



BUSINESS SCHOOL

# Chapter 2: The comparative advantage : the Ricardian model

International Economics

Yeganeh Forouheshfar

2017-2018

# Outline

- Introduction
- Key concepts
- A One-Factor Economy
- Trade in a One-Factor World
- Misconceptions About Comparative Advantage
- Criticisms to the Ricardian theory of trade
- International Trade Theory

# Introduction

- The Ricardian model: the simplest model that shows how differences between countries give rise to trade and gains from trade
- One of the first theories to explain why trade among countries takes place
- The gain in trade is identified by comparing two extreme cases:
  - Autarky: no trade taken place (domestic production=domestic consumption)
  - Free exchange of goods: without trade barriers nor transportation cost
- The goal is not to reflect the reality, just to understand the main mechanisms underlying trade (more of a thought experiment!)
- Labor is the only factor of production and countries differ only in the productivity of labor in different industries

# Dominant school of thought before Ricardo (1500 -1750): Mercantilism



# Key concepts

- Absolute advantage
- Opportunity cost
- Comparative advantage

# Absolute advantage

A country can produce a good more efficiently than other countries

- A country can either produce more of a specific product or produce it using less input
- Examples:
  1. The US can produce 20 planes  
France can produce 12 planes
  2. Korea can produce 3 cars or 9 motorcycles  
Germany can produce 4 cars or 8 motorcycles
  3. Japan can produce 4 laptops or 12 phones  
Brazil can produce 1 laptops or 5 phones
  4. Cuba takes 4hrs to make a TV and 12hrs to make salsa  
Mexico takes 1hr to make a TV and 5hrs to make salsa

# Opportunity cost

*Opportunity cost* is all about the most basic of economic concepts: trade-offs

- Every economic choice that we make entails a cost

Ex. producing more robots requires that we take some resources away from the production of pizza, reducing the output of pizza.

The forgone pizza is the opportunity cost of producing more robots.

$$\text{Opportunity cost} = \frac{\text{Quantity Lost}}{\text{Quantity Gained}} \quad \text{or} \quad \frac{\text{Value Lost}}{\text{Value Gained}}$$

# Comparative advantage

Comparative advantage is an economic law referring to the ability of any given economic actor to produce goods and services at a lower opportunity cost than other economic actors.

- Having comparative advantage  $\neq$  one country is better in producing

The country can produce with less sacrificing !



# Example 1

	Plane	Ship
US	20	2
France	12	2

- **Opportunity costs?**
- **Who has comparative advantage?**
- **What is a term of trade that benefits both countries? 1 ship for \_\_\_\_ Planes**

# Example 1

	Plane	Ship
US	20 (1P costs 1/10 S)	2 (1S costs 10 P)
France	12 (1P costs 1/6 S)	2 (1S costs 6 P)

- Opportunity costs?
- Who has comparative advantage?
- What is a term of trade that benefits both countries? 1 ship for      Planes



$6 < 8 < 10$

## Example 2

	Cars	Motorcycles
Korea	3	9
Germany	4	8

- **Opportunity costs?**
- **Who has comparative advantage?**
- **What is a term of trade that benefits both countries? 1 car for \_\_\_\_ Motorcycles**

# Example 3

	Laptops	Phones
Japan	4	12
Brazil	1	5

- Opportunity costs?
- Who has comparative advantage?
- What is a term of trade that benefits both countries? 1 Laptop for \_\_\_\_ Phones

# Example 4

	TV	Salsa
Cuba	4	12
Mexico	1	5

- Opportunity costs?
- Who has comparative advantage?
- What is a term of trade that benefits both countries? 1 ship for \_\_\_\_ Planes

# Example 4

	TV	Salsa
Cuba	4 (1TV costs 1/3 S)	12 (1S costs 3 TV)
Mexico	1 (1TV costs 1/5 S)	5 (1S costs 5 TV)

- Opportunity costs?
- Who has comparative advantage?
- What is a term of trade that benefits both countries? 1 Salsa for      TVs



$3 < 3.5 < 5$

# The Concept of Comparative Advantage

- This difference in opportunity costs offers the possibility of a mutually beneficial rearrangement of world production
- The reason that international trade produces this increase in world output is that it allows each country to specialize in producing the good in which it has a comparative advantage
- A country has a **comparative advantage** in producing a good if the opportunity cost of producing that good in terms of other goods is lower in that country than it is in other countries
- Trade between two countries can benefit both countries if each country exports the goods in which it has a comparative advantage
- David Ricardo famously demonstrated how England and Portugal both benefit by specializing and trading according to their comparative advantages, Portugal with wine and England with cloth

# A One-Factor Economy

- Assume that we are dealing with an economy (which we call Home). In this economy:
  - Labor is the only factor of production
  - Only two goods (say wine and cheese) are produced
  - The supply of labor is fixed in each country
  - The productivity of labor in each good is fixed
  - Perfect competition prevails in all markets



- The constant labor productivity is modeled with the specification of unit labor requirements:
  - The **unit labor requirement** is the number of hours of labor required to produce one unit of output.
    - Denote with  $a_{LW}$  the unit labor requirement for wine (e.g. if  $a_{LW} = 2$ , then one needs 2 hours of labor to produce one gallon of wine).
    - Denote with  $a_{LC}$  the unit labor requirement for cheese (e.g. if  $a_{LC} = 1$ , then one needs 1 hour of labor to produce a pound of cheese).
- The economy's total resources are defined as  $L$ , the total labor supply (e.g. if  $L = 120$ , then this economy is endowed with 120 hours of labor or 120 workers).

