

# International Trade: Costs and Benefits

Prof. Lutz Hendricks

Econ520

April 4, 2023

# Issues

- ▶ Why do countries trade?
- ▶ Is trade beneficial?
- ▶ Can we compete with low wage countries?

## Concerns about trade

### Imports cost jobs

*"While growing exports tend to support domestic employment, growing imports costs jobs and reduces domestic output. Thus, the size and growth of trade deficits is strongly correlated with trade-related job loss." – Robert Scott, NY Times, 2016*

### Trade reduces wages

*"Companies that produce goods in foreign countries to take advantage of cheap labor should not be permitted to **dictate the wages** paid to American workers." – Philadelphia Inquirer, 1996*

# Competitiveness

How can we compete with low wage countries?

*Each nation is “like a big corporation competing in the global marketplace” - President Clinton*

**Competitiveness** is a major concern when it comes to

- ▶ regulation
- ▶ taxes
- ▶ trade restrictions

## Concerns about trade

Most of the above concerns are (largely) based on a misunderstanding.

There are valid concerns about trade.

But they are mostly about **redistribution** within the U.S.

More recent concerns:

- ▶ global supply chain disruptions (semiconductors)
- ▶ trade as a weapon (energy)

# Comparative Advantage

# Comparative Advantage

The key benefit of trade:

Countries can **specialize** in what they are particularly good at.

A major insight of economics:

International trade is determined by comparative advantage.  
(So is within country trade)

# Absolute advantage

Absolute advantage just means higher productivity

Simple example:

- ▶ there are 2 good (Apples, Computers)
- ▶ there 2 countries (North, South).
- ▶ productivities are  $z_{i,c}$
- ▶ e.g.: one unit of labor produces  $z_{A,N}$  Apples in North.

$N$  has an absolute advantage in  $A$ , if  $z_{A,N} > z_{A,S}$ .



# Absolute advantage

Rich countries have an absolute advantage in most goods.

- ▶ Except for highly localized goods (bananas), rich countries are highly productive at making just about anything.

This is where the (poor country's) concern about competitiveness comes from.

- ▶ How can we compete with the U.S., if our productivity is so much lower?

## Fact

*Absolute advantage is irrelevant for international trade.*

# Comparative advantage

## Definition

N has a comparative advantage in A, if it has higher relative productivity (lower relative unit costs):

$$\frac{z_{A,N}}{z_{C,N}} > \frac{z_{A,S}}{z_{C,S}} \quad (1)$$

In words:

*N*'s productivity **advantage** for good *A* ( $z_{A,N}/z_{A,S}$ ) is greater than for good *C*.

The basic idea:

Should Tiger Woods cut his own grass, do his own taxes, drive his own car ...?

## Comparative advantage example

Productivities:

	North	South
Apples $z_{A,j}$	10	2
Computers $z_{C,j}$	10	1

North has an **absolute advantage** in both goods:  $10 > 2$  and  $10 > 1$ .

South has a **comparative advantage** in Apples:  $\frac{2}{1} < \frac{10}{10}$ .

Looking ahead: South will (successfully) export Apples to North.

## Trade with production – Example

- ▶ 2 countries: North and South
  - ▶ indexed by  $j \in (N, S)$
- ▶ 2 goods: Apples and Computers
  - ▶ indexed by  $g \in (A, C)$
- ▶ Households spend half of their incomes on each good.
  - ▶ harmless simplification
- ▶ North is more productive in all goods (**absolute advantage**).
- ▶ The point: there are still gains from trade for both countries.

## Trade with production

	North	South
Labor force $L_j$	100	400
Productivity: apples / worker $z_{A,j}$	160	100
Productivity: computers / worker $z_{C,j}$	16	2
Productivity ratio: $z_A/z_C$	10	50

Absolute advantage:

- ▶ Productivity is higher in the North for all goods.

Comparative advantage:

- ▶  $\frac{160}{16} < \frac{100}{2}$
- ▶ South has comparative advantage in ...

# Popular concerns about trade

South:

- ▶ Can we compete with the productive North?
- ▶ We need protection.

North:

- ▶ Can we compete with the low wage South?
- ▶ It will drive down our wages.

## The point we will make

Countries can always compete with each other.

Competitiveness applies to firms, but not to countries.

Thinking ahead: what is the key difference between countries and firms?

# Autarky

Let's solve for the equilibrium without trade (autarky).

Notation:

- ▶ price of apples = 1 (why can we do this?)
- ▶ price of computers =  $p_j$  [where  $j \in \{S, N\}$  is the country]
- ▶ wage rate  $w_j$ .
- ▶ all differ across countries

# Technologies

Labor is the only input.

$$\underbrace{Y_{g,j}}_{\text{output}} = \underbrace{z_{g,j}}_{\text{productivity}} \times \underbrace{L_{g,j}}_{\text{employment}} \quad (2)$$

for each good  $g$  ( $A, C$ ) and country  $j$  ( $N, S$ ).

