

## Chapter 14

# Trade: Comparative Advantages

The classical theory of comparative advantages started almost 200 years ago (1818) when David Ricardo made his seminal contribution. Ricardos view of the world was fantastically simple and tremendously influential. So influential that in 150 years it became the paradigm of international economics.

The theory of comparative advantages has a very simple message but a relatively loaded message: we gain when we exploit our differences. This is true not only for countries but in our everyday lives – like it or not. When we get together in working teams we divide the tasks such that everybody can do what they do best. When we play baseball each one takes the position that is best fit for each player. It does not make any sense to put some scared of the ball in first base, nor someone unable to throw to be a pitcher, etc. We always improve and gain when we can assign tasks to those that can perform them better. Ricardos views about trade are the same. Countries should produce what they do best. As in the baseball example this is not an absolute term, but a relative one. Countries should produce what they do best, relative to others.

Ricardos classical theory of comparative advantage is not an ordinary appeal to common sense. Actually, it is the outcome of a formal maximization problem in which firms choose production, using technologies that exhibit constant returns to scale and face perfect competition. Thats it! However, I do not think I need to torture you with a framework, I will like to discuss a numerical exercise that provides almost all the relevant intuition instead.

### 14.1 A Benevolent Dr. Evil

The purpose of this exercise is to understand all the forms of conflict that arise when two countries trade. Our objective is going to be a very simple one: to maximize world production using the exact same resources. In fact, this is mostly what we would love to do to improve our standards of living, and also protecting the environment. Imagine producing what we produce today, but more efficiently... using less oil and energy, less water and pollutants, etc. However, achieving efficient has costs – political costs. Here we address them.

For the rest of the section think of me as Dr. Evil and you my friends.... just my *mini-me's*.

#### 14.1.1 Problem

To keep things as simple as possible lets assume that there are only two countries in the world, that there are only two goods (apples and bananas), The only difference that exist in our countries is the fact that they

produce using different technologies – in other words, they use different number of hours to produce apples and bananas.

The purpose is to allocate the production of labor in each country to maximize world production. There are two other additional simplifying assumptions. First, assume that consumer preferences are as follows: agents consume apples and bananas in equal proportions. This assumption implies that we need to organize production such that the total amount of apples is equal to the total amount of bananas; otherwise, goods are wasted. Second, in order to compute GDP we assume the price of each apple and banana is one dollar.

### 14.1.2 Case 1: Free Trade versus Fair Trade

In Table 14.1 we present the number of hours required to produce one unit of the respective product. The first entry indicates that in Country 1 we can produce one apple using one hour of work. In this country, we need 3 hours to produce one banana. So, in Country 1, workers are more productive in apples than bananas. Country 2 is symmetric. They need three hours to produce one apple, but one for a banana.

Table 14.1: Case 1

Hours Required	Apples	Bananas
Country 1	1	3
Country 2	3	1

The first step is to evaluate what happens when the countries do not trade. This is known as Autarky. That means that each country has to supply the food that it will be consume in each respective country. So, country 1 needs to supply the exact same amount of apples and bananas to its consumers. The same for country 2.

How can we allocate labors to achieve this? Our work is to maximize production and therefore we will use all the labor available, but if we distribute them half and half (120-120) then the country produces 120 apples and only 40 bananas. Because the country is in autarky and cannot trade, then the country would be wasting 80 apples. Not a good idea. The allocation needs to assign 3 times more labor in bananas than in apples. Allocating 60 hours in apples and 180 in bananas implies that the production is 60 and 60. That actually is the only way to allocate labor and maximize production. Country 2 is symmetric and labor is allocated 180-60. The results are summarized in the first panel of Table 14.2.

The next step is to study what happens when we allow the countries to trade: free trade. However, before doing that, let us explore some simple questions. Who is the most efficient in the world at producing apples? Country 1. Who is the most efficient in the world at producing bananas? Country 2. What does country 1 produces the best (which sector internally they are more efficient)? Apples; and country 2? Bananas.

