Econ 2203 | International Trade and Policy in Agriculture

Department of Development Economics

# Recap: The Gap in Smith's Theory

**Last lecture:** Adam Smith argued that countries should export goods they produce *absolutely* more efficiently.

**But this raises an obvious question:**

*What if one country is better at producing everything?*

- Should the more efficient country trade at all?
- Should the less efficient country simply import everything?
- Would the inefficient country have *any* exports?

Smith's absolute advantage gives **no answer**.

**Stylised fact:** The United States is more productive than Bangladesh in *both* textiles *and* aircraft. Yet the US imports textiles from Bangladesh. **Why?** → Enter David Ricardo (1817).

# Ricardo's Insight: What Matters is *Relative* Cost

Ricardo's key insight was deceptively simple:

> *A country should specialise in the good for which it has the* **lower opportunity cost** *— regardless of absolute productivity.*

**Opportunity cost** = what you must give up to produce one more unit of a good.

Even a country that is absolutely less efficient in *everything* can still gain from trade by exporting the good in which it is **relatively** less inefficient.

**Analogy:** A lawyer who types faster than her secretary still benefits from hiring the secretary — because the lawyer's time is more valuably spent on legal work. The same logic applies to nations.

# The Labor-Value Model: Notation

We work with the simplest possible model:

- **Two countries:** India ($I$) and the World ($W$)
- **Two goods:** Rice ($R$) and Wheat ($Wh$)
- **One factor of production:** Labour ($L$)
- **Technology:** constant labour requirements per unit of output

**Labour coefficients** (units of labour per unit of output):

| | Rice | Wheat |
|---|---|---|
| India | $a^I_{LR}$ | $a^I_{LWh}$ |
| World | $a^W_{LR}$ | $a^W_{LWh}$ |

$a^I_{LR}$ = labour hours required to produce **one unit of Rice in India**.

# Numerical Example

**Assume:** each country has $L = 600$ worker-hours. **Labour required to produce one unit of output:**

| Country | Rice | Wheat |
|---|---|---|
| India | **3 hours** | **6 hours** |
| World | **2 hours** | **2 hours** |

Labour coefficients: $a^I_{LR} = 3, a^I_{LWh} = 6; a^W_{LR} = 2, a^W_{LWh} = 2$. The **World** has absolute advantage in **both** goods (fewer hours needed per unit).

**Opportunity costs:**

$$OC^I_R = \frac{a^I_{LR}}{a^I_{LWh}} = \frac{3}{6} = \frac{1}{2} \text{ Wheat} \qquad OC^W_R = \frac{a^W_{LR}}{a^W_{LWh}} = \frac{2}{2} = 1 \text{ Wheat}$$

**Comparison:** $OC^I_R = \frac{1}{2} < OC^W_R = 1 \Rightarrow$ **India has comparative advantage in Rice.**

# The Comparative Advantage Condition

**Formal statement:**

India has a comparative advantage in Rice if and only if:

$$\frac{a^I_{LR}}{a^I_{LWh}} < \frac{a^W_{LR}}{a^W_{LWh}}$$

Equivalently, rearranging:

$$\frac{a^I_{LR}}{a^W_{LR}} < \frac{a^I_{LWh}}{a^W_{LWh}}$$

India is *relatively* more efficient in Rice than in Wheat.

**Key takeaway**

Absolute productivity levels ($a^I_{LR}$ vs $a^W_{LR}$) do **not** determine trade patterns. **Relative** productivity — the ratio of ratios — does.

With $L = 600$ worker-hours, each country's PPF is a straight line (constant opportunity cost):

**India:**

$$3R + 6Wh = 600 \;\Rightarrow\; R + 2Wh = 200$$

Slope $= -2$ (give up 2 Rice per Wheat)

**World:**

$$2R + 2Wh = 600 \;\Rightarrow\; R + Wh = 300$$

Slope $= -1$ (give up 1 Rice per Wheat)

The **slope** of the PPF = opportunity cost of Wheat.

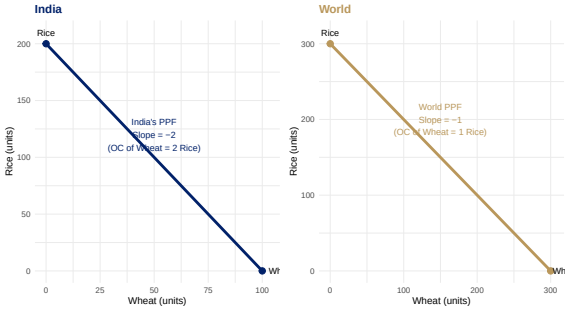


**Figure 1:** Production Possibility Frontiers: India and World Source: Author's illustration.

# The Terms of Trade Range

For trade to be mutually beneficial, the world price ratio must lie **between** the two autarky opportunity costs.

