ECO364H1S: International Trade Theory

Lecture 2a

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- Last Class
  - Facts
  - Ricardian Model: Definitions, Autarky Equilibrium

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  - Ricardian Model: Definitions, Autarky Equilibrium
- Today
  - Ricardian Model
    - Gains from Trade
    - Trade Equilibrium
    - Wages

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- Readings
  - KMO Chapter 3

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

$$\text{Consumption} = \text{Production}$$

- Under free trade, a country's consumption need not equal to production
  - PPF and budget constraint need not overlap
  - Why? Because prices are now set in the global market

- We will continue with the same example from Lecture 1
  - Two Countries: North (Canada) and South (Mexico)
  - Two Goods: Computers and Textiles
  - One Factor of Production: Labour

- PPF (same as before)

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

- 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 (removed superscripts on prices)
    - We will continue to seamless transition of labour across industries but no immigration

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

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

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

  - Follows from the labour mobility across industries and perfect competition assumptions

- We will 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:

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

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

- Slope of PPF no longer equals slope of budget constraint
  - Budget constraint will pivot
- Will it be mutually advantageous for countries to trade?

Gains from trade?

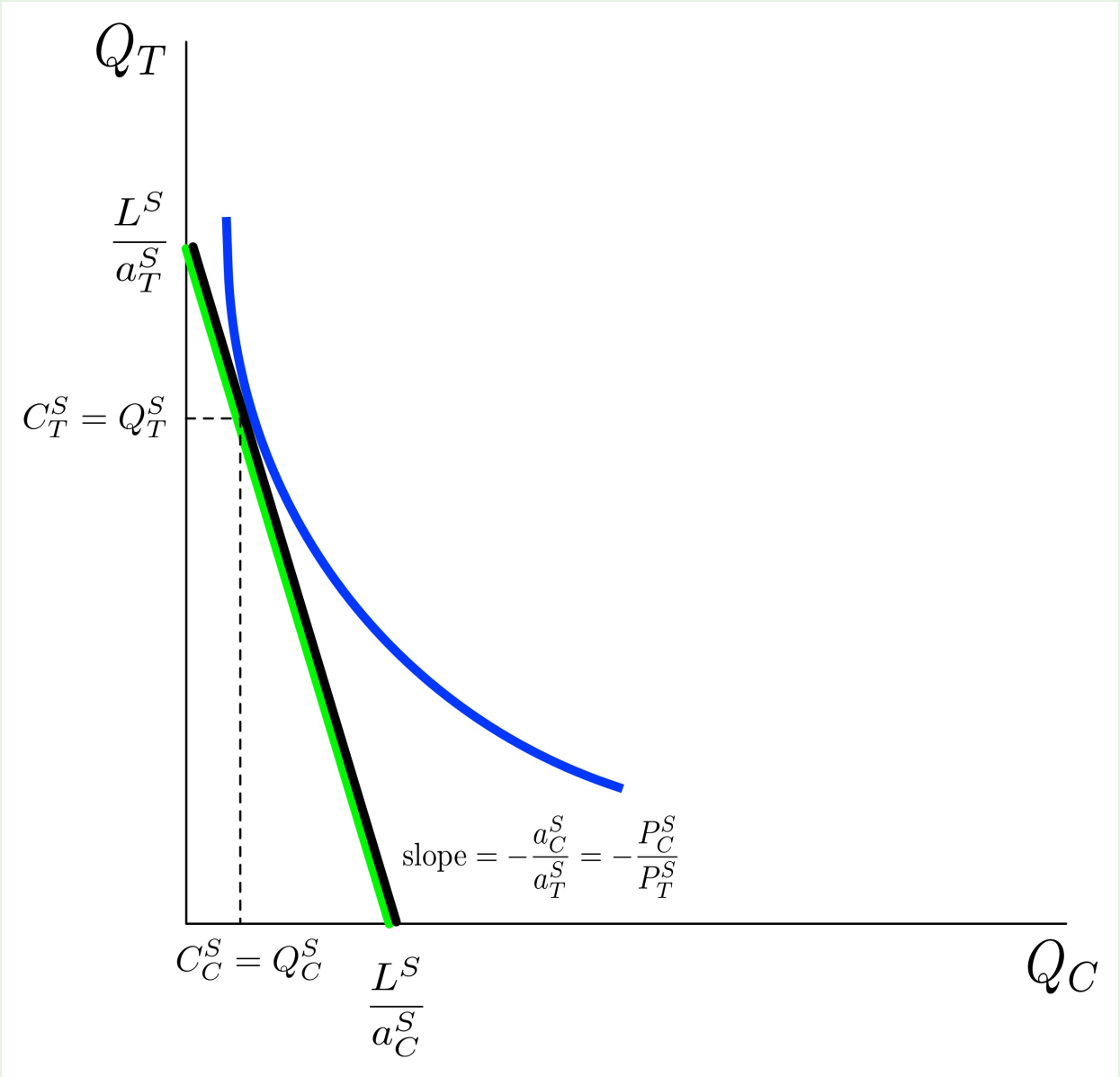
- Stated more precisely, can a country gain from producing only one good and importing the other?
  - Gains from trade are made by attaining an indifference curve higher than what can be achieved under autarky

Gains from trade?

- Consider country South
- Since $\frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$, the budget constraint has a flatter slope than the PPF

