International Trade and Policy

WEEK 3 – **Comparative Advantage and Factor Endowment**

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Our Roadmap for Today

1. The Ricardian Model

- **Driver of Trade:** Technology (labor productivity)
- **Key Insight:** Comparative advantage = lower opportunity cost
- **Outcome:** Gains from specialization; no domestic income conflict

2. The Heckscher-Ohlin (H-O) Model

- **Driver of Trade**
- **Four Core Theorems: H-O:, FPE;** and **Stolper-Samuelson**

3. Reality Check

- **Leontief Paradox (1953)**
- **Modern View**

Why Do Countries Trade?

- **Why do countries trade?** What is the underlying cause of international exchange?
- **What determines the pattern of trade?** Which goods does a country export, and which does it import?
- **Who gains from trade?** Does trade benefit everyone in a country, or are there winners and losers?
- **How does trade affect a country's economic structure, wages, and income distribution?**

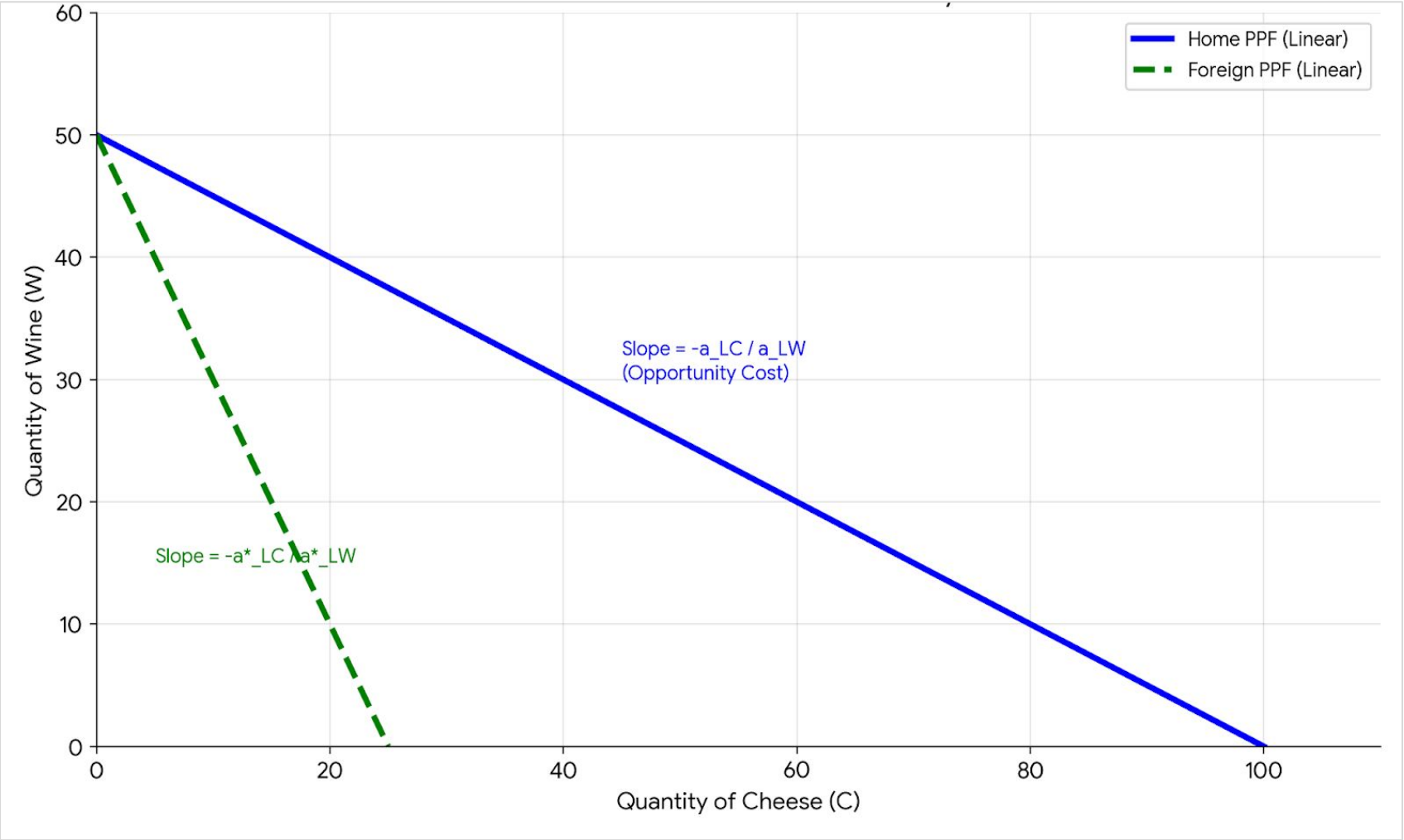
Definition ….

Over the centuries, economists have developed theoretical frameworks to answer these questions. The two most foundational theories are the **Ricardian model** and the **Heckscher-Ohlin (H-O) model**. These models form the bedrock of trade theory, and understanding them is essential for analyzing more complex modern trade phenomena.

The Ricardian Model of Comparative Advantage

The **Ricardian model** posits that international trade is driven by cross-country differences in technology, reflected in labor productivity. It operates under a simplified framework with two countries, two goods, and a single factor of production labor which is perfectly mobile within each country but immobile internationally. The model assumes constant returns to scale, perfect competition, and that technology differences are captured by unit labor requirements.