Autarky opportunity costs of Wheat (in terms of Rice):

$$OC^{I}_{Wh} = 2 \text{ Rice} \qquad OC^{W}_{Wh} = 1 \text{ Rice}$$

The **terms of trade** (price of Wheat relative to Rice) must satisfy:

$$1 < \frac{P_{Wh}}{P_R} < 2$$

- If $P_{Wh}/P_R \leq 1$: India would not import Wheat (cheaper to produce at home)
- If $P_{Wh}/P_R \geq 2$: World would not export Wheat (too expensive)
- At any intermediate price, **both countries benefit**.

**Equilibrium ToT** is determined by relative demand – say $P_{Wh}/P_R = 1.5$.

# Gains from Trade: India's Perspective

**Mechanism:**

1. India **fully specialises** in Rice → produces (0 Wheat, 200 Rice)
2. Trades Rice for Wheat at world price $P_{Wh}/P_R = 1.5$
3. **Consumption** moves to a point **above** the PPF

The trade possibilities line starts at full specialisation (0, 200) with slope $= -1.5$ (less steep in absolute value than the PPF slope $-2$).

Consumption bundle **above the PPF** = welfare gain!

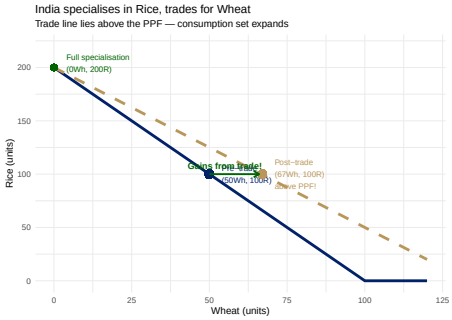


**Figure 2:** India: Gains from Trade — Consuming Beyond the PPF Source: Author's illustration.

# Quantifying the Gains

**Before trade** (autarky): India produces and consumes on the PPF at $(Wh, R) = (50, 100)$

**After trade** (at $P_{Wh}/P_R = 1.5$): India fully specialises → 200 Rice, trades $\approx 100$ Rice for $\approx 67$ Wheat:

$$(Wh, R) \approx (67, 100)$$

**Welfare gain:** 17 more units of Wheat at the same Rice — the **real wage** of Indian workers rises.

**The algebra:** budget constraint under trade: $R + 1.5 \cdot Wh = 200$

Compare with autarky constraint: $R + 2 \cdot Wh = 200$

The trade budget line is **flatter** → larger feasible consumption set.

To find the *exact* equilibrium consumption bundle, we need **indifference curves (ICs)**.

**Properties of ICs:**

- Downward sloping (MRS > 0)
- Convex to origin (diminishing MRS)
- Higher IC = higher utility

**Autarky equilibrium (E1):**

$$\text{MRS} = \frac{P_{Wh}}{P_R} = \frac{a^I_{LWh}}{a^I_{LR}} = 2$$

IC1 is tangent to the PPF at E1.

**Free-trade equilibrium (E2):**

IC2 is tangent to the **trade possibilities line** at E2.

Since IC2 is above IC1: **trade raises welfare**.

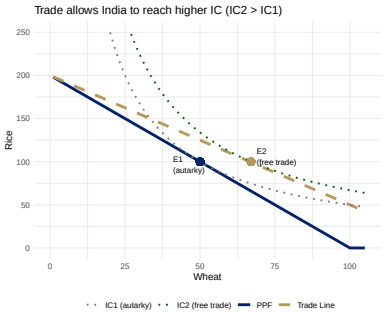


**Figure 3:** Free Trade Equilibrium: IC tangent to Trade Possibilities Line Source: Author's illustration.

# Utility Maximisation Under Trade

**Formal optimisation:**

India maximises $U(R, Wh)$ subject to the trade budget constraint:

$$\max_{R,\,Wh} \; U(R, Wh) \quad \text{s.t.} \quad P_R \cdot R + P_{Wh} \cdot Wh = P_R \cdot \bar{R}$$

where $\bar{R} = 200$ (full specialisation output).

**First-order condition:**

$$\frac{MU_R}{MU_{Wh}} = \frac{P_R}{P_{Wh}} = \frac{1}{1.5}$$

**Separation of production and consumption decisions:**

Under free trade, India:

1. **Produces** where slope of PPF $= P_R/P_{Wh}$ → full specialisation in Rice
2. **Consumes** where MRS $= P_R/P_{Wh}$ → tangency of IC with trade line

These two points generally differ — the gap is filled by **trade flows**.