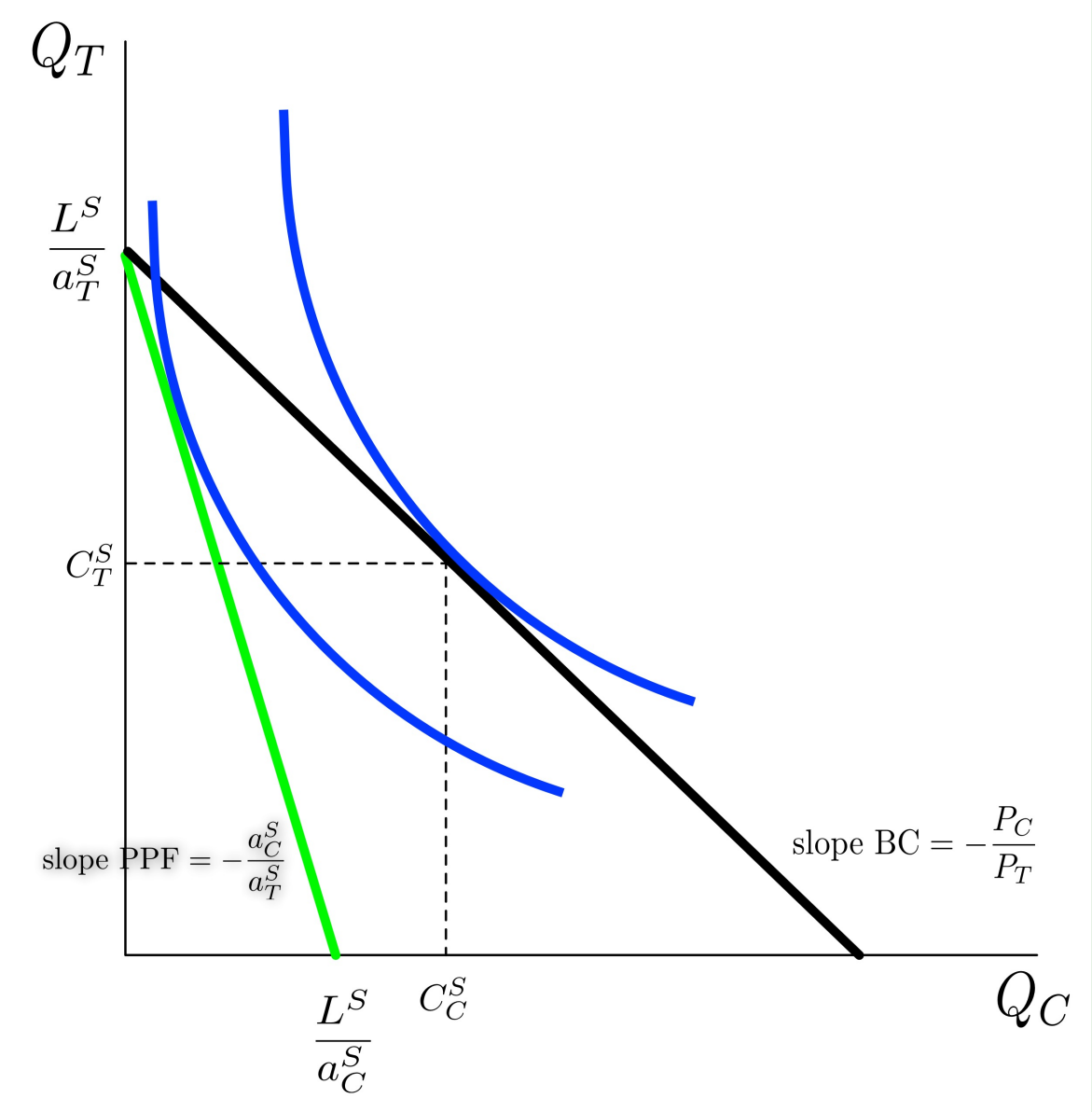
Gains from trade?

- Previously

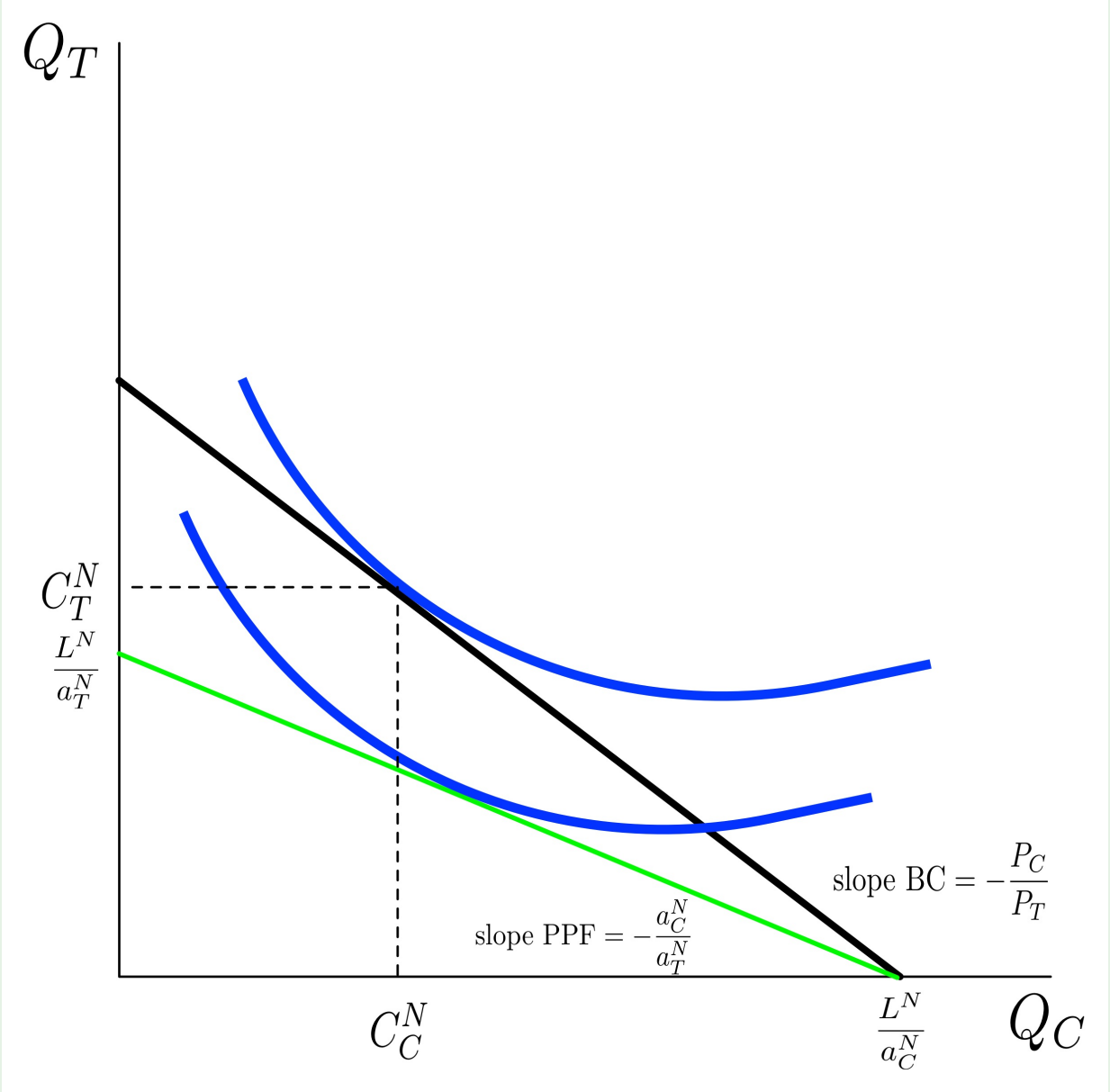


Gains from trade?

