *total* quantity,  $\frac{Q_C^N + Q_C^S}{Q_T^N + Q_T^S}$
- We will derive the relative supply curve, RS, first

# Assumptions

Recall,

- North, Canada, has a comparative advantage in producing computers
  - Unit labour requirements and **autarky** relative prices are

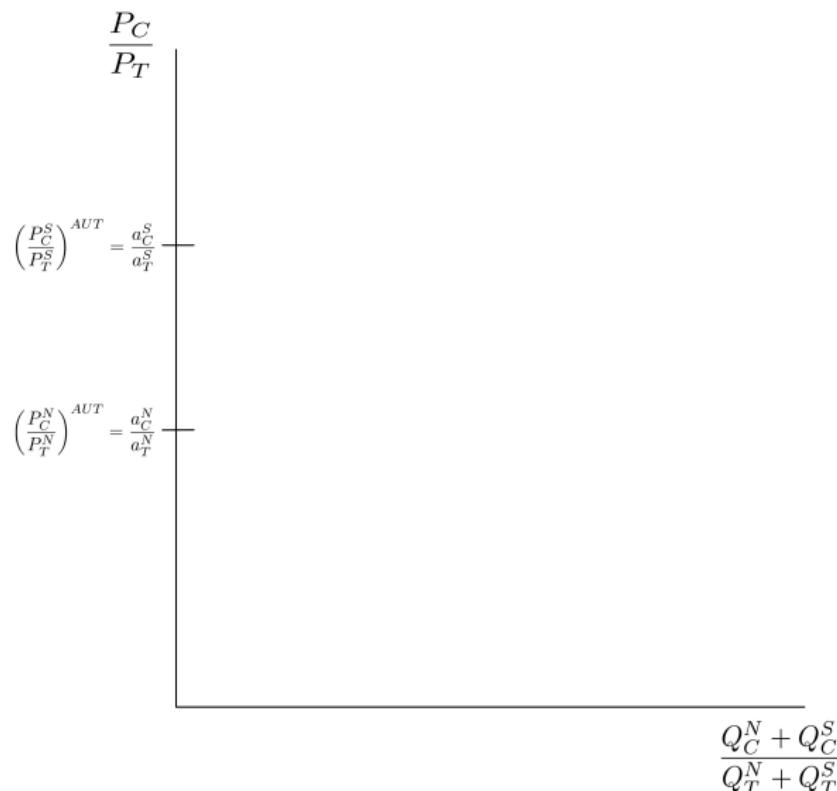
$$\left(\frac{P_C}{P_T}\right)_{aut}^N = \frac{a_C^N}{a_T^N} < \frac{a_C^S}{a_T^S} = \left(\frac{P_C}{P_T}\right)_{aut}^S$$

- Note that we have changed notations
- Also, perfect competition across firms in each country implies

$$P_C = w^N a_C^N \text{ and } P_T = w^N a_T^N$$

- Prices driven down so that marginal revenue = marginal cost
- These conditions are true for South, too

# Relative Autarky Prices



- If we allow countries to trade goods, the price of a good will be equal across the two countries

$$P_C^N = P_C^S = P_C$$

$$P_T^N = P_T^S = P_T$$

# Relative Supply Curve

- To derive the relative supply curve, we must consider three cases:
  - ① Equilibrium relative prices could be **between**  $\frac{a_C^N}{a_T^N}$  and  $\frac{a_C^S}{a_T^S}$
  - ② Equilibrium relative prices could be **greater** than both  $\frac{a_C^N}{a_T^N}$  and  $\frac{a_C^S}{a_T^S}$
  - ③ Equilibrium relative prices could be **below** both  $\frac{a_C^N}{a_T^N}$  and  $\frac{a_C^S}{a_T^S}$
- Lets consider each one