When you have a country that is the best in the world at something we say that the country has pure competitive advantages.

Now each country can produce in different proportions, but we need to have world production equalized. In other words, country 1 can produce  $x$  and  $y$  but then country 2 needs to produce  $y$  and  $x$  such that the total world production of the two products is equal, and there is no waste. This is a very simple exercise in the sense we can specialize each country in what they do best. So, if we put the 240 hours of country 1 in apples the production is 240 apples and no bananas. We can do the opposite in country 2, 240 into bananas, which implies a production of 0 apples and 240 bananas. The world production is 240-240 which is double what we had before. The results are shown in the second panel of Table 14.2

Table 14.2: Results of Case 1

Case	Trade	Country	Labor		Production		GDP		
			Apple	Banana	Apple	Banana	Apple	Banana	Total
Case 1	Autarky	Country1	60	180	60	60	60	60	120
		Country2	180	60	60	60	60	60	120
		World			120	120	120	120	240
	Free Trade	Country1	240	0	240	0	240	0	240
		Country2	0	240	0	240	0	240	240
		World			240	240	240	240	480

Notice that free trade increases world production, and world GDP: from 240 dollars to 480! This gain in efficiency occurs because each country can devote itself to produce what they do best. The countries specialize, and the world benefits from it because we use the limited resources we have much better. Notice that in this case the GDP of both countries increases in the same proportion – both double. Another interesting thing I want to highlight is that country 1 exports apples to country 2, and country 2 exports bananas to country 1. So, you export what you are best! You export where you have competitive advantages – at least in this simple example.

A couple of questions that right now sound stupid, but they will not in the following subsection: first, does country 1 produces what they do best in the world? yes. does it produces what they in particular do best? yes. Is that the same for country 2? yes. Confused? do not worry, it will become clear in a minute.

The free trade has generated a lot of resources. Now, lets share them equitably. It is impossible for me to replicate the theater/parody I do in class. But let me summarize it – and I hope you remember it. Assume I am country 1 and you are country 2. Obviously because free trade is forcing me to trade with you, MBA's, lesser humans, I think the fair share of the world GDP is that you should take 121 and I should make the sacrifice to accept 359. I think this is fair. Because I produce Apples which shares so much with cool products produced by Apple, and you produce Bananas which shares a lot with uncool things as *you-are-a-bananana-republic* then I hope it is clear I am making a huge sacrifice. What do you think? Deal or No Deal?

In fact, can you understand why you **SHOULD** accept this offer? You should accept because your outside option is 120 (autarky) and this clearly improves the welfare of your citizens. What? You are not going to accept this because hurts your confused ego? So, you are putting your feelings before the welfare of your citizens? Isn't that what you hate from the politicians you criticize, and you are doing the same! Shame on you! You selfish bureaucrats! If you are not happy, what is your offer? 240-240? Who said that is fair? In fact, why is this fair? I think you truly believe this is fair mainly because you have a very confused and distorted view of fairness. Are you French? I'm sorry but I'm Republican... so sorry baby. But I am a benevolent liberal Republican so I will improve my offer. I can push it up to 125-355 but I am already giving you much more than what you deserve.

Hard to solve this dilemma, isn't it? How can we split the surplus?

Free trade generates a surplus, how we split it is the result of bargaining, and it is unclear why it has to fall exactly in the middle. In this example I know it is natural to split the surplus in the middle. The two countries are perfectly symmetric and it is difficult to argue for something other than the middle is fair, but in real life this is not the case. Still, I hope this makes clear that *free* has nothing to do with *fair*. Fair refers to the sharing rule of the surplus, and free is about creating it.

I also hope you never use free and fair trade in the same sentence after this example – and especially after the parody I go through in class. That comparison is one of the most ignorant comparisons ever made. That does not mean that free trade is fair. It can be perfectly unfair but mostly because world institutions are not good enough to guarantee all countries enter the negotiation with the same power.

