Lecture Note 10 - International Trade and the Principle of Comparative Advantage

David Autor, MIT Economics and NBER[*]

14.03/14.003 Microeconomic Theory and Public Policy, Fall 2022
(Compiled on October 24, 2022)

1 International Trade and the Principle of Comparative Advantage

We now want to add international trade to our study of general equilibrium, Pareto efficiency, and social welfare. Our objective is to answer the following questions:

1. Are the gains from trade (international trade, that is) 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?

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 (international) trade are necessarily positive in aggregate, why is trade so often violently opposed?

In the notes below, we use the word trade somewhat differently than in our previous discussion of the Edgeworth box. Here, we will distinguish between trade meaning international trade, and *autarky*, meaning trade only among citizens of a given country. In both cases, citizens engage in trade, but under autarky, this trade does not cross borders.

1.1 Trade in the General Equilibrium Diagram

- As discussed in Lecture Note 9, we can think of the General Equilibrium problem as a utility maximization subject to three constraints:

  1. No actor is worse off in the market equilibrium than in the initial allocation. This is satisfied because a person could always refuse to trade and consume her original endowment instead.

  2. In equilibrium, no party can be made better off without making another party worse off (otherwise there are un-exhausted gains from trade).

  3. No more goods can be demanded/consumed than the economy is endowed with. That is, sum of the consumption of both parties cannot exceed the total endowment.

- Now, we want to analyze how opening to international trade affects utility in the previously closed economy.

- A critical thing to notice here is that *opening to International trade relaxes the 3rd constraint.* Countries that are trading can potentially swap part (or all) of their endowments with their trading partners. In equilibrium, a country may consume a different bundle of goods from what it is originally endowed with (e.g., it could trade some food for shelter and hence consume more shelter than it could possibly produce).

- Moreover, if the country opening to trade is *small* relative to the rest of the world, it effectively faces no constraint on the set of goods it could potentially purchase at world prices. That doesn't mean it can buy anything it wants; it has to be able to afford the goods it desires by trading other goods. But its budget set effectively extends linearly beyond the borders of the Edgeworth box until it crosses the x or y axis (at the axes, it is constrained by the fact that it cannot consume less than zero of any good).

- Let's formalize this insight (see figure)
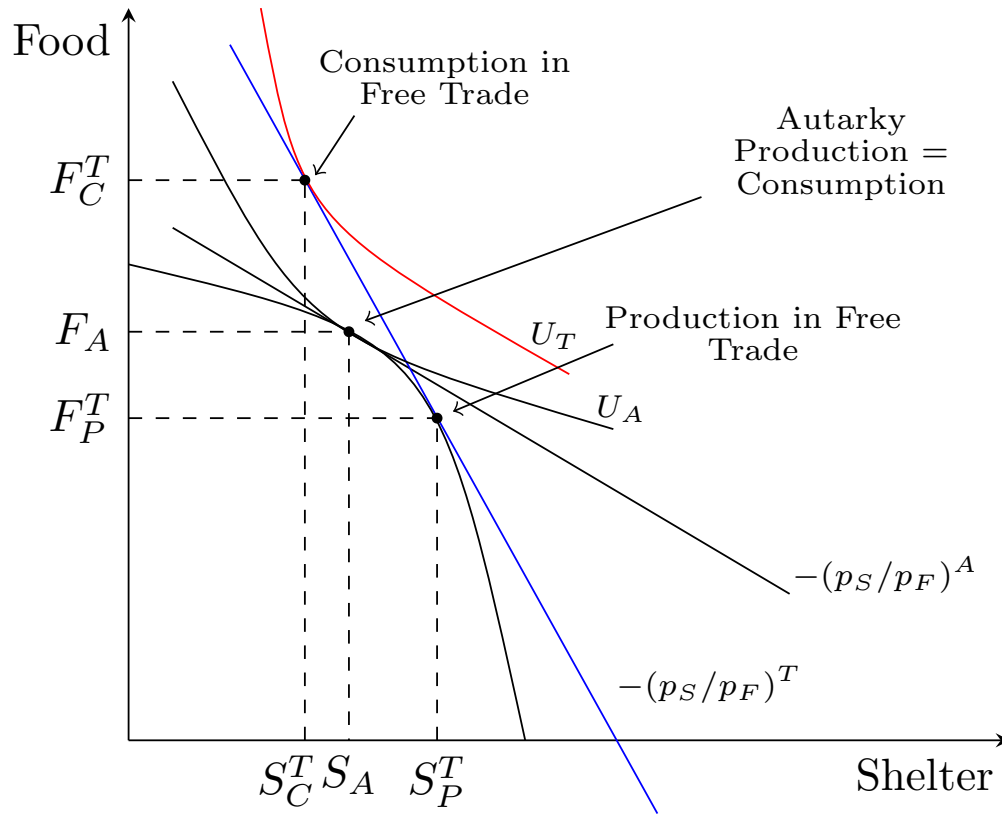
- The initial consumption possibilities for the country called Home under *autarky* (no trade) is depicted by the Production Possibility Frontier (PPF) for Food and Shelter (F and S) and the community indifference curve U_A.

