

Ricardian Theory

ECON 171 - Spring 2026

Week 2: March 31st

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Ricardian Model

Today's Agenda

1. Absolute vs. comparative advantage
2. The Ricardian model setup
3. Production possibilities frontier with one factor
4. Deriving the trading equilibrium
5. Gains from trade under comparative advantage

Motivation for Ricardian Model

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 - Which questions can we not answer with this model?
- The simple exchange economy model cannot:
 - Explain the effects of trade on the economy's *structure*
 - Capture the notion of **specialization**
- Therefore, we need to introduce the production side

Absolute vs. Comparative Advantage

Linear technology

- Consider a technology that uses a single factor of production – labor:

$$Y = AL,$$

where

- L – the amount of labor used
- Y – the amount of produced output
- A – the **productivity** of labor: 1 worker can produce A units of output

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A mirror-image notion: **Unit requirement of labor**

- It takes $a \equiv \frac{1}{A}$ workers to produce 1 unit of output

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- 2 transacting *sides* (countries/agents)
- Each side has access to different technologies of producing the goods
- A 2×2 productivity matrix with rows = sides and columns = goods is enough to summarize the technology

We will look at scenarios with different patterns of technologies and see which allocations of resources are efficient

Example 1

- Two big economies (USA & EU)

Output per 8 labor-hours

	Aircraft	Pharma.
USA	8	4
EU	4	8

Each side is more productive in one sector.

Implied opportunity costs

	OC (1 aircr.) in pharma.	OC (1 ph.) in aircr.
USA	$\frac{1}{2}$	2
EU	2	$\frac{1}{2}$

Absolute and comparative advantage line up.

- USA has the absolute advantage in aircraft; EU in pharmaceuticals
- The side with the higher productivity also has the lower opportunity cost

Example 2

- Two asymmetric economies (Japan & Vietnam)

Output per 6 labor-hours			Implied opportunity costs		
	Electr.	Textiles		OC(1 electr.) in textiles	OC(1 textile) in electr.
Japan	6	4	Japan	$\frac{2}{3}$	$\frac{3}{2}$
Vietnam	2	3	Vietnam	$\frac{3}{2}$	$\frac{2}{3}$

Japan is more productive in both, but the gap is larger in electronics.

Each country's comparative advantage matches its domestic strength.

- Japan has absolute advantage in both goods, but comparative advantage in electronics
- Vietnam has comparative advantage in textiles — the good it is **relatively** better at

Example 3

- Two asymmetric economies (Germany & Mexico)

Output per 6 labor-hours			Implied opportunity costs		
	Cars	Chem.		OC(1 car) in chem.	OC(1 chem.) in cars
Germany	6	4	Germany	$\frac{2}{3}$	$\frac{3}{2}$
Mexico	3	1	Mexico	$\frac{1}{3}$	3

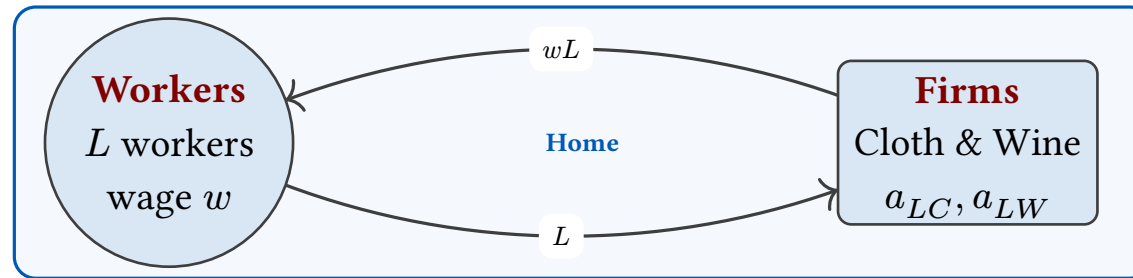
Germany is more productive in both, but the gap is much larger in chemicals ($4 \times$ vs $2 \times$).

Comparative advantage depends on what you give up, not on which output number is larger.

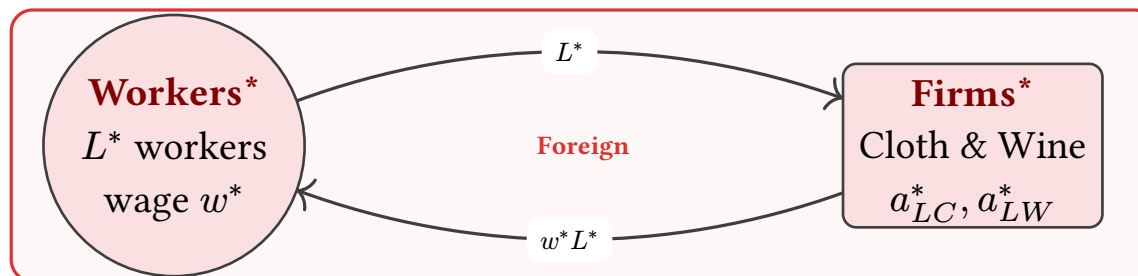
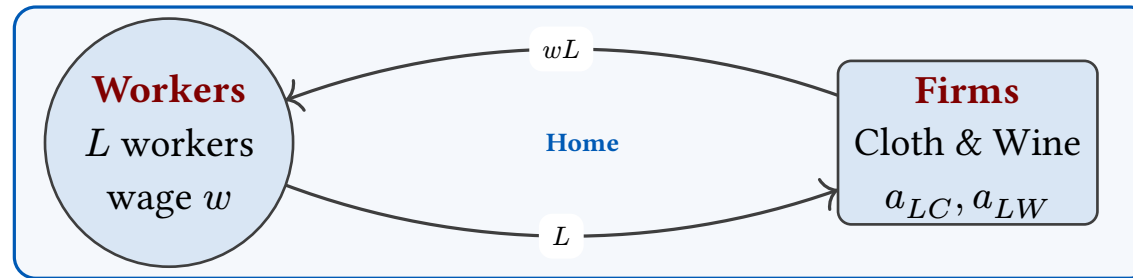
- Germany is more productive in cars than chemicals, yet its comparative advantage is in **chemicals**
- Mexico's comparative advantage is in cars — even though Mexico is less productive in both goods

The Ricardian Model

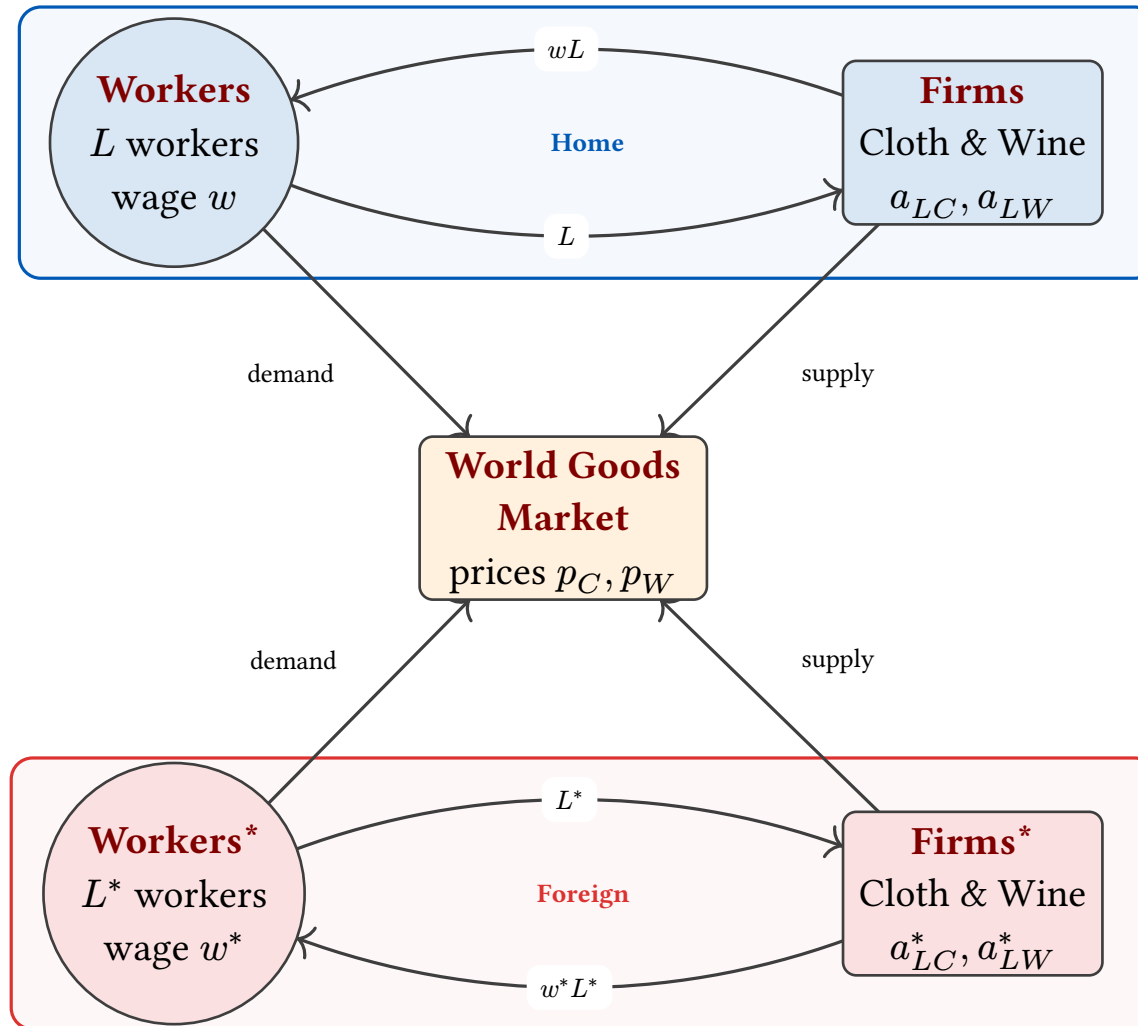
Structure of the economies and world market