Relative Supply Curve: 1.  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

- $\frac{P_C}{P_T}$  is between the ratio of relative unit labour requirements of North and South
- For North,  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} \implies P_T \frac{1}{a_T^N} < P_C \frac{1}{a_C^N}$
- These are just wages!
- If these are the prices that prevail, all workers in North will just work in the computer industry
- Country North specializes in producing computers

$$Q_C^N = \frac{L^N}{a_C^N}, \quad Q_T^N = 0$$

Relative Supply Curve: 1.  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

- For South, wages will be higher in textiles:  $P_C \frac{1}{a_C^S} < P_T \frac{1}{a_T^S}$
- South will specialize in textile production (no computers) and outputs are

$$Q_C^S = 0, \quad Q_T^S = \frac{L^S}{a_T^S}$$

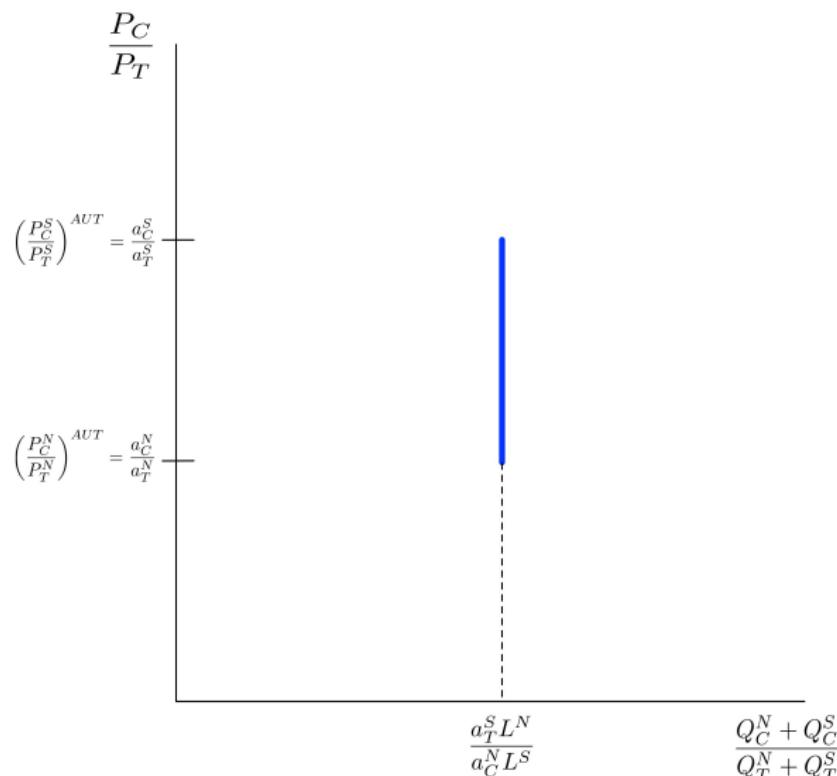
Relative Supply Curve:  $1 \cdot \frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

- In summary, whenever the prices is between  $\frac{a_C^N}{a_T^N}$  and  $\frac{a_C^S}{a_T^S}$ , world relative supply is

$$\frac{Q_C^N + Q_C^S}{Q_T^N + Q_T^S} = \frac{Q_C^N + 0}{0 + Q_T^S} = \frac{L^N/a_C^N}{L^S/a_T^S}$$

- Let's see how this looks like in our figure

Relative Supply Curve: 1.  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$



Relative Supply Curve: 2.  $\frac{a_C^N}{a_T^N} < \frac{a_C^S}{a_T^S} < \frac{P_C}{P_T}$

- $\frac{P_C}{P_T}$  is greater than ratio of relative unit labour requirements of both North and South
- North, same as case 1. :  $P_T \frac{1}{a_T^N} < P_C \frac{1}{a_C^N}$
- South, same as North:  $P_T \frac{1}{a_T^S} < P_C \frac{1}{a_C^S}$
- In both countries, wage is higher in the computer industry