- The concavity of this PPF stems from the underlying assumption that as Home devotes more and more of its resources to either food or shelter, it experiences diminishing marginal returns to the expanding sector. Concretely, if Home doubles the resources used to produce food, it gets less than double the output. Why would this be true? It's likely that the suitability of land for farming in Home varies across locations—some areas offer flat fertile

fields, others rocky hilltops. Similarly, it's likely that some heavily wooded areas are suitable for shelter production whereas others offer mostly tall grasses.[1] Efficient resource utilization implies that Home will devote the best farming land to farming and the best shelter land to construction of shelter. If Home were to produce exclusively food, it would have to devote low quality growing land into production, leading to diminishing marginal returns. Conversely, if it devoted all land to shelter production, shelter output per acre of land would also fall. Even if all land in Home were identical, it is still likely that Home would have a concave PPF for another reason: variation in the suitability of labor (i.e., skills) for farming versus shelter construction. Specifically, workers trained as carpenters don't necessarily make productive farmers and vice versa.

- Assume for simplicity that $\left(\frac{P_S}{P_F}\right)_A = 1$. 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 $\left(\frac{P_S}{P_F}\right)_W$ is linear from Home's perspective. No matter how much F, S it buys/sells on world markets, the world price will be unaffected.

- How will Home's production, consumption, and utility be affected by the option to engage in international trade?

- Provided that $\left(\frac{P_S}{P_F}\right)_A \neq \left(\frac{P_S}{P_F}\right)_W$, the movement from autarky to free trade effectively expands the domain of Home's budget set. Aggregate utility must rise.

- To see this, draw a ray with slope $\left(\frac{P_S}{P_F}\right)_W$ 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 by Home.

- 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. Under autarky, Home was forced to consume at a point that lies within the PPF.

---

[1]Houses made out of sod (tall grasses) were commonplace in the American prairie in the 19th century and earlier. When railroads began to provide a relatively inexpensive supply of lumber to the prairie, sod houses were quickly displaced by wood frame houses.

Therefore, Home will necessarily achieve a higher level of aggregate utility, represented in the figure by U_T.

- 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

$$\begin{aligned} \text{Exports} &= S_P - S_C, \\ \text{Imports} &= F_C - F_P. \end{aligned}$$

- 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:

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

There is no trade imbalance.

- This is an important observation because many policy discussions confuse the question of trade balance with trade itself. Trade itself is beneficial in aggregate. A trade imbalance may be harmful or beneficial—but this is a distinct and separable question.

- So to summarize:

  - Home still produces on the original PPF.
  - But Home consumes above its original PPF.
  - The gap 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 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 has fallen and its total consumption of F has risen. 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. The rise in consumption of F follows from its lower price. (Note that it is also possible for consumption of S to rise somewhat due to the income effect if S is a normal good and the gains from trade are sufficiently large.)

- This last observation (i.e., the decline in consumption of S) explains why, for example, Colombians usually drink pretty bad coffee, despite the fact that Colombia is one of the world's leading coffee growers. Because consumers worldwide are willing to pay a relatively steep price for Colombian coffee, its opportunity cost of consumption—even in Colombia—is high in terms of foregone earnings.