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Each country has a fixed **labor endowment** L that is the economy's only factor of production:

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- All workers within a country are **identical**
- Each worker supplies **one unit of labor inelastically** (no leisure choice)
- But each worker can choose which firm to work for to earn either w_C or w_W

Labor supply:

- If $w_C > w_W$, then everyone chooses to work for the cloth firm (and vice versa)
- If $w_C = w_W$, everyone is indifferent between the two firms

Consumers/workers

Workers have Cobb-Douglas preferences over bundles of cloth and wine:

$$U(C_C, C_W) = C_C^{\frac{3}{4}} C_W^{\frac{1}{4}}$$

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With Cobb-Douglas preferences, optimal demands are:

$$C_C = \frac{0.75 I}{p_C} = \frac{3I}{4p_C}, \quad C_W = \frac{(1 - 0.75) I}{p_W} = \frac{I}{4p_W}$$

Firms

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- These firms have different linear technologies:

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Labor demand

- If $w_j > p_j A_j$, then firm j chooses to shut down
- If $w_j < p_j A_j$, then firm j always wants to hire more workers
- If $w_j = p_j A_j$, then firm j is indifferent between hiring any number of workers

Autarky Equilibrium (Labor market)

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In equilibrium in this economy:

- Wages are the same across sectors:

$$w_C = w_W \equiv w$$

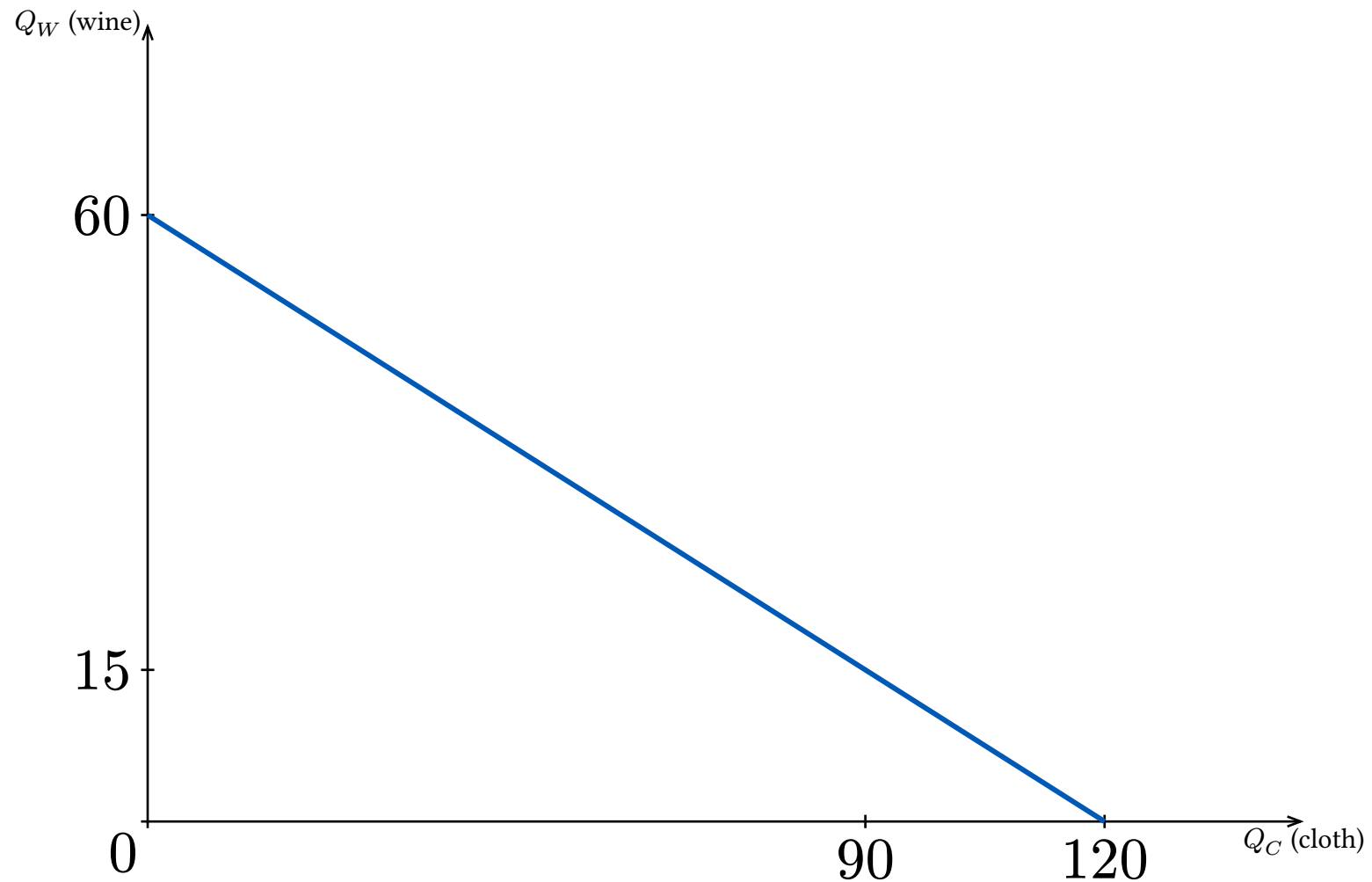
- Prices in both sectors are equal to the marginal costs:

