

International Trade: Costs and Benefits

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Issues

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

Concerns about trade

Popular concerns:

- ▶ Imports cost jobs
- ▶ Trade reduces wages
- ▶ We cannot compete with low wage countries?

The AS/AD model suggests that all of these concerns are misguided.

But how does it really work?

And what do we gain from trade anyway?

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.

$$\underbrace{p_{A,j}}_1 C_{A,j} = p_{C,j} C_{C,j} = 0.5 w_j L_j \quad (3)$$

This is for analytical simplicity only.

Autarky wages

Workers are paid their marginal products in both sectors

North:

- ▶ producing apples (the numeraire):

$$w_N = 160[\textit{apples}] = 160 \times \underbrace{p_A}_1 \quad (4)$$

- ▶ producing computers:

$$w_N = 16[\textit{computers}] = 16p_N \quad (5)$$

Autarky prices

Mobile labor:

$$w_N = 160 = 16p_N \quad (6)$$

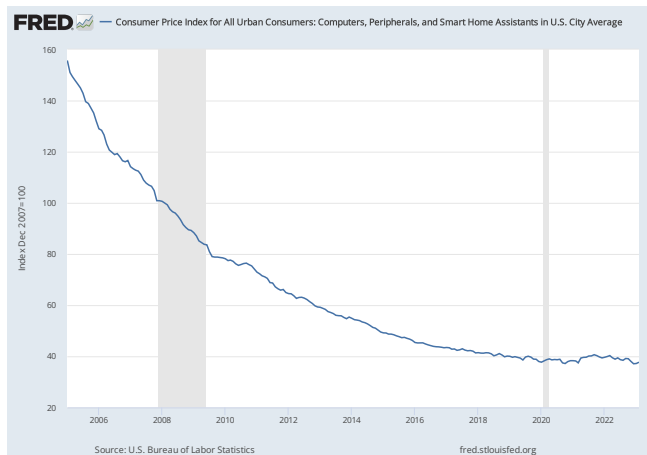
Price:

$$p_N = 10[\text{apples}/\text{computer}] \quad (7)$$

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



Example: As the computer industry become more productive, prices for computers declined.

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

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:

$$Y_{A,S} = z_{A,S} \times L_{A,S} = 100 \times 400 = 40,000 \quad (8)$$

$$= w_S L_{A,S} \quad (9)$$

- ▶ 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:

$$Y_{C,N} = z_{C,N}L_{C,N} = 160L_c = 1,600 \quad (10)$$

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:

$$Y_{C,N} = C_{C,N} + C_{C,S} \quad (11)$$

$$1,600 = 800 + 800 \quad (12)$$

Spending on computers:

$$pC_{C,S} = p \times 800 = 20,000 \quad (13)$$

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?

- ▶ assume that countries' specialization does not change
- ▶ production in North:
- ▶ production in South:
- ▶ price of Apples:
- ▶ welfare:

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

More on productivity growth in South

	North	South	Note
Labor force	100	400	unchanged
Productivity: apples / worker	160	100	unchanged
Productivity: computers / worker	16	10	was 2

Productivity in **computers** rises in the South.

What happens now?

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.