- Under free trade



North


Q_T
C_T^N
$\frac{L^N}{a_T^N}$
slope BC $= -\frac{P_C}{P_T}$
slope PPF $= -\frac{a_C^N}{a_T^N}$
C_C^N
$\frac{L^N}{a_C^N}$
Q_C

Gains from Trade: Conclusion

- If countries were to specialize in the production of a type of good, trading their surplus would achieve a higher indifference curve
  - There are gains from trade and specialization
- If, on the other hand, $\frac{a_C^N}{a_T^N} = \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$, North does not gain from trade
  - North's relative price is equal to autarky
  - South, however, achieves gains from trading
- Both countries gain when prices are such that $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$
  - 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 trading

Trade Equilibrium

Where do prices come from?

- In autarky, prices 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 just assumed that relative prices fell some where between the autarky prices

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

- There are infinitely many points between $\frac{a_C^N}{a_T^N}$ and $\frac{a_C^S}{a_T^S}$
  - How do we find the equilibrium relative price?

Where do prices come from?

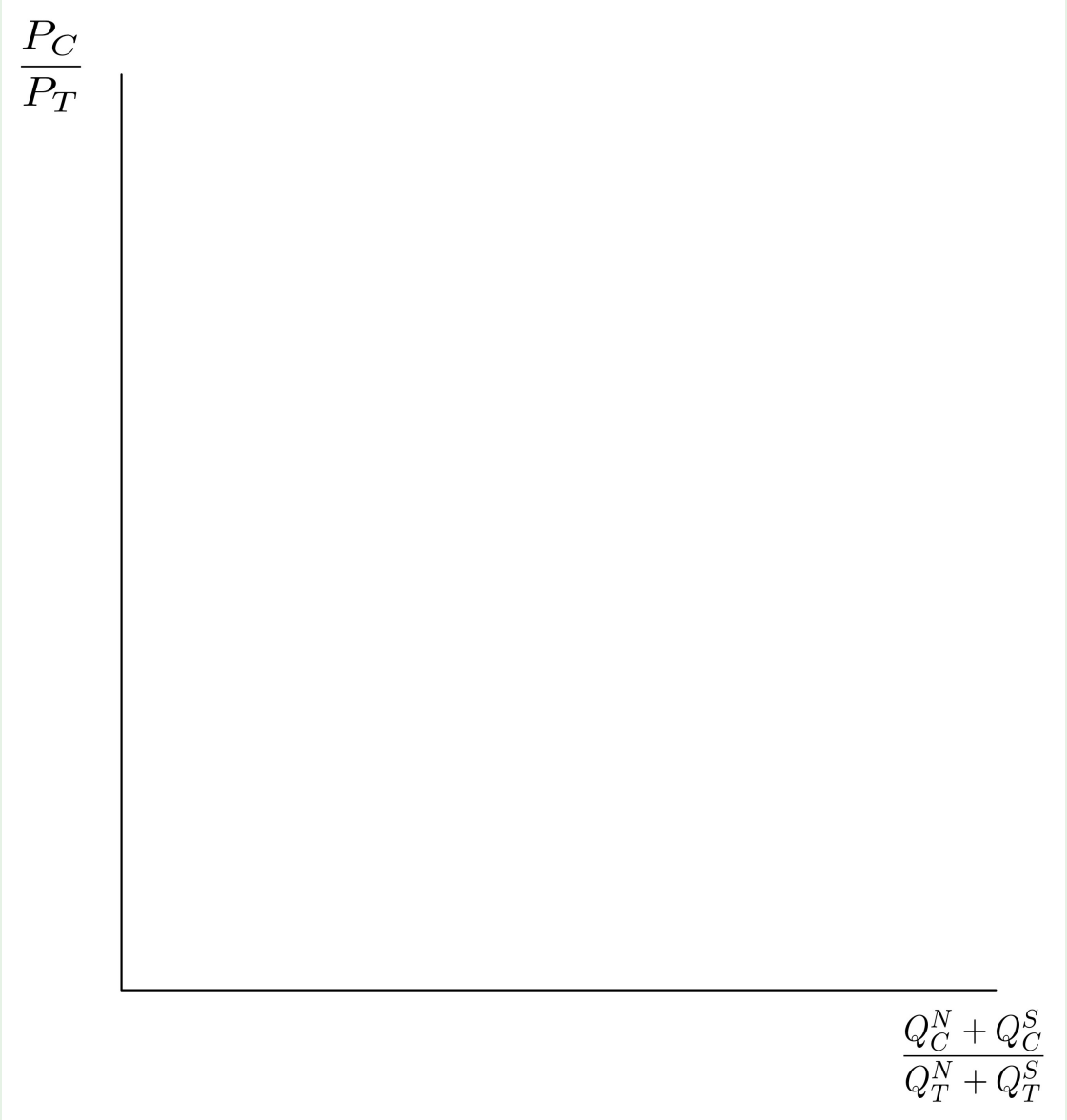
- What do we remember from second-year micro theory about how to derive equilibrium prices?

Where do prices come from?

- What do we remember from second-year micro theory about how to derive equilibrium prices?

- The price at which the supply curve crosses the demand curve!
- But since we are working with relative prices, we will focus on **Relative Demand (RD)** and **Relative Supply (RS)**
  - Ratio of prices and total quantities for both goods
  - We need to derive both

Relative Price and Total Quantity



Relative Price and Total Quantity

- Vertical axis: relative price, $\frac{P_C}{P_T}$
- Horizontal axis: relative *total* quantity, $\frac{Q_C^N + Q_C^S}{Q_T^N + Q_T^S}$