2 Where do the 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.

- 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 condition 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. Hence, both countries will want to (and be able to) consume bundles that would not be feasible under their initial endowments (e.g., consuming more coffee than was previously feasible while giving up some sushi).

- This observation immediately raises two further questions:

  1. Why do relative prices differ among countries?
  2. Why is it *relative not absolute* prices that matter?

- Let's take these in turn.

2.1 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 (facing the same prices) consumer's in Country A prefer sushi to coffee and consumer's in Country B prefer coffee to sushi. There would be gains from trade because A would export coffee and import sushi and vice versa for 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 sushi chefs and country B

6

has better baristas, then A will export sushi and B will export coffee, even if tastes are identical.

3. Endowments: If countries A, B have different endowments but are otherwise identical, there will also be gains from trade. For example, if consumers in A, B have the same taste for coffee and sushi but A has a hot climate suitable for coffee growing and B has abundant coastal waters for fishing, then A will be an exporter of coffee and B an exporter of sushi.

- As these examples show, any or all of these factors—tastes, technology, endowments—may give one country a comparative advantage in selling sushi relative to coffee or vice versa. These differences make trade beneficial. In general, the larger the differences, the more trade permits countries to consume bundles that are desired but otherwise infeasible under their initial endowments.

2.2 Why do only relative prices matter for trade? Comparative versus absolute advantage

- We have noted 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 since China makes just about everything cheaper than the U.S. does. [It has an "absolute advantage" in that all goods are cheaper to produce in China.]

- But doesn't that mean that China will *not* benefit from trade with the U.S. since everything the U.S. makes is too expensive for China (i.e., the U.S. has an absolute disadvantage in all goods production)? Is free trade with China good for the U.S. but bad for the Chinese (or v.v.)?

- 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, which is one of the most fundamental—and least widely understood—ideas in economics.

- We said that for an equilibrium to be Pareto efficient, the Marginal Rate of Substitution among goods for all consumers must be equated (how? by the price ratio). Otherwise, there are gains from trade. This same idea extends naturally to trade among countries. If two countries in autarky (no trade) have different marginal rates of substitution among goods (due to tastes, technologies, or endowments), then trade between these countries will potentially make both countries better off (i.e., by equating their MRS's and thereby realizing gains from trade).

- Comparative Advantage is closely analogous to the trade that goes on in the Edgeworth box. It is immediately apparent in the Edgeworth box that, relative to the initial endowment, no

7

party can be harmed by trade and generally both parties benefit—that is, no one expects the consumer with the smaller endowment to be "exploited" by trade with the consumer with the larger endowment. This is also true for trade among countries.

- In particular, 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
$$\left(\frac{P_S}{P_F}\right)_W > \left(\frac{P_S}{P_F}\right)_A,$$
then 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: Home reallocates production from F to S until its opportunity cost of F relative to S is identical to that in the rest of the World.

- The key point is that trade allows Home to specialize in production of the good in which it is has comparative advantage relative to the rest of the world. If Home has a lower internal cost of producing shelter relative to the rest of the world, then consumer utility will rise in Home if it produces more shelter and less food and then trades shelter for food on world markets. The converse is also true for the rest of the world.

- 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 is that 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.

2.3   A Concrete Example

- When Prof. Autor was a graduate student, he coauthored a research paper with Prof. Lawrence Katz. The paper involved both theory and empirical work. He did most of the empirical work and his thesis advisor did most of the theoretical work. He initially thought that this division of labor was due to the fact that his advisor recognized that he (a 2nd year graduate student) was already a world-class empirical researcher. But he eventually realized that this was not quite what Katz had in mind. Not long into the project, he made the

rude discovery that Katz was much faster than him at empirical work—and also *far* better at theoretical work. He had an *absolute advantage* in both activities.[2]

- So the question: Why did Katz bother to coauthor with him if he could do the entire paper faster or better by himself? The answer is comparative advantage. Katz, as it turned out, was times about twenty-five times as good at empirical work but several hundred times as good at theoretical work (perhaps even infinite, since Autor knew squat about theory at the time). By arranging for him to do the empirical work, Katz freed his time to do the theoretical work, where his comparative advantage lay.

