Universität Zürich[UZH]

Topic 3 – Gains from Trade

Prof. Ralph Ossa

Introduction

- One of the main insights of the Ricardian model was that countries usually gain and never lose from trade. We will see in the coming weeks that this is a robust finding in the sense that it holds across a wide range of models

- Upon reflection this also makes a lot of sense. The division of labor is clearly essential for our prosperity (or would you want to produce everything you consume?). Why should these gains then be limited to the division of labor within countries?

- This raises the question how large these gains from trade are. Much progress has been made towards answering this question in the recent literature and this is what we will take a closer look at today

- Our main result will be that the gains from trade are large. A move to autarky would reduce real incomes around the world by around 1/3 on average

Introduction (contd.)

- In particular, we will derive a formula which relates a country's gains from trade to its own trade share, i.e. the share of a country's expenditures on domestic goods

- We will derive this formula in the context of the so-called **Armington model** which simply assumes that Home and Foreign produce different goods

- While this is the simplest model to deliver this formula, it turns out to be much more general than that. Arkolakis et al (2012), have recently shown that it applies in a wide range of so-called gravity models, i.e. models delivering a gravity equation of the sort discussed in Topic 1

- The Eaton and Kortum (2002) model is one of these models. Recall that it is a multi-country multi-industry extension of the Ricardian model discussed in Topic 2

Overview of the lecture

- Simple Armington model
- Simple gains from trade formula
- Extensions
- Results
- Reduced-form evidence

Simple Armington model - Setup

- There are two countries (“Home” and “Foreign”) producing two goods (“cheese” and “wine”) from a single factor of production (“labor”) under perfect competition

- The main difference from the Ricardian model is that we now assume that Home can only make cheese and Foreign can only make wine

- We now also go beyond saying that preferences are identical and homothetic and impose that they are of the constant elasticity of substitution (CES) form

- We will not solve the full model (you will be asked to do that for an example in the problem set) but merely derive the equations we need for our gains from trade formula

Simple Armington model – Utility maximization

- Home consumers choose their cheese and wine consumption Q_C and Q_W to maximize the following **CES utility function**

$$U = \left(Q_C^{\frac{\sigma-1}{\sigma}} + Q_W^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

- $\sigma > 1$ is the **elasticity of substitution** which measures how substitutable consumers perceive cheese and wine to be. Higher values of σ indicate higher substitutability

- They maximize this utility function subject to the budget constraint $P_C Q_C + P_W Q_W = wL$, which simply says that their expenditure has to equal their labor income

Clicker question:

Are you broadly familiar with CES utility functions?

Simple Armington model – Utility maximization (contd.)

- As you are asked to show in the problem set, this maximization problem yields the following demands for cheese and wine

$$Q_C = \frac{P_C^{-\sigma}}{P^{1-\sigma}} wL \qquad Q_W = \frac{P_W^{-\sigma}}{P^{1-\sigma}} wL$$

- Substituting these demands back into the utility function, yields the following maximized utility (also called indirect utility)

$$U = \frac{wL}{P}$$

- P is simply the consumer price index in this environment and is given by

$$P = \left(P_C^{1-\sigma} + P_W^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$$

Simple Armington model – Welfare formula

- Together with the familiar break-even condition $P_C = a_{LC}$w, this implies that Home's expenditure on cheese is given by

$$P_C Q_C = \left(\frac{a_{LC}\text{w}}{P}\right)^{1-\sigma} wL$$

- Defining the **own trade share** $\lambda = \frac{P_C Q_C}{wL}$, this equation yields a simple expression for the real wage $\frac{w}{P}$ (which is also equal to per-capita indirect utility)

$$\frac{\text{w}}{P} = \frac{1}{a_{LC}} (\lambda)^{-\frac{1}{\sigma-1}}$$

- λ is an inverse measure of openness. It is smaller than 1 under trade (since Home then buys cheese and wine) and equal to 1 under autarky (since Home then only buys cheese)

Simple gains from trade formula

- Hence, per-capita welfare under trade is given by

$$\frac{w^T}{P^T} = \frac{1}{a_{LC}} (\lambda^T)^{-\frac{1}{\sigma-1}}$$

- Moreover, per-capita welfare under autarky is given by

$$\frac{w^A}{P^A} = \frac{1}{a_{LC}}$$

- Defining $G = \frac{w^T}{P^T} / \frac{w^A}{P^A}$, this implies the following simple formula for the gains from trade

$$G = (\lambda^T)^{-\frac{1}{\sigma-1}}$$

Simple gains from trade formula (contd.)

- This formula measures the increase in per-capita welfare resulting from a move from autarky to current levels of trade

- Notice that the gains from trade are decreasing in λ^T which simply captures that more open economies gain more from trade

- Notice also that it is decreasing in σ which captures that having access to foreign goods is more valuable the more different these goods are from domestic goods

- While λ^T can be read directly off of the data, σ has to be estimated which can be done in various ways (which we will not further explore in this class)

Extensions

- We derived this formula in the context of a simple two-country, two-industry model, which abstracted from many important features of the economy

- However, it readily generalizes to a multi-country, multi-industry Armington model with non-traded goods, intermediate goods, and trade costs (and many more sophisticated environments)

- In Ossa (2015), I show that the general formula is of the form $G = (\lambda^T)^{-\sum_s \alpha_s \frac{1}{\sigma_s - 1}}$, where s indexes an industry and the weights α_s sum to 1

- We will not explore the details of the weights α_s in this class, but they capture parameters like industry expenditure shares

Extensions (contd.)

