

# Lecture 16 - International Trade and the Principle of Comparative Advantage

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## 1 International Trade and the Principle of Comparative Advantage

### 1.1 Introduction

- Given the General Equilibrium production model we sketched earlier, it is a simple matter to add free trade to this picture.
- In this exercise, we want to answer the following questions:
  1. Are the ‘gains from trade’ necessarily positive in aggregate? Or does the answer depend upon which country we are trading with ?
  2. What are the underlying economic factors that give rise to gains from trade (e.g., tastes, technologies, factors, wealth/poverty)?
  3. Why is it only differences in the **price ratio** across countries that matter for trade, rather than differences in the absolute level of prices?
  4. If the gains from trade are positive for all parties, why is trade so often violently opposed?

### 1.2 Trade in the General Equilibrium Diagram

- See Figure 1.
- The initial situation of the country Home under *autarky* (no trade) is depicted by the *PPF* for  $F$  and  $S$  and the community indifference curve  $u_A$ .
- Assume for simplicity that  $(\frac{P_S}{P_F})_A = 1$ . Hence, the slope of the *PPF* at the point of tangency with  $u_A$  is equal to 1.
- Production/consumption of  $F$  and  $S$  are given by  $F_A$  and  $S_A$ .
- Now imagine this country ‘Home’ opens to world trade.

- For simplicity, take the case where Home is small relative to the rest of the world. In particular, Home's consumption has no effect on World prices – it is a price taker.
- This means that the World price ratio  $(\frac{P_S}{P_F})_W$  is linear from Home's perspective. No matter how much  $F, S$  it buys/sells on world markets, the world price is fixed.
- How will Home's production, consumption, and utility be affected?
- Provided that  $(\frac{P_S}{P_F})_A \neq (\frac{P_S}{P_F})_W$ , the movement from autarky to free trade effectively expands the domain of Home's budget set. Aggregate utility must rise.
- Draw a ray with slope  $(\frac{P_S}{P_F})_W$  tangent to the  $PPF$ . Denote the points  $S_P, F_P$  as the quantities of  $S, F$  that correspond to this tangency point. The subscript  $P$  refers to Production. These points are the quantities of  $F, S$  produced.
- This ray is the new budget set for Home,  $I_H$ . Why? Because the world value of  $S_P, F_P$  is:

$$I_H = S_P P_S^W + F_P P_F^W,$$

All other combinations of  $P, S$  that lie on this set are now feasible.

- Except for the single point of tangency, the new budget set lies everywhere above the original  $PPF$ . Home will necessarily be at a higher level of aggregate utility, represented in the figure by  $u_T$ .
- This higher utility is achieved through trade because Home can produce one bundle, represented by  $S_P, F_P$  and consume any other bundle on the new budget set. In this case, this new bundle is given by  $S_C, F_C$  where the subscript  $C$  denotes consumption.
- Notice that for each good, the quantity produced differs from the quantity consumed. Hence, there will be imports and exports. In particular

$$\text{Exports} = S_P - S_C,$$

$$\text{Imports} = F_C - F_P.$$

- Will there be a trade imbalance? Both points  $(S_C, F_C)$  and  $(S_P, F_P)$  lie on the same budget line, so they must cost the same:

$$\begin{aligned} S_P P_S^W + F_P P_F^W &= S_C P_S^W + F_C P_F^W, \\ P_S^W (S_C - S_P) + P_F^W (F_C - F_P) &= 0. \end{aligned}$$