- Let's make this example explicit. Say that writing a research paper has two components E and T (Empirical and Theoretical) and the only input into both activities is labor.

- The value of a completed paper is $\$10,000$ for a solo authored paper. If we coauthor the paper, it's worth $\$5,000$ to each of them.

- Autor's advisor, Katz, can do E in 75 hours and T in 25 hours. Were he writing the paper himself, it would take him 100 hours.

- His internal rate of conversion of time into output is the following:

$$\left(\frac{P_E}{P_T}\right)_K = \frac{75}{25} = 3.$$

One way to look at this "price ratio" is that the opportunity cost of one hour is $1/75^{th}$ of the empirical part of a paper or $1/25^{th}$ of the theory part of the paper.

- Let's say that Autor (as a graduate student) could do E in $2,000$ hours and T in $8,000$ hours. So, it would take me $10,000$ hours to write the paper.

$$\left(\frac{P_E}{P_T}\right)_A = \frac{2,000}{8,000} = 0.25.$$

- These price ratios, expressed as opportunity costs of each of our time, indicate that our internal trade-offs differ. In particular
$$\left(\frac{P_E}{P_T}\right)_K > \left(\frac{P_E}{P_T}\right)_A,$$
Katz'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.

- Note, however that $P_E^K < P_E^A$ and $P_T^K < P_T^A$. That is, Katz has a lower time cost (an *absolute advantage*) in doing *either* activity.

- Consider the following production possibilities

	Time E	Time T	Time Katz	Time Autor	$/hr Katz	$/hr Autor
Katz	75	25	100	0	$100	
Autor	2,000	8,000	0	10,000		$1.00
Katz: E Autor: T	75	8,000	75	8,000	$66.67	$0.63
Katz: T Autor: E	2,000	25	25	2,000	$200	$2.50

Consider Katz's choices:

1. If Katz does the paper himself, he spends 100 hours. Hence, his effective wage is $100 per hour for the solo-authored paper.

2. If Katz does E and Autor does T, Katz spends 75 hours. Katz earns $66.67 per hour for the joint-authored paper. He is better off to solo-author the paper.

3. If Katz does T and Autor does E, Katz spends 25 hours. His effective wage is $200 per hour for the joint paper.

Consider Autor's choice:

1. If Autor does the paper solo (not likely!), he spends 10,000 hours and earns $1 per hour, consistent with the terms of his graduate stipend.

2. If Autor does T and Katz does E, Autor spends 8,000 hours, and his effective wage is $0.63 per hour for the joint-authored paper. Notice that even though Autor is absolutely worse at both activities than Katz, Autor is worse off still coauthoring with Katz than writing the paper solo. [Intuition might suggest that Autor would be better off to coauthor with Katz regardless of the allocation of tasks, simply because Katz has an absolute advantage in writing papers. Clearly, this is not so.]

3. If Autor does E and Katz does T, Autor spends 2,000 hours, and his effective wage is $2.50 per hour for the joint-authored paper (which is pretty much off the charts for a graduate student).

- So, although Katz has an absolute advantage in both activities, both Katz and Autor gain from joining forces to have Autor do E and Katz do T. This is because Katz's comparative advantage is in T and Autor's comparative advantage is in E. Conversely, if each does the task in which they have a comparative *disadvantage* (Katz does E, Autor does T), they are *both* worse off than not collaborating. This is true despite the fact that Katz has an absolute advantage at both activities.

3 Why is Free Trade Controversial?

The analysis above suggests that if countries (or grad students) choose to trade with one another (or their thesis advisors), the gains from trade are positive—otherwise, they will not trade. Moreover, in contrast to popular perceptions, trade is not a Robin Hood operation that takes from rich countries to give to poor countries, or vice versa.

This raises a puzzle: If trade is so terrific, why isn't everyone in favor of it? Here are two potential explanations:

1. Politicians and lay people just don't get it. Like much of economics, the principle of Comparative Advantage is simple and yet not immediately intuitive. Once you understand the principle of Comparative Advantage, you start to ask, how could anyone else think differently? But in fact there is a long tradition of thinking differently. An influential school of thought called Mercantilism 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.