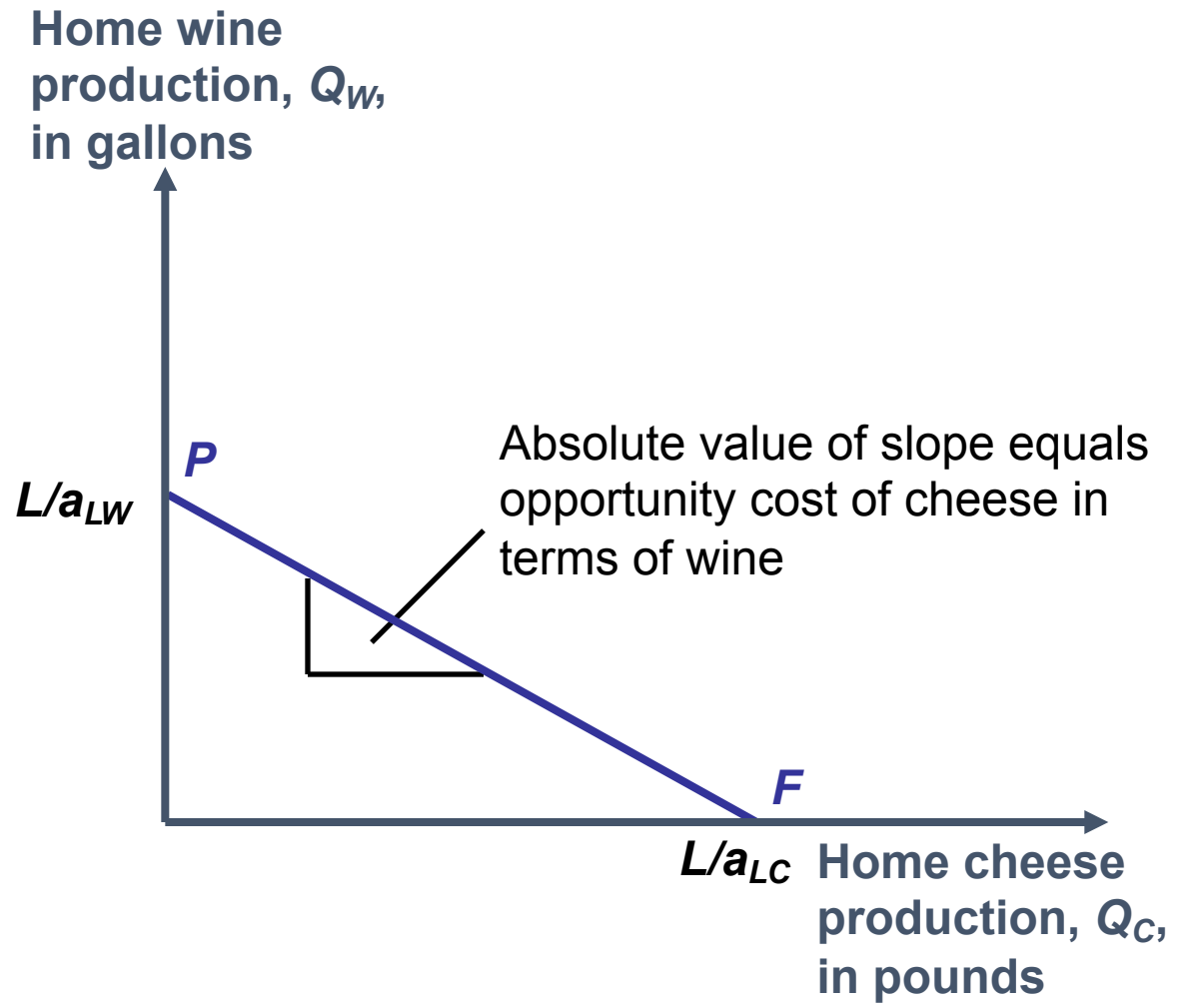
## ■ Production Possibilities

- The **production possibility frontier** (PPF) of an economy shows the maximum amount of a good (say wine) that can be produced for any given amount of another (say cheese), and vice versa.
- The PPF of our economy is given by the following equation:

$$a_{LC} Q_C + a_{LW} Q_W = L$$

- From our previous example, we get:

$$Q_C + 2Q_W = 120$$



- **Relative Prices and Supply**

- The particular amounts of each good produced are determined by prices.
- The relative price of good  $X$  (cheese) in terms of good  $Y$  (wine) is the amount of good  $Y$  (wine) that can be exchanged for one unit of good  $X$  (cheese)

- Denote with  $P_C$  the dollar price of cheese and with  $P_W$  the dollar price of wine. Denote with  $w_W$  the dollar wage in the wine industry and with  $w_C$  the dollar wage in the cheese industry.
- Then under perfect competition, the non-negative profit condition implies:
  - If  $P_W / a_W < w_W$ , then there is no production of  $Q_W$ .
  - If  $P_W / a_W = w_W$ , then there is production of  $Q_W$ .
  - If  $P_C / a_C < w_C$ , then there is no production of  $Q_C$ .
  - If  $P_C / a_C = w_C$ , then there is production of  $Q_C$ .