$$p_C = w/A_C \quad p_W = w/A_W$$

Production Possibilities Frontier

Home $a_{LC} = 1, a_{LW} = 2, L = 120$ PPF: $1Q_C + 2Q_W = 120$

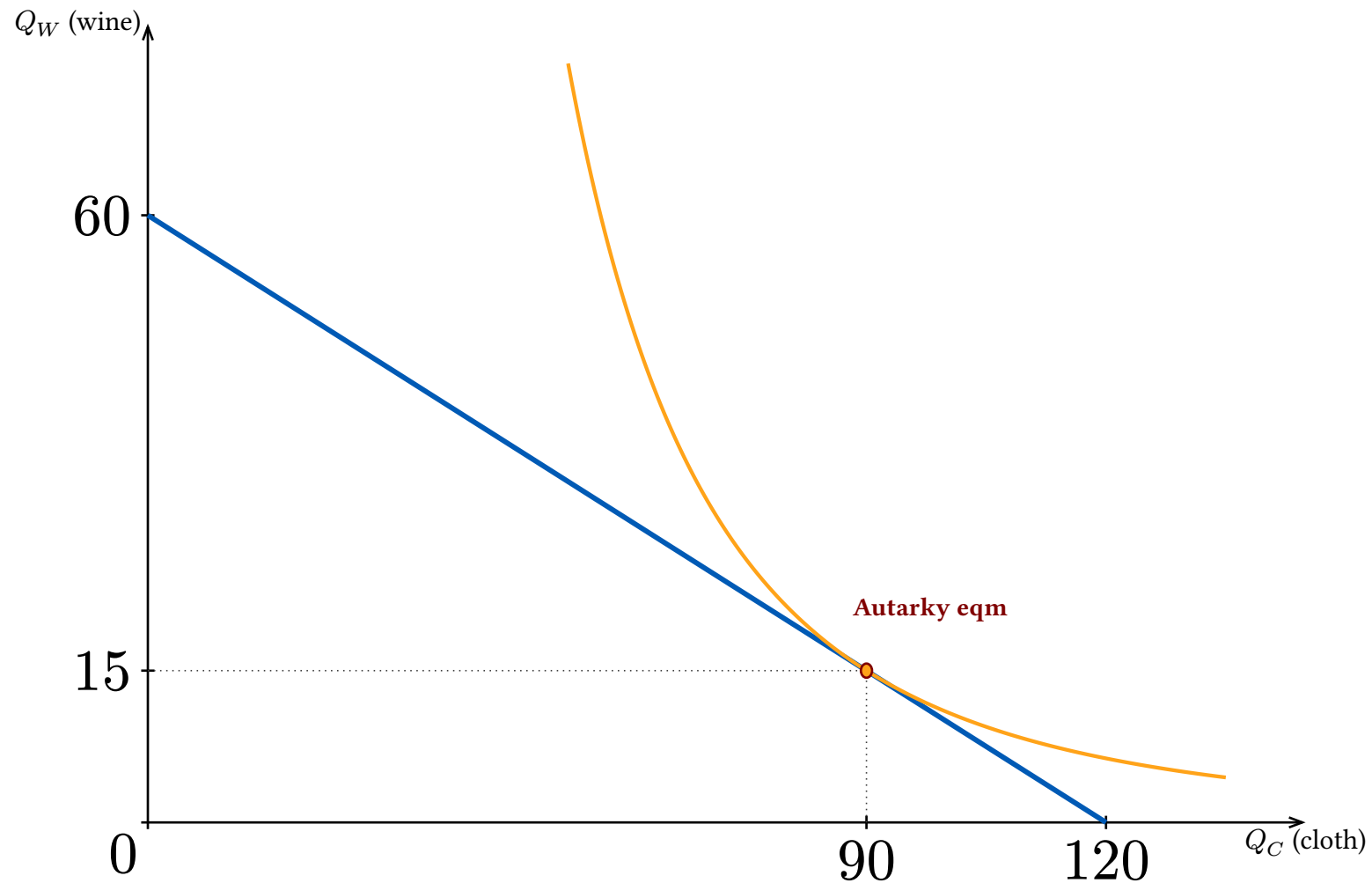
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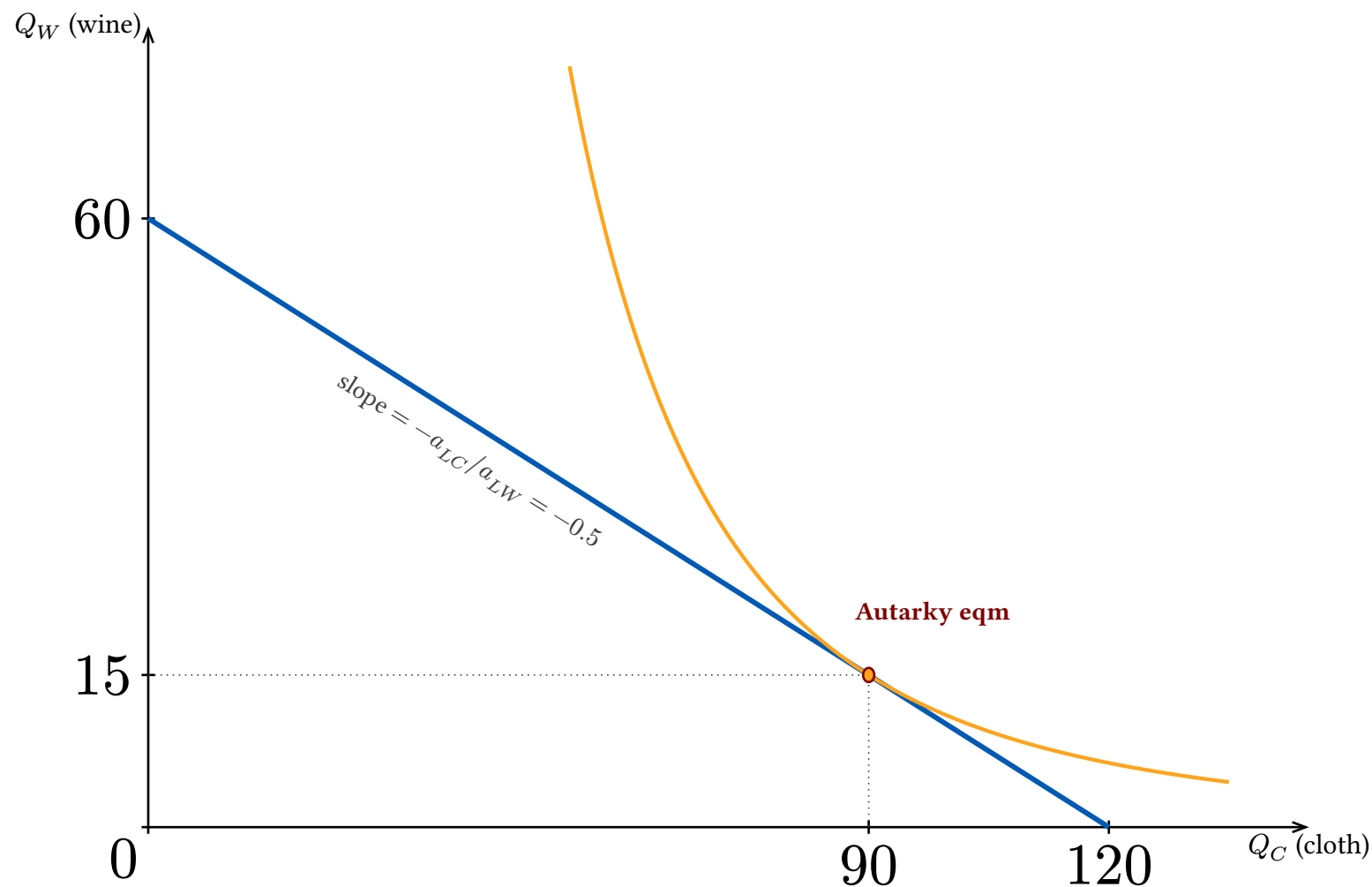
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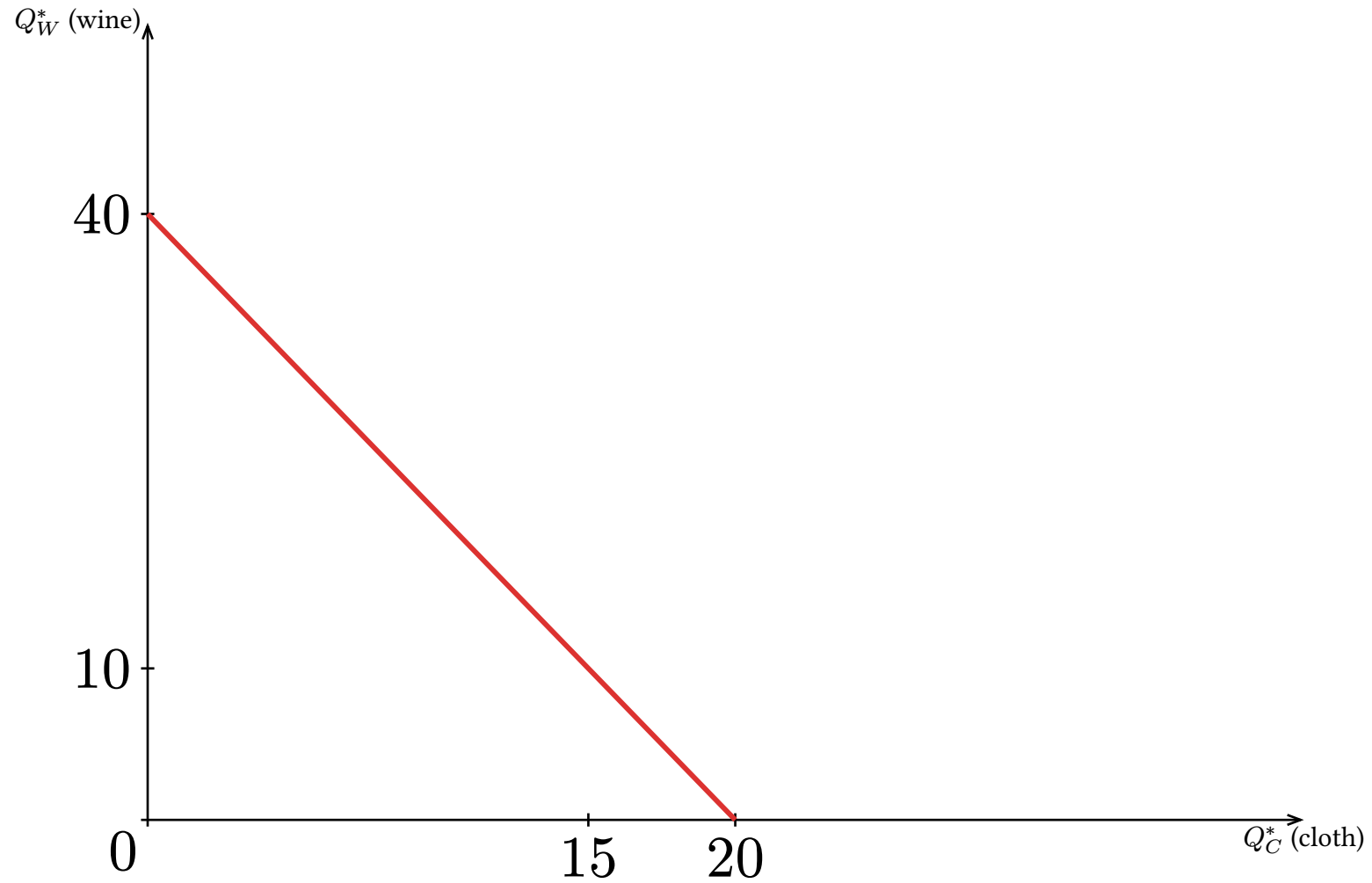
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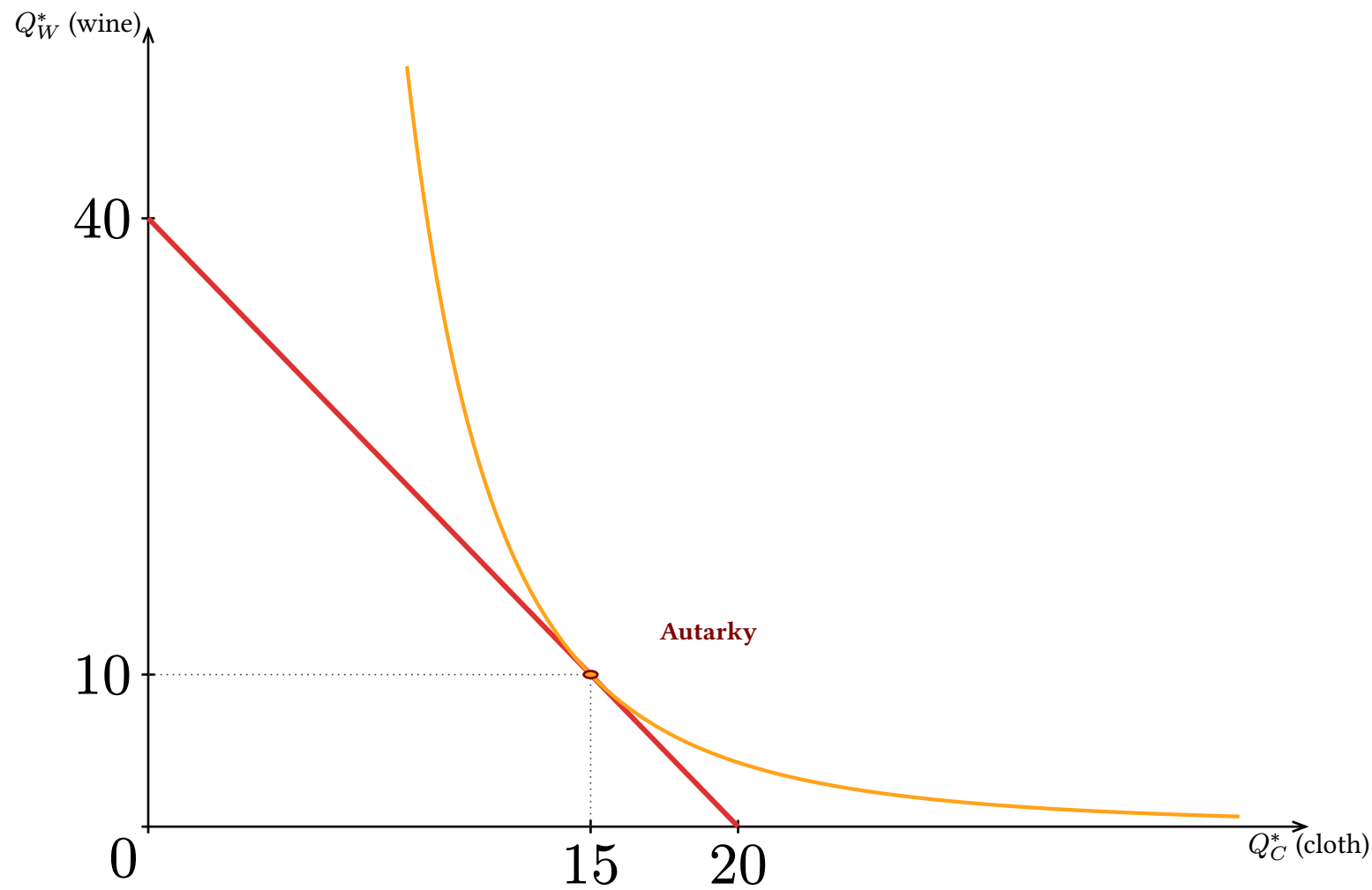
Production Possibilities Frontier