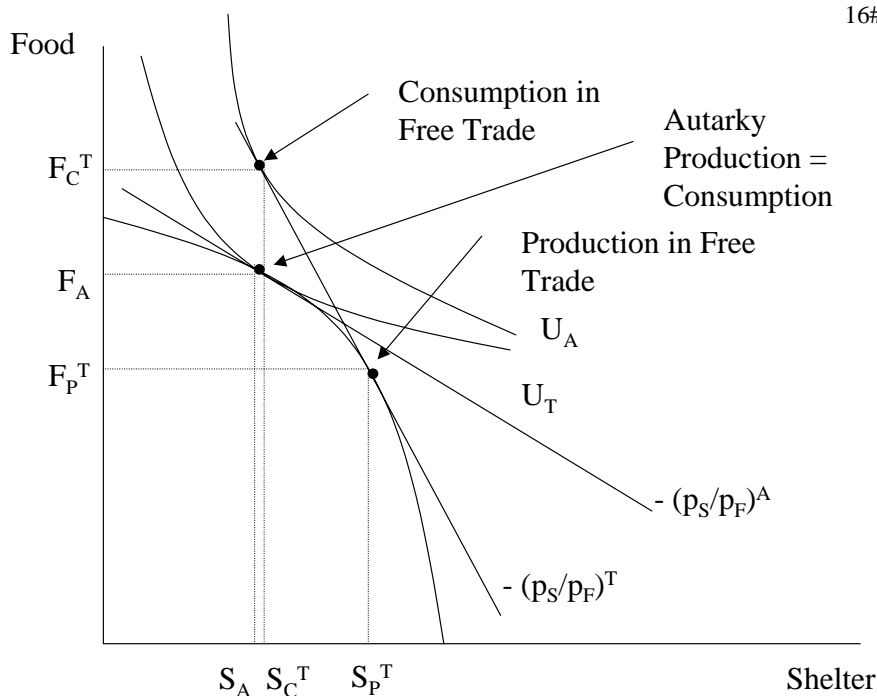
So, there is no trade imbalance.

- This is an important observation because most policy discussions confuse the question of trade balance with trade itself. Trade itself is necessarily beneficial in aggregate. A trade imbalance may be harmful or beneficial, but this is an entirely separate question.
- So to summarize:
  - Home still produces on the original  $PPF$ .
  - But Home consumes above its original  $PPF$ .
  - The disparity between production and consumption reflects the gains from trade.
- Note also that it is not an accident which good Home is importing and which good it is exporting. Because

$$\left(\frac{P_S}{P_F}\right)_W > \left(\frac{P_S}{P_F}\right)_A,$$

Home holds a comparative a *comparative advantage* in producing shelter. It can produce  $S$  relative to  $F$  at comparatively low cost relative to the rest of the world.

- Accordingly, as Home opens to trade, it increases its production of  $S$  and decreases its production of  $F$ .
- Notably, after trade opening, Home's total consumption of  $S$  declines and its total consumption of  $F$  increases. Why? Because, when choosing consumption, Home faces the world price of these goods. Why not its original autarky price  $\left(\frac{P_S}{P_F}\right)_A$ ? Because it can now sell  $S, F$  at the world prices, and so the opportunity cost of consuming them at Home is the price they could have fetched on the world market.
- This last observation explains why, for example, Colombian citizens usually drink low quality coffee despite the fact that Columbia grows some of the world's best coffee. Consuming this excellent coffee is expensive, even in Columbia, since the rest of the world is willing to pay a high price for it. Hence, it's not surprising that comparatively poor Colombians would rather sell the high coffee that they grow rather than drink it.



### 1.3 Where do ‘gains from trade’ come from?

- The first thing to notice is that if  $\left(\frac{P_F}{P_S}\right)_A = \left(\frac{P_F}{P_S}\right)_W$ , there will be no gains from trade whatsoever.
- This is a crucial observation: *Gains from trade come entirely from differences between countries.* If there were truly ‘a level playing field’ among trading partners—as many politicians demand as a precondition for trade—then there would be no point in trading. The gains from trade come precisely from the fact that *relative* prices differ between Home and World.
- This observation immediately raises two further questions:
  1. Why would relative prices differ?
  2. Why is it *relative not absolute* prices that matter?
- Let’s take these in turn.

