ECON 664: Issues in International Trade
Problem Set 1
Due: September 29, 2023

Instructions: You may work with up to one other person on this assignment. If you do work in a pair, please make sure both names are listed on the assignment, and only turn in one copy. Please submit your assignments on Canvas by 11:59 pm on September 29, 2023.

Question 1

1. Home has 1,200 units of labor available. It can produce two goods: apples and bananas. The unit labor requirement in apple production is 3, while in banana production it is 2.
   a. Graph Home's production possibilities frontier.
   b. What is the opportunity cost of apples in terms of bananas?
   c. In the absence of trade, what would be the price of apples in terms of bananas? Why?
2. Home is the same as described above. There is now also another country, Foreign, with a labor force of 800. Foreign's unit labor requirement in apple production is 5, while in banana production it is 1.
   a. Graph Foreign's production possibility frontier.
   b. Construct the world relative supply curve.
3. Now suppose world relative demand takes the following form:

$$\frac{\text{Demand for Apples}}{\text{Demand for Bananas}} = \frac{\text{Price of Bananas}}{\text{Price of Apples}}$$

   a. Graph the relative demand curve along with the relative supply curve.
   b. What is the equilibrium relative price of apples?
   c. Describe the pattern of trade.
   d. Show that both Home and Foreign gain from trade.

Question 2

Consider a country (U.S.) that produces two goods: fishing rods (F) and sailboats (S). Suppose the country has L workers, F units of a specific factor used to produce fishing rods and S units of a specific factor used to produce sailboats. The production function for fishing rods is given by:

$$Q_F = (F)^{\frac{1}{2}}(L_F)^{\frac{1}{2}},$$

where L_F is the labor allocated to fishing rods. The production function for sailboats is given by:

$$Q_S = (S)^{\frac{1}{2}}(L_S)^{\frac{1}{2}},$$

where L_S is the labor allocated to sailboats. Suppose that there is a representative agent in the U.S. with preferences:

$$U = \min\{C_S, C_F\}$$

over consumption of sailboats (C_S) and consumption of fishing rods (C_F).

1. Follow parts (a)-(d) of this question to solve for the equilibrium autarkic relative price of fishing rods to sailboats ($\frac{P_F}{P_S}$) in terms of exogenous (given) variables.

(a) *Step 1.* The representative agent in this economy wants to consume both goods, requiring workers to be indifferent between both sectors. This means the following has to hold:

$$\underbrace{P_S \times \frac{\partial Q_S}{\partial L_S}}_{\text{Marginal Revenue Product of Labor in Sailboats}} = \underbrace{P_F \times \frac{\partial Q_F}{\partial L_F}}_{\text{Marginal Revenue Product of Labor in Fishing Rods}}$$

Plug in the production functions and rearrange to get an expression for $\frac{P_F}{P_S}$ in terms of S, F, L_F, and L_S.

(b) *Step 2.* In equilibrium, consumers will want to maximize utility. What is the utility maximizing combination of C_S and C_F for a consumer with this type of preferences (Leontief)?

(c) *Step 3.* In the autarky equilibriumb, production must equal consumption—i.e., $C_S = Q_S$ and $C_F = Q_F$. Use your answer to Step 2, plug in the production functions, and rearrange to get an equation for $\frac{S}{F}$ in terms of L_F and L_S.

(d) *Step 4.* Substitute your answer to Step 3 into Step 1 to yield an expression for autarky relative prices, $\frac{P_F}{P_S}$, in terms of exogenous variables, S and F.

2. Suppose there is another country, Mexico, where we assume that $\frac{S^*}{F^*} > \frac{S}{F}$. The production technology and preferences in Mexico are the same as in the U.S. If the two countries begin trading, how will the labor allocation across sectors change compared to the autarkic equilibrium? Your response should be graphical. Who would lose from trade in the U.S.?

Question 3

Evaluate the following statement in the context of the theories we have discussed in class: *"The world's poorest countries cannot find anythign to export. There is no resource that is abundant—certainly not capital or land, and in small poor nations not even labor is abundant."*

Question 4: Empirical Exercise on Revealed Comparative Advantage

For this exercise, please submit your code (preferably a `.do` file) in addition to answering the questions below. You are welcome to use a program other than stata, but the data files and answer key will be for stata. The `.zip` file `ps1_data.zip` contains three stata `.dta` files: `peru_exports.dta` — Peruvian exports by HS2 industry, 2000-2019; `german_exports.dta`—German exports by HS2 industry, 2000-2019; `world_exports.dta`—Total world exports by HS2 industry, 2000-2019.

1. Merge these files together in stata. You should end up with a dataset with five variables: `HS2, year, peru_exports, german_exports, and world_exports`. This will require loading one file, and then performing two `merge` commands in stata. Type "help merge" in stata to learn more about how this command works.

2. What were the top three industries exported by Peru in 2019? What were the top three industries exported by Germany in 2019? The file `hs2_category_descriptions` provides the descriptions of each HS2-digit industry. (Hint: The command `gsort` will allow you to sort the data in descending order. For example, if I wanted to sort data on height in descending order, I would type `gsort -height`.)

3. The Revealed Comparative Advantage (RCA) index is calculated as:

$$\frac{X_k^i / X^i}{X_k / X},$$

where X_k^i is country i's exports in industry k, X^i is country i's total exports, X_k is world exports of sector k, and X is total world exports. Calculate the RCA index for all industries in both countries in 2019.

(a) In how many industries does Peru have RCA in 2019? Germany?

(b) In which three industries does Peru have the strongest RCA? What about Germany?

(c) Are your answers to (b) the same as your answers to Part 2 of this question? Why or why not?

4. The Ministry of Foreign Trade and Tourism in Peru is developing a new export strategy. Because Peru is known for its famous Pima cotton, they have decided to target their campaign toward expanding exports in the cotton industry (HS 52). Does the Ricardian model suggest this is a good sector to be targeting? If not, can you recommend a better sector to target?

   Note, this question has more than one right answer. Just be clear about what data you are using to support your answer. Coding hint: If you want to compare RCAs in two years, the following lines of code will create a new variable called `rca_peru_yyyy`, which has the RCA for Peru in each sector in year yyyy:

```
gen rca_peru_temp = rca_peru if year == yyyy
bys hs2:  egen rca_peru_yyyy = max(rca_peru_temp)
drop rca_peru_temp
```

5. For a long time, Germany has been known for its auto industry. How has Germany's RCA in the automobile sector (HS 87) changed over the past 20 years? Do you think the shift toward electric cars has had (or will have) an effect? (The second part of this question hs no "correct" answer—just provide some thoughts.)