- The above relations imply that if the relative price of cheese ( $P_C / P_W$ ) exceeds its opportunity cost ( $a_{LC} / a_{LW}$ ), then the economy will specialize in the production of cheese.
- In the absence of trade, both goods are produced, and therefore  $P_C / P_W = a_{LC} / a_{LW}$ .

- What is the significance of the number  $(a_{LC} / a_{LW})$ ?

We saw in the previous section that it is the opportunity cost of cheese in terms of wine. We have therefore just derived a crucial proposition about the relationship between prices and production: *The economy will specialize in the production of cheese if the relative price of cheese exceeds its opportunity cost; it will specialize in the production of wine if the relative price of cheese is less than its opportunity cost.*

- *In the absence of international trade, the relative prices of goods are equal to their relative unit labor requirements.*

# Trade in a One-Factor World

- Assumptions of the model:
  - There are two countries in the world (Home and Foreign).
  - Each of the two countries produces two goods (say wine and cheese).
  - Labor is the only factor of production.
  - The supply of labor is fixed in each country.
  - The productivity of labor in each good is fixed.
  - Labor is not mobile across the two countries.
  - Perfect competition prevails in all markets.
  - All variables with an asterisk refer to the Foreign country.



- **Absolute Advantage**

- A country has an **absolute advantage** in a production of a good if it has a lower unit labor requirement than the foreign country in this good.
- Assume that  $a_{LC} < a_{LC}^*$  and  $a_{LW} < a_{LW}^*$ 
  - This assumption implies that Home has an absolute advantage in the production of both goods. Another way to see this is to notice that Home is more productive in the production of both goods than Foreign.
  - Even if Home has an absolute advantage in both goods, beneficial trade is possible.
- The pattern of trade will be determined by the concept of comparative advantage.

- Comparative Advantage

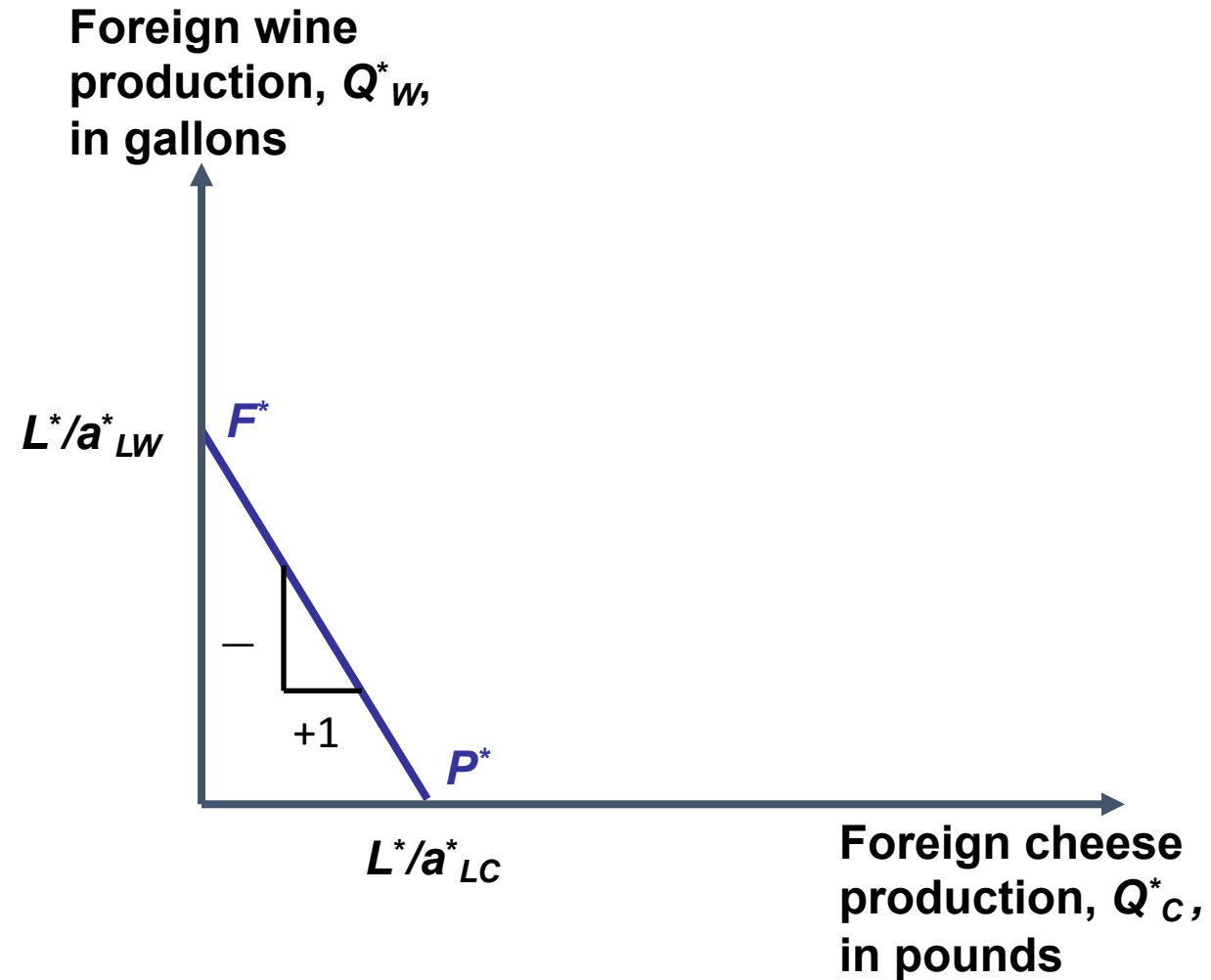
- Assume that  $a_{LC} / a_{LW} < a^*_{LC} / a^*_{LW}$