2. But it's also possible that there is something potentially troubling about trade that people *do* recognize. This thing, also implied by the model, is that although trade improves aggregate consumer surplus, it typically creates winners and losers. This is because international trade maximizes the pie and *changes* the sizes of the slices. It is quite possible for trade to improve aggregate consumer surplus while leaving certain groups distinctly worse off than they would have been in Autarky, meaning under domestic trade alone (though not worse off than they would have been in the absence of any trade, i.e., consuming their initial endowments). Here is why...

Refer to the following figure:
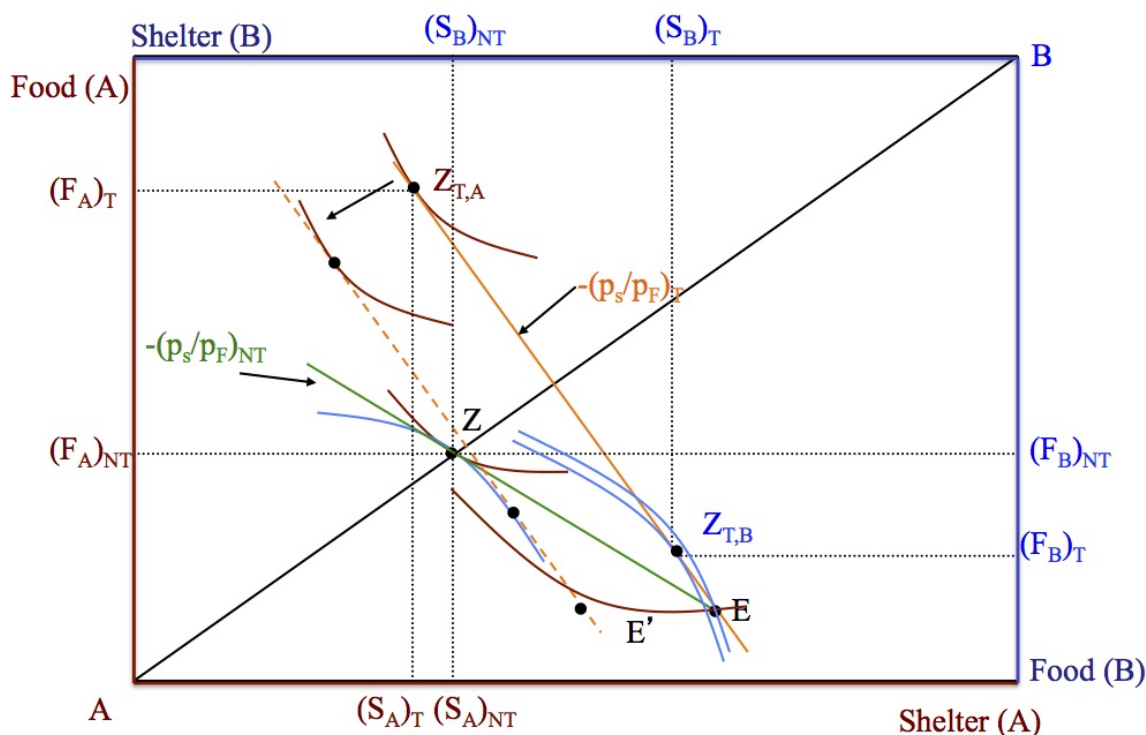
- In this economy:

  - E is the initial endowment.

  - The two goods are F and S (food and shelter) on the X and Y axes respectively.

  - $A's$ consumption is increasing as we move from the lower-left corner to the upper-right corner, and vice versa for consumer B.

  - The subscripts NT and T refer to "No International Trade" and "International Trade." (We assume that trade among consumers within the Home economy always occurs.)

- First, consider the equilibrium under no trade (NT).

  - The equilibrium price ratio that clears the market is $-(p_s/p_f)_{NT}$ and consumption is at point Z, which is on the Contract Curve (not drawn).

  - The markets for Food and Shelter both clear.

  - Consumers A and B are both better off relative to their initial indifference curves (those intersecting point E). Point Z represents a Pareto improvement relative to point E.

- Now consider what would have occurred had Home opened itself to international trade instead starting from the initial endowment, E.

