Check your understanding: Trade Example[1]

Bill Gibson

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[1] Thanks to Farzad Ashouri

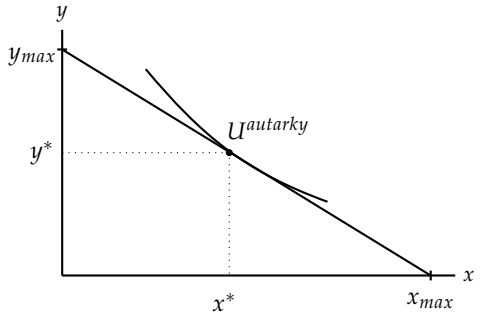
Steps to solve the trade model

- You must have the intercepts of the PPF given as well as the international terms of trade and preferences. The parameter list for this problem is $P(y_{max}, x_{max}, p^*, \alpha)$.
- The variable list is $V(p, B, x^*, y^*, U, E, M)$ where p is the domestic terms of trade, B is the GDP and the starred values of x and y are the demands for the two goods. Here E = is exports and M = imports.
- For a consumer B is the *y-intercept of the budget constraint*; for a country $B = GDP = income$ of the country as a whole.

Step 1: find p the opportunity cost of x in terms of y

- Compute $p = y_{max}/x_{max}$. See figure 1. This is the absolute value of the *slope* of the PPF. It is also the opportunity cost of good 1 in terms of good 2 (the numéraire commodity) = p.

Figure 1: Solution in autarky



Step 2: find B the GDP in terms of y

- The GDP is *constant* along a *linear* PPF. Therefore the simplest solution is to find the intercept on the Y axis and set it equal to B.
- $B = y_{max}$

Step 3: solve the model in autarky

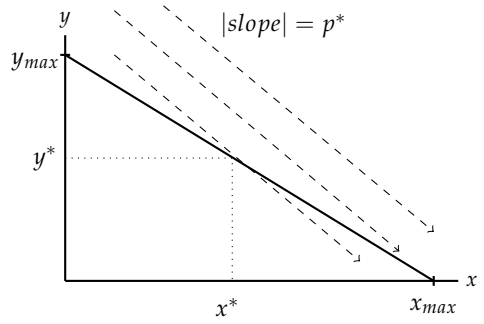
- Production is consumption (no savings).
- Production is also supply since there is no trade in autarky.
- The solution for x^* and y^* are the same as in the consumers problem. There one solves the tangency condition $\frac{\alpha}{1-\alpha}\frac{y}{x} = p$ and the budget constraint, $B = px + y$ simultaneously to find the optimal solutions x^* and y^*. It is best to memorize the solution rather than derive it each time.
- Demand curve for the first good is $x^* = \frac{\alpha B}{p}$
- Demand for the second good is $y^* = (1 - \alpha)B$.

- Once x and y are known, then solve for the U the autarkic level of utility or welfare.
- Next find $U = x^{\alpha}y^{(1-\alpha)}$

Step 4: determine the pattern of specialization

- **If** the relative price of good 1 is less than $p*$, specialize in good one. **Else**: specialize in good 2.
- This is **comparative advantage**...not absolute.
- Comparison of technology in two countries is what matters.
- **Example:** Domestic price is 2. The international prices is 1. Specialize in? *Answer:* The second good since the cost of first good is too high to confer a comparative advantage in the first good. Second example: domestic price is 1.5 and international price 3. Specialize in first good.

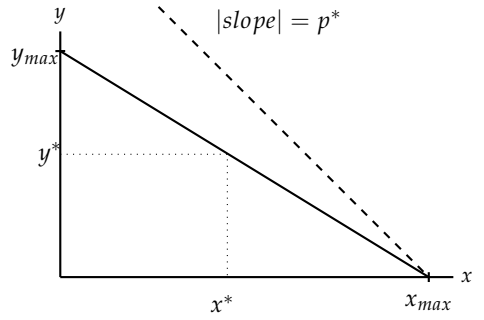
Figure 2: Country should specialize in good x



Step 5: compute new feasible region

- Make the new p^* international terms of trade line the new PPF as shown in figure 3.
- This defines a *larger* feasible region and is the new budget constraint for the country.