- This assumption implies that the opportunity cost of cheese in terms of wine is lower in Home than it is in Foreign.
- In other words, in the absence of trade, the relative price of cheese at Home is lower than the relative price of cheese at Foreign.

- Home has a comparative advantage in cheese and will export it to Foreign in exchange for wine.

# Trade in a One-Factor World

**Figure 2-2:** Foreign's Production Possibility Frontier



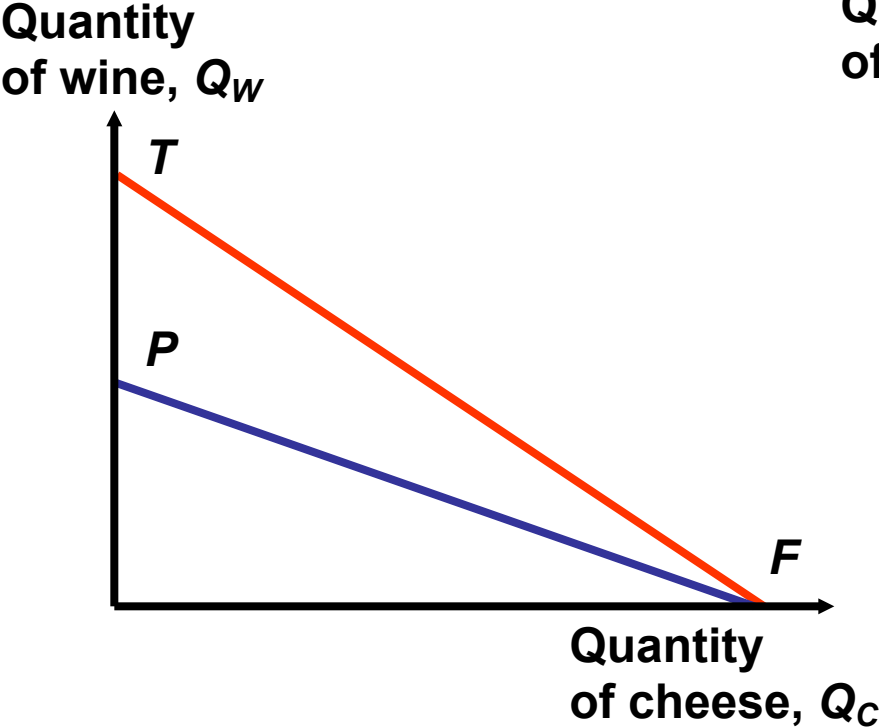
- **The Gains from Trade**

- If countries specialize according to their comparative advantage, they all gain from this specialization and trade.
- We will demonstrate these gains from trade in two ways.
- The first way to show that specialization and trade are beneficial is to think of trade as an indirect method of production. Home could produce wine directly, but trade with Foreign allows it to "produce" wine by producing cheese and then trading the cheese for wine. This indirect method of "producing" a gallon of wine is a more efficient method than direct production.