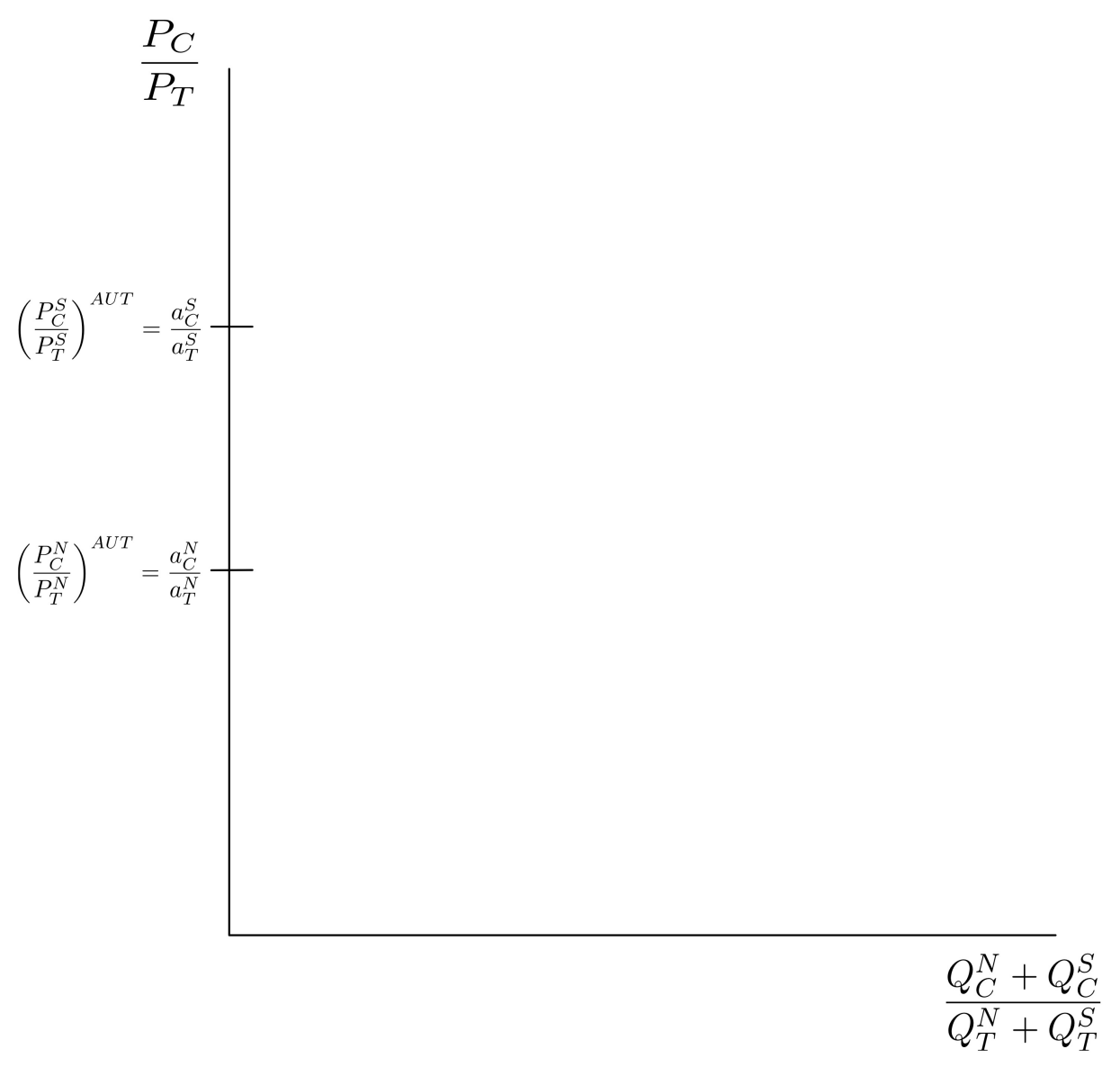
Assumptions

Recall,

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

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

Relative Autarky Prices



Prices under Free Trade

- 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 RS curve, we must consider three cases:
  1. Equilibrium relative prices **between** $\frac{a_C^N}{a_T^N}$ and $\frac{a_C^S}{a_T^S}$
  2. Equilibrium relative prices **greater** than both $\frac{a_C^N}{a_T^N}$ and $\frac{a_C^S}{a_T^S}$
  3. Equilibrium relative prices **below** both $\frac{a_C^N}{a_T^N}$ and $\frac{a_C^S}{a_T^S}$

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

- 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 under perfect competition
  - Under these prices, nobody will work in the textile industries
- North will specialize in producing computers:

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

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:

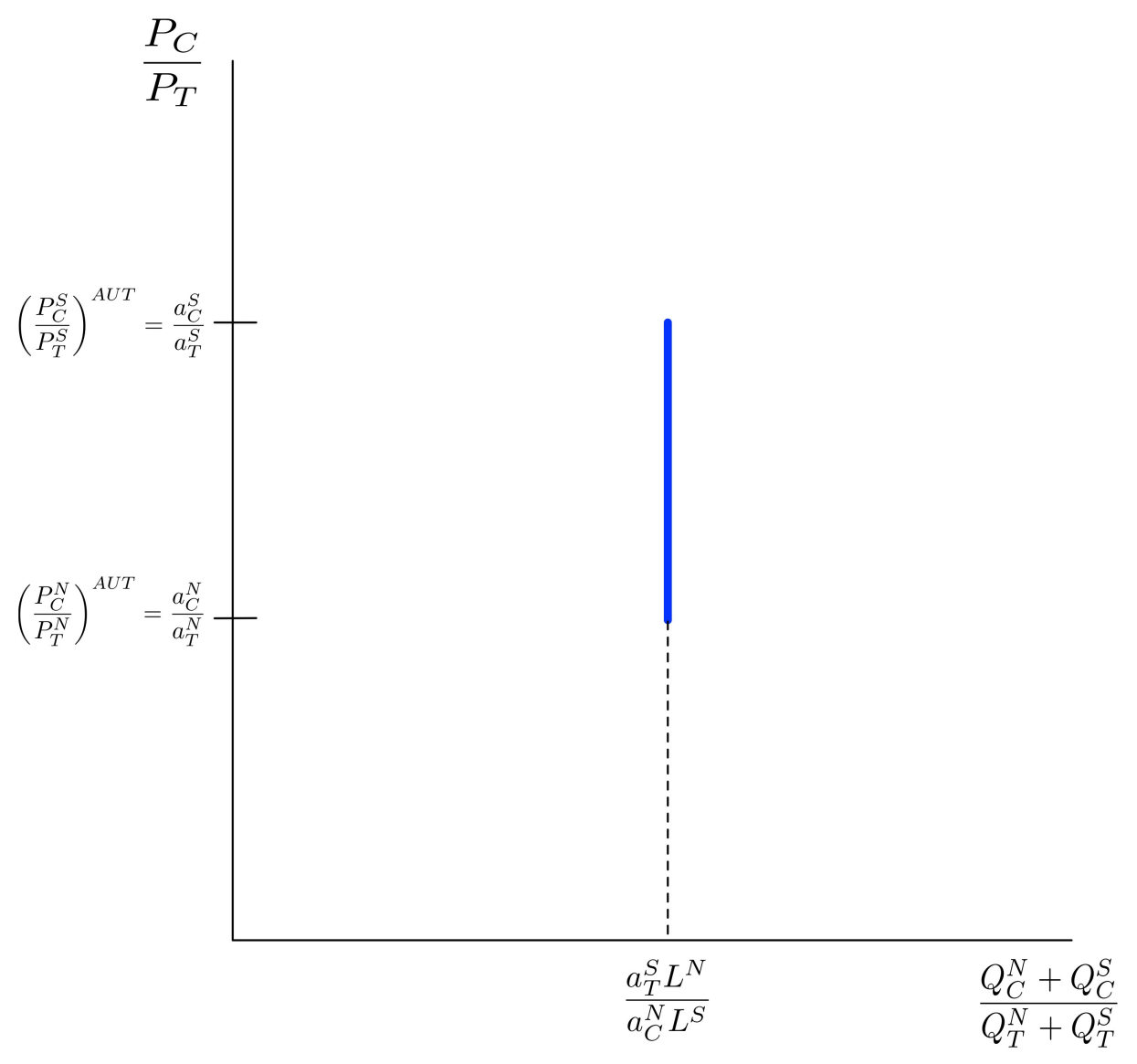
$$Q_C^S = 0, \; Q_T^S = \frac{L^S}{a_T^S}$$