Foreign $a_{LC}^* = 6$, $a_{LW}^* = 3$, $L^* = 120$ PPF: $6Q_C^* + 3Q_W^* = 120$



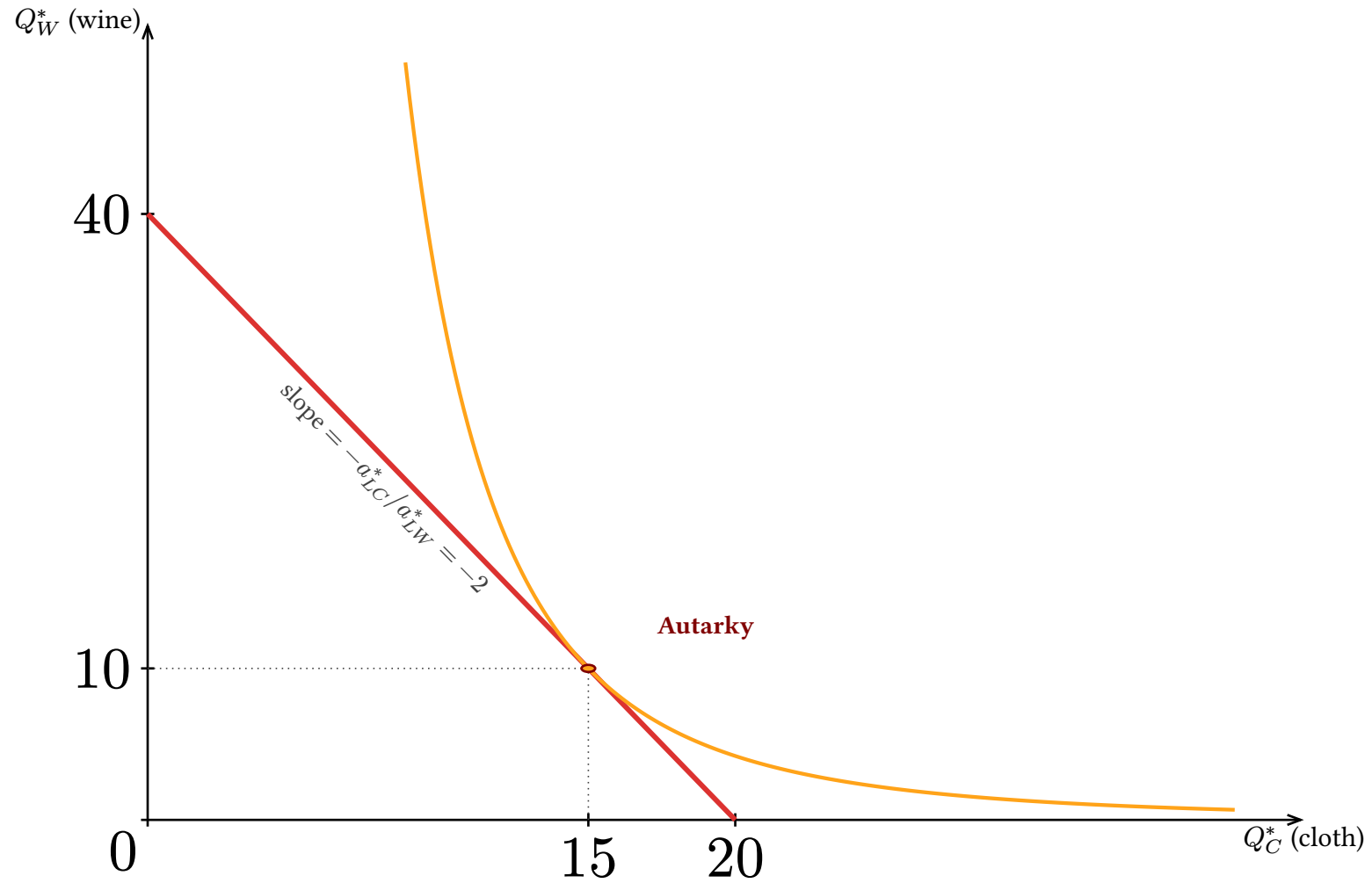
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Ricardian Trading Equilibrium

Deriving Relative Supply

Suppose $p_C/p_W < a_{LC}/a_{LW}$

→ In Home, cloth firms pay

$p_C/a_{LC} < p_W/a_{LW}$, i.e.

the cloth wage is lower

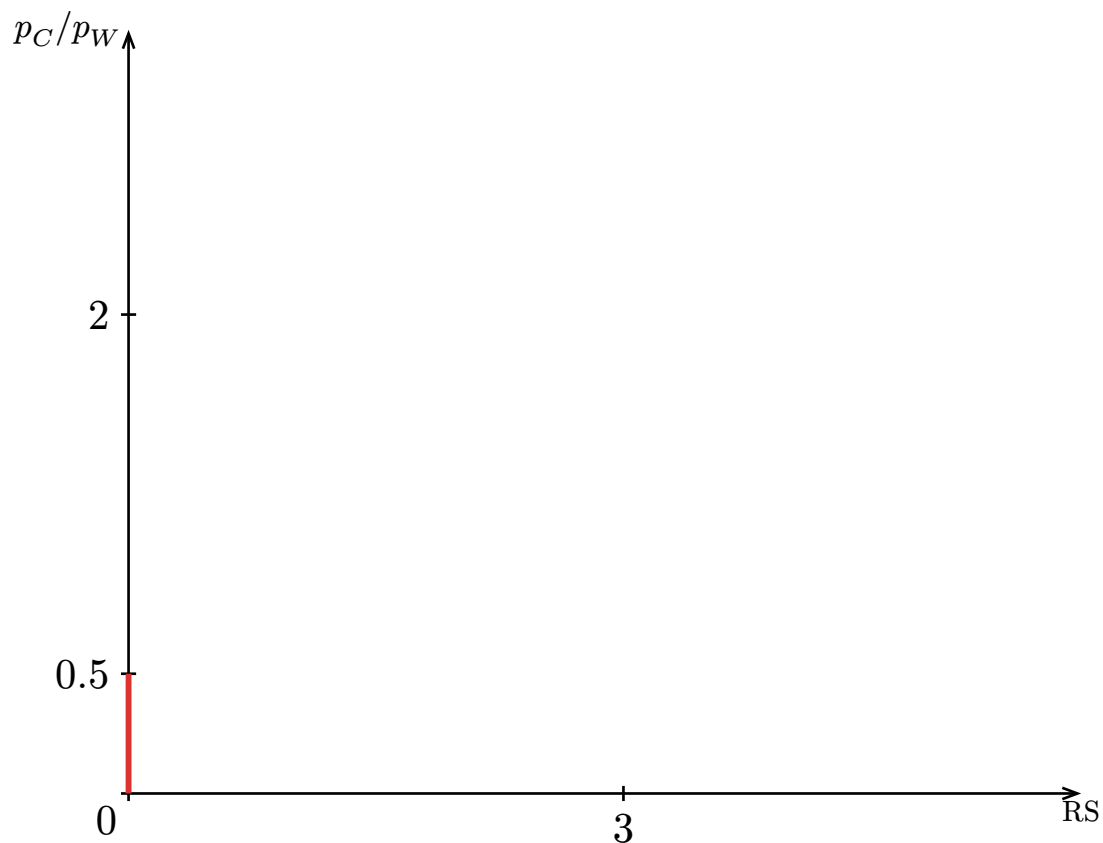
→ All Home workers move to wine

Same logic applies in Foreign

(since $a_{LC}/a_{LW} < a_{LC}^*/a_{LW}^*$)