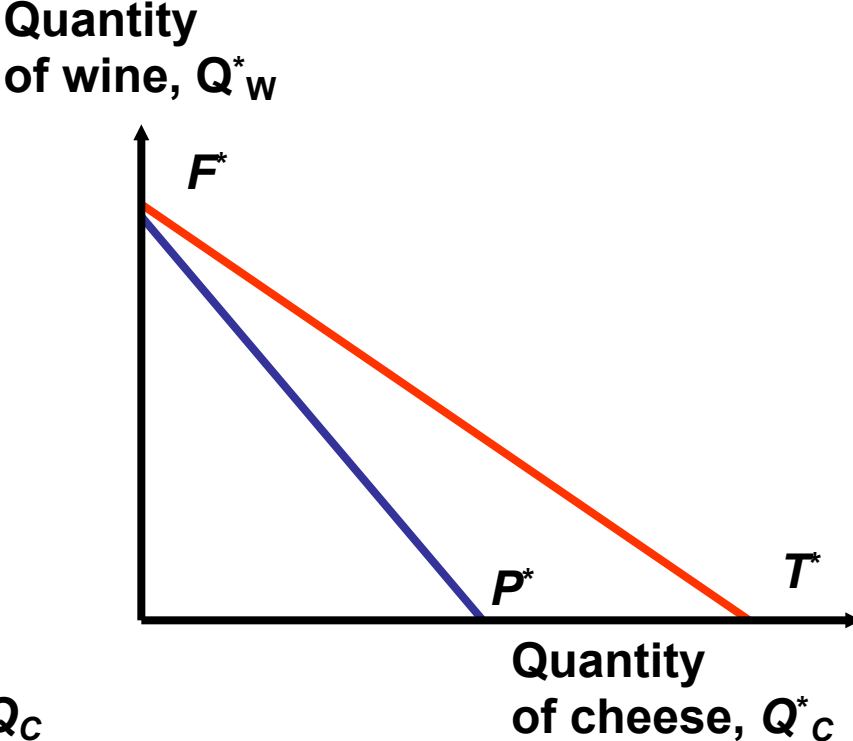
- Another way to see the gains from trade is to consider how trade affects the consumption in each of the two countries.
- The consumption possibility frontier states the maximum amount of consumption of a good a country can obtain for any given amount of the other commodity.
- In the absence of trade, the consumption possibility curve is the same as the production possibility curve.
- Trade enlarges the consumption possibility for each of the two countries.

# Trade in a One-Factor World

Trade Expands Consumption Possibilities



(a) Home



(b) Foreign

# Trade in a One-Factor World

## A Numerical Example

- The following table describes the technology of the two counties:

**Table** : Unit Labor Requirements

	<b>Cheese</b>	<b>Wine</b>
Home	$a_{LC} = 1$ hour per pound	$a_{LW} = 2$ hours per gallon
Foreign	$a_{LC}^* = 6$ hours per pound	$a_{LW}^* = 3$ hours per gallon

- The previous numerical example implies that:

$$a_{LC} / a_{LW} = 1/2 < a^*_{LC} / a^*_{LW} = 2$$

- In world equilibrium, the relative price of cheese must lie between these values. Assume that  $P_c/P_w = 1$  gallon of wine per pound of cheese.
- Both countries will specialize and gain from this specialization.
  - Consider Home, which can transform wine to cheese by either producing it internally or by producing cheese and then trading the cheese for wine



- Home can use one hour of labor to produce  $1/a_{LW} = 1/2$  gallon of wine if it does not trade.
- Alternatively, it can use one hour of labor to produce  $1/a_{LC} = 1$  pound of cheese, sell this amount to Foreign, and obtain 1 gallon of wine.

- In the absence of trade, Foreign can use one unit of labor to produce  $1/a_{LC}^* = 1/6$  pound of cheese using the domestic technology.
- Can it do better by specializing in wine and trading wine with Home for cheese?
- In the presence of trade, Foreign can use one unit of labor to produce  $1/a_{LW}^* = 1/3$  gallon of wine.
- Since the world price of wine is  $P_W / P_C = 1$  pound of cheese per gallon, Foreign can obtain  $1/3$  lb of cheese which is more than  $1/6$  lb.

- **Relative Wages**

- Because there are technological differences between the two countries, trade in goods does not make the wages equal across the two countries.
- A country with absolute advantage in both goods will enjoy a higher wage after trade.

- This can be illustrated with the help of a numerical example:
  - Assume that  $P_C = \$12$  and that  $P_W = \$12$ . Therefore, we have  $P_C / P_W = 1$  as in our previous example.
  - Since Home specializes in cheese after trade, its wage will be  $(1/a_{LC})P_C = (1/1)\$12 = \$12$ .
  - Since Foreign specializes in wine after trade, its wage will be  $(1/a_{LW}^*)P_W = (1/3)\$12 = \$4$ .
  - Therefore the relative wage of Home will be  $\$12/\$4 = 3$ .
  - Thus, the country with the higher absolute advantage will enjoy a higher wage after trade.

# Misconceptions About Comparative Advantage

- **Productivity and Competitiveness**
  - Myth 1: Free trade is beneficial only if a country is strong enough to withstand foreign competition.
    - This argument fails to recognize that trade is based on comparative not absolute advantage.
- **The Pauper Labor Argument**
  - Myth 2: Foreign competition is unfair and hurts other countries when it is based on low wages.
    - Again in our example Foreign has lower wages but still benefits from trade.

- **Exploitation**

- Myth 3: Trade makes the workers worse off in countries with lower wages.
  - In the absence of trade these workers would be worse off.
  - Denying the opportunity to export is to condemn poor people to continue to be poor.