Figure 1. Ricardian Model: Linear Production Possibility Frontier



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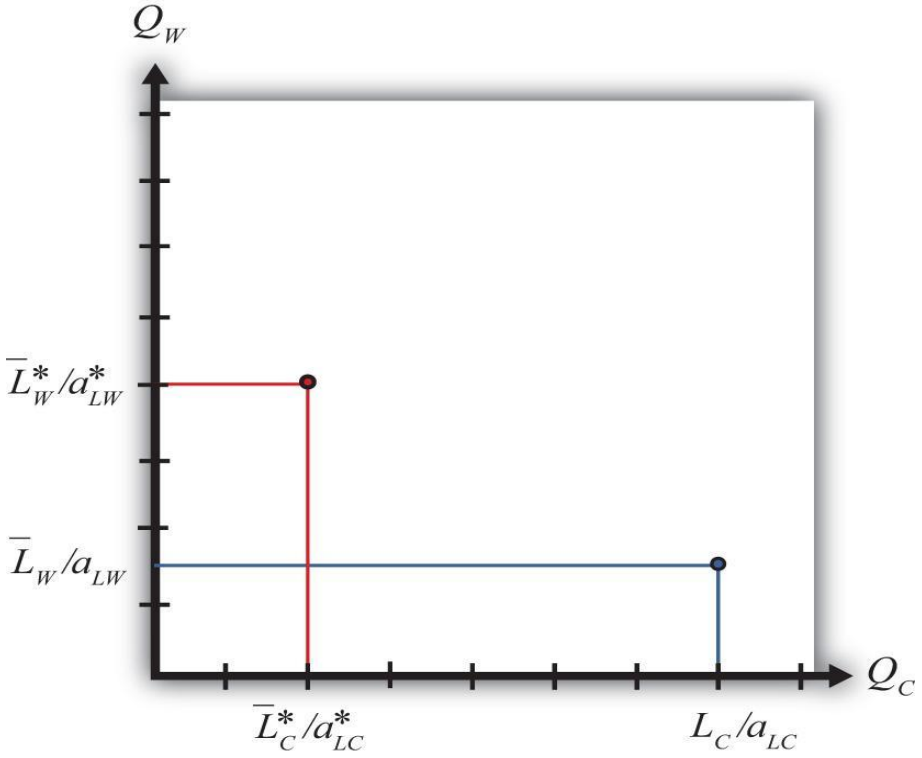
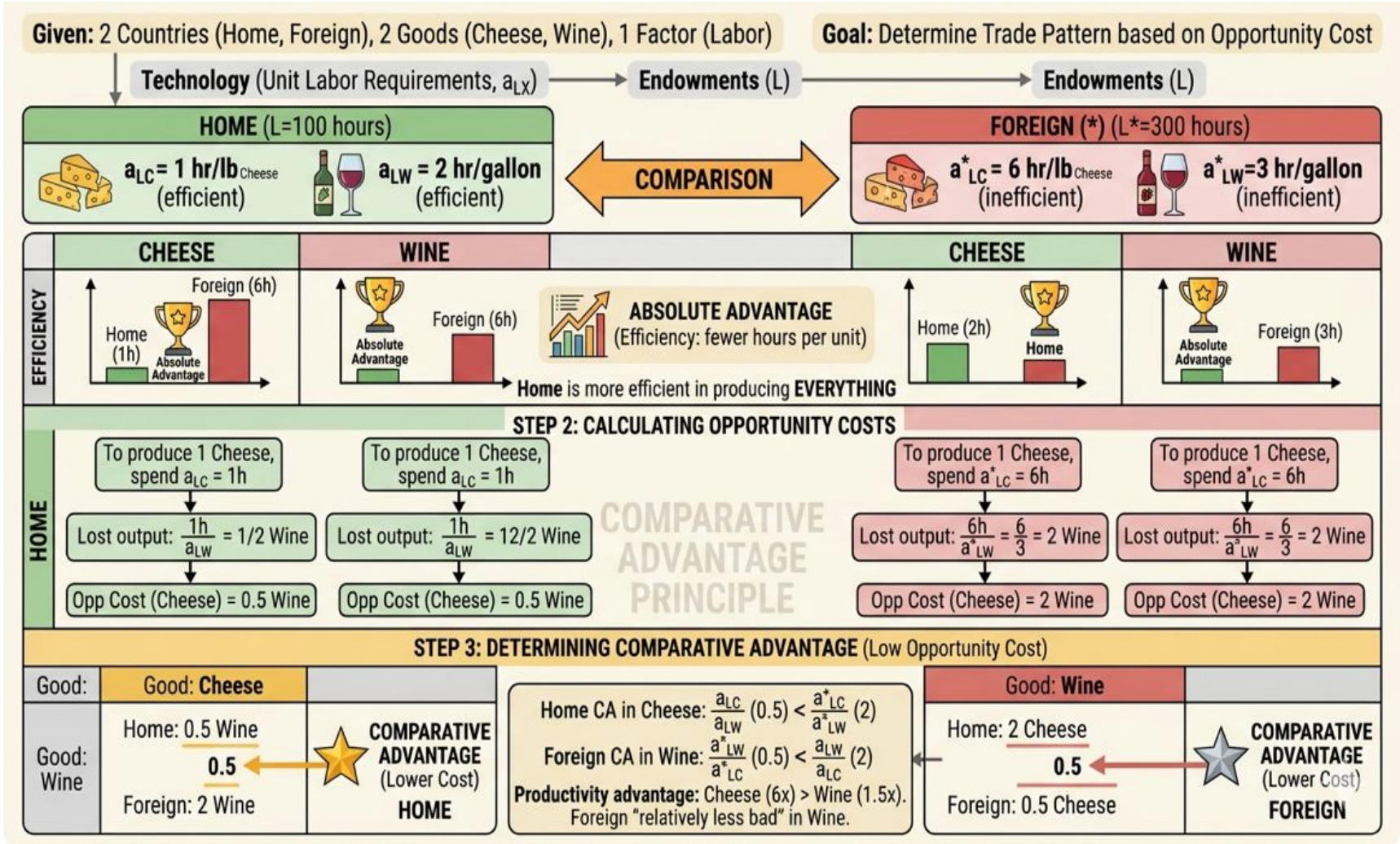
Autarky Equilibrium: Production and Consumption

In **autarky**, in the immobile-factor model, consumption will occur at the only production point possible. The **autarky** terms of trade for a good will be lower in the country with the productivity advantage (or the greater factor endowment in that product).



Source: Saylor Foundation. (n.d.). Autarky equilibrium in the immobile factor model. In International trade: Theory and policy. Retrieved March 1, 2026, from https://saylordotorg.github.io/text_international-trade-theory-and-policy/s07-06-autarky-equilibrium-in-the-imm.html

Figure 2. The Determination of Comparative Advantage via Opportunity Costs.



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Free Trade Equilibrium: Specialization and Gains from Trade

Krugman (1981) argues that with economies of scale and imperfect competition, trade generates gains through intraindustry specialization. Countries exchange similar goods by expanding market size, increasing product variety, and reducing average costs, even when countries are identical in resources and technology.

Figure 3. Ricardian Model: Free Trade Equilibrium, Specialization, and Gains from Trade.