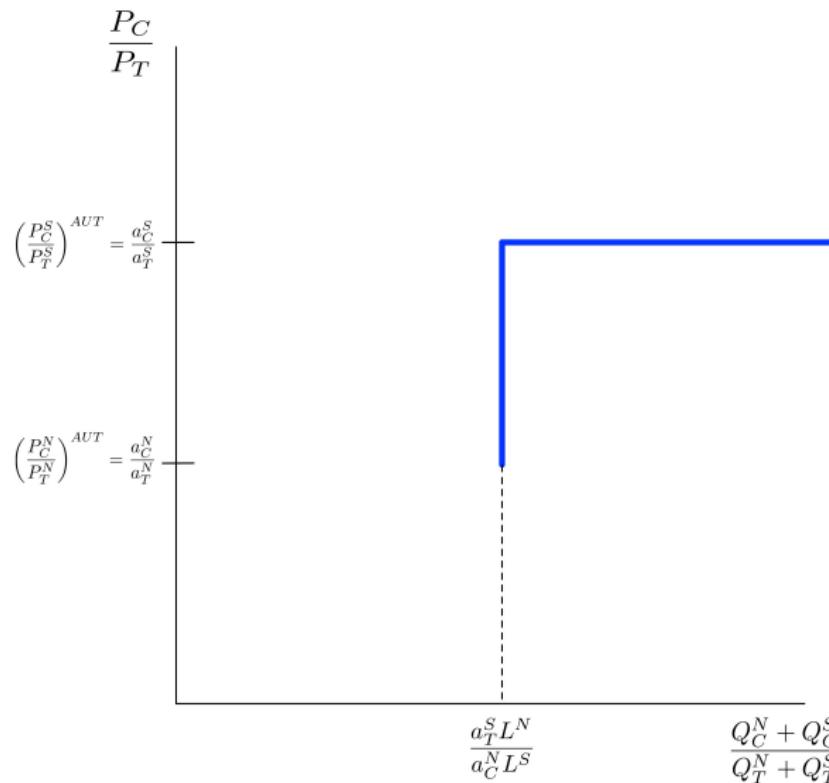
Relative Supply Curve: 2.  $\frac{a_C^N}{a_T^N} < \frac{a_C^S}{a_T^S} < \frac{P_C}{P_T}$

- Because wage is higher in the computer industry in both countries, world supply of textile will be zero
- The world relative supply will be infinity

$$\frac{Q_C^N + Q_C^S}{Q_T^N + Q_T^S} = \frac{Q_C^N + Q_C^S}{0 + 0} = \infty$$

- See figure

Relative Supply Curve: 2.  $\frac{a_C^N}{a_T^N} < \frac{a_C^S}{a_T^S} < \frac{P_C}{P_T}$



Relative Supply Curve: 3.  $\frac{P_C}{P_T} < \frac{a_C^N}{a_T^N} < \frac{a_C^S}{a_T^S}$