#### 1.3.1 Why do relative prices differ among countries?

- Based on our analysis of General Equilibrium price setting, there are three underlying factors that affect prices: tastes, technologies, and endowments:

1. Tastes: Two otherwise identical countries might have different prices for the same goods if for example consumer's in Country *A* preferred meat to fish and consumer's in Country *B* preferred fish to meat. There would be gains from trade because *A* would export fish and import meat and vice versa for the *B*.
  2. Technology: If countries *A, B* have different technologies but are otherwise identical, they will have different relative prices. So, if country *A* has better fishing boats and country *B* has better slaughterhouses, then *A* will export fish and *B* will export meat, even if tastes are identical. (They could also export their technologies instead.)
  3. Endowments: If countries *A, B* have different endowments but are otherwise identical, there will also be gains from trade. So, if consumers in *A, B* both have the same taste for fish and meat but *A* has better fishing grounds and *B* has better grazing lands, then *A* will be an exporter of fish and *B* an exporter of meat.
- As these examples show, any or all of these factors—tastes, technology, endowments—may give one country a comparative advantage in selling fish relative to meat (or vice versa). And as above, it is precisely these differences that make trade beneficial. And the larger the differences, the greater the gains.

### 1.3.2 Why only relative prices matter for trade: Comparative versus absolute advantage.

- I've implicitly asserted all along that it's only the *relative* price of *F* versus *S* in Home versus World that determines what the gains are from trade. But doesn't the *absolute* level of prices matter? Put more concretely, it's easy to see that the U.S. would benefit from trade with China. After all, China makes just about everything cheaper than the U.S. does—so of course it's advantageous to buy their stuff rather than make it at home. China has an absolute advantage in all goods production.
- But by the same token, doesn't that mean that China will *not* benefit from trade with the U.S. since everything we make is too expensive for them? (i.e., the U.S. has an absolute disadvantage in all goods production.)
- This is a profoundly important question, to which the answer is **no**. As long as relative prices differ between China and the U.S., both countries experience gains from trade.
- The explanation is the principle of Comparative Advantage, one of the most fundamental and most misunderstood (or just *not understood* ideas in Economics).
- The principle of comparative advantage follows directly from the notion of opportunity costs.

- In Home under Autarky, the opportunity cost of making one more unit of shelter at the margin is simply  $\left(\frac{P_S}{P_F}\right)_A$ , that is the amount of food the economy is foregoing at the margin to produce shelter instead. Notice that we can use the price ratio to express this value because the price ratio is equal to the slope of the *PPF* at the equilibrium production mix.
- Similarly, in World (excluding Home), the opportunity cost of making one more unit of shelter at the margin is simply  $\left(\frac{P_S}{P_F}\right)_W$ , the amount of food one must forego to obtain shelter instead.
- So, if it is the case that

$$\left(\frac{P_S}{P_F}\right)_W > \left(\frac{P_S}{P_F}\right)_A,$$

this means that the opportunity of shelter relative to food is relatively higher in the rest of the World relative to home.

- If so, Home should specialize further in shelter and buy more of its food from World, which is exactly what is shown in Figure 1. In fact, Home reallocates  $K, L$  from  $F$  to  $S$  until its opportunity cost of  $F$  relative to  $S$  is identical to the rest of the World.
- Notice that this conclusion in no ways depends on whether both  $F$  and  $S$  prices are in *absolute* terms higher or lower in the World than they are at Home. All that matters Home's cost of producing shelter relative to its cost of producing food is less than World's cost of producing shelter relative to World's cost of producing food. A concrete example may make this point clearer.