Figure 3: The new feasible region



Step 6: compute B^* the budget or GDP in trade

- Next, determine the new GDP = specialized output times the international price.
- If specialized in good 1, this is p^*x_{max} where x_{max} is the x-intercept of the PPF.
- If specialized in good 2, this is y_{max} where y_{max} is the y-intercept of the PPF.
- If specialized in good 2, under no circumstances multiply by p^*.

Step 7: compute the solution for x, y and U in trade

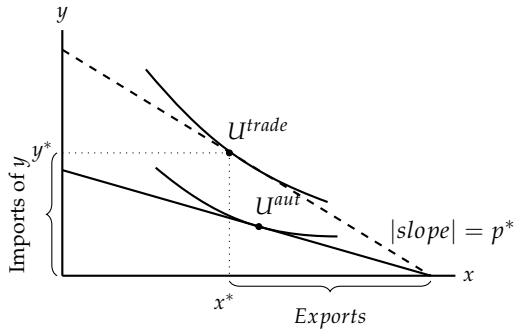
- Solve the new budget constraint with the tangency condition to find out demand for goods x and y in trade or apply the memorized expressions.

- Demand curve for first good in trade is $x^* = \frac{\alpha B^*}{p^*}$
- Demand for second good in trade is $y^* = (1-\alpha)B^*$
- Solve for the new level of utility $U^* = x^\alpha y^{(1-\alpha)}$
- See figure 4

Step 8: compute gains from trade, imports and exports

- Compute *gains from trade* ΔU by subtracting the level of utility in autarky from this $\Delta U = U^* - U$.
- Exports is the level of specialized production minus consumption.
- Imports is consumption of other good since there is no production.
- To check: confirm that the budget constraint is satisfied.
- To check: confirm that trade is in balance.
- See figure 4

Figure 4: Gains from trade and imports and exports



Check your understanding: a numerical example

1. The economy can produce either 10 units of good 1 or 10 units of good 2. The utility is
$$U = x^{0.7}y^{0.3}$$
The international terms of trade are $p^* = 1.5$.
2. Check to see that the necessary data is present. Is it?[2]
3. Step 1: Find p.[3]
4. Step 2: Find the GDP in terms of good 2.[4].
5. Step 3: Solve for x, y, U in autarky. [5].
6. Step 4: Determine the pattern of specialization, x or y.[6]
7. Step 5: Find the new budget constraint or GDP B^*?[7]
8. Step 6: Find the new feasible region.[8]
9. Step 7: Solve for x, y, U in trade.[9].
10. Step 8: Solve for the gains from trade, imports and exports.[10].

[2] Yes!

[3] *Solution*: $p = 10/10 = 1$

[4] *Solution*: $B = y_{max} = 10$

[5] *Solution*: $x = \alpha B/p = 0.7(10)/1 = 7$; $y = (1-\alpha)(10) = .3(10) = 3$, $U = 7^{0.7}3^{0.3} = 5.43$

[6] *Solution:* Since $p < p^*$, good x is cheaper at home than in the world. Specialize in good x.

[7] *Solution:* Since $p^* = 1.5$, and $x_{max} = 10$, we have $B^* = 15$.

[8] *Solution*: See figure 3

[9] *Solution*: $x = \alpha B/p = 0.7(15)/1.5 = 7$; $y = (1-\alpha)(15) = .3(15) = 4.5$, $U = 7^{0.7}4.5^{0.3} = 6.13$

[10] *Solution*: The gains from trade $U^* - U = 6.13 - 5.43 = 0.7$. Exports are $10 - 7 = 3$ of good x and imports are all of good y consumed or 4.5. Trade is in balance since $p^*E = M$ or $1.5(3) - 4.5 = 0$