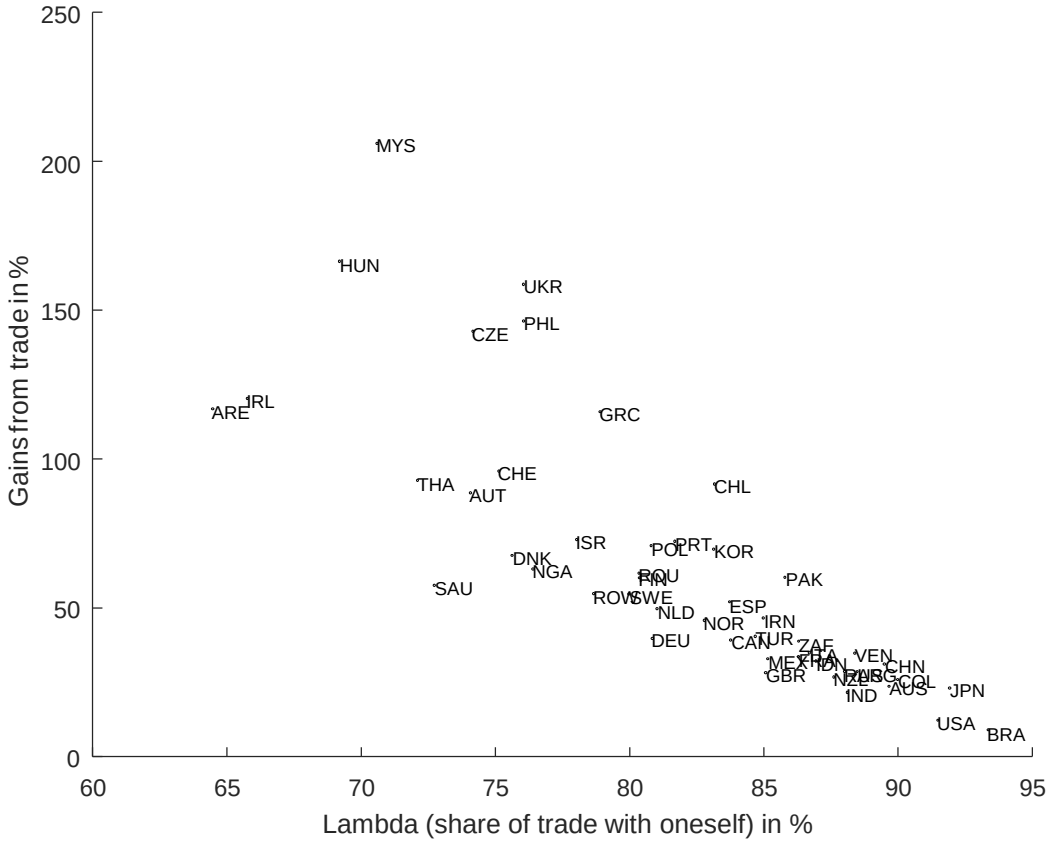
- For our purposes, the most important feature of the extended formula $G = (\lambda^T)^{-\sum_s \alpha_s \frac{1}{\sigma_s - 1}}$ is that it tends to predict much larger gains than the simple formula $G = (\lambda^T)^{-\frac{1}{\sigma - 1}}$

- This is because the exponent becomes large as long as at least one industry has an elasticity of substitution close to 1 which tends to be the case empirically

- Intuitively, this captures that all it takes for there to be large gains from trade is the dependence on some imports which are critical for the functioning of the economy

- Examples of critical imports would be crucial medicines or raw materials which the economy could not produce under autarky

Results



Source: Ossa (2015)

- A move to autarky would reduce real incomes by around 1/3 on average
- Switzerland's real income would fall by around 1/2
- 90% of the gains are driven by the 10% most critical industries

Reduced form evidence – Frankel and Romer (1999)

- Researchers have long regressed per-capita incomes on measures of trade openness and found a positive correlation between the two

- Frankel and Romer (1999) were the first to try to establish causality using an instrumental variables approach

- In particular, they first isolate the effect of geography (mainly distance) on trade using a gravity equation and then use the predicted trade flows as an instrument for actual trade flows

- They find that increasing the ratio of imports plus exports to GDP by one percentage point raises income per person by between one-half and two percent

Reduced form evidence – Feyrer (2009a)

- Frankel and Romer's identifying assumption is that geography affects per capita incomes only through trade which is unlikely to be true

- For example, countries which are close to the equator generally have longer trade routes and may have lower per capita incomes due to their colonial legacy

- To address this, Feyrer (2009a) proposes a time varying instrument based on geographic fundamentals which allows the inclusion of country fixed effects. His main idea is that the rise of air transportation has significantly altered the effective distances between countries

- Using this approach, he finds that increasing trade (the average of imports and exports) by one percent increases per-capita incomes by around one-half percent

Reduced form evidence – Feyrer (2009b)

- However, countries may benefit from having better access to air transportation through channels other than simple goods trade

- For example, air links also facilitate the movement of people and thereby technological spillovers, foreign direct investment, and so on

- To isolate the effects of goods trade, Feyrer (2009b) considers the effects of the closure of the Suez Canal between 1969 and 1975 as a natural experiment

- Using this approach, he finds that increasing trade (the average of imports and exports) by one percent increases per-capita incomes by around one-quarter percent

Conclusions

- We derived a simple formula to measure the gains from trade which holds in a broad class of trade models

- It suggests that the gains from trade are large. A move to autarky would reduce real incomes around the world by around 1/3 on average

- It is important to remember that numbers like this always depend on model specifications and should therefore be interpreted cautiously

- We also considered some reduced form evidence which corroborates our conclusion that there are substantial gains from trade

References

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