### Comparative Advantage: A Concrete Example

- When I was a graduate student, I coauthored a research paper with my thesis advisor, Larry. The paper involved both theory and empirical work. I did most of the empirical work and my thesis advisor did most of the theory. Originally, I thought that this was because my advisor thought I was better empiricist than he. But I quickly realized that this was far from the truth. Larry was about 10 times as fast at empirical work as I was. He was also far better at theoretical work than I was. In other words, he had an *absolute advantage* in both activities.
- So the question: Why did he bother to coauthor with me if he could do the entire paper better himself? The answer is comparative advantage. Larry, as it turned out, was 10 times better at empirical work but 100 times better at theoretical work. By allowing me to do the empirical work, he freed his time to do the theoretical work, where his comparative advantage lay.

- Let's make this example explicit. Say writing has a research paper has two components  $E$  and  $T$  (Empirical and Theoretical) and both require only labor input.
- The value of a completed paper is \$600 for a solo authored paper. If we coauthor the paper, it's worth \$300 to each of us.
- My advisor, Larry, can do  $E$  in 100 hours and  $T$  in 50 hours. Were he writing the paper himself, it would take him 150 hours. So, we can say

$$\left(\frac{P_E}{P_T}\right)_L = \frac{100}{50} = 2.$$

- Let's say that I (as a graduate student) could do  $E$  in 1,000 hours and  $T$  in 5,000 hours. So, it would take me 6,000 hours to write the paper.

$$\left(\frac{P_E}{P_T}\right)_A = \frac{1,000}{5,000} = 0.2$$

- These price ratios, expressed as opportunity costs of each of our time, indicate that our internal trade-offs differ, In particular

$$\left(\frac{P_E}{P_T}\right)_L > \left(\frac{P_E}{P_T}\right)_A,$$

Larry's opportunity cost of doing Empirical work is implicitly higher than Autor's opportunity cost of doing empirical work. So, there should be gains from trade.

- Consider the following production possibilities

	Time on $E$	Time on $T$	Total time Larry	Total time Autor
Larry Solo	100	50	150	0
Autor Solo	1,000	5,000	0	6,000
Larry does $E$ Autor does $T$	100.	5,000	100	5,000
Larry does $T$ Autor does $E$	1,000	50	50	1,000

- Consider Larry's choices:
  1. If Larry does the paper himself, he spends 150 hours. Hence, he effective wage is \$4 per hour for the solo-authored paper.
  2. If Larry does  $E$  and Autor does  $T$ , Larry spends 100 hours. Larry earns \$3 per hour for the joint-authored paper. He is better off to solo author.

3. If Larry does  $T$  and Autor does  $E$ , Larry spends 50 hours. His effective wage is \$6 per hour for the joint paper.
- Consider Autor's choice:
    1. If he does the paper solo, he spends 6,000 hours, for an effective wage of \$0.10 per hour (which is subsistence level for a graduate student).
    2. If Autor does  $T$  and Larry does  $E$ , Autor spends 5,000 hours, and his effective wage is \$0.06 per hour for the joint-authored paper. Notice that even though Larry is absolutely better off at both activities, Autor is still worse off than if he wrote the paper solo.
    3. If Autor does  $E$  and Larry does  $T$ , Autor spends 1,000 hours, and his effective wage is \$0.30 per hour for the joint-authored paper.
  - So clearly even though Larry has an absolute advantage in both activities, both Larry and Autor gain from joining forces to have Autor do  $E$  and Larry do  $T$ . This is because Larry's comparative advantage is in  $T$  and Autor's comparative advantage is in  $E$ .
  - Intuition would suggest to most non-economists that Autor would be better off to coauthor with Larry regardless of the allocation of tasks, simply because Larry's has an absolute advantage in writing papers.
  - But this is **not** true. If each does the task in which they *comparative disadvantage* (Larry does  $E$ , Autor does  $T$ ), they are *both* worse off than not collaborating. This is true despite the fact that Larry has an absolute advantage at both activities.
  - This example suggests that the principle of comparative advantage is simple but far from obvious and so widely misunderstood.