- Assume that the world price ratio is given by $(p_s/p_f)_T$. This ratio places a higher relative value on shelter than the home price ratio: $(p_s/p_f)_T > (p_s/p_f)_{NT}$.

- Now, the equilibrium looks quite different:

  - The price ratio rotates clockwise to $-(p_s/p_f)_T$.
  - Although both A and $B's$ chosen bundles are tangent to the world price ratio, they are not tangent to one another. That is $Z_{T,A}$ and $Z_{T,B}$ both lie along the budget set $-(p_s/p_f)_T$, but they are not the same point.
  - Consumer A is now consuming much more food than under the NT equilibrium and slightly less shelter.
  - Consumer B is now consuming more food than under the NT equilibrium and much *less* shelter.
  - Home is now a net exporter of shelter and a net importer of food. Home's chosen consumption bundle would not have been feasible absent trade.

A welfare analysis in three parts.

3.1 Is the equilibrium under free trade Pareto superior to the initial allocation, E?

Yes. It's clear that both A and B prefer $Z_{T,A}$ and $Z_{T,B}$ to E.

Moreover, there is no way that trade could make them worse off than they were at E since either party could always choose to consume his or her initial endowment rather than trade.

Free trade is Pareto improving relative to the initial allocation.

3.2 Is the equilibrium under free trade Pareto superior to the equilibrium under Autarky (*only* within-country trade)?

Interestingly, the answer is **no**.

It's clear that party A is much better off at $Z_{T,A}$ than Z and party B is considerably worse off at $Z_{T,B}$ than Z.

Why did this happen? Because trade raised the relative price of shelter and lowered the relative price of food. Consumer A was relatively rich in shelter and consumer B was relatively rich in food. So, trade increased the value of $A's$ bundle and decreased the value of $B's$ bundle.

This is a fundamental result: trade increases consumer welfare by altering prices. Conversely, if trade does not change prices, it does not affect consumer welfare. While trade raises consumer surplus by allowing consumers to consume bundles that were not previously feasible given the old endowment and prices, it also devalues the endowments of consumers who are specialized in the good whose relative price has fallen. So, if you were a food producer, and your country opened to trade with a country that had a relatively abundant supply of food, you may effectively be made

poorer by the trade-opening since your endowment of food cannot buy as much shelter as it could under the Autarky equilibrium.

Does trade *necessarily* make one party worse off? Actually, the answer is no, not necessarily. Although rotating the price ratio through the initial endowment E has the effect of raising the value of food relative to shelter or vice versa—thus worsening the terms of trade for the agent who is relatively more endowed in the good whose relative price is falling—opening to trade has a second effect that potentially benefits both agents: trade makes it feasible for agents A and B to consume bundles that do not lie within the feasible set under Autarky. Concretely, although their indifference curves still need to be tangent to the price ratio in equilibrium, under trade, their indifference curves no longer need to be tangent to one another. Thus, trade *can be* Pareto improving. By playing with the diagram above, you can demonstrate to yourself that small changes in the price ratio from the initial Autarkic price ratio can in some cases make both parties better off relative to the point they would have attained on the contract curve under autarky. (Of course, the equilibrium under trade would not lie on the Autarkic contract curve.)

Bottom line: International trade raises total consumption but it does not necessarily (or even typically) yield a Pareto improvement relative to the Autarkic setting. In general, some parties will be better off and other parties will be worse off.

3.3 Is there a *potential* Pareto improvement from opening to international trade?

The Second Welfare Theorem says that there is no trade-off between equity and efficiency. But we seem to have found one here. We showed previously that trade raises 'national welfare,' yet this seemingly comes at the expense of harming at least one consumer.

Now ask: Are the gains from trade *large enough* that we could make consumer A better off without making B worse off by redistributing the gains from trade? If yes, there is a *potential* Pareto improvement here.

Keeping B as well off as he was at point Z requires that he consume on the same indifference curve on which point Z lies.

Consider moving the endowment from point E to point E'. That is, we redistribute some shelter from A to B (a lump-sum transfer).

Now, starting from point E', the same world price ratio prevails: $(p_s/p_f)_T$. (Remember that Home is a price-taker on world markets.)