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

- Whenever prices are between $\frac{a_C^N}{a_T^N}$ and $\frac{a_C^S}{a_T^S}$, world relative supply will be

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

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

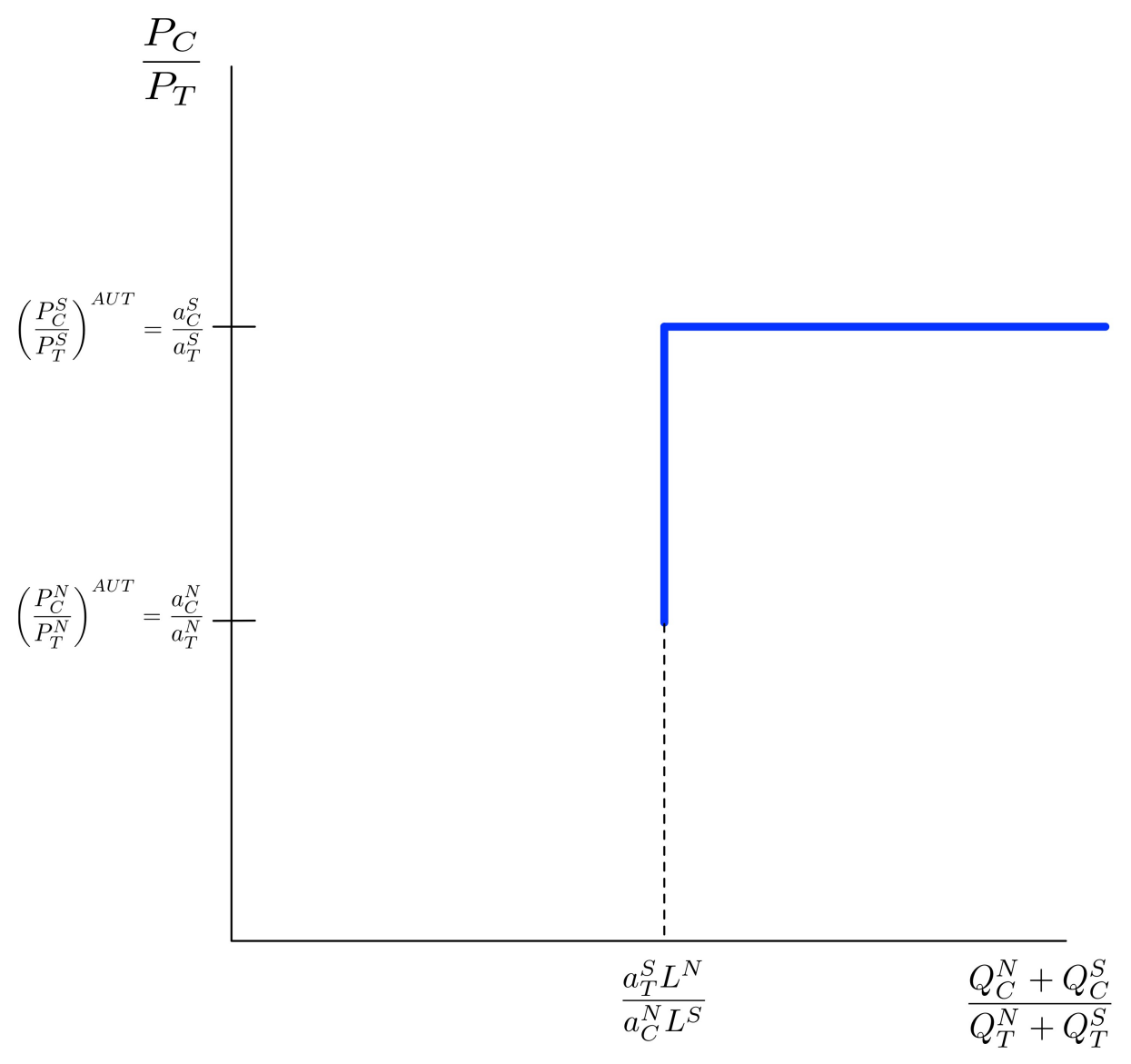
- $\frac{P_C}{P_T}$ is greater than ratio of relative unit labour requirements of both North and South
- North, same as case 1. : $P_T \frac{1}{a_T^N} < P_C \frac{1}{a_C^N}$
- South, same as North: $P_T \frac{1}{a_T^S} < P_C \frac{1}{a_C^S}$
- In both countries, wage is higher in the computer industry