#### 1.4 If the Gains From Trade are Always Positive (or Zero in the Worst Case), Why is Free Trade so Controversial?

- The analysis above suggests that if countries trade at all, the gains from trade are positive—otherwise, they will not trade.
- Moreover, both high and low wage countries benefit from trade. Trade is not a Robin Hood operation (taking from the rich countries to give to the poor countries) or the opposite. Both countries win. See for example the *NY Times* editorial in your reading packet by Nicholas Kristoff entitled “Let Them Sweat.”
- But this raises a puzzle: If trade is so great, why isn't everyone in favor of it? There are two possible explanations:



1. Politicians and lay people just don't get it. Like much of economics, the principle of Comparative Advantage is simple and yet non-obvious. Once you understand Comparative Advantage, you start to ask, how could anyone else think differently? But in fact there is a long tradition of thinking differently. This school of thought, called Mercantilism, passionately believes that trade is a zero-sum game: if a foreign country buys my goods, I win and it loses. And vice versa if I buy its goods. It's clear from current trade negotiations that countries continue to strongly believe in Mercantilism. They act as if the objective of trade is to maximize exports and minimize imports. Which suggests that many people really still "just don't get it," and this view is spelled out in Krugman's paper on your syllabus called "Ricardo's Difficult Idea." (Ricardo was the economist who first formally articulated the principle of Comparative Advantage.)
2. But it's also possible that there is something unpleasant that people *do* recognize. This thing, also implied by the model, is that although trade improves aggregate efficiency, it also necessarily creates winners and losers. This because it maximizes the pie and *changes* the sizes of the slices simultaneously. In fact, it is quite possible for trade to improve aggregate efficiency while leaving certain groups distinctly worse off. Here is why...
  - Recall from above the third efficiency criterion for General Equilibrium: efficient product mix.

$$\frac{\partial u/\partial F}{\partial u/\partial S} = \frac{\partial S/\partial K}{\partial F/\partial K} = \frac{\partial S/\partial L}{\partial F/\partial L}. \quad (1)$$

- In our example above, trade between Home and World lowers  $\frac{P_F}{P_S}$ , which is to say that it raises the real price of Shelter, the good in which Home has a comparative advantage.
- Recalling that along the *PPF*

$$\begin{aligned} -\frac{dF}{dS} &= \frac{\partial S/\partial K}{\partial F/\partial K} = MRTS_{FS}, \text{ and} \\ -\frac{dF}{dS} &= \frac{\partial S/\partial L}{\partial F/\partial L} = MRTS_{FS}, \text{ and} \\ -\frac{dF}{dS} &= \frac{P_S}{P_F}, \end{aligned}$$

these equations imply that a rise in the relative price of shelter raises the marginal productivity of capital in the shelter sector relative to the marginal productivity of capital in the food sector. Similarly, it raises the productivity of labor in this sector. This means that both capital and labor will be reallocated to *S* from *F*.

- But here is the crux of the matter. We know that  $S$  is relatively more  $K$  intensive than is  $F$ . This means that if *all* labor and capital were allocated to  $S$ , wages of labor would be relatively low relative to capital:  $\frac{P_K}{P_L}$  high. Conversely, if *all* labor and capital were allocated to  $F$ , wages of labor would be relatively high:  $\frac{P_K}{P_L}$  low. Most relevant here, the intermediate cases of these two extremes will generate a weighted (convex) combination of these outcomes.
- In other words, an increase in the price of shelter,  $\frac{P_S}{P_F} \uparrow$ , necessarily raises the the price of capital relative to labor:  $\frac{P_K}{P_L} \uparrow$ .
- This means that, in this example, opening to trade hurts workers and benefits the owners of capital. If instead, Home had a comparative advantage in  $F$  relative to  $S$ , opening to trade would have benefited workers and hurt capital.
- In either case, aggregate gains in Home would necessarily have been large enough to make both groups better off – but only if redistributive policies were put in place. Without this, one group loses though the other group gains even more.
- Notice here that there is no trade-off between the 1st and 2nd welfare theorems. The aggregate gains do not *necessarily* come at the expense of equity. But the implications of the 1st welfare theorem come automatically: trade improves aggregate efficiency through the operation of the free market, generating a Pareto improvement over the autarkic equilibrium.
- By contrast, the application of the 2nd welfare theorem requires government intervention. Equity need not suffer from trade, but it *will* unless governments implement policies to prevent it.
- Finally, notice that if opening to trade reduces the wages of  $L$  in Home, it will typically raise the wages of  $L$  in World. This is not true in our small-country example where World prices are unaffected by Home’s entry into the market. But in the more realistic case where Home’s demand affects world prices, the World price of Shelter will fall somewhat and the World price of Labor will rise somewhat. This means that workers elsewhere do benefit from trade, which is one of the best arguments for trade as a policy for increasing prosperity in low income countries. (See again Kristoff, “Let Them Sweat.”)