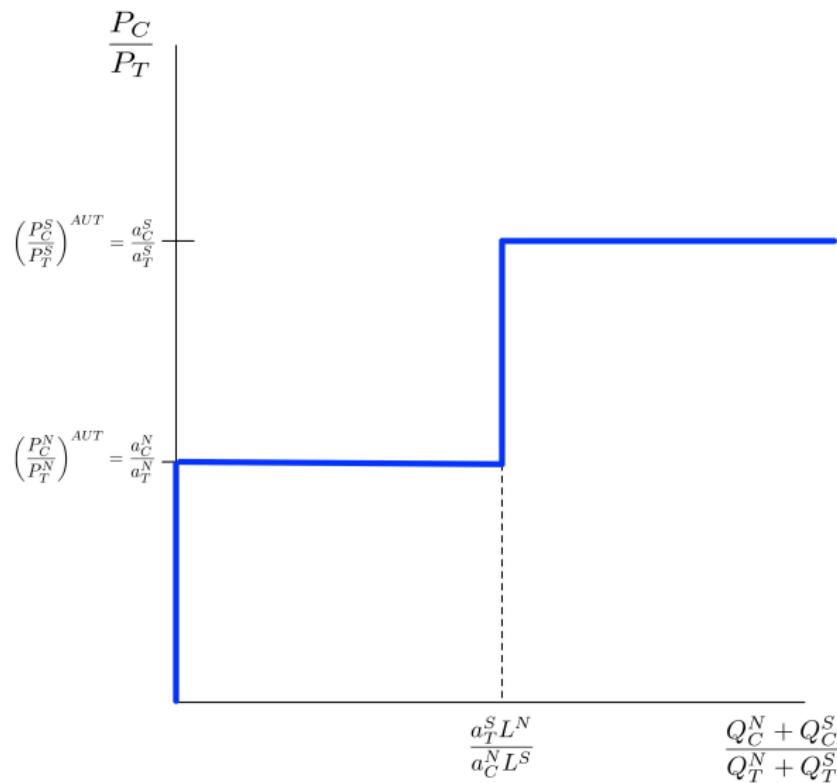
- $\frac{P_C}{P_T}$  is less than ratio of relative unit labour requirements of both North and South
- North:  $P_C \frac{1}{a_C^N} < P_T \frac{1}{a_T^N}$
- South:  $P_C \frac{1}{a_C^S} < P_T \frac{1}{a_T^S}$
- This time wage in textile is higher in both countries

Relative Supply Curve: 3.  $\frac{P_C}{P_T} < \frac{a_C^N}{a_T^N} < \frac{a_C^S}{a_T^S}$

- World relative supply is now

$$\frac{Q_C^N + Q_C^S}{Q_T^N + Q_T^S} = \frac{0 + 0}{Q_T^N + Q_T^S} = 0$$

Relative Supply Curve: 3.  $\frac{P_C}{P_T} < \frac{a_C^N}{a_T^N} < \frac{a_C^S}{a_T^S}$



# Relative Demand Curve

- Demand depends on consumer preferences
- If the price of computers relative to textile is high, then the relative demand for computers will be low
  - Relative demand curve slopes downward
- Homothetic preferences means we can focus on aggregate demand

