Lecture Notes:
International Trade I

Based on lectures by **Monika Mrazova** in Spring semester, 2025

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These lecture notes were taken in the course *International Trade I* taught by **Monika Mrazova** at Graduate of International and Developoment Studies, Geneva as part of the International Economics program (Semester II, 2024).

Currently, these are just drafts of the lecture notes. There can be typos and mistakes anywhere. So, if you find anything that needs to be corrected or improved, please inform at jingle.fu@graduateinstitute.ch.

Contents

Lecture 1.

Comparative Advantage and Gains from Trade

1.1 Internatioanl trade: Standard Assumptions

What distinguished trade theory from general-equilibrium analysis is the exiatence of a **hierarchical market structure**.

- 'International' good markets
- 'Domestic' factor markets.

Question.

- How does the integration of good markets affect good prices?
- How do changes in good prices, in turn, affect factor prices, factor allocation, production and welfare?

While these assumptions are less fundamental, we will also often assume that:

Assumption 1.1.1.

- Consumers have identical homothetic preferences in each country (representative agent)
- Model is static.

1.2 Neoclassical trade

"Neoclassical trade theory" is characterized by three key assumptions:

1. **Perfect competition** in all markets
2. **Constant returns to scale** in production
3. **No distortions**

Note.

Increasing returns to scale (IRS) are a much more severe issue addressed by "New" trade theory

Let's first stick to the general case and show how simple revealed preference arguments can be used to establish two important results:

1. *Gains from trade*(Samuelson 1939)
2. *Law of comparative advantage*(Deardorff 1980)

1.2.1 Basic environment

Consider a world economy with $n = 1, 2, \cdots, N$ countries, each populated by $h = 1, \cdots, H$ households. There are $g = 1, \cdots, G$ goods:

- $y^n \equiv (y_1^n, \cdots, y_G^n) \equiv$ Output vector in country n
- $c^{nh} \equiv (c_1^{nh}, \cdots, c_G^{nh}) \equiv$ Consumption vector of household h in country n
- $p^n \equiv (p_1^n, \cdots, p_G^n) \equiv$ Price vector in country n

There are $f = 1, \cdots, F$ factors:

- $v^n \equiv (v_1^n, \cdots, v_F^n) \equiv$ Factor endowment vector in country n
- $w^n \equiv (w_1^n, \cdots, w_F^n) \equiv$ Factor price vector in country n

Supply side

We denote by Ω^n the set of combinations (y, v) feasible in country n, our assumption of constant returns to scale implies that Ω^n is a convex set.

Definition 1.2.1 (Revenue function).

The **revenue function** in country n of a firm producing output y using factors v is a function $r^n(y, v)$ such that:

$$r^n(y, v) \equiv \max_y \{py | (y, v) \in \Omega^n\} \tag{1.1}$$

Note (see Dixit-Norman pp. 31-36 for details).

- Revenue function summarizes all relevant properties of technology;
- Under perfect competition, y^n maximizes the value of output in country n:

$$r^n(p^n, v^n) = p^n y^n.$$

Demand side

We denote by u^{nh} the utility function of household h in country n.

Definition 1.2.2 (Expenditure function).

The **expenditure function** of household h in country n is a function $e^{nh}(p^n, u^{nh})$ such that:

$$e^{nh}(p, u) \equiv \min_c \{pc | u^{nh}(c) \geq u\} \tag{1.2}$$

Note (see Dixit-Norman pp. 59-64 for details).

- Here factor endowments are in fixed supply, but easy to generalize to case where households choose factor supply optimally
- Holding p fixed, $e^{nh}(p, u)$ is increasing in u.

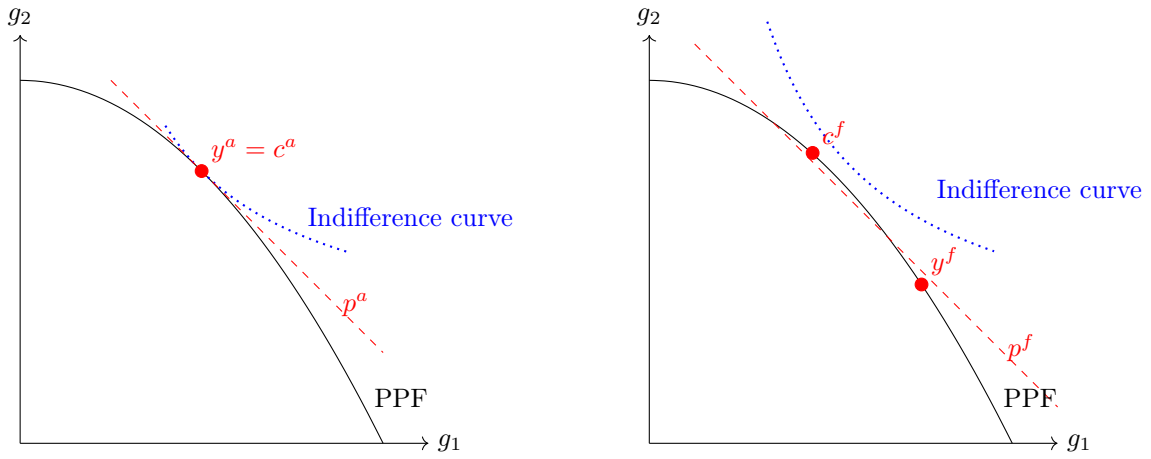
- Household's optimization implies:

$$e^{nh}(p^n, u^{nh}) = p^n c^{nh}$$

where c^{nh} and u^{nh} are the consumption and utility level of the household h in country n in equilibrium, respectively.