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

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

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

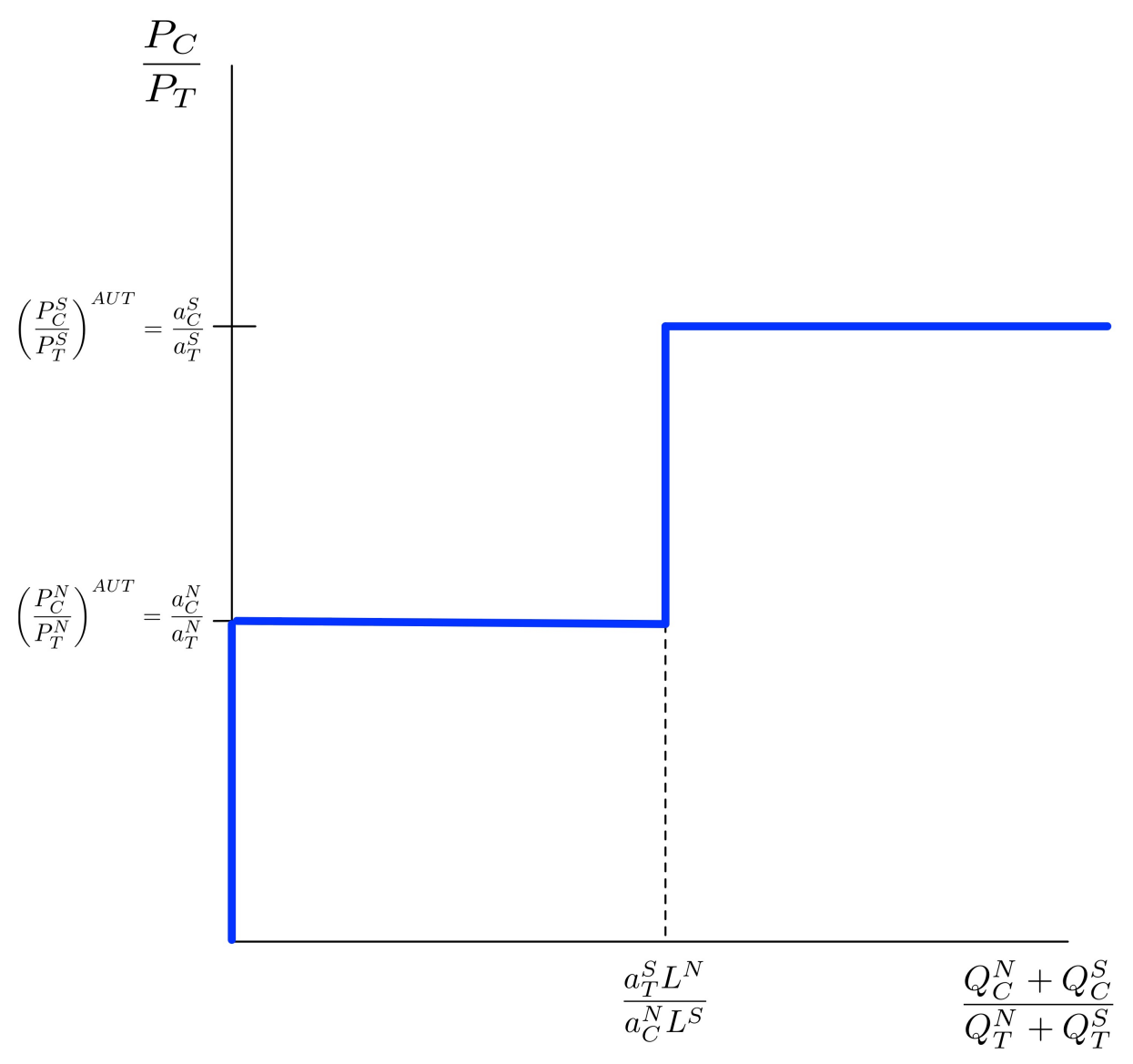
- $\frac{P_C}{P_T}$ is less than ratio of relative unit labour requirements of both North and South
- North: $P_C \frac{1}{a_C^N} < P_T \frac{1}{a_T^N}$
- South: $P_C \frac{1}{a_C^S} < P_T \frac{1}{a_T^S}$
- Wage in textile is higher in both countries

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 (utility function)
- We will assume well-behaved demand functions
  - High prices maps to lower demand for goods
  - Downward sloping demand curves
- Homothetic preferences means we can focus on a single consumer
  - Consumers differ only in income and not in shares of goods consumed

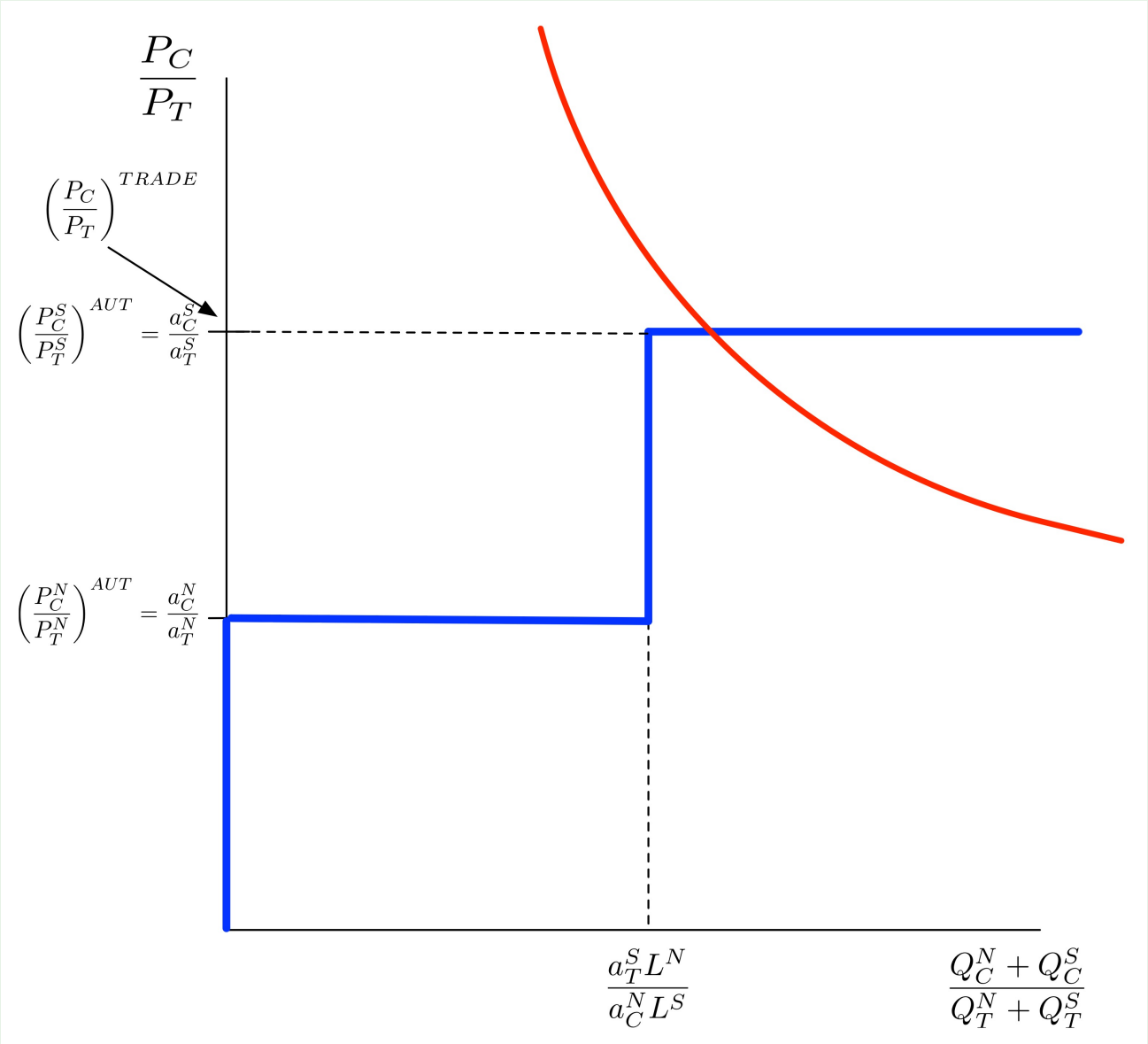
Relative Demand Curve

- Equilibrium price depends on where the demand curve is located
- For a given relative price, $\frac{\bar{P}_C}{P_T}$, consumer preferences could be such that
  - there is greater demand for computers over textiles
  - there is greater demand for textiles over computers
  - demand for computers and textiles is relatively even