Total income = total earnings =  $w_j L_j$ .

Income per capita:  $w_j$ .



## Demand functions

Everyone spends half of their income of each good.

Computers:

$$p_{C,j}C_{C,j} = 0.5w_jL_j \quad (3)$$

Apples:

$$C_{A,j} = 0.5w_jL_j \quad (4)$$

This is for analytical simplicity only.

## Autarky wages

Workers are paid their marginal products in both sectors

North:

- ▶ producing apples (the numeraire):

$$w_N = 160 [\textit{apples}] = 160 \quad (5)$$

- ▶ producing computers:

$$w_N = 16 [\textit{computers}] = 16p_N \quad (6)$$

# Autarky prices

Mobile labor:

$$w_N = 160 = 16p_N \quad (7)$$

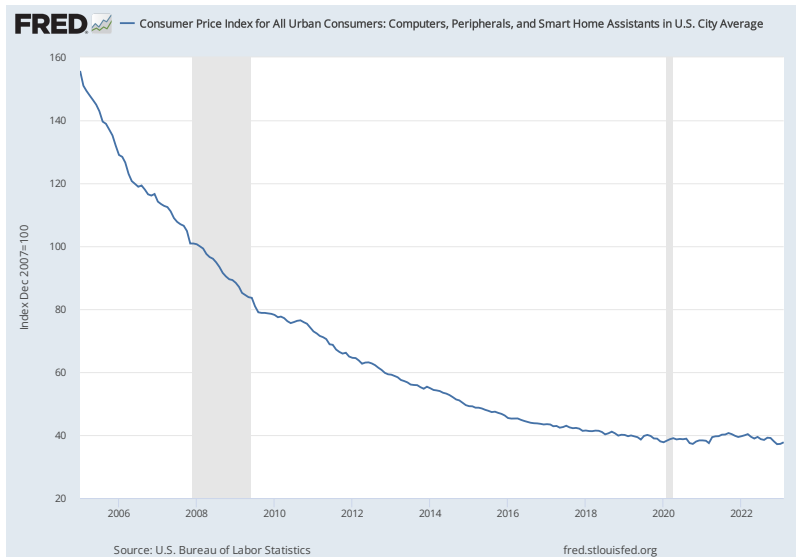
Price:

$$p_N = 10[\text{apples}/\text{computer}] \quad (8)$$

Relating back to micro:

- ▶ the relative price equals the **marginal rate of transformation**
- ▶ with our technology: the MRT equals the productivity ratio  $z_{A,N}/z_{C,N}$
- ▶ goods are cheap in sectors where productivity is high

# Prices and Productivities



# Autarky wages

South:

- ▶ producing apples:  $w_S = 100$
- ▶ producing computers:  $w_S = 2p_S$
- ▶  $p_S = 50 [\text{apples}/\text{computer}]$

No surprise: computers are expensive where they are difficult to make.

# Employment and output

How is labor allocated across sectors?

That's determined by the demand for goods.

Assumption: half of income ( $0.5wL$ ) is spent on each good

▶  $C_{A,j} = p_j C_{C,j} = 0.5w_j L_j$

The value of output equals factor costs

Apples:

▶ labor is the only input; cost  $w_j L_{A,j}$

▶ demand:  $0.5w_j L_j$

▶  $L_{A,j} = 0.5L_j$

Half of employment is in apples, half in computers

## Autarky summary

	North	South	Note
Employment	100	400	$L$
Wage	160	100	$w = z_A$
Price of computers	10	50	$p = z_A/z_C$
Income	16,000	40,000	$wL$
Consumption: A	8,000	20,000	$0.5wL$
Consumption: C	800	400	$0.5wL/p$
Fraction working in A sector	50%	50%	cost = revenue
Fraction working in C sector	50%	50%	
Apple output	8000	20,000	$z_A L_A$
Computer output	800	400	$z_C L_C$

Note: all prices are in apples (the numeraire)

## Autarky Summary

Concept	Equation
Income = earnings	$Y_j = w_j L_j$
Output = productivity $\times L$	$Y_{g,j} = z_{g,j} \times L_{g,j}$
Wage = value marginal product	$w_j = z_{A,j} = p_j z_{C,j}$
Demand = half of income	$p_{g,j} C_{g,j} = 0.5 Y_j$
Goods market clearing	$C_{g,j} = Y_{g,j}$
Labor market clearing	$L_j = L_{A,j} + L_{C,j}$

Endogenous ( $9 \times 2$ ):  $Y_j, Y_{g,j}, L_{g,j}, C_{g,j}, w_j, p_j$



# Free trade

- ▶ Who produces what?
- ▶ With free trade, each good costs the same in both countries.
  - ▶ Law of one price
- ▶ Normalize the price of apples to 1 again.
- ▶ It costs 10 to produce computers in the North, but 50 in the South.
- ▶ The price of computers must be between 10 and 50.