→ No cloth produced anywhere

⇒ **RS = 0**



Deriving Relative Supply

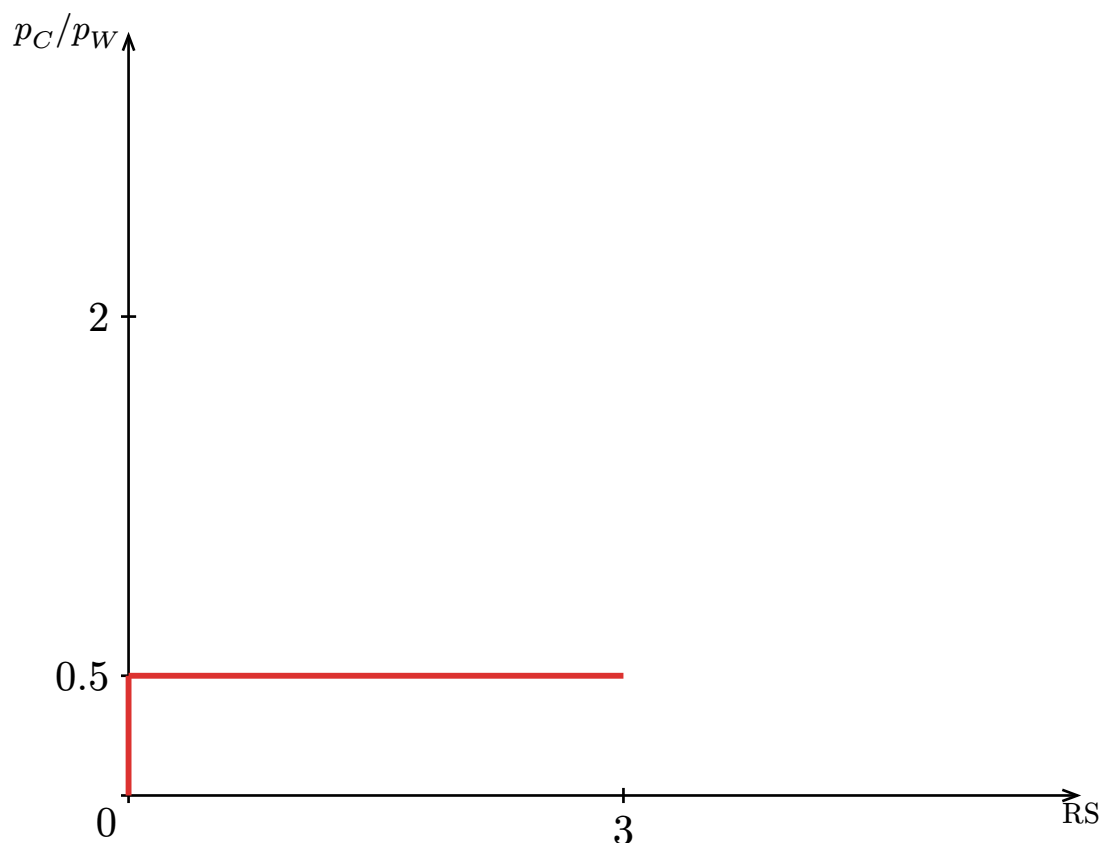
Suppose $p_C/p_W = a_{LC}/a_{LW}$

→ In Home, $p_C/a_{LC} = p_W/a_{LW}$:
both firms offer the **same wage**

→ Home workers are *indifferent* —
any split of L across sectors is an
equilibrium

→ Foreign still all wine (its cloth
wage is still lower)

⇒ **RS sweeps from 0 to**
 $L/a_{LC} = 120$ cloth, 40 wine



Deriving Relative Supply

Suppose $a_{LC}/a_{LW} < p_C/p_W < a_{LC}^*/a_{LW}^*$

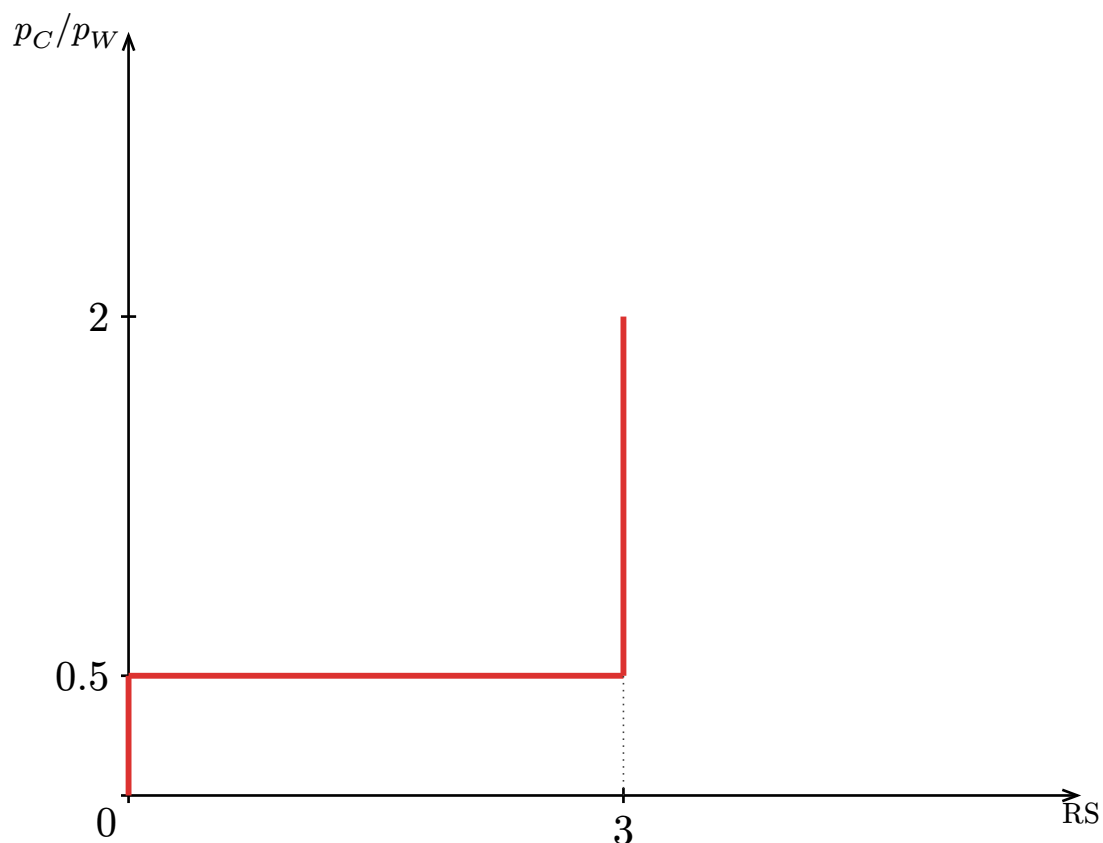
→ In Home, $p_C/a_{LC} > p_W/a_{LW}$:
cloth firms pay *higher* wages

→ All Home labor goes to cloth:
 $Q_C = 120$

→ In Foreign, $p_C/a_{LC}^* < p_W/a_{LW}^*$: wine firms still pay
more

→ All Foreign labor goes to wine:
 $Q_W^* = 40$

⇒ **$RS = 120/40 = 3$** (constant)



Deriving Relative Supply

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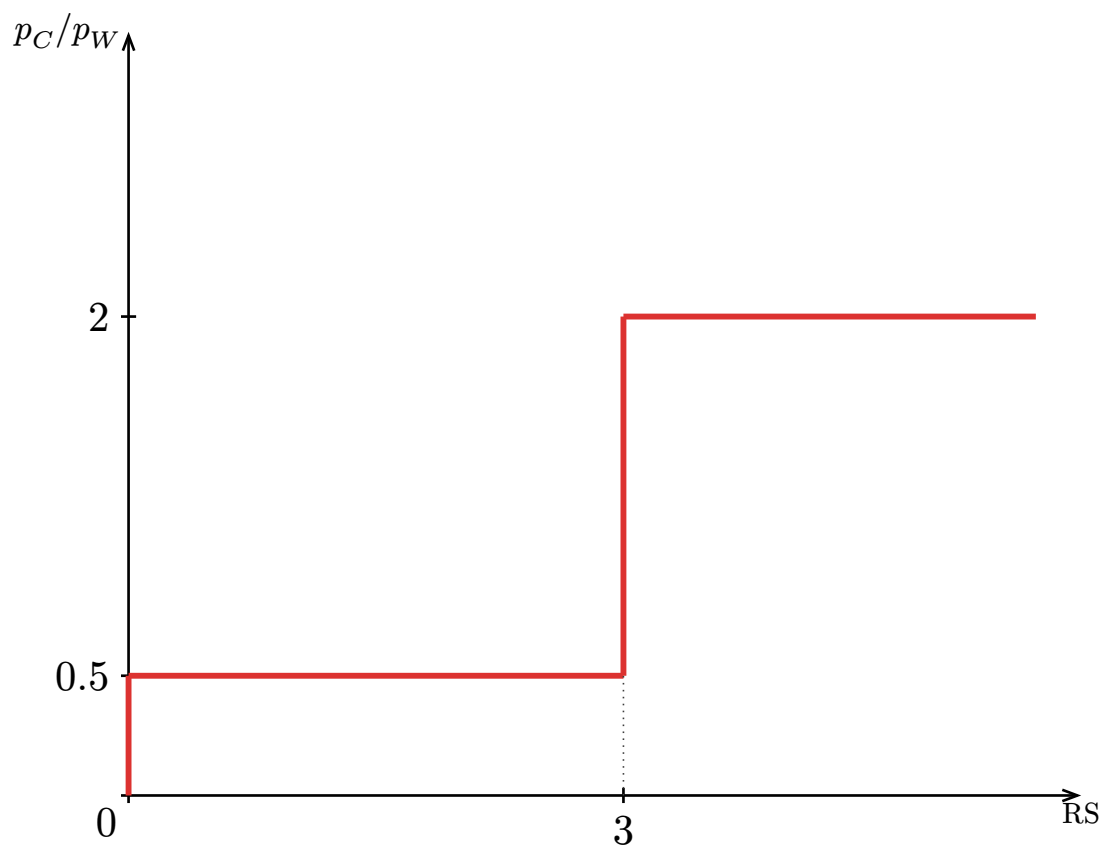
→ Home is still all cloth ($Q_C = 120$)