### 14.1.3 Case 2: Specialization and Uncertainty

Let us now turn our attention to a case in which country 1 is good at everything. The hours per product are shown in Table 14.3. Country 1 is identical, but now country 2 requires 4 hours to produce apples or bananas.

Let us go back to the questions we asked before: Who is the most efficient in the world at producing apples? Country 1. Who is the most efficient in the world at producing bananas? Country 1. What does country 1 produce the best? Apples; and country 2? they are indifferent. In other words, country two is as good at producing apples as it is at producing bananas – which by the way they are horrible in comparison to country 1.

Table 14.3: Case 2

Hours Required	Apples	Bananas
Country 1	1	3
Country 2	4	4

Solving for autarky, the allocation in country 1 is the same as before (60-180). Country 2 allocates 120-120 to apples and bananas and produces 30 and 30. Notice that because Country 2 is less efficient, the world production is 90-90. The GDP of country 1 is 120 and it is 60 for country 2. In line with the BBNN the more productive country is richer, and the less productive is poorer.

Let us move now to free trade. Solving the allocation for free trade is not that easy. The reason is that in this example, one country specialized in one good and the other one produces both. So, to solve the problem we have to be careful of two things: first, that every apple has a banana; and second, that we use all the workers.

Assume we specialize country 2 in bananas. This means that we allocate all 240 hours in bananas and we produce 60. How we allocate workers in country 1? The easiest way to solve the problem is to first allocate enough workers to assure that the 60 bananas have 60 apples. Then, the hours left we allocate in ratio of 3:1 to increase apples and bananas together. Given that country 1 needs one hour to produce an apple, this means that we can allocate 60 hours to apples and now every banana from country 2 has an apple in country 1. We have 180 hours left, though. So, we can allocate 135-45 hours to produce 45-45 apples and bananas in country 1. In the end, the production is 105-105.<sup>1</sup>

Table 14.4: Results of Cases 1 and 2

Case	Trade	Country	Labor		Production		GDP		
			Apple	Banana	Apple	Banana	Apple	Banana	Total
Case 1	Autarky	Country1	60	180	60	60	60	60	120
		Country2	180	60	60	60	60	60	120
		World			120	120	120	120	240
	Free Trade	Country1	240	0	240	0	240	0	240
		Country2	0	240	0	240	0	240	240
		World			240	240	240	240	480
Case 2	Autarky	Country1	60	180	60	60	60	60	120
		Country2	120	120	30	30	30	30	60
		World			90	90	90	90	180
	Free Trade	Country1	105	135	105	45	105	45	150
		Country2	0	240	0	60	0	60	60
		World			105	105	105	105	210

<sup>1</sup>Please check that this is maximum possible to can achieve

There are several important properties of this solution that we need to discuss: First, clearly there is a surplus – from 90-90 to 105-105 – and therefore the exact same discussion between free and fair appears. Second, notice that the benefits in terms of growth are not equally shared. Country 1 GDP increases from 120 to 150, while Country 2’s GDP stays at 60! Third, one country is specialized while the other one is diversified – in terms of their production. Imagine that each sector has shocks that are idiosyncratic. That means that country 1 would be less risky than country 2! Finally, country 2 exports 30 bananas to country 1, which exports 30 apples to country 2. In other words the production of bananas in country 2 need to be exchange for apples so that country 2 consumes in pairs. This is quite interesting. Country 2 is exporting bananas. Is it because they are the best country on earth at producing bananas? NO! Actually exporting something and being good at it have very little to do, in theory and practice. We come back to this point after the next example.

#### 14.1.4 Case 3: Standard of Living

The last case is quite close to what happens in the data. The hours requires for each production are shown in Table 14.5. Notice that country 1 is good at everything, and country 2 is bad at everything. The only difference is that both country 1 and country 2 strictly prefer to produce apples.