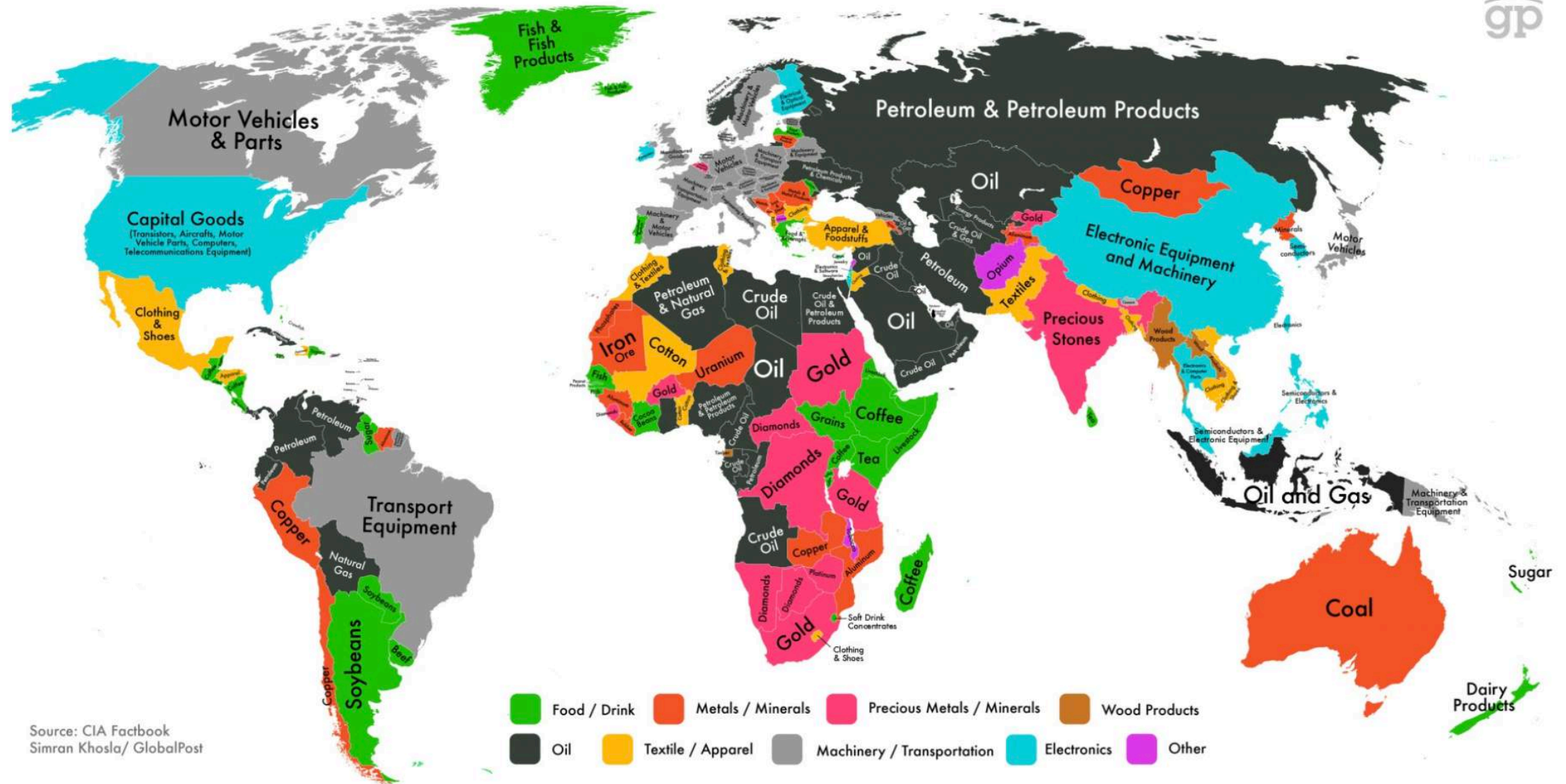
# Criticisms to the Ricardian theory of trade



David Ricardo  
British political economist  
(1772-1823)

The legacy of Ricardo dominated economic thinking throughout most of the 19th Century

- Simple world (only 2 goods ...)
- No transportation cost
- No price differences
- The theory only applies in situations where capital is immobile
- It assumes production is continuous and absolute (Constant return to scale)
- Effects on income distribution



Source: CIA Factbook  
Simran Khosla/ GlobalPost

Main message of Ricardo: If a country is producing multiple stuff and they are better in producing multiple things, it does not necessarily mean that they should produce all that stuff , they should specialize in the stuff where they have lower opportunity cost → Specialization



# International Trade Theory

## 1. Mercantilism:

Government involvement in promoting exports and limiting imports (popular in 1500) : goal → accumulating gold and silver

Zero-sum game → gain by one country is a loss to another

Mostly practiced with currency manipulation → shrink the trade by reducing imports

Today: Neo-Mercantilism policies:

Countries are accused of deliberately keeping their currency low against US\$ to sell more to US.