1.2.2 Gains from Trade

In the next propositions, when we say "in a neoclassical trade model", we mean in a model where equations (1.1) and (1.2) hold in any equilibrium.



(a) Autarky Equilibrium (b) Free Trade Equilibrium

Figure 1.1: Equilibria for a Small Country

Formula of Gains from Trade

Arkolakis, Costinot, Rodriguez-Clare (AER, 2012)

Assumption 1.2.1.

- CES utility function(Dixit-Stiglitz)

$$U = \left[\int q(\omega)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}$$

- One factor production(labor) and constant RS
- 'Iceberg' trade costs
- Import demand system is CES: artial equilibrium (given wages) elasticity of aggregate bilateral trade flow relative to domestic demand is ε w.r.t. trade costs τ_{ij} fo any i, j.

Define a "foreign shock" as any change in (foreign) endowments and trade costs that do not affect a country's endowment or its ability to serve its own market. Define $\hat{W} = \frac{W'}{W}$ and $\hat{\lambda}_{jj} = \frac{\lambda'_{jj}}{\lambda_{jj}}$

Proposition 1.2.1. The change in country j's real income associated with any foreign shock can be computed as $\hat{W}_j = \hat{\lambda}_{jj}^{\frac{1}{\varepsilon}}$, where λ_{ij} is the share of country j's spending on country i's goods.

Corollary 1.2.1. Gains from TRade relative to autarky can be computed as $\hat{W}_j = \lambda_{jj}^{-\frac{1}{\varepsilon}}$.

One household per country

Consider first the case where there is just one household per country, $H = 1$. Without risk of confusion, we drop h and n from all variables.

We denote by:

- (y^a, c^a, p^a) the vector of output, consumption and good prices under autarky;
- (y^f, c^f, p^f) the vector of output, consumption and good prices under free trade.
- u^a and u^f the utility levels under autarky and free trade.

Proposition 1.2.2. *In a neoclassical trade model with one household per country, free trade makes all households (weakly) better off.*

Proof.

Under free trade, households can consume at prices p^f. By definition of the expenditure function, we have:

$$\begin{aligned} e(p^f, u^a) &\leq p^f c^a \\ &= p^f y^a \\ &\leq r(p^f, v^f) \\ &= e(p^f, u^f) \end{aligned}$$

Since $e(p, \cdot)$ is increasing, we get $u^f \geq u^a$. □

Note.

- Two inequalities in the previous proof correspond to consumption and production gains from trade.
- Previous inequalities are weak. Equality if kinks in IC or PPF.
- Previous proposition only establishes that households always prefer "free trade" to "autarky." It **does not** say anything about the comparisons of trade equilibria.

Multiple households per country: domestic lump-sum transfers

With multiple households per country, moving away from autarky is likely to create winners and losers. In order to establish the Pareto-superiority of trade, we will need to allow for **policy instruments**. We start with *domestic lump-sum transfers* and then *commodity taxes*.

We now reintroduce the index h and denote by:

- c^{ah} and c^{fh} the consumption vectors of household h under autarky and free trade;

- v^{ah} and v^{fh} the endowment vectors of country h under autarky and free trade;
- u^{ah} and u^{fh} the utility levels of household h under autarky and free trade;
- τ^h the lump-sum transfer from the government to household h under free trade. [1]

Proposition 1.2.3.

In a neoclassical trade model with multiple households per country, there exist domestic lump-sum transfers such that free trade is (weakly) Pareto superiority than autarky in all countries.

Proof.

For any h, set the lump-sum transfer τ^h such that:

$$\tau^h = (p^f - p^a)c^{ah} - (w^f - w^a)v^{fh}.$$

Budget constraint unde rautarky implies that: $p^a c^{ah} \leq w^a v^{fh}$. Therefore, we have:

$$p^f c^{ah} \leq w^f v^{fh} + \tau^h.$$

Thus c^{ah} is still int he budget set of household h under free trade.