## 1.5 Conclusion

- The principle of comparative advantage is a fundamental economic insight, both powerful and general. This insight explains why, almost to a person, economists support free trade everywhere and always.

- The argument is as fundamental as the general welfare theorems, and closely analogous. The welfare theorems (as seen in the Edgeworth box) demonstrate that allowing individuals to trade freely with one another until all gains from trade are exhausted necessarily benefits all parties.
- The principle of comparative advantage says that allowing countries to trade always raises welfare in both countries in a similar manner.
- There is one key difference between these two conclusions. Trade does *not necessarily* benefit every individual. In fact, it's almost certain to create winners and losers. This is not true for trade among individuals, which always generates Pareto improvements.
- But the principle of comparative advantage combined with the 1st and 2nd welfare theorems proves that it is possible to make every single individual better off through trade simply by redistributing the gains from trade to compensate the losers (by taxing the winners).
- But whether this will occur depends on the political feasibility of implementing redistributive policies to counteract the redistribution accompanying trade liberalization. Little in recent political history suggests that the gains from trade are typically redistributed to compensate the losers.
- The relevance of this to the U.S. is as follows. In general, trade between the U.S. and less-developed countries (LDCs) will lower the wages of less-educated U.S. workers. This is because the U.S. has a comparative advantage (relative to most other countries) in technology- and skill-intensive products and services.
- Simultaneously, this trade raises the earnings of less-educated workers in LDCs because these countries have a comparative advantage in low-skill intensive production such as agriculture and mass manufacturing production.
- Over time, trade tends to create employment growth, raise wages, and foster economic development in these LDCs by raising demand for less-skilled workers. Several prominent examples of this process include Japan (which now has wage levels comparable to the U.S), Korea, China and India.
- Consequently, trade is probably a much more effective economic development policy than most other forms of foreign 'aid' the U.S. offers.
- Another way to see this: the United States and Europe are *net exporters* of agricultural products, which is simply absurd for high wage economies. This reality is explained by the expensive and distortionary systems of farm subsidies in place in these countries. These subsidies, of which the U.S. Sugar Program discussed in class is but one small example, make it possible for U.S. and European farmers to sell farm products on world

markets at prices below those charged by developing countries. This is only possible. Given that developing countries should have a comparative advantage in labor-intensive agricultural products, the exports of developed country farmers are only made feasible by subsidies.

- This system of policies is an incredible waste of resources in developed countries, a point that many would concede (except for farm-state congressional representatives).
- Less obvious, but more insidious, this policy is also quite harmful to LDCs. Because of these subsidies, these countries are not able to realize their comparative advantage in exporting agricultural products to developed countries because of the existence of subsidies. The subsidies in effect cause both developing and developed countries to specialize in its areas of *comparative disadvantage*.
- A Conjecture: If the U.S. and the OECD were to simultaneously eliminate their systems of agricultural subsidies *and* cancel their entire foreign aid budgets, developing countries would be substantially better off than under the current system of foreign aid and agricultural subsidies.