Let's try to find an equilibrium with  $10 < p < 50$  (strict inequalities).

## Free trade summary

Concept	Equation
Income = earnings	$Y_j = w_j L_j$
Output = productivity $\times L$	$Y_{g,j} = z_{g,j} \times L_{g,j}$
Wage = value marginal product	$w_j = z_{A,j} = p z_{C,j}$
Demand = half of income	$p C_{g,j} = 0.5 Y_j$
Goods market clearing	$C_{g,S} + C_{g,N} = Y_{g,S} + Y_{g,N}$
Labor market clearing	$L_j = L_{A,j} + L_{C,j}$

Endogenous:  $Y_j, Y_{g,j}, L_{g,j}, C_{g,j}, w_j, p$

What changed:

- ▶ only one goods market clearing condition per good
- ▶ only one price  $p$

## Equilibrium Intuition

Let's say the price is  $p = 25$ .

What happens in the North?

- ▶ autarky price  $p_N = 10$

Trade increases the price of computers - why?

Firms move labor to computer production (profits)

Wages must rise (in terms of the numeraire  $A$ )

- ▶ firms compete for workers
- ▶ until  $w_N = p \times z_{C,N}$
- ▶ as long as  $N$  produces  $C$ , the real wage  $w_N/p = z_{C,N}$  is fixed!

## Equilibrium in the South

Trade increases the price of apples (relative to computers)

▶  $1/p$  falls

Firms move labor to apples production

Do wages rise?

How does the South gain?

Why do changes in the South look different from the North?

## Free trade: South

Apple sector:

- ▶  $z_{A,S} = 100$
- ▶ price of apples = MC:  $1 = w_S/100$
- ▶ that pins down  $w_S = 100$  (for both sectors!)

Computer sector:

- ▶ price of home grown computers = MC:  $w_S/2 = 50 > p$

South cannot produce computers - it specializes in **apples**.

## Free trade: South

Let's compute prices and quantities produced.

- ▶ employment in apples (everyone):  $L_{A,S} = 400$
- ▶ apple production = income:

$$Y_{A,S} = z_{A,S} \times L_{A,S} = 100 \times 400 = 40,000 \quad (9)$$

$$= w_S L_{A,S} \quad (10)$$

- ▶ consumption of apples (half of income):  $C_{A,S} = 20,000$
- ▶ consumption of computers (half of income):  $p \times C_{C,S} = 20,000$

We don't know  $p$  yet.

## Free trade: North

Computer sector:

- ▶  $z_{C,N} = 160$
- ▶  $p = w_N/160$ .
- ▶ We don't know  $w_N$  yet.

The example is rigged so that the North only produces computers. In general, one country would produce both goods and the other would produce the good with comparative advantage.

## Free trade: North

Employment in computers (everyone):  $L_{C,N} = 100$

- ▶ complete specialization

Computer production:

$$Y_{C,N} = z_{C,N}L_{C,N} = 160L_c = 1,600 \quad (11)$$

Income:  $1,600p$ .

Spending on apples (half of income):  $C_{A,N} = 800p$

Spending on computers (half of income):  $pC_{C,N} = 800p$

$$C_{C,N} = 800$$



## Free trade: Market clearing

Computers:

$$Y_{C,N} = C_{C,N} + C_{C,S} \quad (12)$$

$$1,600 = 800 + 800 \quad (13)$$

Spending on computers:

$$pC_{C,S} = p \times 800 = 20,000 \quad (14)$$

This pins down  $p = 20,000/800 = 25$

Income:  $Y_N = 1,600p = 40,000$

## Free trade

	North	South	
Wage	16	100	$z_{C,N}P$ and $z_{A,S}$ equilibrium
Price of computers	25	25	
Income	40,000	40,000	$wL$
Consumption: apples	20,000	20,000	$0.5 \times wL$
Consumption: computers	800	800	$0.5 \times wL/p$
Frac. working in apple sector	0%	100%	
Frac. working in computer sector	100%	0%	
Apple output	0	40,000	$z_{A,S}L_S$
Computer output	1,600	0	$z_{C,N}L_N$

# Free trade

- ▶ Consumption of both goods rises in both countries (weakly).
- ▶ Welfare definitely improves.
- ▶ Real wages rise in both countries.
  - ▶ South:  $w = 100$  (apples), but  $w$  rises in terms of computers
  - ▶ North:  $w = 16p$  (computers), but  $w$  rises in terms of apples.

# Competitiveness

Both countries worry about competitiveness:

- ▶ North: Wages are too low in the South
- ▶ South: Productivity is too high in the North

Both are mistaken.

- ▶ Wages are low because productivity is low.
- ▶ This ensures that both countries are competitive in some goods.