By definition, the government revenue is given by:

$$\begin{aligned} -\sum \tau^h &= (p^a - p^f)\sum c^{ah} - (w^a - w^f)\sum v^{fh} \\ &= (p^a - p^f)y^a - (w^a - w^f)v^f \\ &= -p^f y^a + w^f v^f \\ &\geq -r(p^f, v^f) + w^f v^f \\ &= -(p^f y^f - w^f v^f) = 0. \end{aligned}$$

□

So, each household can buy its autarky consumption bundle at free trade prices and still have some money left. But, the government must know individual preferences to implement the transfers.

If it does not, households can manipulate mechanism by altering their announcements or autarky behavior. In other words, lump-sum transfers typically are not incentive compatible.

Multiple households per country: commodity taxes

We now restrict the set of instruments to commodity taxes/subsidies.

Suppose that the government can affect the porices faced by households under free trade by setting τ^{good} and τ^{factor}:

$$\begin{aligned} p^h &= p^f + \tau^{good} \\ w^h &= w^f + \tau^{factor}. \end{aligned}$$

Proposition 1.2.4.

In a neoclassical trade model with multiple households per country, there exist commodity taxes/subsidies such that free trade is (weakly) Pareto superior to autarky in all countries.

[1] $\tau^h \leq 0 \Leftrightarrow$ lump-sum tax and $\tau^h \geq 0 \Leftrightarrow$ lump-sum subsidy.

Proof.

Consider two following taxes:

- $\tau^{good} = p^a - p^f$
- $\tau^{factor} = w^a - w^f$

By construction, household is indifferent between autarky and free trade. Now consider the government revenue:

$$\begin{aligned}
-\sum \tau^h &= \sum \tau^{good} c^{ah} - \sum \tau^{factor} v^{fh} \\
&= (p^a - p^f) \sum c^{ah} - (w^a - w^f) \sum v^{fh} \\
&= (p^a - p^f) y^a - (w^a - w^f) v^f \\
&= -p^f y^a + w^f v^f \\
&\geq -r(p^f, v^f) + w^f v^f \\
&= -(p^f y^f - w^f v^f) = 0.
\end{aligned}$$

□

Tax revenue is non-negative. If all households are on the same side of the market for at least for at least one good ot factor, government can cut a tax or raise a subsidy to generate Pareto improvement.

This scheme sacrifices the consumer gains from trade, but preserves the gains from reorganizing production.

Lecture 2.

Ricardian Model

Appendix

Recommended Resources

Books

[1] James H. Stock and Mark W. Watson. *Introduction to Econometrics*. 4th ed. New York: Pearson, 2003

[2] Jeffrey M. Wooldridge. *Introductory Econometrics: A Modern Approach*. 7th ed. Cengage Learning, 2020

[3] Bruce E. Hansen. *Econometrics*. Princeton, New Jersey: Princeton University Press, 2022

[4] Fumio Hayashi. *Econometrics*. Princeton, New Jersey: Princeton University Press, 2000

[5] Jeffrey M. Wooldridge. *Econometric Analysis of Cross Section and Panel Data*. 2nd ed. Cambridge, Massachusetts: The MIT Press, 2010

[6] Joshua Chan et al. *Bayesian Econometric Methods*. 2nd ed. Cambridge, United Kingdom: Cambridge University Press, 2019

[7] Badi H. Baltagi. *Econometric Analysis of Panel Data*. 6th ed. Cham, Switzerland: Springer, 2021

[8] James D. Hamilton. *Time Series Analysis*. Princeton, New Jersey: Princeton University Press, 1994. ISBN: 9780691042893

[9] Takeshi Amemiya. *Advanced Econometrics*. Cambridge, MA: Harvard University Press, 1985

Others

[10] Roger Bowden. "The Theory of Parametric Identification". In: *Econometrica* 41.6 (1973), pp. 1069–1074. DOI: 10.2307/1914036

[11] Robert I. Jennrich. "Asymptotic Properties of Non-linear Least Squares Estimators". In: *The Annals of Mathematical Statistics* 40.2 (1969), pp. 633–643. DOI: 10.1214/aoms/1177697731

[12] Michael P. Keane. "A Note on Identification in the Multinomial Probit Model". In: *Journal of Business & Economic Statistics* 10.2 (1992), pp. 193–200. DOI: 10.1080/07350015.1992.10509906

[13] Thomas J. Rothenberg. "Identification in Parametric Models". In: *Econometrica* 39.3 (1971), pp. 577–591. DOI: 10.2307/1913267

[14] George Tauchen. "Diagnostic Testing and Evaluation of Maximum Likelihood Models". In: *Journal of Econometrics* 30 (1985), pp. 415–443. DOI: 10.1016/0304-4076(85)90149-6

[15] Abraham Wald. "Note on the Consistency of the Maximum Likelihood Estimate". In: *The Annals of Mathematical Statistics* 20.4 (1949), pp. 595–601. DOI: 10.1214/aoms/1177729952

[16] Halbert White. "Maximum Likelihood Estimation of Misspecified Models". In: *Econometrica* 50.1 (1982), pp. 1–25. DOI: 10.2307/1912526