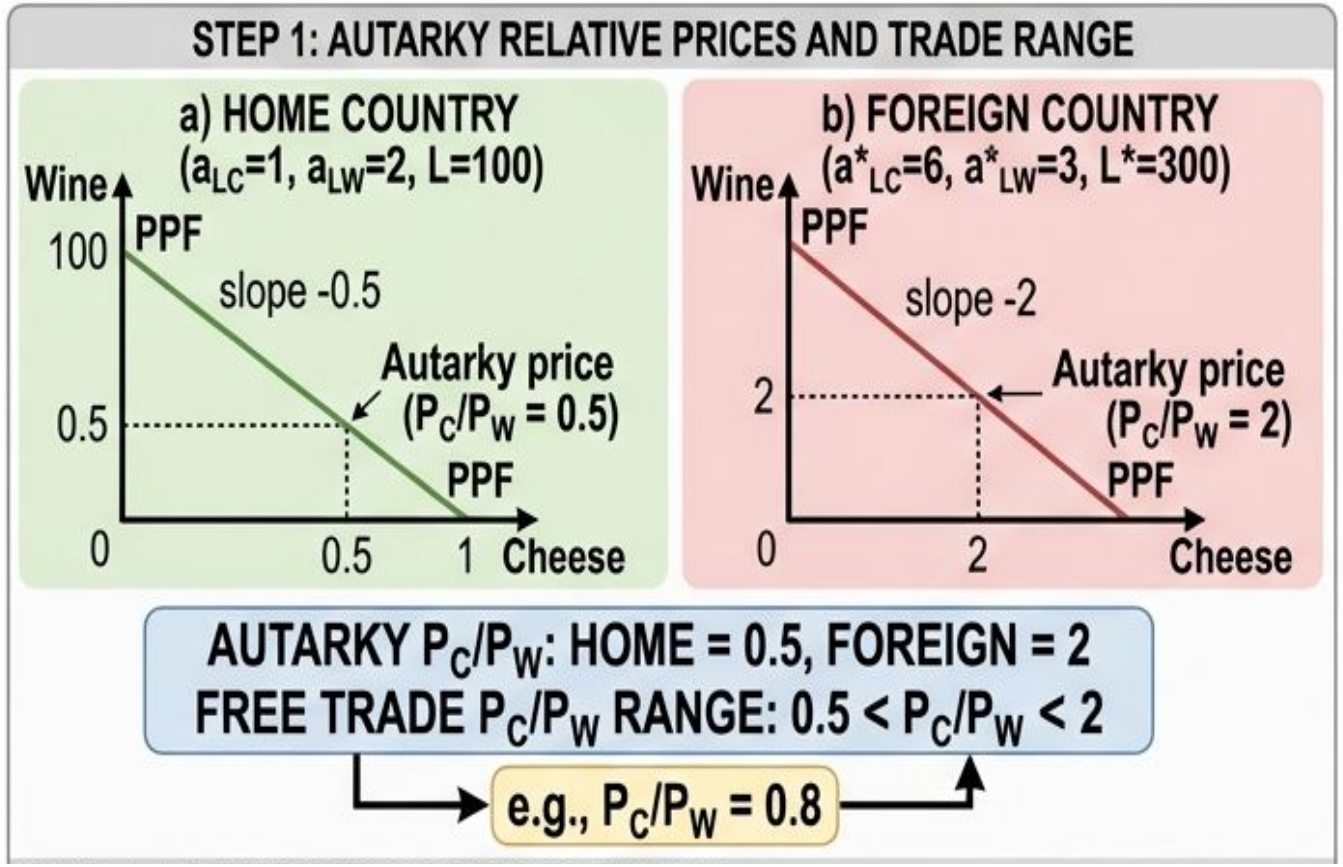

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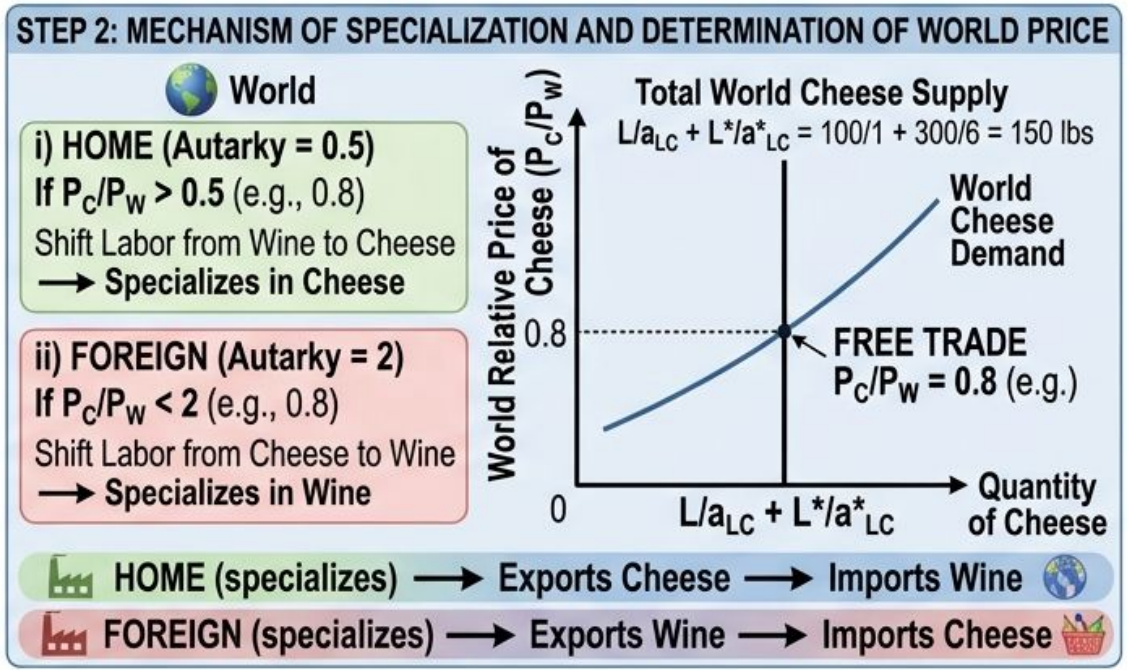
Figure 3….