→ In Foreign, $p_C/a_{LC}^* = p_W/a_{LW}^*$: both firms offer the **same wage**

→ Foreign workers are *indifferent*

— they start shifting into cloth

⇒ **RS sweeps from 3 to ∞**



Deriving Relative Supply

Suppose $p_C/p_W > a_{LC}^*/a_{LW}^*$

→ In both countries, cloth firms pay strictly higher wages

→ All labor in both countries goes to cloth

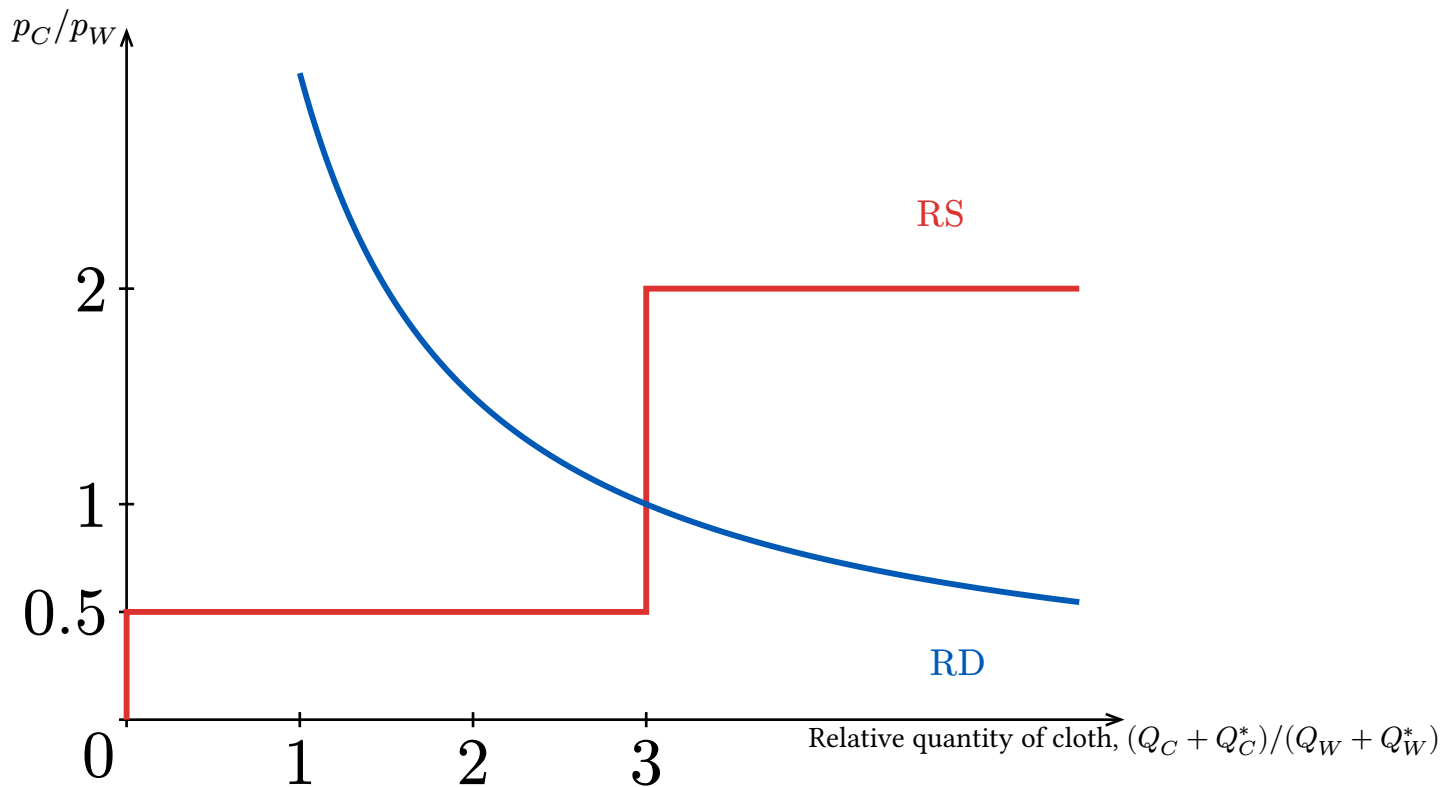
→ $Q_W = Q_W^* = 0$

⇒ **RS** → ∞



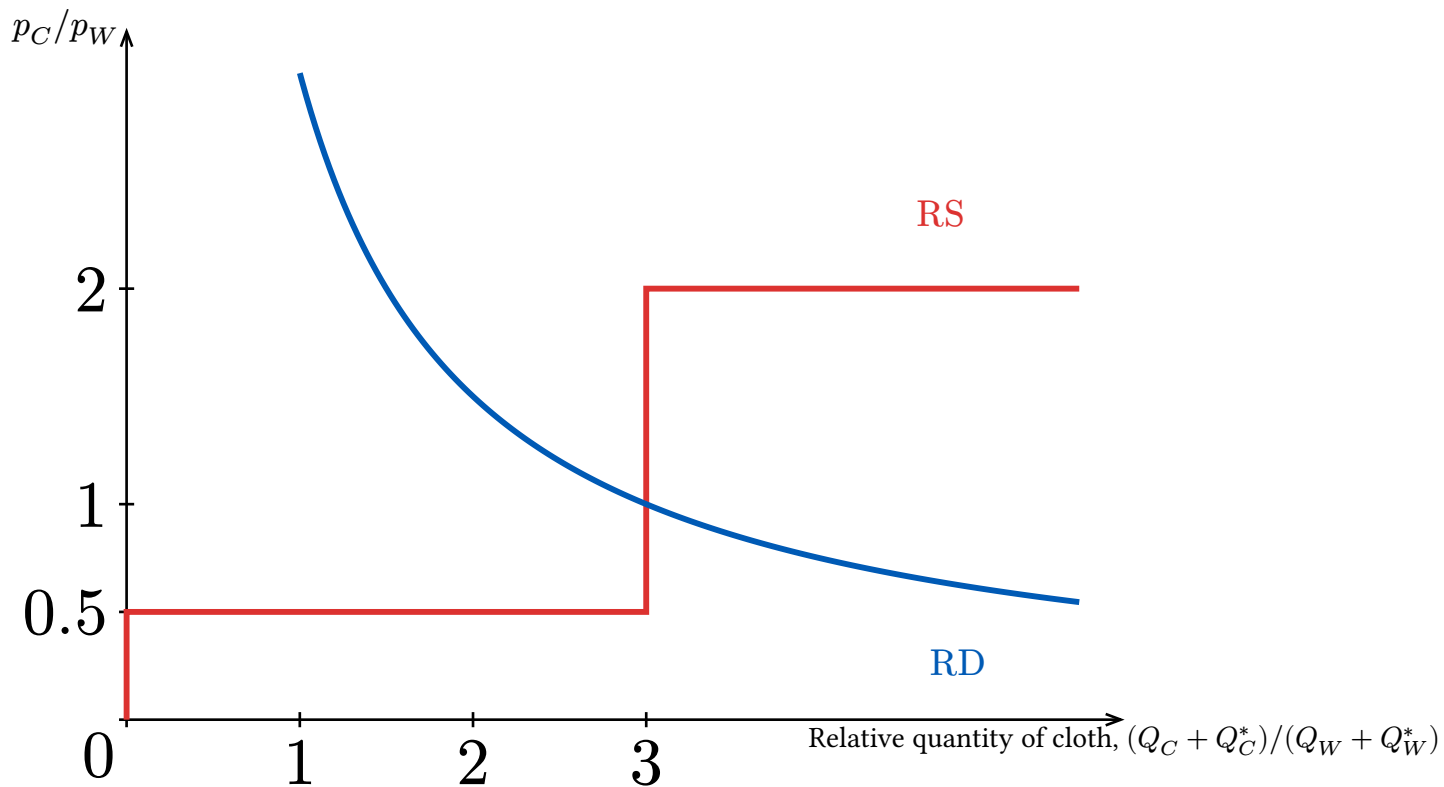
Derivation of the Equilibrium

$$U = C_C^{3/4} C_W^{1/4}; \quad a_{LC} = 1, a_{LW} = 2, L = 120; \quad a_{LC}^* = 6, a_{LW}^* = 3, L^* = 120.$$



