INTERNATIONAL ECONOMICS

Lecture 5 — November 29, 2022

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Last week

- Tom Friedman: “The World is Flat” ..... Leamer (2009): It’s not.
  - → Distance puzzle: Why is the distance elasticity of trade not decreasing?
  - → Border puzzle: Why do countries trade so much more with themselves?

This week

- Gains from trade

EVALUATION

GAINS FROM TRADE

Armington model with two countries

Assumptions

- National product differentiation (“Armington assumption”)
- Linear production technologies
- Two countries i, j: Domestic and rest of the world

Armington model with two countries

CES utility function

$$U_j = \left(\alpha_i^{\frac{1-\sigma}{\sigma}} c_{ij}^{\frac{\sigma-1}{\sigma}} + \alpha_j^{\frac{1-\sigma}{\sigma}} c_{jj}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \quad \text{with} \quad \sigma > 1,$$

and country-specific demand parameters $\alpha_i, \alpha_j > 0$.

Optimal expenditure

Maximize utility subject to a budget constraint

$$\max_{c_{ij},c_{jj}} \quad U_j = \left(\alpha_i^{\frac{1-\sigma}{\sigma}} c_{ij}^{\frac{\sigma-1}{\sigma}} + \alpha_j^{\frac{1-\sigma}{\sigma}} c_{jj}^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}} \qquad \text{s.t.} \qquad E_j = X_{ij} + X_{jj} = w_i c_{ij} + w_j c_{jj}$$

Corresponding Lagrangian is

$$\max_{c_{ij},c_{jj}} \quad \mathcal{L}\left(c_{ij}, c_{jj}, \lambda\right) = \frac{\sigma}{\sigma-1}\left(\alpha_i^{\frac{1-\sigma}{\sigma}} c_{ij}^{\frac{\sigma-1}{\sigma}} + \alpha_j^{\frac{1-\sigma}{\sigma}} c_{jj}^{\frac{\sigma-1}{\sigma}}\right) + \lambda\left(E_j - w_i c_{ij} - w_j c_{jj}\right).$$

Optimal expenditure

First order conditions

$$\frac{\partial \mathcal{L}\left(c_{ij}, c_{jj}, \lambda\right)}{\partial c_{ij}} = \alpha_i^{\frac{1-\sigma}{\sigma}} c_{ij}^{-\frac{1}{\sigma}} - \lambda w_i \stackrel{!}{=} 0,$$

$$\frac{\partial \mathcal{L}\left(c_{ij}, c_{jj}, \lambda\right)}{\partial c_{jj}} = \alpha_j^{\frac{1-\sigma}{\sigma}} c_{jj}^{-\frac{1}{\sigma}} - \lambda w_j \stackrel{!}{=} 0,$$

$$\frac{\partial \mathcal{L}\left(c_{ij}, c_{jj}, \lambda\right)}{\partial \lambda} = E_j - w_i c_{ij} - w_j c_{jj} \stackrel{!}{=} 0.$$

Optimal expenditure

In optimum, marginal rate of substitution equal to price ratio:

$$\underbrace{\left(\frac{\alpha_i}{\alpha_j}\right)^{\frac{1-\sigma}{\sigma}} \left(\frac{c_{ij}}{c_{jj}}\right)^{-\frac{1}{\sigma}}}_{\text{MRS}} = \frac{w_i}{w_j}$$

$$\Leftrightarrow c_{jj} = \left(\frac{\alpha_i}{\alpha_j}\right)^{\sigma-1} \left(\frac{w_i}{w_j}\right)^{\sigma} c_{ij}.$$

Optimal expenditure

Substitute into budget constraint

$$\begin{aligned} E_j &= w_i c_{ij} + w_j c_{jj} \\ &= \alpha_i^{\sigma-1} w_i^{\sigma} c_{ij} \left((\alpha_i w_i)^{1-\sigma} + (\alpha_j w_j)^{1-\sigma} \right) \end{aligned}$$

Expenditure shares

Expenditure share of country *i*'s good in country *j*

$$\lambda_{ij} = \frac{X_{ij}}{E_j} = \frac{w_i c_{ij}}{E_j} = \left(\frac{\alpha_i w_i}{P_j} \right)^{1-\sigma}$$

with $P_j \equiv \left((\alpha_i w_i)^{1-\sigma} + (\alpha_j w_j)^{1-\sigma} \right)^{1/(1-\sigma)}$ as price index in *j*

Welfare formula for international trade

Expenditure share for country j

$$\lambda_{jj} = \frac{X_{jj}}{E_j} = \left(\frac{\alpha_j w_j}{P_j} \right)^{1-\sigma}$$

Define welfare as real income, i.e.

$$\begin{aligned} W_j \equiv \frac{Y_j}{P_j} &= \frac{w_j L_j}{P_j} \\ &= \lambda_{jj}^{\frac{1}{1-\sigma}} \frac{L_j}{\alpha_j} \end{aligned}$$

Welfare formula for international trade

For $\widehat{W}_j \equiv W'_j/W_j$ and $\hat{\lambda}_{jj} \equiv \lambda'_{jj}/\lambda_{jj}$ we get

$$\widehat{W}_j = \frac{\lambda_{jj}'^{\frac{1}{1-\sigma}} \frac{L_j}{\alpha_j}}{\lambda_{jj}^{\frac{1}{1-\sigma}} \frac{L_j}{\alpha_j}} = \hat{\lambda}_{jj}^{\frac{1}{1-\sigma}}$$

and importantly

$$\widehat{W}_j^{\text{Autarky}} = \frac{\lambda_{jj}^{\frac{1}{1-\sigma}} \frac{L_j}{\alpha_j}}{1^{\frac{1}{1-\sigma}} \frac{L_j}{\alpha_j}} = \lambda_{jj}^{\frac{1}{1-\sigma}}.$$

ABSOLUTE AND COMPARATIVE ADVANTAGE

Motives to trade

Cross-country differences: countries export the goods they can produce with an inherent advantage

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- Heckscher-Ohlin: differences in factor endowments
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  $\rightarrow$ Next weeks!

Absolute and comparative advantage

- 2 countries: Germany and Turkey

Absolute and comparative advantage

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- 2 goods: cars and boats

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- 1 factor of production: labor

Absolute and comparative advantage

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- 2 goods: cars and boats
- 1 factor of production: labor

Units of goods produced by one worker in a month:

	boats	Cars
Germany	300	90
Turkey	900	30

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- Germany has **absolute advantage** in the production of cars

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- Germany has **absolute advantage** in the production of cars
- Turkey has **absolute advantage** in the production of boats

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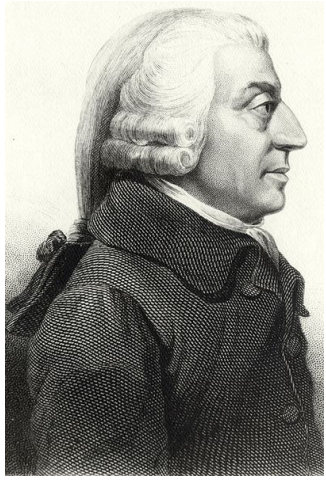

Adam Smith, 1723-1790

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  $\rightarrow$ German workers are two times more efficient in producing boats, but three times more efficient in producing cars

Absolute and comparative advantage

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David Ricardo, 1771-1823