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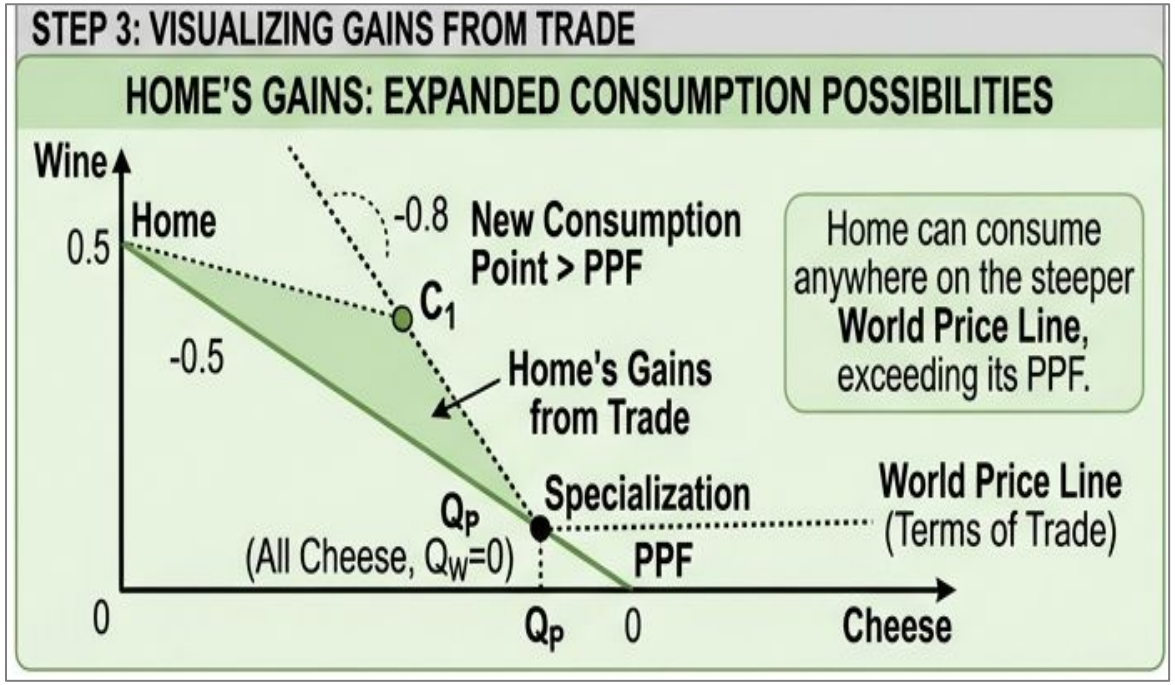

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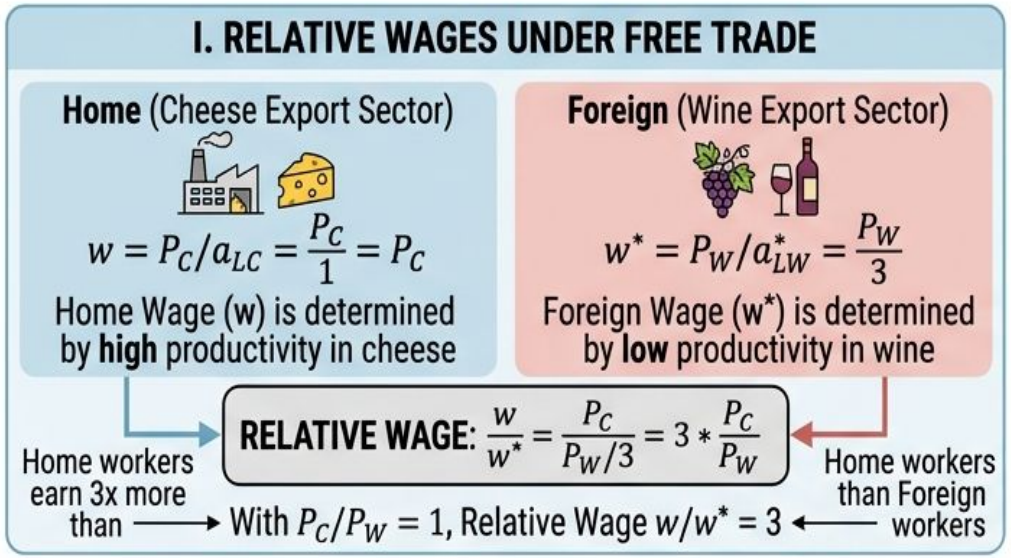
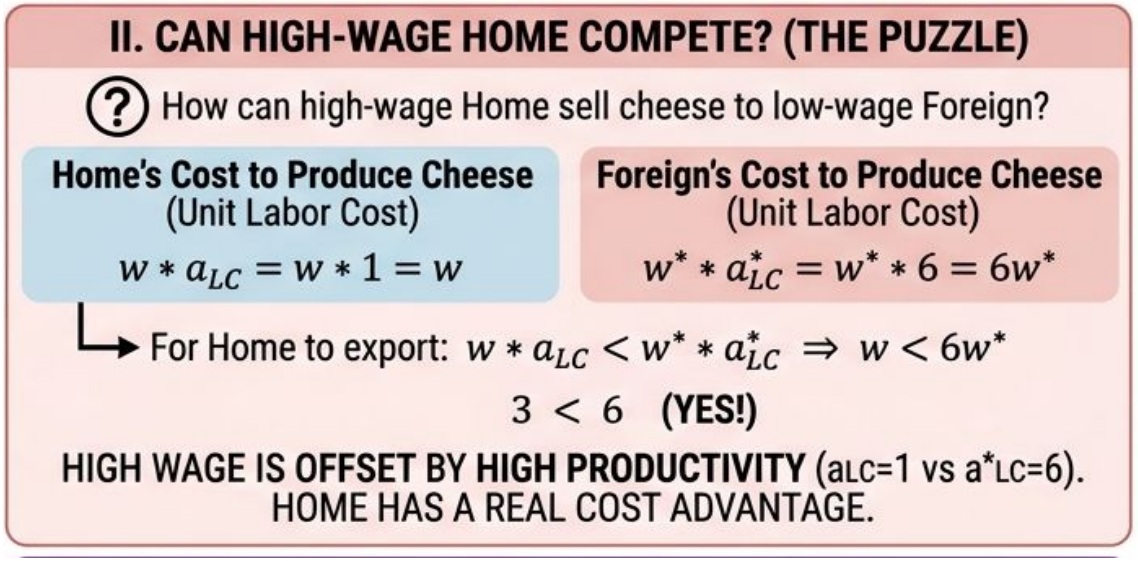
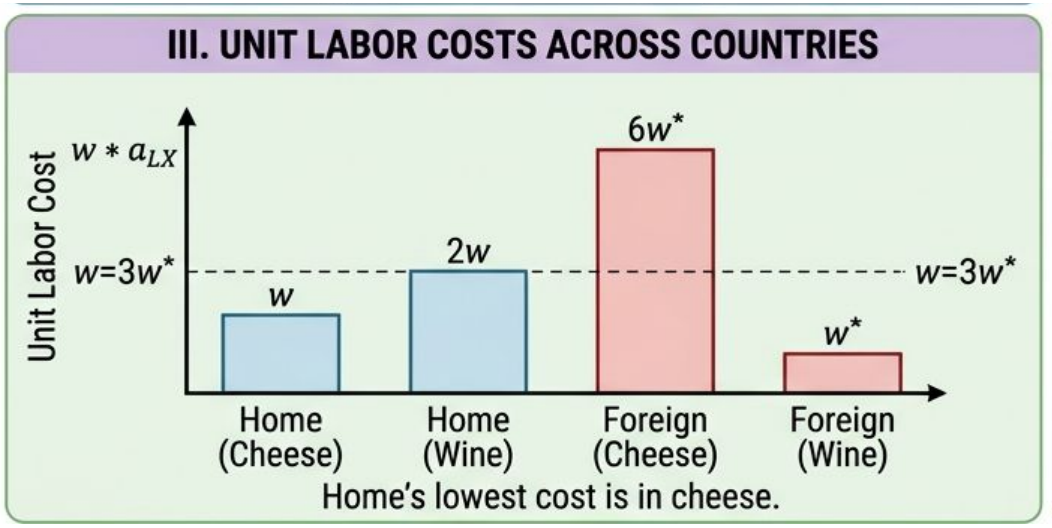
Figure 4. The Role of Wages and the Limits to Trade