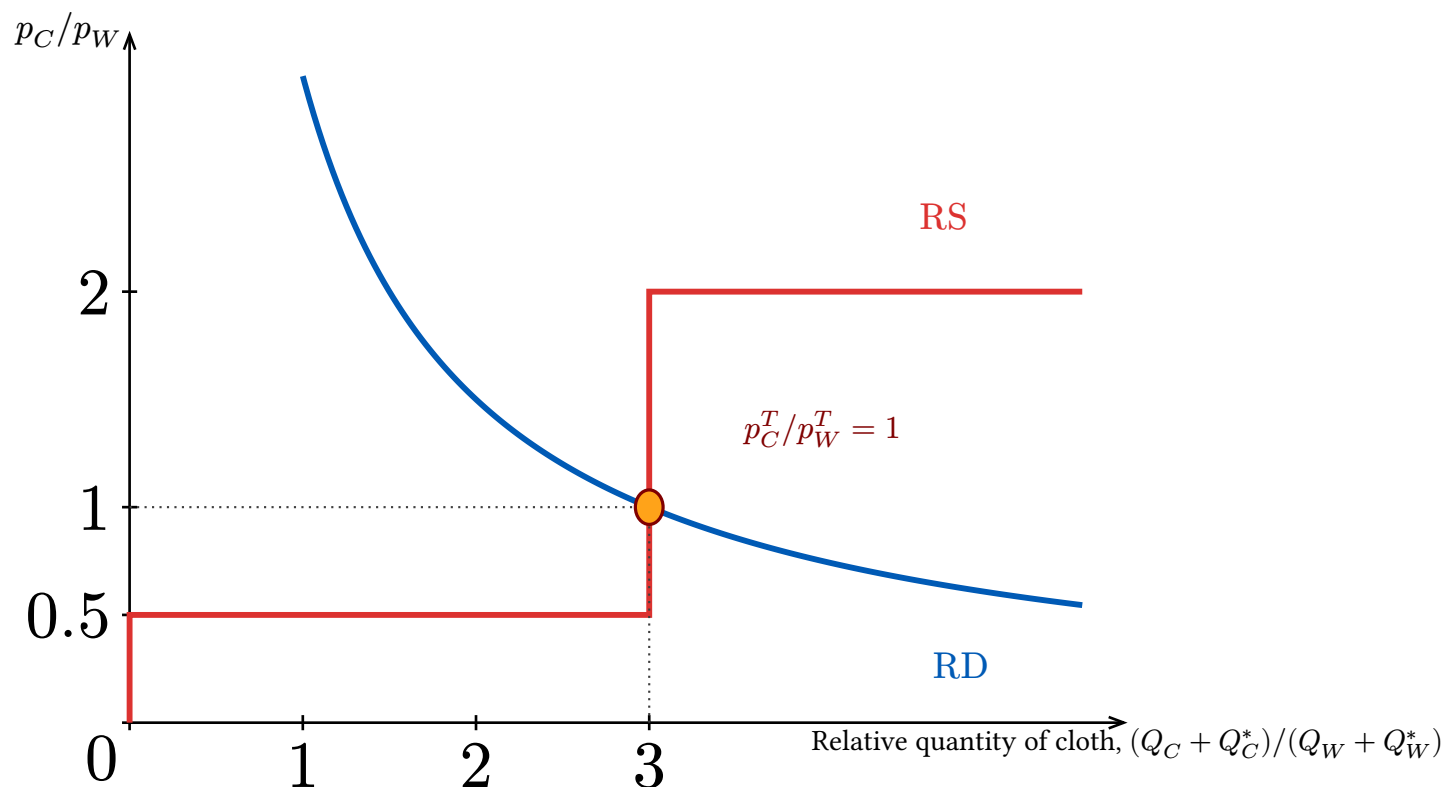
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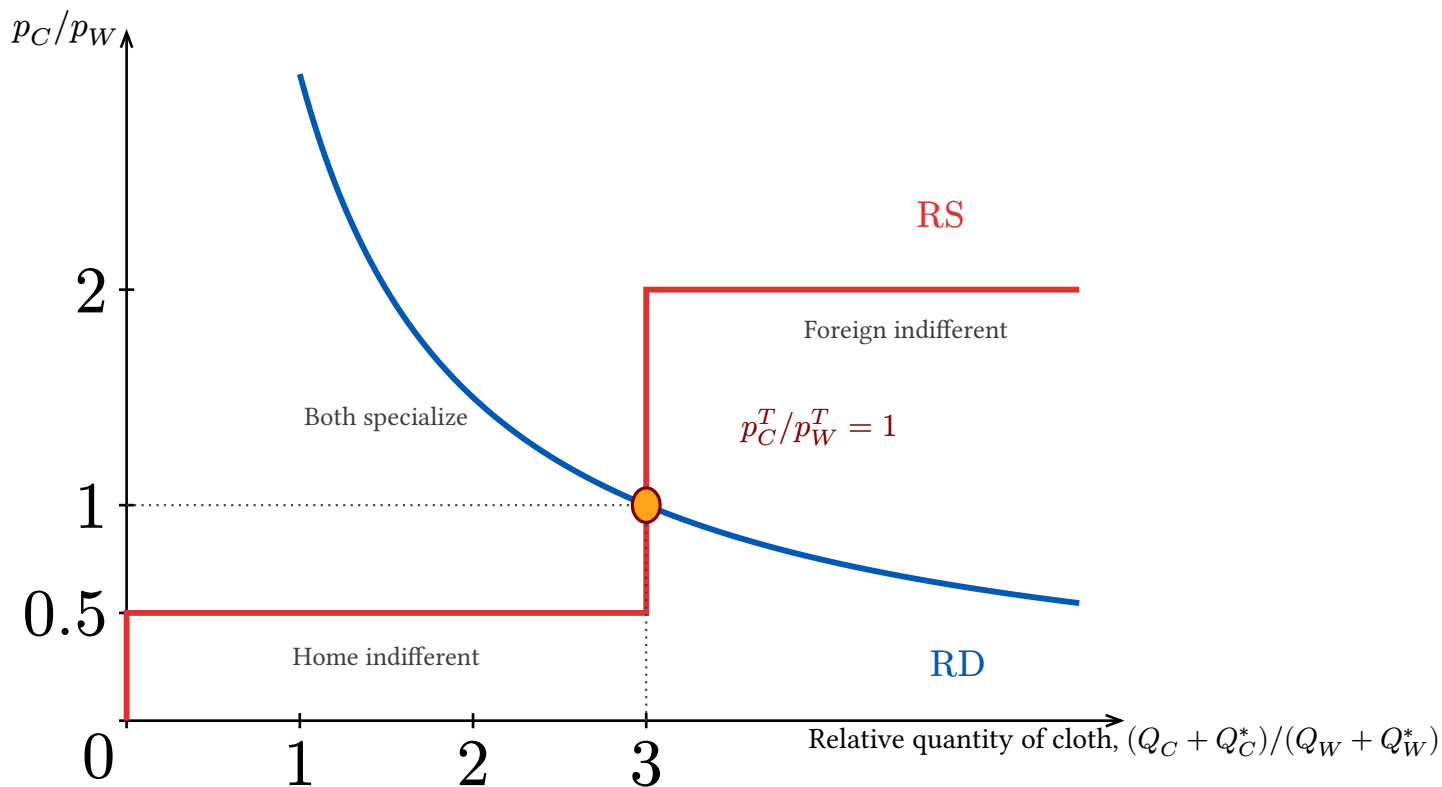
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At $p_C^T/p_W^T = 1$: Home fully specializes in cloth, Foreign in wine. The trade price p^T lies strictly between the autarky prices (0.5 and 2), so both gain from trade.

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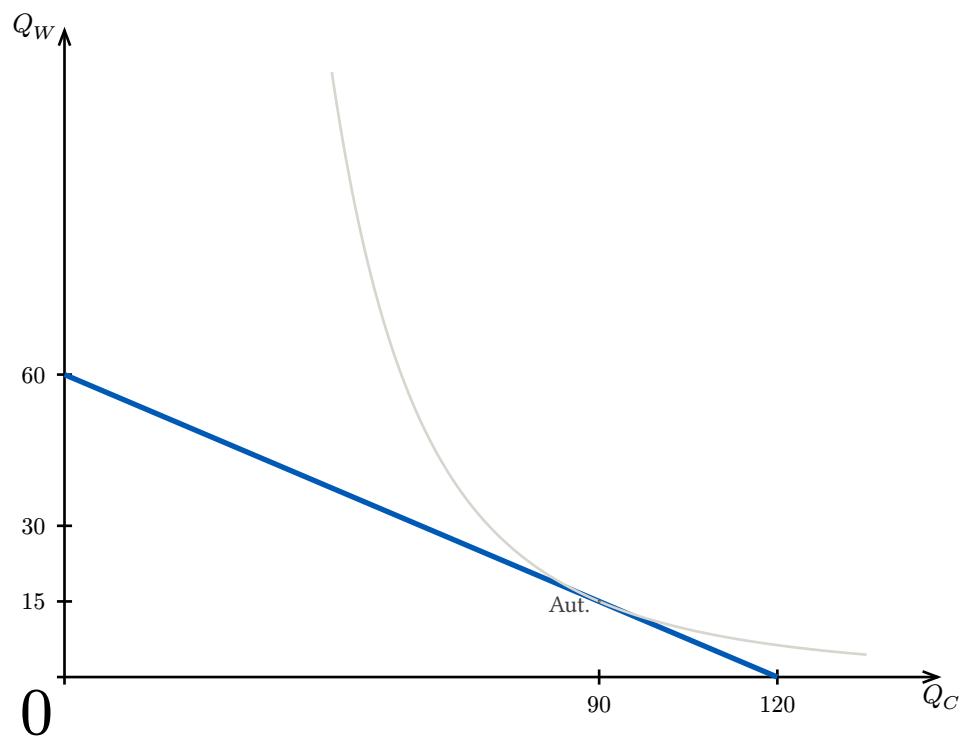