Table 14.5: Case 3

Hours Required	Apples	Bananas
Country 1	1	3
Country 2	3	5

In other words, this is like comparing HighTech (apples) and Agriculture (bananas). In both countries, works are more productive in HighTech than in Agriculture – where “productive” can be thought as value added: HT has indeed a higher value added than Agriculture. This is why I think this example resembles the data. I think every country prefers to produce aircraft, high end electronics, IT, biotech, etc. And they prefer those sectors not because they are sexy but because they have a very high value added. Let us see what the allocation implies.

The maximization of world production implies

Here the process of finding the solution is similar to the one described before. Implications? As before, there is a world surplus – we have improved the standards of living in the world. Second, the benefits are unfairly shared. Country 1 GDP increases from 120 to 144, while Country 2’s GDP decreases from 60 to 48! Third, as before country 2 is specialized while country one is diversified. All these three are in principle identical to the previous example.

Fourth, as before country 2 exports bananas, but what is even worse than in the previous case is the fact that country concentrates on what they do worse! In the previous example, country 2 was indifferent between apples and bananas, but here country 2 really prefers to produce apples and we are forcing them to produce bananas – explaining the reduction in GDP.

Fifth, notice that country 2 exports a product in which they are not good at all! In this example, which sector is the one in which country 2 is less productive? Bananas. Who is the worst on earth at producing bananas? Country 2. Who is the only one that exports bananas in the world? Country 2. Why is this important? Well, most people believe that if a country exports something it must be because “it is good at it!”. This is called in academia as revealed comparative advantages. In other words, by looking at the patters of trade we try to infer what are the implied degree of competitive of a nation. As this example shows, the

Table 14.6: Results of Cases 1 to 3

Case	Trade	Country	Labor		Production		GDP		
			Apple	Banana	Apple	Banana	Apple	Banana	Total
Case 1	Autarky	Country1	60	180	60	60	60	60	120
		Country2	180	60	60	60	60	60	120
		World			120	120	<b>120</b>	<b>120</b>	<b>240</b>
	Free Trade	Country1	240	0	240	0	240	0	240
		Country2	0	240	0	240	0	240	240
		World			240	240	<b>240</b>	<b>240</b>	<b>480</b>
Case 2	Autarky	Country1	60	180	60	60	60	60	120
		Country2	120	120	30	30	30	30	60
		World			90	90	<b>90</b>	<b>90</b>	<b>180</b>
	Free Trade	Country1	105	135	105	45	105	45	150
		Country2	0	240	0	60	0	60	60
		World			105	105	<b>105</b>	<b>105</b>	<b>210</b>
Case 3	Autarky	Country1	60	180	60	60	60	60	120
		Country2	90	150	30	30	30	30	60
		World			90	90	<b>90</b>	<b>90</b>	<b>180</b>
	Free Trade	Country1	96	144	96	48	96	48	144
		Country2	0	240	0	48	0	48	48
		World			96	96	<b>96</b>	<b>96</b>	<b>192</b>

conditions for that to produce the correct inference are quite restrictive. Without further information, the fact that you export something is not informative about the ability of the country in producing such item.

Finally, and more importantly, the only way to sustain this allocation is for country 1 to subsidize country 2 all the time. In other words, the GDP in autarky for country 2 is 60 and it falls to 48. Therefore, country 1 needs to provide  $12 + \epsilon$  to country 1 so it participates in free trade. Country 2 is willing to do so, because their increase in GDP is 24, so, it can share part of that with the other country. This example implies that country 2 will be receiving Foreign Aid forever just to improve their income by  $\epsilon$ ! Depressing. isn't it?

We have seen several sources of conflict in this discussion.

1. Fairness of the sharing rule of the surplus generated by free trade.
2. Specialization.
3. Output Volatility.
4. Specialization on the least productive good, and reduction of GDP.
5. Lifetime AID need.

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