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Extensions and Limitations of the Ricardian Model

The **Ricardian** model has been extended (e.g., Dornbusch-Fischer-Samuelson continuum of goods, non-traded goods, transport costs) but suffers key limitations: it assumes only labor as a factor, ignores income distribution effects (despite evidence trade creates winners and losers), rules out economies of scale and imperfect competition, and treats technology as exogenousleading to the Heckscher-Ohlin model, which incorporates multiple factors of production.

The Heckscher-Ohlin (H-O) Model: A General Equilibrium Approach

The Heckscher–Ohlin model, developed by Eli Heckscher (1919) & Bertil Ohlin (1933), represents a significant advance over the Ricardian model. While Ricardo emphasized technology differences, the H–O model proposes that the fundamental cause of comparative advantage is differences in countries' **factor endowments** their relative supplies of labor, capital, land, etc.

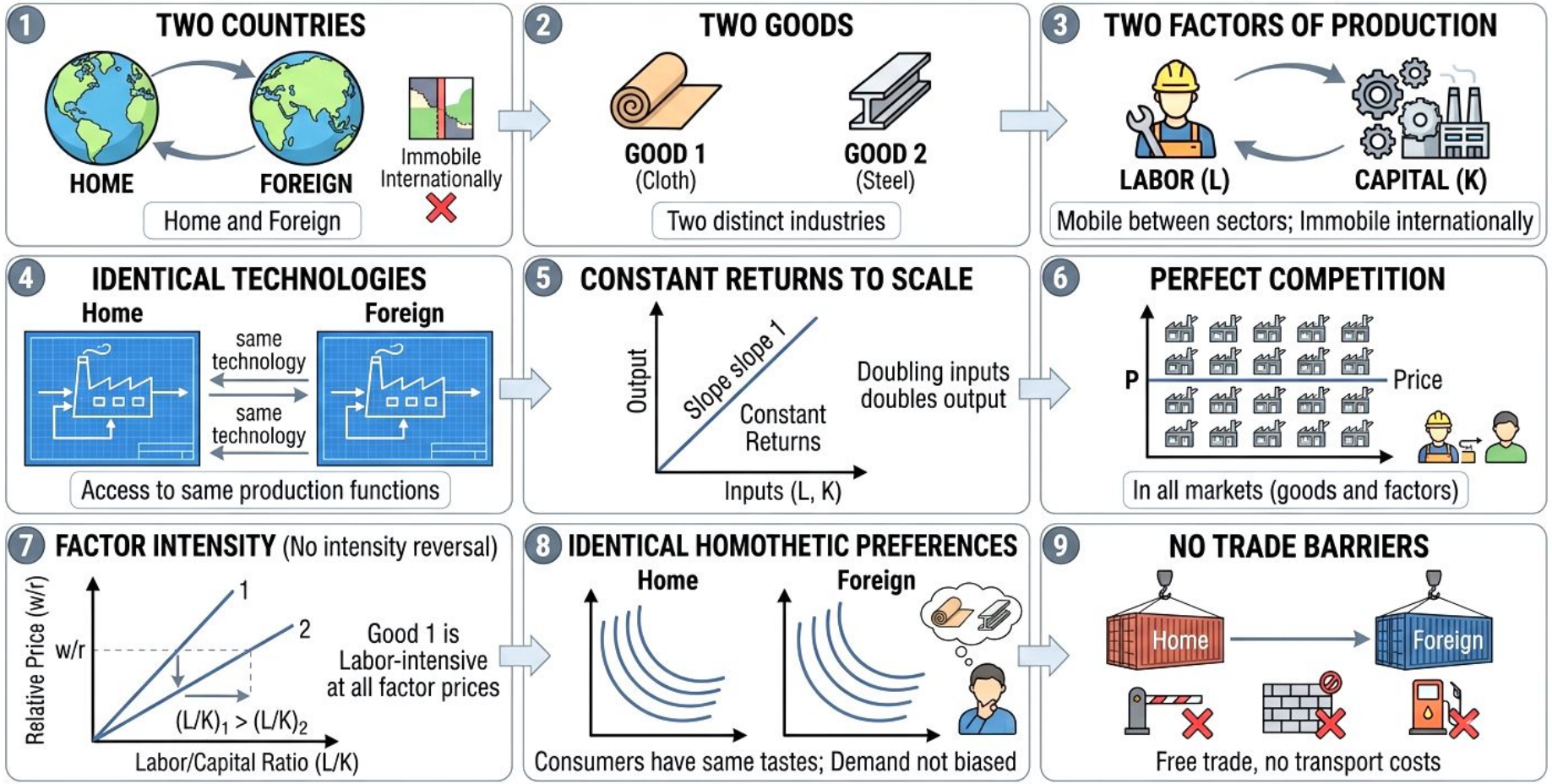
From Labor Productivity to Factor Endowments: Motivation

While the Ricardian model assumes only labor as a factor of production, the Heckscher-Ohlin (H-O) model introduces factor intensity goods differ in their use of labor, capital, and land and factor endowments countries differ in their relative abundance of these inputs. Building on this, the Heckscher-Ohlin theorem states that a country will export goods that use its abundant factors intensively and import goods that use its scarce factors intensively, shifting the explanation for trade patterns from technological differences to differences in countries' relative factor endowments.

Core Assumptions of the 2x2x2 H-O Model

The **2x2x2 Heckscher–Ohlin** model assumes two countries, two goods, and two factors of production (labor and capital), with identical technologies across countries, constant returns to scale, perfect competition, identical homothetic preferences, free trade, and factors that are mobile domestically but immobile internationally, so that differences in factor endowments alone determine the pattern of trade.

