BIEF

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HANDOUTS

INTERNATIONAL ECONOMICS

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This handout is written by students with no intention of replacing university materials.

It is a useful tool for studying the subject, but does not guarantee preparation as exhaustive and complete as the material recommended by the University.

International Economics Exam

Comprehensive Integrated Material

Gravity Model of Trade

It's a **basic statistical model** made by observing trade patterns and their dependence on distance and GDP:

$$T_{ij} = A\frac{Y_i * Y_j}{D_{ij}} \text{ or } \frac{T_{ij}}{T_{ik}} = \frac{Y_j * D_{ik}}{Y_k * D_{ij}}$$

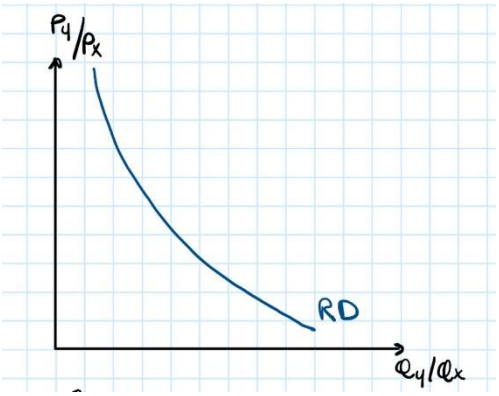
It's not an economic model, it cannot answer the questions on broader economic forces, types of products and income distribution. It is also a cross-sectional model, given the fact that **A changes constantly**, making it impossible to conduct a time-series analysis.

Consumer Relative Demand – Broadly Valid

Considering a typical Cobb-Douglas function $U = C_x * C_y$ we assume consumers equally split their income between two goods, which is exemplified as:

$$C_x * P_x = C_y * P_y = \frac{w * L}{2}$$

For the entire economy. This leads to deriving the **Marshallian Demand Functions** for the country: $C_{x,y} = \frac{w*L}{2P_{x,y}}$.



By this, we can safely state that the *relative demand* consumers adhere to in order to maximize their utility is given by equating consumption to supply of goods (*goods market-clearing condition*):

$$\frac{C_x}{C_y} = \frac{P_y}{P_x} = \frac{Q_x}{Q_y} \quad (RD)$$

This will be the standard utility-maximization model for the next models.

Ricardian Model of Trade

The model hinges on the concept of **relative comparative advantage in trade**. Countries gain from trade if *they export products that are relatively cheaper to produce to import those that are relatively more expensive to produce*. This happens even if the country has no absolute advantage or comprehensive absolute advantage in any of the goods it produces.

Consider the following assumptions for the Ricardian Model:

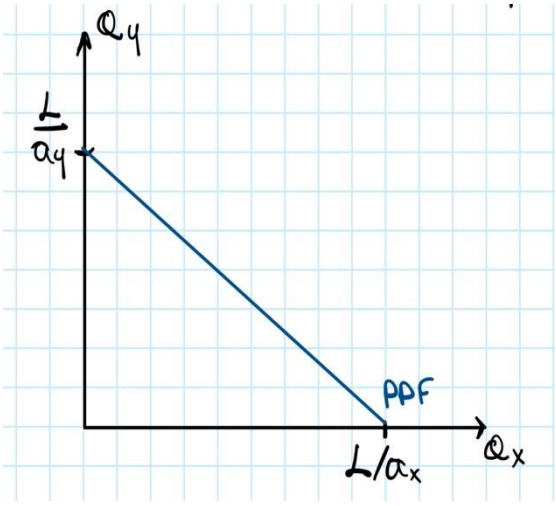
1. Two countries H and F;
2. Two goods X and Y;
3. Labor as the only factor of production;
4. Constant returns to scale in production;
5. Inelastic supply of labor per worker;
6. Labor productivity varies across countries and goods;
7. Markets are perfectly competitive, and producers are price and wage takers;
8. Workers can relocate across sectors, but not countries.

Assumptions on Technology and Market Structure

By assumption 3 and 4, $Q_x = \frac{1}{a_x} l_x$ and $Q_y = \frac{1}{a_y} l_y$ where $a_{x,y}$ is the number of workers necessary to produce a good. By assumption 5 we have that:

$$l_x + l_y = L \rightarrow Q_x * a_x + Q_y * a_y = L$$

Which is the *labor market clearing condition*. With these specific conditions in mind, we get that the **Production Possibility Frontier (PPF)** for the economy is given by:



$$Q_y = \frac{L}{a_y} - \frac{a_x}{a_y} Q_x$$

In which $-\frac{a_x}{a_y}$ is the **Marginal Rate of Transformation (MRT)**. Its calculation is more complicated for a nonlinear PPF. The frontier is subject to shocks that can determine either **shifts or pivots**.