# Key Assumptions of the Ricardian Model

| Assumption | Implication |
|---|---|
| One factor (labour) | Ignores capital, land |
| Constant returns to scale | PPF is linear |
| Perfect factor mobility within country | Instantaneous reallocation |
| Immobile factors across countries | No international migration |
| No transport costs | TOT fully determines trade |
| Perfect competition | No strategic behaviour |

# The Ricardian Model: What It Gets Right

**Remarkably robust predictions:**

- Countries do specialise along lines of comparative advantage
- Trade raises real incomes on average
- Even the “least competitive” country has something to export
- Cannot explain intra-industry trade (→ new trade theory, Lecture 6)
- **Extensions:** Many goods (Dornbusch-Fischer-Samuelson chain); technology changes shift comparative advantage over time

# Measuring Comparative Advantage: The Balassa Index

The **Revealed Comparative Advantage (RCA)** index (Balassa, 1965):

$$RCA_{ij} = \frac{X_{ij}/X_{i.}}{X_{.j}/X_{..}}$$

where:

- $X_{ij}$ = country $i$'s exports of good $j$
- $X_{i.}$ = country $i$'s total exports
- $X_{.j}$ = world exports of good $j$
- $X_{..}$ = world total exports

**Interpretation:**

- $RCA_{ij} > 1$: country $i$ has a comparative advantage in good $j$
- $RCA_{ij} < 1$: country $i$ has a comparative disadvantage in good $j$

# India’s RCA in Agricultural Products

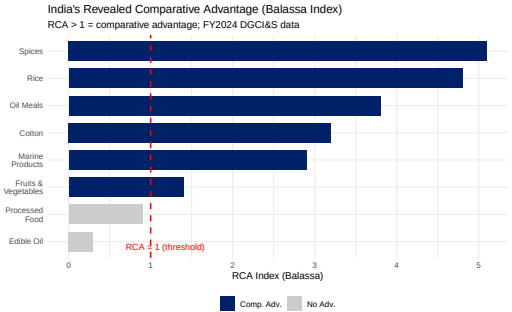


**Figure 4:** India: Revealed Comparative Advantage in Agricultural Products (FY2024) Source: Author’s calculations using DGCI&S / UN Comtrade data.

# India: Rice as the Flagship Export

**India's Rice sector — Ricardo in practice:**

- India is the **world's largest rice exporter** (>22% of global exports, FY2024)
- Rice cultivation is labour-intensive — India's abundant factor
- **Relative** labour productivity in rice > relative labour productivity in capital-intensive goods

**Policy tension:** September 2023: India imposed a **25% export duty** on non-Basmati white rice → global rice prices spiked 15%.

$$P_R^{\text{world}} \uparrow \Rightarrow \text{India's ToT deteriorate for future exporters}$$

The ban is welfare-reducing under comparative advantage theory: India surrenders gains from trade to achieve food security goals. **Central tension:** Static efficiency ↔ food security; comparative advantage ↔ strategic reserves; export competitiveness ↔ domestic price stability.

# Comparative Advantage: Summary

**Core results of the Ricardian Model:**

1. Trade is driven by **relative**, not absolute, productivity differences
2. Comparative advantage condition: $\frac{a^I_{LR}}{a^I_{LWh}} < \frac{a^W_{LR}}{a^W_{LWh}}$
3. Gains from trade: consumption bundle moves **beyond the PPF**
4. Terms of trade must lie between autarky opportunity costs: $OC^W_R < \frac{P_R}{P_{Wh}} < OC^I_R$
5. Both countries gain — even the absolutely less productive one

**Empirical verdict:** Labour productivity differences strongly predict export patterns — Costinot et al. (2012) find $R^2 \approx 0.9$ across countries. India's rice exports (RCA = 4.8) confirm comparative advantage. Complete specialisation is rarely observed in practice, and short-run distributional losses are documented — but aggregate welfare gains are robust.

**What Ricardo cannot explain:** *Why* labour productivity differs (→ H-O model); income distribution effects (→ Stolper-Samuelson); intra-industry trade (→ Lecture 6)

# Additional Resources

## Further Reading

- *International Economics* — Salvatore (Ch. 3)
- *International Economics* — Appleyard & Field (Ch. 3)
- RBI/DGCI&S/APEDA databases for latest data

## Key Data Sources

- DGCI&S: India's merchandise trade
- RBI: Balance of payments data
- APEDA: Agricultural export statistics
- WTO: Tariff and trade databases