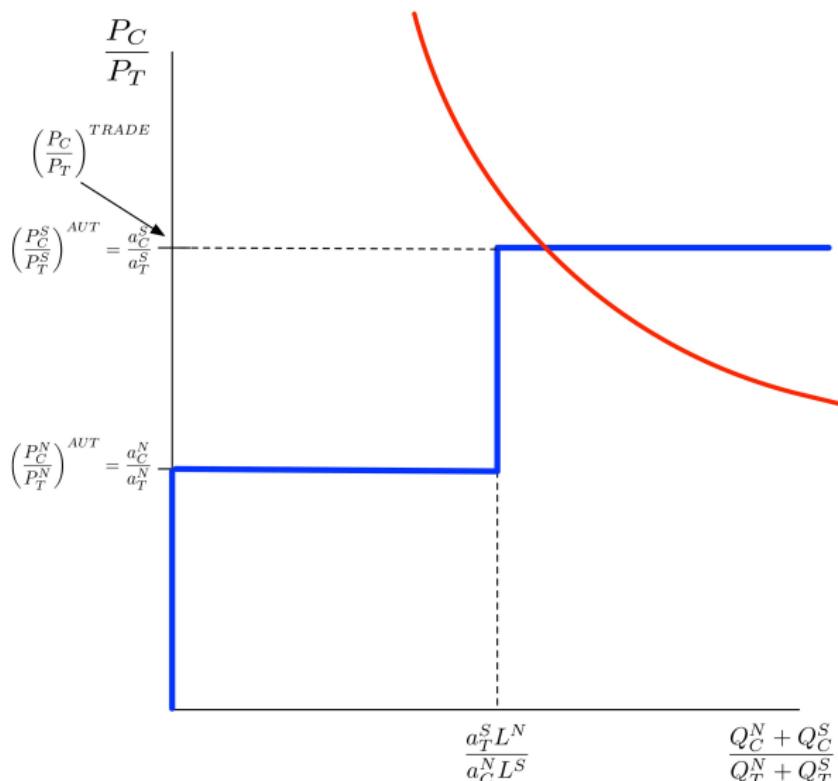
## Relative Demand Curve

- Equilibrium price depends on where the demand curve is located
- For a given relative price,  $\frac{\bar{P}_C}{\bar{P}_T}$ , world preferences could be such that
  - they like computers more than textiles
  - they like textiles more than computers
  - they like computers just as much as textiles

## Relative Demand Curve

Let's consider each type of preferences and their corresponding demand curve and study their equilibrium relative price

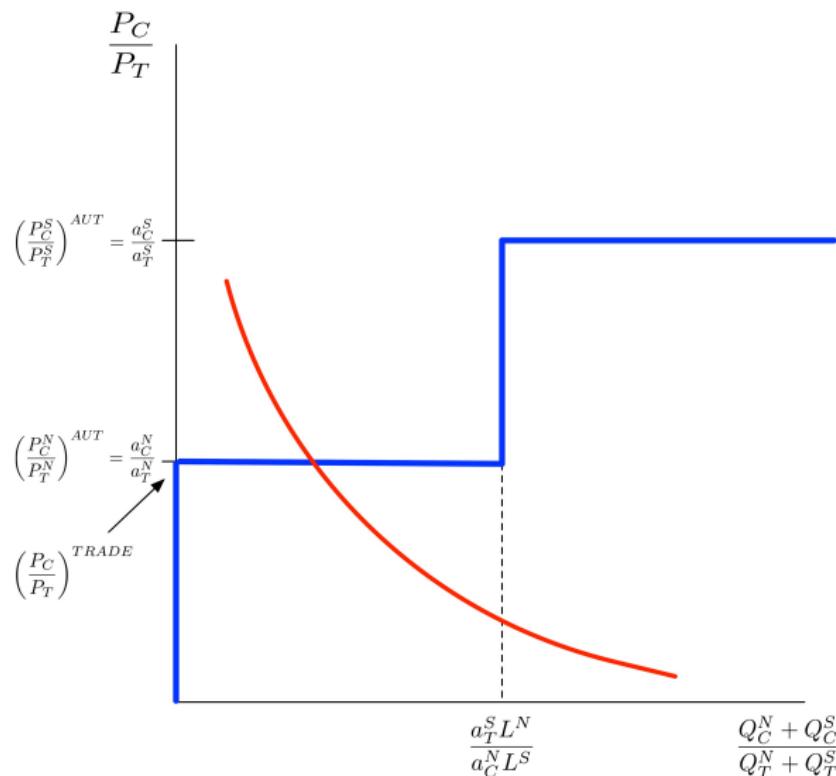
# World likes computers more



## World likes computers more

- With this demand curve, the equilibrium relative price is South's autarky price,  $\frac{a_C^S}{a_T^S}$
- With this equilibrium price, North will produce only computers
- South will produce both computers and textiles
- **Interpretation:**
  - Under these preferences, the world demand for computer is high
  - The Northern country's production is not sufficient to supply it, so the South produces some computers to make up for the shortage
- Who gains from trade?
  - Only the Northern country
  - South is facing its autarky price and is producing its autarky level of output