If markets are perfectly competitive, firms will act in a profit-maximizing way and at equilibrium we'll have:

$$max(\pi)_{Q_{x,y}} = \left(P_{x,y} - w * a_{x,y}\right) * Q_{x,y} \rightarrow P_{x,y}^{max} = w * a_{x,y}$$

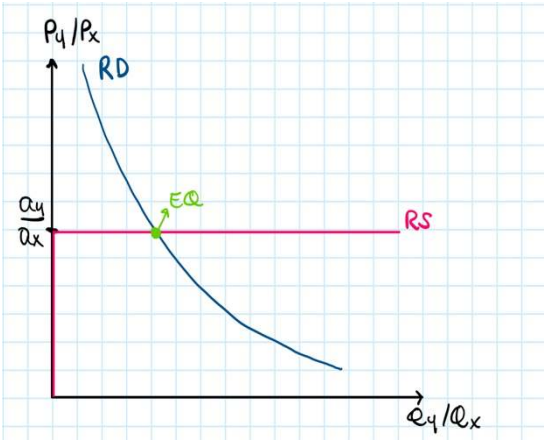
By analyzing the FOCs. This implies that **wages are equal to the Marginal Product of Labor**: $w = \frac{P_{x,y}}{a_{x,y}}$. The same can be obtained through *cost minimization in the factor market*: $min(wL_i)_{L_i}$ with the constraint $Q_i = \frac{1}{a_i} L_i$. By rewriting as a Lagrangian function:

$$\mathcal{L} = wL_i - \lambda * \left(\frac{1}{a_i} L_i - Q_i\right) \rightarrow \frac{\partial \mathcal{L}}{\partial \mathrm{L_i}} = w - \lambda \frac{1}{a_i} \rightarrow \lambda = w * a_i$$

Which is the *shadow price of a unit of output* corresponding to price under perfect competition.

Autarky Equilibrium

In autarky, consumers are bound by their budget and their **relative demand curve**, supply is more complex. Prices must be equal to **marginal cost**, hence:



$$\frac{P_y}{P_x} = \frac{w * a_y}{w * a_x} = \frac{a_y}{a_x} \quad (RS)$$

In case $\frac{P_y}{P_x} < \frac{a_y}{a_x}$ it will only be that $p_y < w * a_y$ will hold in equilibrium, leading to the non-production of good x. Noticeably, the **Relative Supply Curve is Flat** due to assumption 4 and the previous discussion on market structure and technology.

In equilibrium, *autarky prices are determined by RS alone and RD determines only the production levels*:

$$RS = RD \rightarrow \frac{Q_x}{Q_y} = \frac{a_y}{a_x} \rightarrow \frac{a_x * Q_x}{a_y * Q_y} = \frac{L_x}{L_y} = 1 \rightarrow L_x = L_y = \frac{L}{2}$$

Which leads to $C_i = \frac{L}{2a_i}$ since **consumers are expected to evenly split their wage across goods**.

Free Trade Equilibrium – Two Countries Sub-Model

Now update the autarky sub-model by assuming that **World demand and supply are equated,** and **each country's demand and supply of labor are equated**. By this, RD remains equal as under autarky *as long as the two countries' consumers share the same preferences*.

Now assume that $\frac{a_y^H}{a_x^H} < \frac{a_y^F}{a_x^F}$ (H specializes in producing y), to construct the world's RS function, we result to using a piecewise system:

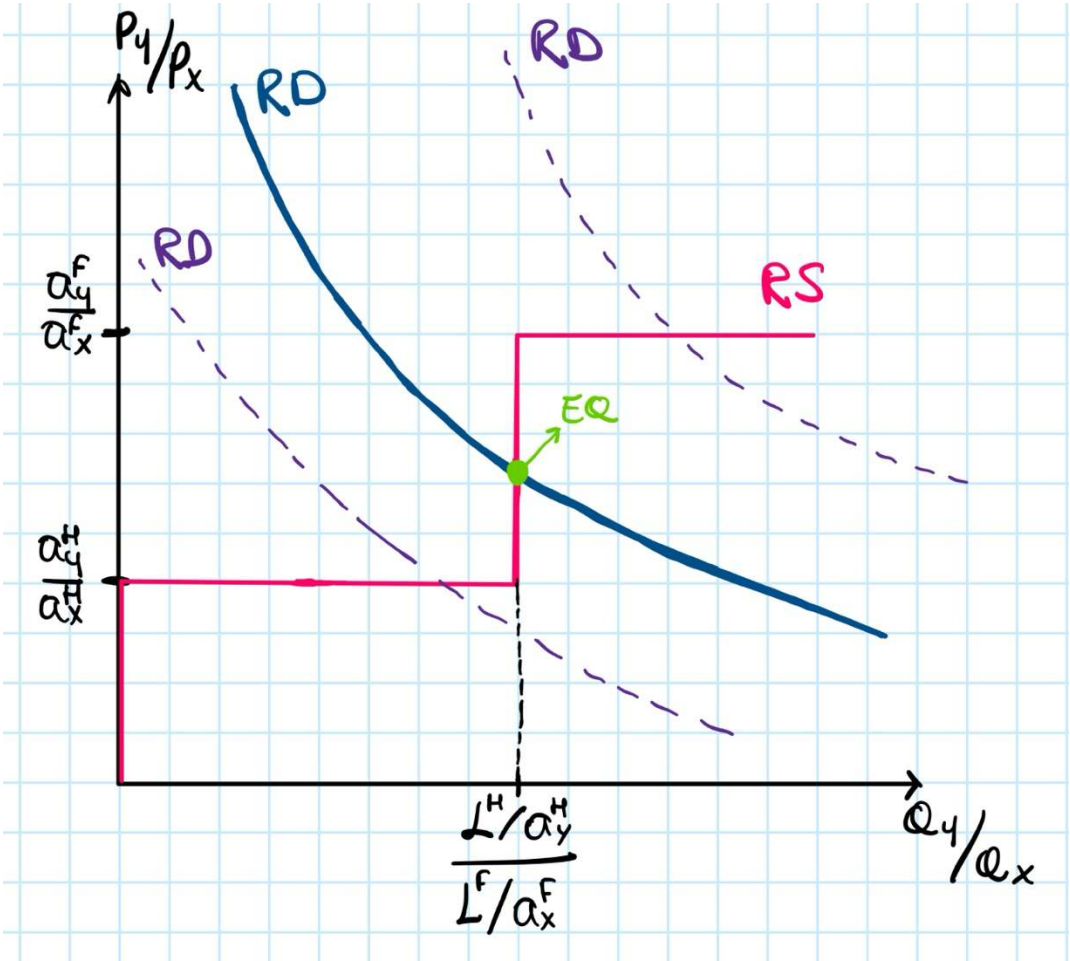
- If $\left(\frac{P_y}{P_x}\right)^W < \frac{a_y^H}{a_x^H} < \frac{a_y^F}{a_x^F}$ nobody will produce good y, as its price is lower than MC;
- If $\left(\frac{P_y}{P_x}\right)^W = \frac{a_y^H}{a_x^H} < \frac{a_y^F}{a_x^F}$, country H will be indifferent in producing x and y, but F will produce only x;
- If $\frac{a_y^H}{a_x^H} < \left(\frac{P_y}{P_x}\right)^W < \frac{a_y^F}{a_x^F}$, then each country will **fully specialize in producing only one item**;