Ex. Japan & recently China

## 2. Ricardo's theory of comparative advantage:

Trade patterns reflect differences in labor productivity

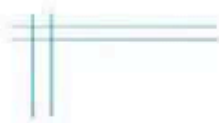
## 3. Heckscher and Ohlin:

Links pattern of trade of a country to its endowments of factors of production

Trade reflects the interplay between the proportions in which the factors of production are available in different countries and the proportions in which they are needed for producing particular goods

Countries will export products that use extensively the factor that is abundant in the country

**Leontief Paradox**: Although capital is abundant in US, US exports are less capital extensive than US imports!



# Trade Theories

## Heckscher-Ohlin Theory

---

And The Leontief Paradox



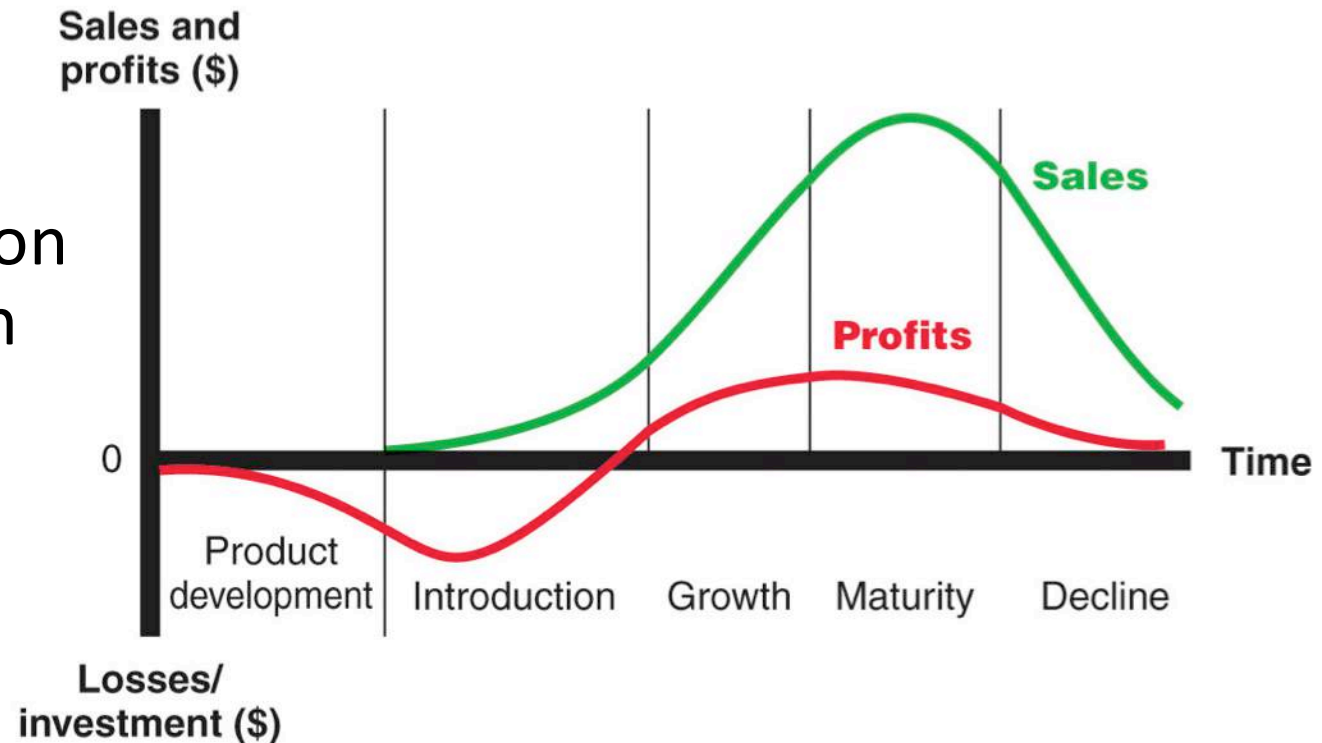
## 4. Raymond Vernon: (mid -1960s)

### Products life cycle theory

As products mature both the location of sales and the optimal production location will change, affecting the flow and direction of trade

Explained the high-tech products in 60s and 70s

Today : less valid



## 5. New Trade Theory:

Paul Krugman's "New trade theory" developed in the 80's  
(Krugman's Nobel 2008)

The economies of scale (unit cost reduction)

- The world market can only support a limited number of firms in some industries  
(Without trade a small nation cannot support the necessary demand and certain products may not be produced)
- Trade will skew toward those countries that have firms that were able to capture first mover advantages
- If you can get the economy of the scale first, it is very challenging for the others to enter the market (creates a barrier)  
Ex. In video game business → Nintendo and Sony (very few companies could challenge them Microsoft tried with Xbox with many years of loss!)