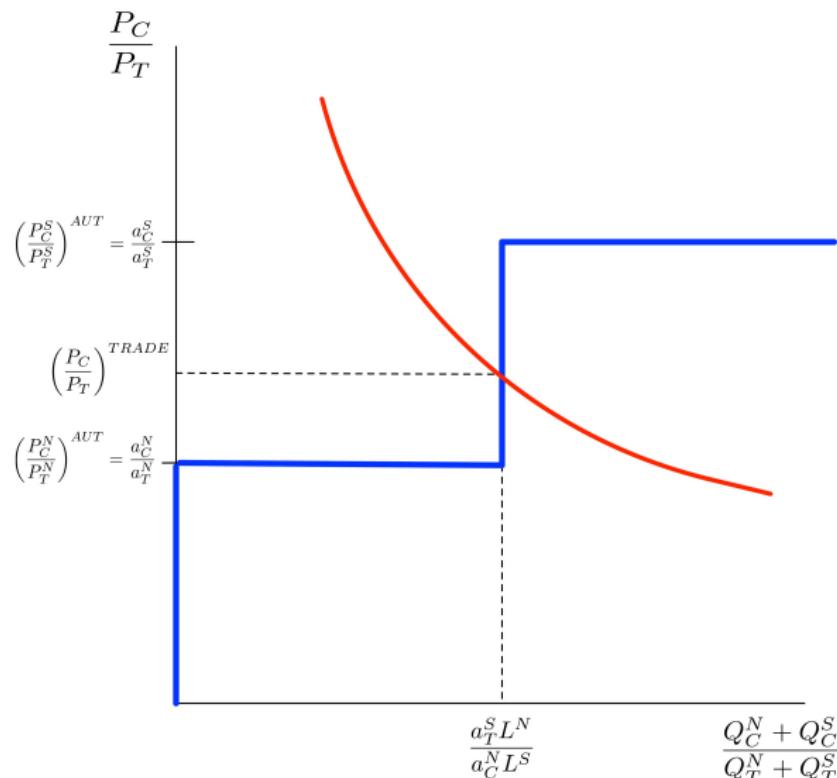
# World likes textiles more



# World likes textiles more

- With this demand curve, the equilibrium price is North's autarky price,  $\frac{a_C^N}{a_T^N}$
- South will produce only textiles
- Interpretation:**
  - Here the world generally prefer more textiles over computers
  - South's production is insufficient to supply it, so North will make up for the shortage
- Who gains from trade?
  - Only the Southern country
  - At this equilibrium price, North is producing at autarky level

# World likes computers as much as textiles



# World likes computers as much as textiles

- Equilibrium price is in between the autarky prices of each country
- Each country will specialize in the production of the good for which they have a comparative advantage
  - North: Computers
  - South: Textiles
- Both countries gain from trade (see *Gains from Trade* section of this lecture for a review why)

# Relative Wages

# Why look at wages?

- We have established that with free trade at least one country will gain
  - Both will gain if both countries are able to specialize
- We define a *gain* as being able to attain a higher indifference curve relative to autarky
  - What on earth does an indifference curve mean in the real world?!
- Since, in studying international trade, we are interested in peoples welfare, perhaps it might be useful look at something we can measure
- Let's start with wages

# Assumptions

- Suppose that under trade, the relative demand curve is such that relative prices is strictly between each country's relative unit labour requirements

$$\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$$

- In this case, North will specialize in computers and South will specialize in textiles
- Thus, wages paid in each country only comes from the surviving industry
  - No wages from textiles in North
  - No wages from computers in South

# Assumptions

- For each country, we have two revenue = cost conditions

$$P_C = w^N a_C^N$$

$$P_S = w^S a_T^S$$

- North is only producing computers, thus all of its income comes from just the computer industry
- All of South's income come from the textile industry

# Assumptions

$$P_C = w^N a_C^N$$

$$P_T = w^S a_T^S$$

- These conditions can be combined to give

$$\frac{w^N}{w^S} = \frac{a_T^S}{a_C^N} \frac{P_C}{P_T}$$

- Relative wages depends on labour productivity and prices
  - If computers and textiles have the same price, wages depend only on labour productivity
  - Otherwise, wages depend on both