This logic works for countries, but low productivity firms go out of business.

- ▶ What's the difference?

## Productivity Growth in the South

	North	South	Note
Labor force	100	400	unchanged
Productivity: apples / worker	160	200	was 100
Productivity: computers / worker	16	4	was 2

We double productivity in the South.

What do you expect to happen?

- ▶ (if countries' specialization does not change)

## Productivity Growth in the South

Try an equilibrium where the North specializes in computers and the South in apples.

South (specialize in A):

- ▶ everyone produces A:  $L_{A,S} = 400$
- ▶  $Y_{A,S} = z_{A,S}L_{A,S} = 400 \times 200 = 80,000$  (doubles of course)
- ▶  $w_S = 200$  (doubles of course).
- ▶ income:  $Y_S = 80,000$  ( $p_A = 1$ ).
- ▶ consumption (half of income):  $C_{A,S} = 0.5 \times 80,000 = 40,000$

Productivity, income,  $C_{A,S}$  all double.

## Productivity Growth in the South

North (specializes in C):

- ▶  $L_{C,N} = 100$ .
- ▶  $Y_C = z_{C,N}L_{C,N} = 100 \times 16 = 1,600$  (unchanged of course).
- ▶  $w_N = 16 \times p$  (unchanged real wage).
- ▶  $pY_N = 1600p$  (unchanged).

Market clearing

- ▶  $C_{A,N} = 0.5 \times 1,600p = 40,000$  (not eaten in South; doubled)
- ▶  $p = 50$
- ▶ effectively: the price of apples fell by half

In both countries:  $C_{A,j} = 40,000$  (doubles) and  $C_{C,j} = 800$  (unchanged).

Welfare gains.

# What Really Happens

In the South: gains from higher output

- ▶ just like a closed economy.

In the North:

- ▶ output unchanged:  $Y_N = z_{C,N}L_N$  (computers)
- ▶ determined by technology
- ▶  $C$  consumption unchanged (half of income)
- ▶  $A$  imports got cheaper
- ▶  $A$  consumption rises



# Lessons

Both rich and poor countries benefit from trade.

- ▶ Your wages are not set in China.
- ▶ They are the marginal product of U.S. labor.
- ▶ The more different the countries, the more beneficial trade is.

Competitiveness is not an issue.

One way of thinking about trade: a production technology.

- ▶ make (U.S.) corn into (Japanese) cars.
- ▶ foreign productivity growth is good.

If trade is so great, why is it not popular?

## Recap Questions

1. What happens when we trade with a country that has  $1/10$  of our productivity in all goods?.
2. Do we gain more from trading with Germany or with Thailand?  
Reality check: who do we actually trade more with?
3. How would **dumping** change the conclusions?  
Dumping: the foreign country exports its good below cost.

# Extensions

1. What happens if we have fixed capital?  
Example: automobile factories that cannot be repurposed when we import cars.
2. What happens if workers cannot move between sectors?

## Opposition to Trade

# Valid concerns about free trade

Trade debates are usually about **redistribution**, not about efficiency.

- ▶ Workers in import competing industries lose their jobs
  - ▶ U.S. cars, European agriculture
  - ▶ Displaced workers suffer permanent earnings losses (Autor, 2016)
- ▶ Trade can increase the skill premium / reduce demand for unskilled labor.

National security concerns

- ▶ Technology trade with China (the Chips Act)
- ▶ Brittle international supply chains (Covid)

# Strategic sectors

Countries want to promote industries with high innovation potential.

Imagine a world with 2 goods: apples and computers

- ▶ Apples are boring: grow trees and pick apples
- ▶ There is innovation in computers
- ▶ Innovators earn monopoly rents

If a country can specialize in computers, its GDP (growth) can rise

Key: **temporary** trade restrictions can **permanently** rearrange comparative advantage

Main motivation of industrial policies

# Summary

Trade increases the size of the pie through

- ▶ **specialization** (comparative advantage)
- ▶ increased scale of production

**Competitiveness** is not an issue at the country level.

Trade also **redistributes** the pie.

Losers are:

- ▶ those employed in import competing sectors (textiles, toys, ...)
- ▶ the unskilled

# Reading

Blanchard / Johnson, Macroeconomics, 6th ed., ch. 19-6

Additional reading:

- ▶ Jones, Macroeconomics, ch. 14.

Advanced reading:

- ▶ Coughlin (2002) nicely summarizes the benefits of free trade.
- ▶ Autor (2016) summaries the costs of trade as well.



# References I

- Autor, D. H. (2016): “International trade and U.S. worker welfare: understanding the costs and benefits,” Washington Center for Equitable Growth.
- Coughlin, C. C. (2002): “The controversy over free trade: the gap between economists and the general public,” *Federal Reserve Bank of St. Louis Review*, 84.