Figure 5. Core Assumption of the 2x2x2 H-O Model



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Key Concepts: Factor Abundance and Factor Intensity

Feature	Factor Abundance	Factor Intensity
Entity Described	The Country (Home vs. Foreign)	The Good (Cloth vs. Steel)
Physical Definition	The relative ratio of total endowments: $K/L > K^*/L^*$	The relative ratio of inputs used: $(K/L)_{Steel} > (K/L)_{Cloth}$
Price Definition	The relative cost of factors in autarky: $(r/w) < (r^*/w^*)$	The relative share of total production costs attributed to a factor.
Nature of Concept	Relative: A country is abundant only in comparison to another country.	Relative: A good is intensive only in comparison to another good.
Key Question	Which resource does this nation have the most of?	Which resource does this product require the most of?
Role in H-O Theory	Determines the comparative advantage of the nation.	Determines which factor will see increased demandduring trade.
Example	Home has 100 machines and 50 workers (K/L=2); it is Capital-Abundant.	Steel requires 5 machines per worker; Cloth requires 1. Steel is Capital-Intensive.

The Heckscher-Ohlin Theorem: The Basis for Trade

The Heckscher-Ohlin Theorem states that a country will export the good that intensively uses its relatively abundant factor of production and import the good that intensively uses its relatively scarce factor, because differences in factor endowments across countries lead to differences in autarky relative prices specifically, the capital-abundant country has a lower autarky price for the capital-intensive good and the labor-abundant country has a lower autarky price for the labor-intensive good and when trade opens, each country specializes in and exports the good in which it has this comparative advantage derived from its factor endowment.

The Factor Price Equalization (FPE) Theorem

The **Factor Price Equalization** (FPE) Theorem, proven by **Paul Samuelson**, states that under the **H–O** model's assumptions identical technologies, free trade, no transport costs, perfect competition, incomplete specialization, and no factor intensity reversals free trade in goods equalizes factor prices (wages and rental rates) across countries by allowing trade to act as a substitute for factor mobility, though this strong prediction fails in reality due to violations like technology differences and trade barriers, while the weaker version that trade narrows factor price differences remains generally supported.

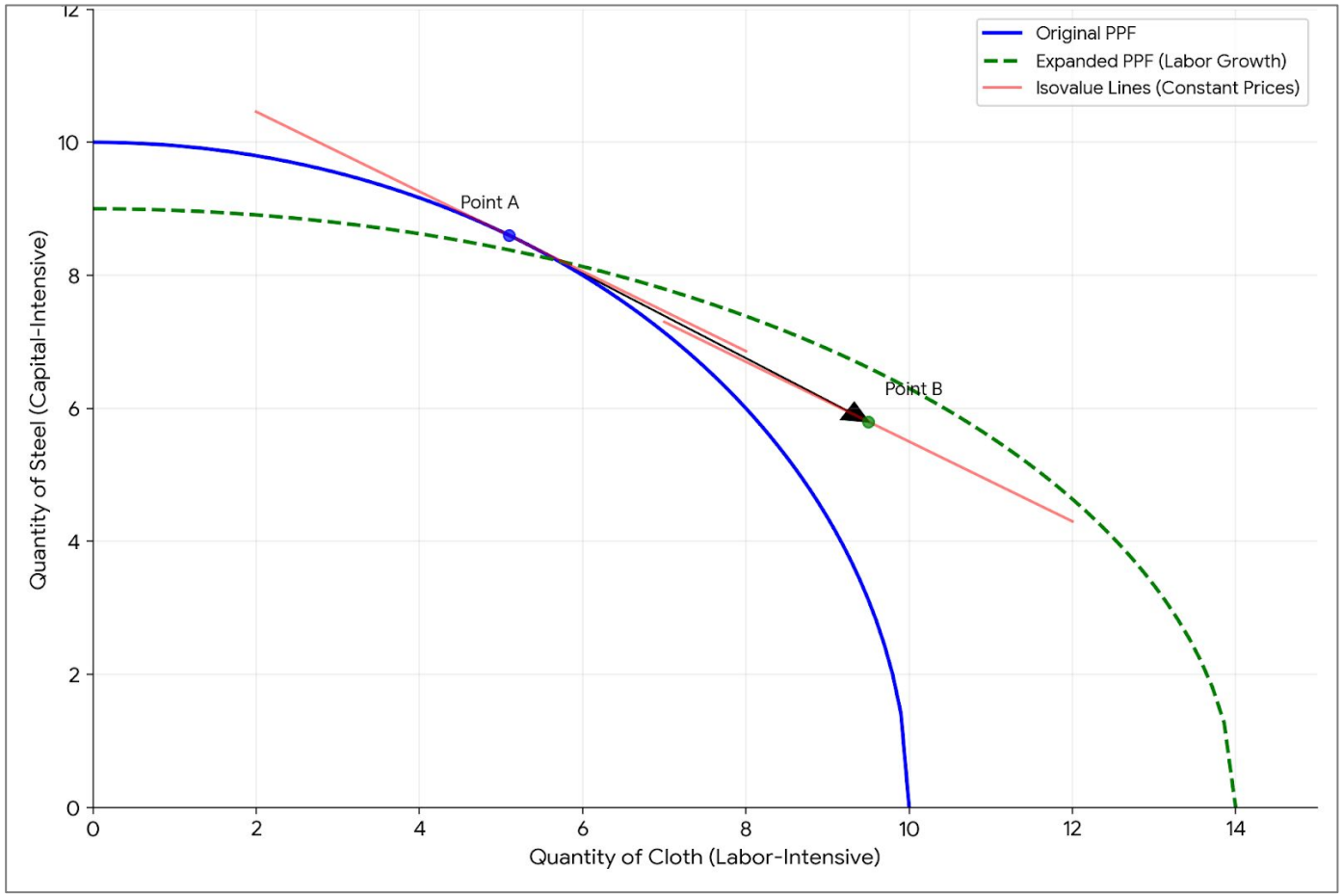
The Stolper-Samuelson Theorem: Income Distribution Effects

- Perhaps the most important political economy implication of the H-O model is the Stolper-Samuelson Theorem (1941). It directly addresses the winners and losers from trade within a country.
- **An increase in the relative price of a good will increase the real return to the factor used intensively in its production, and decrease the real return to the other factor.**

The Rybczynski Theorem: Growth and Output Mix

- The Rybczynski Theorem (1955) explores how changes in factor endowments affect production. It is a key result for understanding how economic growth (an increase in a country's factor supply) impacts its industrial structure and trade patterns.
- **At constant relative goods prices, an increase in the endowment of a factor will increase the output of the good that uses that factor intensively, and decrease the output of the other good.**