# Gains from Trade and Wages

- Keeping the assumptions above in mind (each country specializes), let's see how gains from trade can be seen from wages
- When making welfare statements from wages, it is more informative to look at *real* wages
  - This is your nominal wage adjusted for inflation
  - No one cares about billionaires in Zimbabwe
  - Real wages is defined as  $\frac{w}{p}$  (it is the number of goods—at price  $p$ —you can buy with your wage,  $w$ )

# Gains from Trade and Wages

- Real wages can be in terms of either computers or textiles
- For North, we care about  $\frac{w^N}{P_C}$  and  $\frac{w^N}{P_T}$
- Similarly for South

# Gains from Trade and Wages

- We will consider three cases

$$\textcircled{1} \quad \frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$$

$$\textcircled{2} \quad \frac{a_C^N}{a_T^N} = \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$$

$$\textcircled{3} \quad \frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} = \frac{a_C^S}{a_T^S}$$

# Gains from Trade and Wages

- For each of these cases we will ask *Did real wages increase under trade?*
- We answer this by comparing real wages in both autarky and trade *and* in terms of each of the two industries
- Let's begin!

Gains from Trade and Wages:  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

- What were autarky real wages in each industry?

- $\left(\frac{w^N}{P_C^N}\right)^{AUT} = \frac{1}{a_C^N}$  and  $\left(\frac{w^N}{P_T^N}\right)^{AUT} = \frac{1}{a_T^N}$

Gains from Trade and Wages:  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

- What are trade—with full specialization—real wages in each industry?
  - Because North is only producing computers, the only revenue=cost condition in North is  $P_C = w^N a_C^N$
  - Thus, trade real wages in computers is just  $\left(\frac{w^N}{P_C}\right)^{TRADE} = \frac{1}{a_C^N}$
  - This is the same as autarky computer real wages!
    - $\left(\frac{w^N}{P_C^N}\right)^{AUT} = \frac{1}{a_C^N}$

Gains from Trade and Wages:  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

- What are trade—with full specialization—real wages in each industry?
  - For North, no wages are being earned in textiles
  - But we can still derive an expression for real wages in textiles
    - $\left(\frac{w^N}{P_T}\right)^{TRADE} = \frac{w^N}{P_T} \frac{P_C}{P_C} = \frac{w^N}{P_C} \frac{P_C}{P_T} = \frac{1}{a_C^N} \frac{P_C}{P_T}$
- Now we have everything we need to determine, using real wages, if there are gains from trade

Gains from Trade and Wages:  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

- Did real wages increase under trade?
- From above, we see that real wages in terms of computers did not change  $\left(\frac{w^N}{P_C^N}\right)^{AUT} = \left(\frac{w^N}{P_C}\right)^{TRADE}$
- In terms of textiles, because  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} \implies \frac{1}{a_T^N} < \frac{1}{a_C^N} \frac{P_C}{P_T}$ , real wages are greater under free trade!
  - $\left(\frac{w^N}{P_T^N}\right)^{AUT} < \left(\frac{w^N}{P_T}\right)^{TRADE}$

Gains from Trade and Wages:  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

- In summary, real wages either did not change (for computers) or increased (for textiles)
- Thus, in this scenario, there are gains from trade
- Because of trade, South is able to specialize in the production of good for which it has a comparative advantage (textiles)
- South can then make this good available in the global market at a price less than what North, in autarky, can provide
- EXERCISE: Are there gains from trade for the Southern country under this scenario?