Relative Demand Curve

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

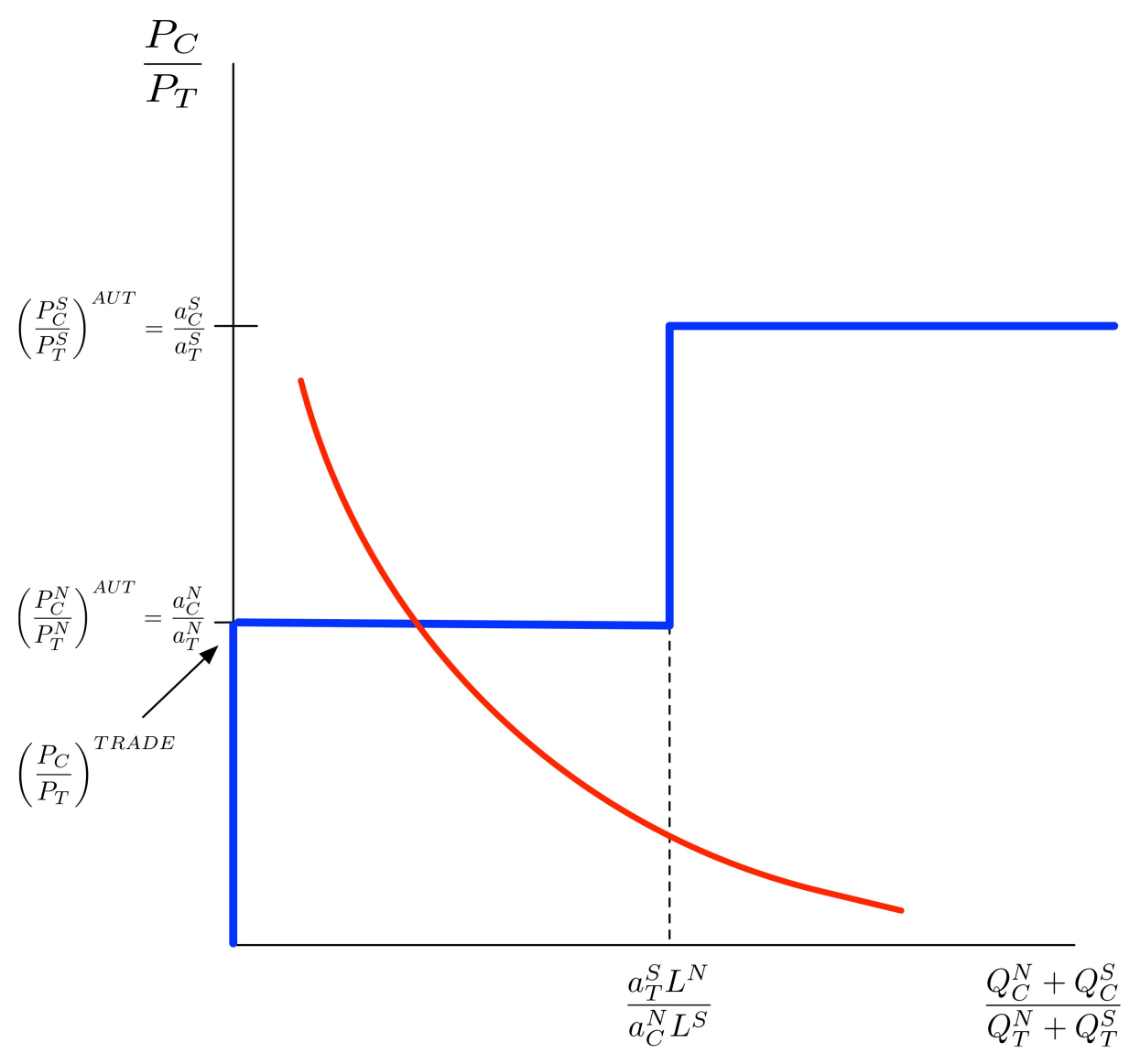
Greater Demand for Computers



Greater Demand for Computers

- For 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:**
  - World demand for computer is high
  - North's production is not sufficient to supply it, so the South produces some computers to make up for the shortage
- Who gains from trade?
  - North (South is producing its autarky level of output)