Figure 10. The Rybczynski Theory: Growth of Labour



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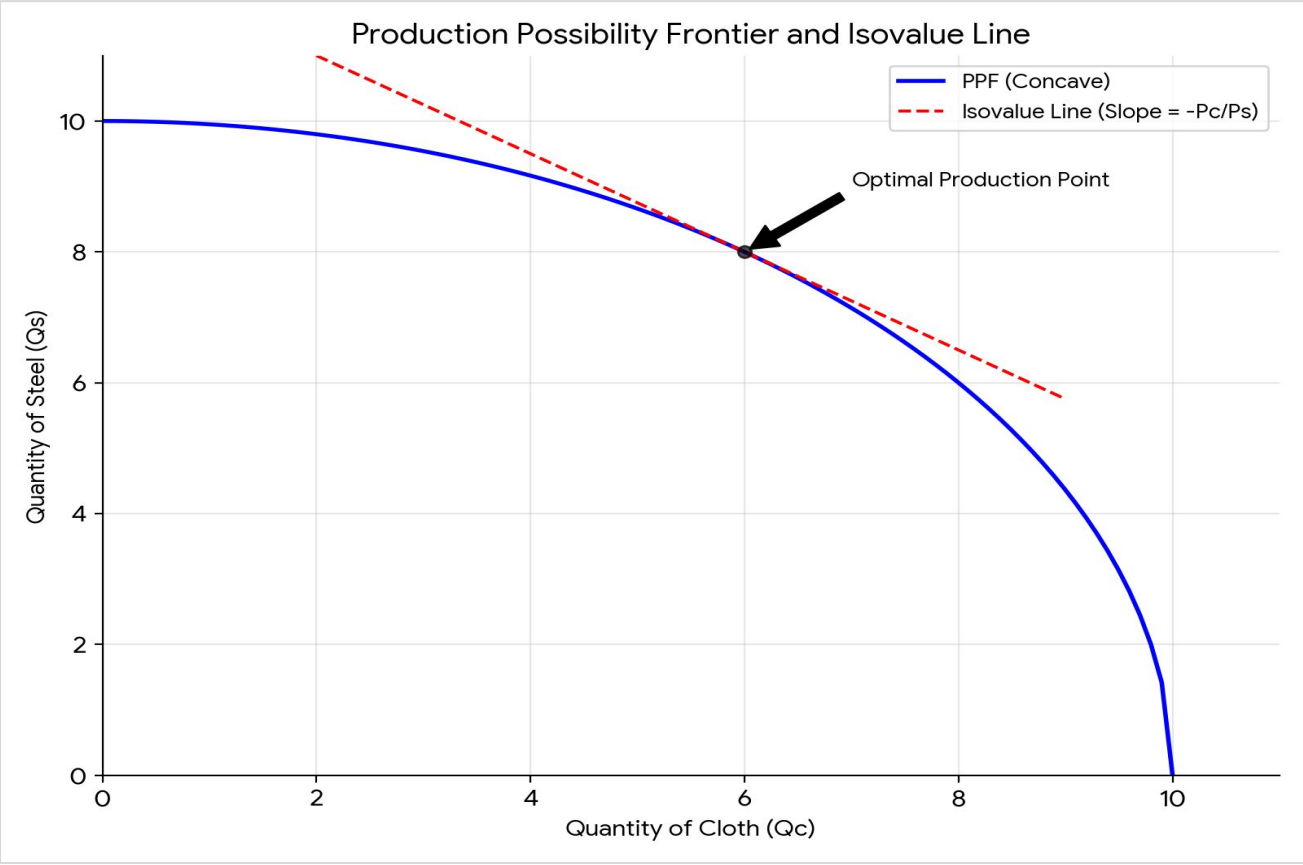
Unified Diagrammatic Analysis of the H-O Model

Figure 11. Production Possibility Frontier with Isovalue Lines



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Autarky Equilibrium in H-O Model

In autarky, Home produces and consumes the same bundle of goods with no international trade. Its production possibility frontier is curved and tilted toward steel, the capital-intensive good, reflecting Home’s abundance of capital.

Figure 12: Autarky Equilibrium in Home (Capital-Abundant)