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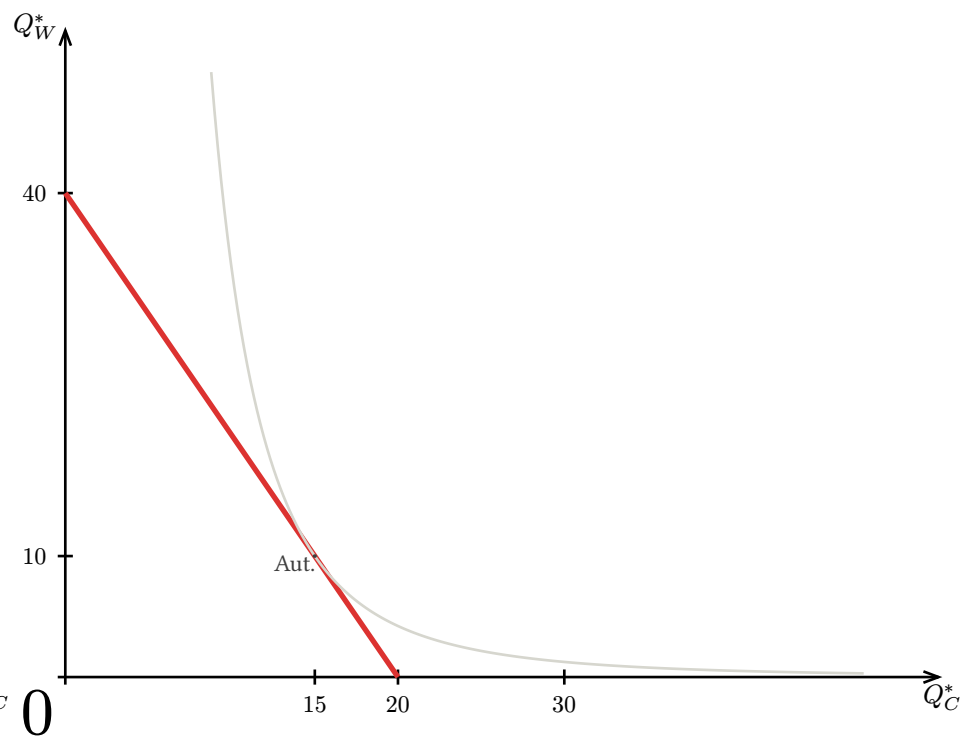
Gains from Trade

World price $p_C^T/p_W^T = 1$

Home



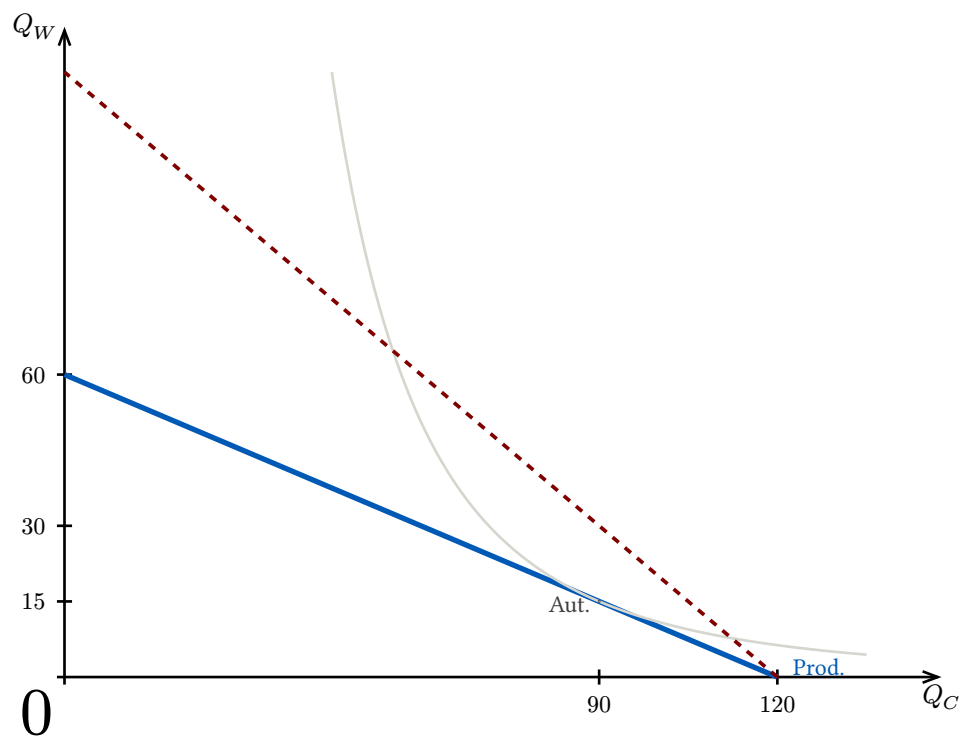
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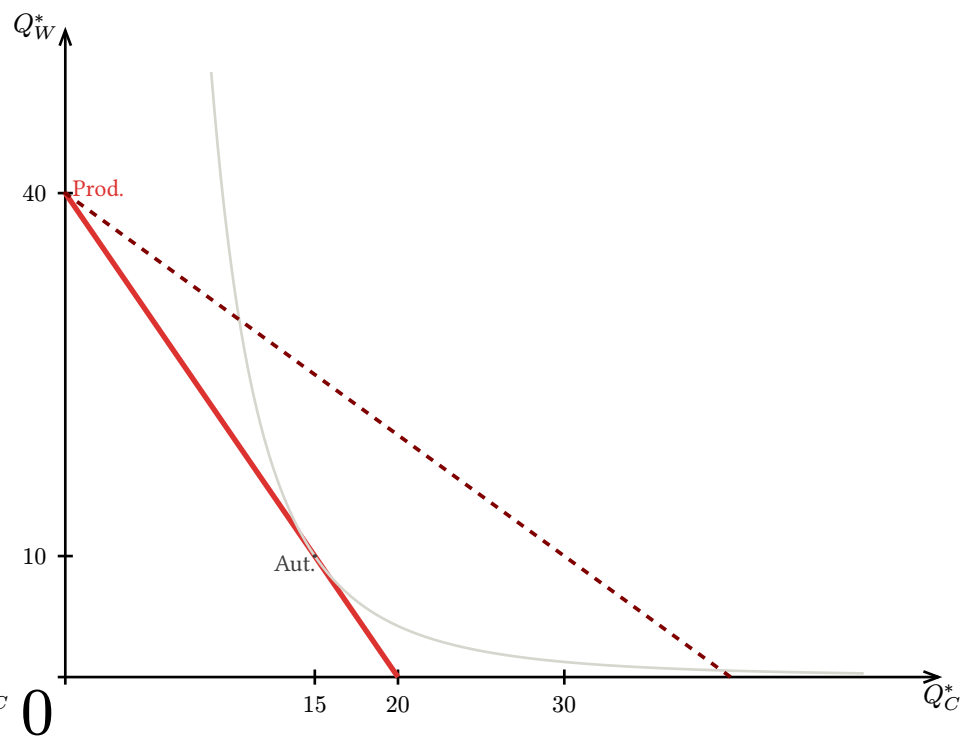
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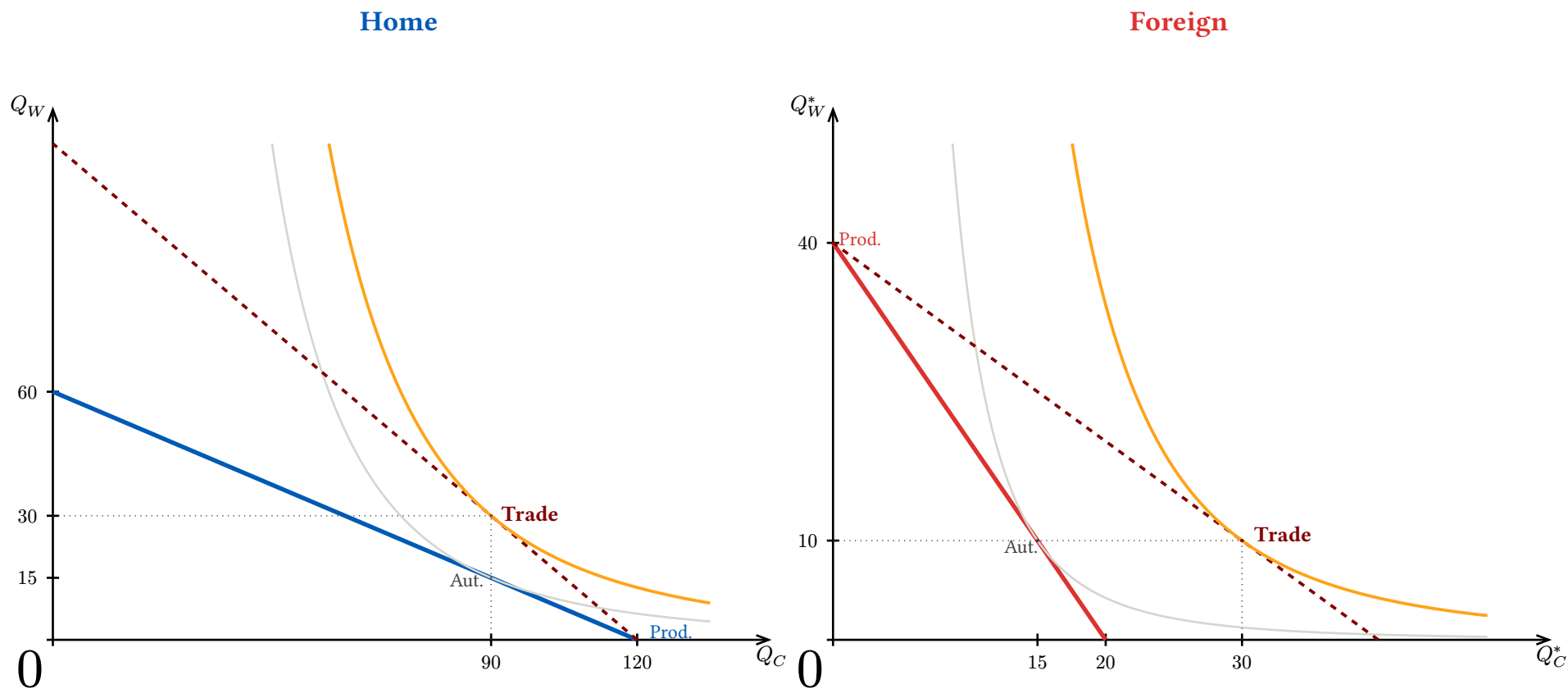


Foreign



Gains from Trade

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Both gain: Home wine $15 \rightarrow 30$; Foreign cloth $15 \rightarrow 30$.