If we draw the ray with slope $-(p_s/p_f)_T$ extending from point E', this ray is tangent to $B's$ indifference curve through Z. Therefore, B is indifferent between trade under autarky and world trade with redistribution from E to E'.

Crucially, A is unambiguously better off. He can still consume on a higher indifference curve.

This answers our question above. There is no trade-off between equality and efficiency. Through an appropriate set of transfers, we can both exhaust all gains from trade and achieve any Pareto efficient allocation desired. The aggregate gains from trade do not *necessarily* come at the expense

of equity—a *potential Pareto improvement* (sometimes called a Kaldor improvement) is always feasible. International trade does not overturn the $1st$ and $2nd$ welfare theorems.

How do we know that the Kaldor criterion will always be satisfied—that is, that the gains from trade are necessarily large enough to potentially make both parties better off? The answer is that international trade is equivalent to relaxing one constraint in our Edgeworth box. In the Autarkic Edgeworth box, the equilibrium required both that consumption was Pareto efficient (MRS equated among consumers) and that the sum of demands of all consumers was equal to the aggregate economy wide endowment. Trade relaxes the second constraint. Although the MRS of all consumers is equated to the price ratio under international trade, it no longer has to be the case that a country consumes only what it produces. So long as another country is willing to trade with it, its consumption may exceed its endowment in some goods (though not all goods—since this would imply a trade imbalance).

But all of this good news contains some less pleasant caveats. International trade necessarily improves national welfare (crudely, GDP), by allowing countries to consume a different bundle than what they produce. But international trade does not necessarily raise welfare of all citizens. Indeed, it will typically make some worse off. The analysis above says that equity *does not have to* suffer due to trade. Gains from trade are inherently large enough to fully compensate the losers and still produce some winners. But trade generally will produce **both** winners and losers unless governments implement redistributive policies to prevent this from occurring.

4   Conclusion and policy relevance

The principle of comparative advantage is a fundamental economic insight of great relevance and generality. This principle 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.

But there is a key difference between these two conclusions. International trade does *not necessarily* benefit every individual. It's likely to create winners and losers (relative to trade among individuals in autarky). By contrast, free trade among individuals always generates Pareto improvements.

The principle of comparative advantage combined with the 1st and 2nd welfare theorems proves that it is *possible* to make each citizen better off through trade than under autarky, when trade is combined with lump-sum transfers. Whether this occurs depends upon the politically feasibility of implementing redistributive policies to counteract the redistribution accompanying trade liberalization. Little in the vast sweep of history suggests that the gains from trade are typically redistributed

so that the losers are compensated.

This insight is relevant to the political economy of trade in developed countries such as the U.S., Japan, the OECD, the U.K., etc. As we will discuss when we read the Feyrer paper, there is compelling causal evidence that trade increases GDP in both developing and developed economies.

But, trade between the developed and less-developed countries (LDCs) will generally tend to lower the wages of less-educated workers in developed countries. This is because developed economies have comparative advantage (relative to most other countries) in technology- and skill-intensive products and services. So, opening of developed countries to trade with LDCs generally raises the wages of highly skilled workers in developed economies and reduces the wages of less skilled workers in these economies. The 2013 *American Economic Review* paper by Autor, Dorn and Hanson (we won't have time to cover it but is in the reading folder as a recommended reading) presents evidence that this is more than just a theoretical possibility. By the same token, however, trade raises the earnings of less-educated workers in LDCs because LDCs hold a comparative advantage in low-skill, labor-intensive production such as agriculture and mass production.

The Second Welfare theorem says that we could compensate less-educated workers in developed countries for their losses and still make everyone else better off. But the political reality is that this is quite unlikely to happen.

Perhaps as a consequence, trade unions and non-college workers are generally strongly opposed to international trade. These interest groups are probably neither sinister or foolish; they do not oppose *Pareto* improvements in general. They may, however, understand that international trade without accompanying redistribution makes them worse off. Politically, opening to trade is comparatively easy. Redistributing gains from winners to losers is politically extremely difficult. Permitting the first without pursuing the second may have strong redistributive consequences—and the redistribution induced by trade in industrialized economies is typically (though not always) from less affluent to more affluent workers.