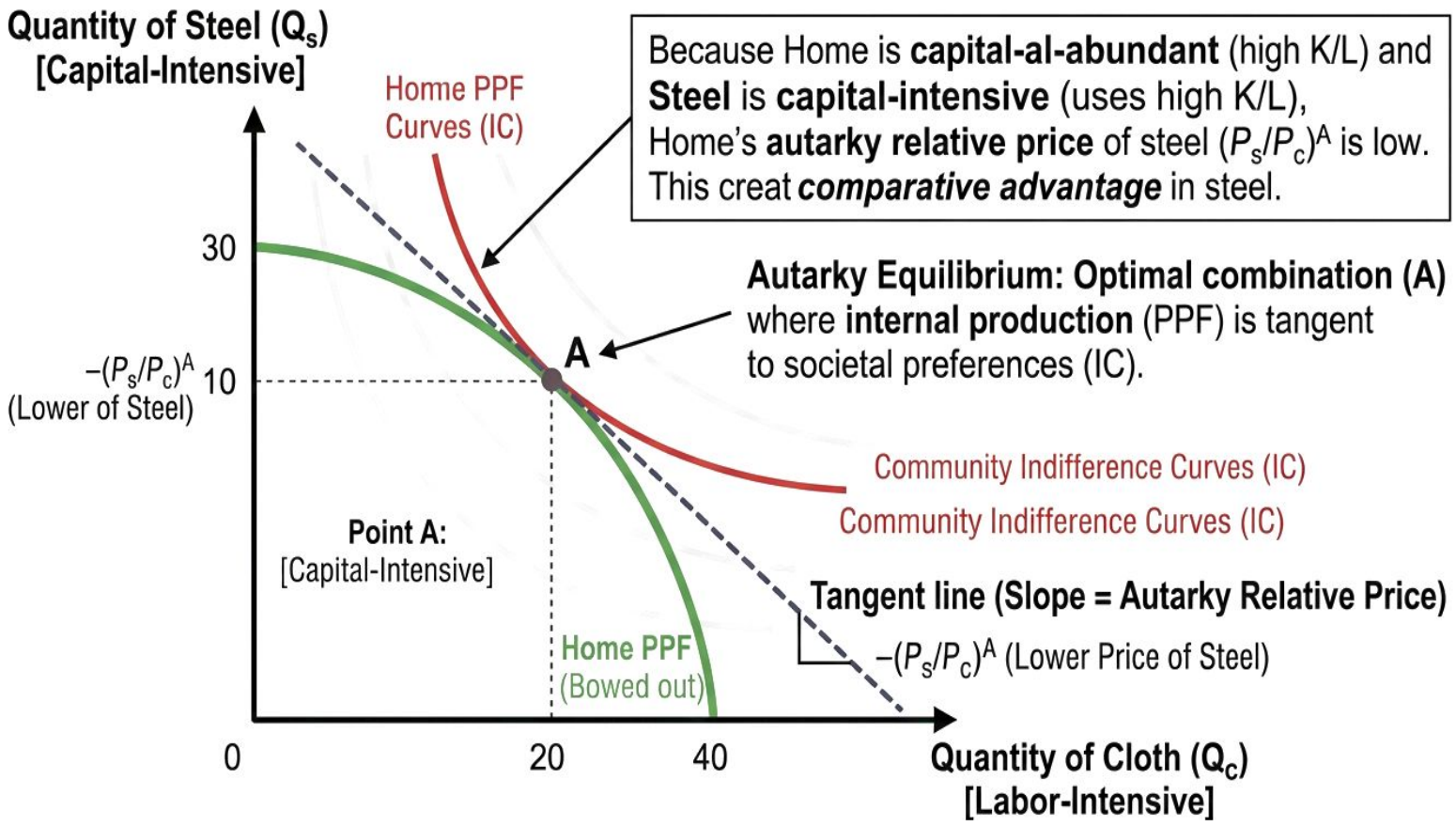

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Figure 13. From Autarky to Free Trade: Global Equilibrium

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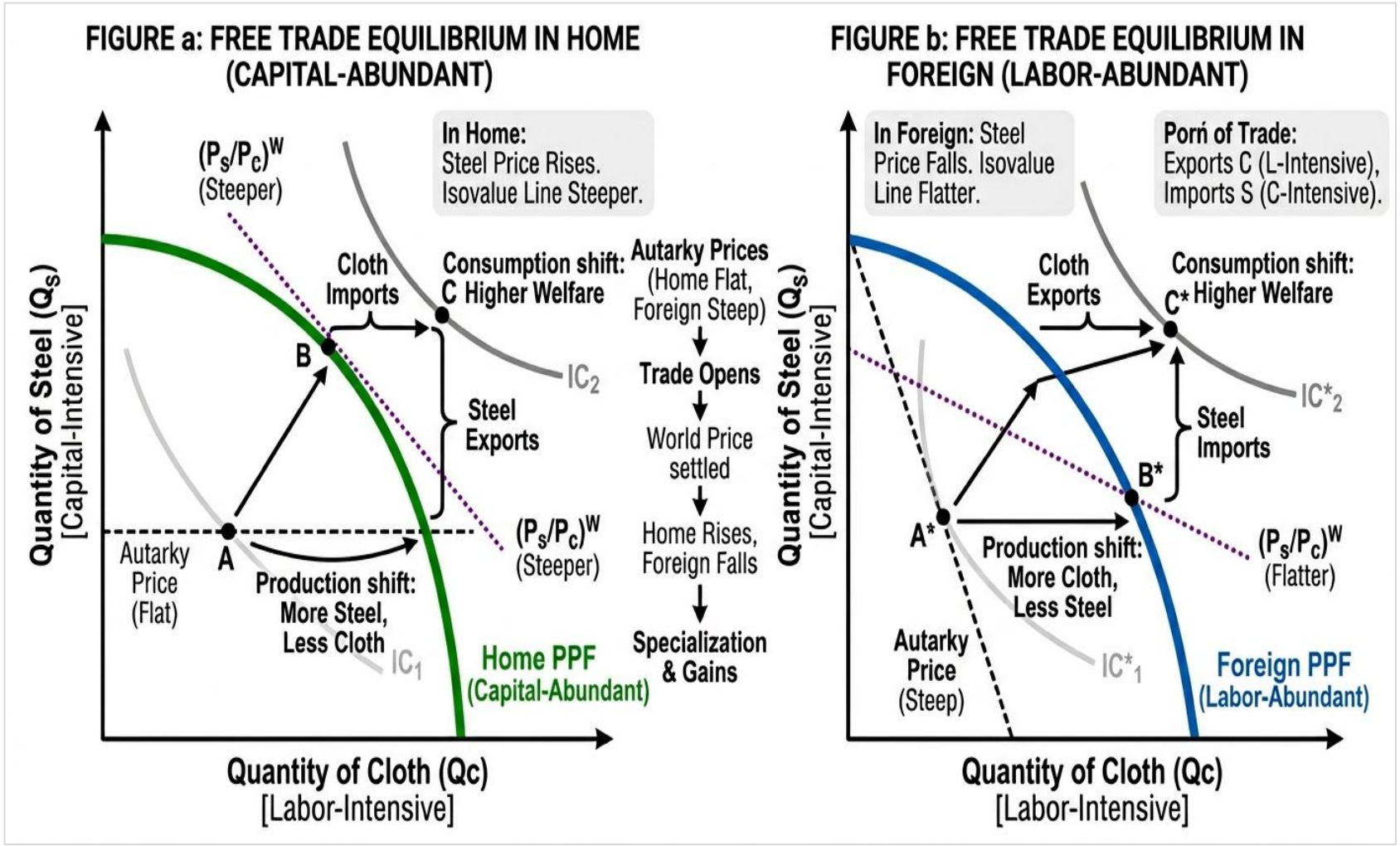

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Empirical Evidence: The Leontief Paradox

The Leontief Paradox (1953) challenged the Heckscher-Ohlin model by finding that the capital-abundant United States exported labor-intensive goods and imported capital-intensive goods the opposite of H-O predictions leading economists to recognize that trade is also driven by human capital, technology, and demand differences.

Conclusion: Comparing the Two Paradigms and Empirical Evidence

Feature	Ricardian Model	Heckscher-Ohlin Model
Basis of Trade	Differences in technology (labor productivity)	Differences in factor endowments
Number of Factors	One (labor)	Two or more (e.g., capital, labor, land)
Production Technology	Constant returns, linear PPF	Constant returns, concave PPF (diminishing returns)
Pattern of Trade	Based on comparative advantage in labor productivity	Based on comparative advantage in factor intensity
Gains from Trade	Yes, for both countries (overall)	Yes, for both countries (overall)
Income Distribution	No effect (all workers identical)	Stolper-Samuelson: Winners and losers within a country
Factor Prices	No prediction on international equality	Factor Price Equalization: Tendency towards equality

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Thank You

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