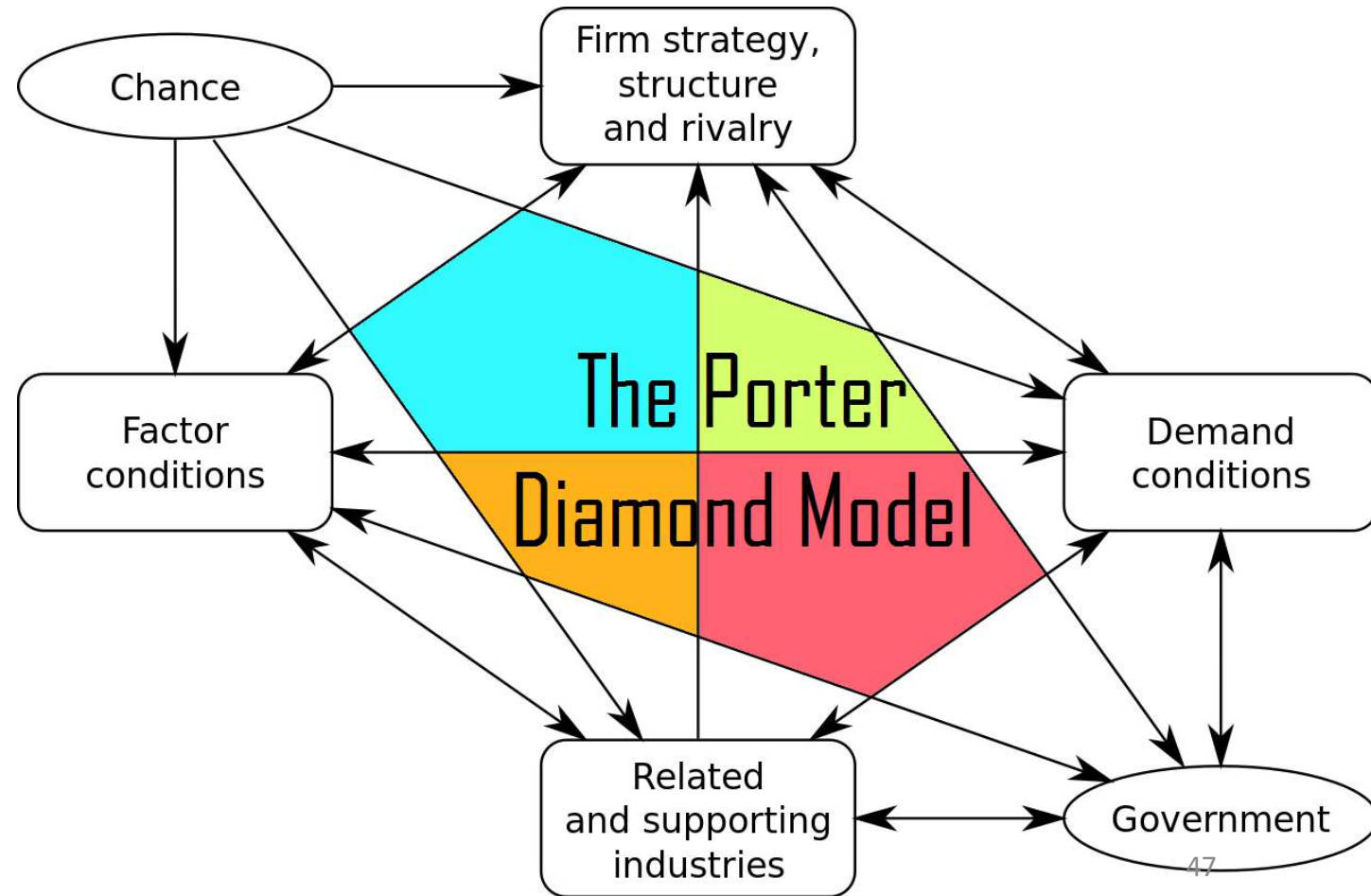
<https://www.youtube.com/watch?v=pfte6Ynpe8w>

## 6. Michael Porter's Diamond : (1979)

**Country factors** explain a nation's dominance in the production and export of certain products (national competitive advantage)

Why certain industries have become internationally competitive or possess *regional advantages*?

Ex. Car industry in Germany  
US. chemical industry  
Switzerland in pharmaceutical



## 7. The Melitz Model: (2003)

- The empirical evidence:
  - Exporters are in the minority. In 1992, only 21% of U.S. plants reported exporting anything.
  - Exporters sell most of their output domestically: around 2/3 of exporters sell less than 10% of their output abroad.
  - Exporters are bigger than non-exporters: they ship on average 5.6 times more than non-exporters (4.8 times more domestically).
  - Plants are also heterogeneous in measured productivity.
- **Note:** the Krugman model is not able to explain the evidence discussed above. In the model, all firms are identical and export to all possible destinations.



## Features of Melitz (2003)

- Dynamic Industry Model with heterogeneous firms where opening to trade leads to reallocations of resources within an industry
- In this framework opening to trade leads to
  - Reallocations of resources across firms
  - Low productivity firms exit
  - High productivity firms expand so there is a change in industry composition
  - High productivity firms enter export markets
  - Improvements in aggregate industry productivity
  - No change in firm productivity

# Implications of the trade theory

Three main implications for international firms:

- Location implication
- First mover implication
- Policy implications