Gains from Trade and Wages:  $\frac{a_C^N}{a_T^N} = \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

- Free trade relative price equals the autarky relative price for North
- Because of this autarky prices for North, they will produce both goods
- Thus, for North, trade real wages is equal to autarky real wages

$$\left(\frac{w^N}{P_C^N}\right)^{AUT} = \left(\frac{w^N}{P_C}\right)^{TRADE} = \frac{1}{a_C^N}$$

$$\left(\frac{w^N}{P_T^N}\right)^{AUT} = \left(\frac{w^N}{P_T}\right)^{TRADE} = \frac{1}{a_T^N}$$

Gains from Trade and Wages:  $\frac{a_C^N}{a_T^N} = \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

- South, on the other hand, will specialize in producing textiles
- However, only real wages for computers will increase in South
- Real wages for textiles will not change
  - EXERCISE: Derive this!

Gains from Trade and Wages:  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} = \frac{a_C^S}{a_T^S}$

- This is similar to the case where  $\frac{a_C^N}{a_T^N} = \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$
- Only this time trade real wages will be the same as in autarky for the Southern country (for both industries)
- The Northern country, however, will experience an increase in real wages in the textile industry but not in the computer industry

# International Trade Misconceptions

- Now that we have a framework in mind, we can address some of the misconceptions about free trade

# International Trade Misconceptions

Myth 1: Free trade can only benefit a country if it is strong enough to stand up to foreign competition (e.g. the country must possess some technological or resource superiority to survive)

# International Trade Misconceptions

Myth 1: Free trade can only benefit a country if it is strong enough to stand up to foreign competition (e.g. the country must possess some technological or resource superiority to survive)

- A country can be technically inferior in all industries and still experience gains from trade. Comparative advantage and not absolute advantage is what gives rise to gains from trade
- This is true so long as countries are *different* in terms of their labour productivity and preferences are such that the resulting equilibrium trade relative prices are different from each countries relative labour productivity
  - In other words, this  $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

# International Trade Misconceptions

Myth 2: Foreign competition is unfair because foreign countries compete by paying their workers low wages

# International Trade Misconceptions

Myth 2: Foreign competition is unfair because foreign countries compete by paying their workers low wages

- The Home country's concern should be whether it is cheaper to produce computers and trade it for textiles versus producing textiles domestically
- If it is cheaper to import textiles, then there are gains from trade, regardless of the fact that the Foreign country is paying a lower wage
- There are short term adjustment costs to free trade (people will lose jobs as industrial production shifts overseas), so perhaps this is why trade reforms remain a contentious issue

# International Trade Misconceptions

Myth 3: Trade exploits a country and makes it worse off if its workers receive much lower wages than workers in other countries (e.g. sweatshops in China)

# International Trade Misconceptions

Myth 3: Trade exploits a country and makes it worse off if its workers receive much lower wages than workers in other countries (e.g. sweatshops in China)

- What's the alternative? Suppose we stop exporting computers to Mexico and stop importing textiles
- In our model, real wages would fall in the South country in terms of computers
  - The South is inefficient at producing computers, so autarky computer prices will be higher than free trade computer prices
- Home country, on the other hand, will see a drop in real wages in terms of textiles

## The Ricardian Model: Summary

- Each country should export the good in which they have a comparative advantage...
  - North: Computers, South: Textiles
- ...and import the good in which they have a comparative disadvantage
  - North: Textiles, South: Computers
- If free trade equilibrium relative price is between each country's autarky relative prices, *both* countries gain from trade
- But if the free trade equilibrium relative price is equal to one of the country's autarky relative price, that country does not gain from trade (it is also no worse off)
  - The other country, though, will gain from trade
- Gains from trade are modeled by a higher indifference curve attained and through higher overall real wages

# The Ricardian Model: Shortcomings

- Only one factor in production: Labour
  - Others: land, distinguish between skilled and low-skill labour, capital
- Assumes perfect labour mobility across industries
  - Not always true
  - Takes time
- Countries can only experience gains from trade
  - At worst, there is no change in welfare
  - Does not model welfare losses from industrial shifts
- Countries differ only in terms of their productivity
  - Does not model resource endowment
  - Canada has plenty of natural resources (lumber and shale oil)
- We will consider some of these issues in our next model:
  - The Heckscher-Ohlin Model