Econ 27000 International Economics

Winter 2021

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Problem Set 1: Ricardian Trade model

This problem set is due on Monday, January 25 2021. It must be submitted by 5pm CT.

Exercise 1

Determine whether the following statements are TRUE, FALSE, or UNCERTAIN, and justify your answer in one paragraph. Please be concise.

1. In the Ricardian model, no country ever loses from free trade relative to autarky.

2. In the Ricardian model with many goods and positive trade costs, there will be at most one good that is produced in both countries in equilibrium.

3. In a Ricardian model of US-China trade, if China increases its productivity by 25% in all goods, US welfare will increase.

Exercise 2

Consider a Ricardian model in which there are two countries, the United States and Canada, and two goods, jerseys and hockey sticks. Suppose that in the United States 1 worker-hour is required to produce each hockey stick, and 2 worker-hours are required to produce each jersey. In Canada, 4 worker-hours are required for each hockey stick, and 3 worker-hours are required for each jersey.

1. Which country has an absolute advantage in each good?

2. Which country has a comparative advantage in each good?

3. Assuming that each country has 60 worker-hours available for production, draw the production possibilities frontiers for each country. (Put hockey sticks on the vertical axis.) What do the slopes of these frontiers indicate?

4. Draw the world production possibilities frontier (defined as the maximum amount of goods that can be produced *worldwide* for a fixed amount of resources). What does its slope indicate?

5. Suppose consumers in both countries have identical Leontief preferences:

$$U = \min\{D_j, D_s\}.$$

What is the trade pattern? (Note: the indifference curves associated with Leontief preferences are right angles – there are no substitution effects between the goods). Derive the exact value of each country's exports and imports.

6. If the labor force of the United States increases to 600 work-hours available, will anything happen to the pattern of trade? You do not need to provide numerical details. Will the gains of trade for the US be higher or lower than when the two countries have the same labor force?

Exercise 3

Consider the utility-maximization of a consumer with preferences

$$U\left(D_C, D_F\right) = \left(D_C\right)^a \left(D_F\right)^{1-a}, \quad \text{with } 0 < a < 1,$$

and a budget constraint of the form

$$P_C D_C + P_F D_F \leq I.$$

1. Solve for the marginal utility of consuming clothing, that is $\partial U\left(D_C, D_F\right)/\partial D_C$.

2. Solve for the marginal utility of consuming food, that is $\partial U\left(D_C, D_F\right)/\partial D_F$.

3. Check that the marginal rate of substitution is equal to $-\left(D_F/D_C\right)a/\left(1-a\right)$.

4. Using the fact that $MRS = -P_C/P_F$ and that $P_C D_C + P_F D_F = I$, solve for the demand for each good in terms of prices and income.

5. What share of income is spent on the consumption of each good?

Exercise 4

"Japanese labor productivity is roughly the same as that of the US in the manufacturing sector, while the US is more productive in the service sector. But most services are nontradable. Some have argued that this poses a problem for the US, because US's comparative advantage lies in things US cannot sell on world markets. "

To evaluate this statement, develop a small Ricardian model:

Suppose that Japan has roughly half the population of the United States, so set $L = 10$ and $L^* = 5$. Suppose there are two manufacturing sectors (i.e., cars and electronics), and a non-tradable service sector. Suppose that the technologies have labor productivity of one in all sectors for Japan. Let the US have a labor productivity for manufacturing sectors of one as well, and a productivity of services of 3. Let utility be Cobb-Douglas, with a share of expenditure on cars and electronics of 0.25 each, and a share of expenditure on services of 0.5. Suppose there are extremely small trade costs between countries, which you normally ignore, but in case of indifference between home and foreign sourcing in the absence of trade costs, the good will be bought from home. Trade costs are infinite for services.

1. Within the tradable goods, which country has a comparative advantage in each good? What would be trade pattern between two countries?

2. Let $p_c = 1$, price of car in the US. What are p_e, p_s (price for electronics and services in the US) and p_c^*, p_e^*, p_s^* (price in Japan)?

3. What would be the wage in each country?

4. Denote the income of the US by E and the income of Japan by E^*. What would be the consumption choice as a function of income and price in each country? (Use the property of Cobb-Douglas preferences.)

5. What would be the final consumption bundle in each country? What is the utility level?

6. Now assume that the US had a labor productivity in services and cars of 1, but a labor productivity in electronics of 2. Repeat exercises (1)–(5) in this case.

7. Use your results from the previous to steps to comment on the statement made at the beginning of this question.

Exercise 5

Part A

Use the Stata dataset titled `PS_1_TradeFlows2011_1970.dta`, which is available on Canvas. Use this file to run a gravity regression of trade flows in the goods sector as well as in the services sector. Include country fixed effects for the source and destination countries in the regression. In 2011, what is the distance elasticity of trade for goods and (separately) for services?[1] How did the distance elasticity for goods change over time? What do you think causes the differences between distance elasticities in the service and goods sectors, as well as the difference in the distance elasticity for goods over time?

There are three other variables in the data that allow you to embellish the gravity equation. They are indicator (dummy) variables for (i) contiguity (whether countries share a border), (ii) whether the countries share an official language, and (iii) whether the countries have a colonial history with one another. Estimate the above regressions with and without controls (i) and (ii). Do **not** use colonial history as a control for this exercise. Do including these first two controls impact your distance elasticity estimates? If so, how and why?

Your answer for this question should contain a single table with the regression results. Use rows for the variables, and columns for specifications (e.g one column shows the result for the regression with only distance and fixed effects as control variables using service trade data in 2011 as the independent variable, etc.). You do not need to report the country fixed effects. Also write some text to address the questions above.

Part B

Next, load the dataset titled `MP_Dataset.dta`. This dataset contains data on both (i) trade shares, which is the amount of import divided by the importing country's GDP and (ii) MP (multinational production) share, which is production by foreign affiliates divided by GDP,[2] in a variety of country-pairs. Each observation is an average of data from 1996–2001. Note that the set of countries is different between this dataset and the last one.

Please run a gravity regression for trade shares and multinational production shares. Note that the variables in this dataset are given in levels, while we would like to see results on the distance elasticities of trade and multinational production. Then, as

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[1]Note that the data are in levels!

[2]For example, production from a Toyota plant located in the USA would count as 'multinational production' in the Japan-US observation.

in part A, run the gravity equation again, this time with controls for contiguity and language (but, again, **not** colonial ties!).

Please report a table, like the one you reported in part A, which documents the distance elasticity and other gravity coefficients. No need to document anything on the country fixed effects. You should also make some comment on the differences between the estimates of these two elasticities and the gravity coefficients. In other words: when it comes to distance, language, and common borders, what's the difference between trade and multinational production?

A note on Stata access

You can open Stata from library computers. Alternatively, you can use Stata from the main desktop, click using vLab software. Refer to the attached document about using Vlab for Stata.

Note that when you regress with a lot of dummy variables, you can put star like `varname*` to use all varname with any numbers. For example, the command `reg loggoods CountryDum_*` will run a regression of `loggoods` with `CountryDum_1` to `CountryDum_231` dummies in part A.