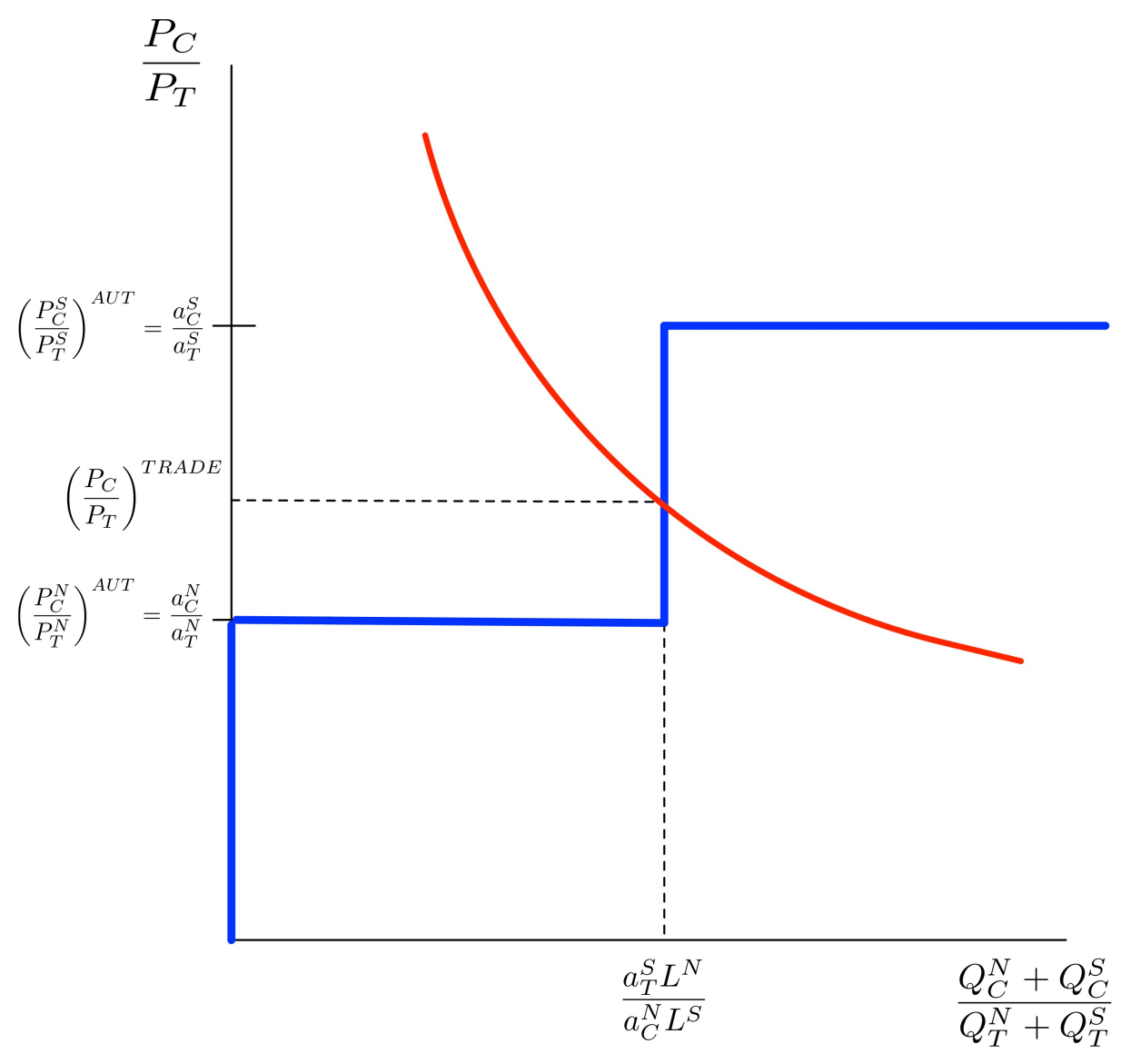
Greater Demand for Textiles



Greater Demand for Textiles

- With this demand curve, the equilibrium price is North's autarky price, $\frac{a_C^N}{a_T^N}$
- South will produce only textiles
- North will produce both computers and textiles
- **Interpretation:**
  - World demand for textiles is high
  - South's production is insufficient to supply it, so North will make up for the shortage
- Who gains from trade?
  - South (North is producing at autarky level)

Relatively Even Demand



Relatively Even Demand

- 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

Trade and Wages

Gains from trade we can observe

- We have established that at least one country can benefit from free trade
  - Both will gain if prices are such that both countries are able to specialize
- We defined *gains* as being able to attain an indifference curve higher than what can be achieved in autarky
- Given our interest in people's welfare, perhaps it might be more useful to look at something we can observe in the real world: 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

Assumptions

- As a result, wages paid only comes from industries that survive
  - All wages are earned only from computers in North and textiles in South
- This leaves us with two profit maximizing conditions:

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

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

Relative Wages

- Combining the two conditions:

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

- These are the wages we expect under free trade with full specialization
- Note that by assumption

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

Relative Wages

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

- Nothing inherently wrong with workers in South being paid a significantly lower wage than North
  - Wage reflects productivity which, in turn, becomes a cost advantage that can result in gains from trade
  - North has a cost advantage in computers despite higher wages, which is offset by higher productivity
- We expect North to have higher wages than South under free trade though both countries still gain from trade

Gains from Trade and Real Wages

- When making welfare statements from wages, it may be more informative to look at ***real*** wages
  - This is just nominal wage adjusted for cost of living (inflation)
  - Real wages is defined as $\frac{w}{p}$ (number of goods you can buy with wage w given price p)

Gains from Trade and Real Wages

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

Gains from Trade and Real Wages

- We will consider the three possible scenarios that may arise:
  1. $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$
  2. $\frac{a_C^N}{a_T^N} = \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$
  3. $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} = \frac{a_C^S}{a_T^S}$

Gains from Trade and Real Wages

- For each of these scenarios 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

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

- Autarky real wages in each industry

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

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

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

- Free trade 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 Real Wages: $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} < \frac{a_C^S}{a_T^S}$

- For North, no wages are being earned in textiles (under these relative prices, North is fully specialized in computer production)
- But we can still derive an expression for real wages in textiles
  - $\left(\frac{w^N}{P_T}\right)^{TRADE} = \frac{w^N}{P_T}\frac{P_C}{P_C} = \frac{w^N}{P_C}\frac{P_C}{P_T} = \frac{1}{a_C^N}\frac{P_C}{P_T}$

Gains from Trade and Real 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?
- We saw 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 Real 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)
- In this scenario, there are gains from trade
- Economic Intuition:
  - Under free trade, South is able to specialize in the production of textiles (their comparative advantage good)
  - 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 Real 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
- For North, trade real wages will just equal 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 Real 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 Real Wages: $\frac{a_C^N}{a_T^N} < \frac{P_C}{P_T} = \frac{a_C^S}{a_T^S}$

- Argument 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 in both industries will be the same as autarky for the Southern country
- The Northern country, however, will experience an increase in real wages in the textile industry but not in the computer industry

Misconceptions about International Trade

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 posses 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 posses 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 country's 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 (in terms of labour expenditure) 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)

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- What's the alternative? Suppose North stops exporting computers and importing textiles from South
- In our model, real wages would fall in the South country in terms of computers
  - The South is inefficient in producing computers resulting in autarky computer prices that are higher than free trade computer prices
- The North country, on the other hand, will see a drop in real wages in terms of textiles due to higher textile prices

Ricardian Model: Summary

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- Each country should export the good for which they have a comparative advantage...
  - North: Computers, South: Textiles
- ...and import the good for 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 (but is no worse off) from trade
  - The other country, however, will gain from trade
- Gains from trade are modeled by using indifference curves and real wages

The Ricardian Model: Limitations

- Only one factor in production: Labour
  - Others: land, skilled v.s low-skill labour, capital
- Assumes perfect labour mobility across industries
  - Countries gain by shifting labour to more productive industries
  - Some resources may not be perfectly mobile (retraining takes time)
- No losses from trade
  - At worst, there is no change in welfare
  - Does not model welfare losses from industrial shifts

The Ricardian Model: Limitations

- Countries differ only in terms of their productivity
  - Does not model resource endowment (e.g. lumber and shale oil)
- We will consider some of these issues in the Heckscher-Ohlin model next class