- If $\frac{a_y^H}{a_x^H} < \frac{a_y^F}{a_x^F} = \left(\frac{P_y}{P_x}\right)^W$, country F will be indifferent in producing x and y, but H will produce only y;
- If $\frac{a_y^H}{a_x^H} < \frac{a_y^F}{a_x^F} < \left(\frac{P_y}{P_x}\right)^W$ nobody will produce good x, as its price is lower than MC;

Which leads to the following RS curve:

$$\frac{P_y}{P_x} = \begin{cases} \frac{a_y^H}{a_x^H} & \text{if H is imperfectly specialized} \\ \left[\frac{a_y^H}{a_x^H}; \frac{a_y^F}{a_x^F}\right] & \text{if both are perfectly specialized} \\ \frac{a_y^F}{a_x^F} & \text{if F is imperfectly specialized} \end{cases}$$

With *perfect specialization acquired if* $\frac{Q_y^W}{Q_x^W} = \frac{L^H/a_y^H}{L^F/a_x^H}$.

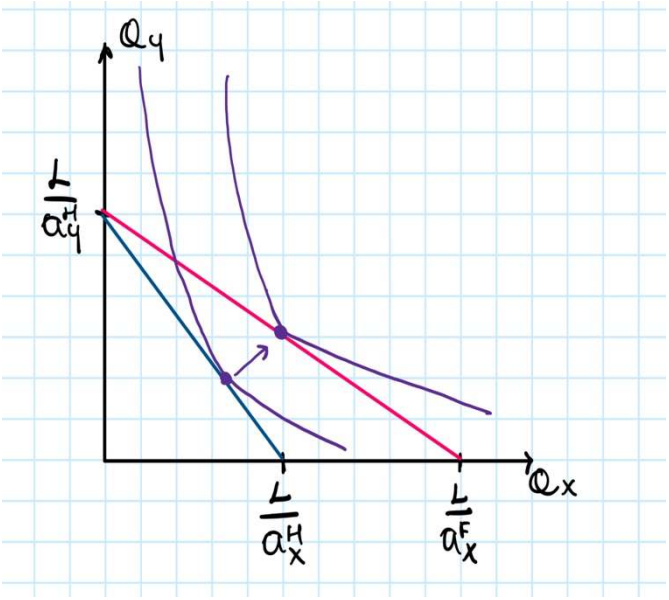


Gains from Trade

The PPF under autarky is given by $Q_y = \frac{L}{a_y} - \frac{a_x}{a_y} * Q_x$, whilst under free trade is given by:

$$wL = Q_x P_x + Q_y P_y \rightarrow Q_y = \frac{wL}{P_y} - \frac{P_x}{P_y} Q_x \rightarrow Q_y = \frac{P_x L}{a_x * P_y} - \frac{P_x}{P_y} Q_x$$

And since it's held that $\frac{P_x L}{a_x * P_y} > \frac{L}{a_y}$ and that $\frac{P_x}{P_y} > \frac{a_x}{a_y}$, it's implied that the **effects of trade are analogous to an expansion of the PPF**, hence **aggregate welfare will increase**. *Attention: under autarky wage is irrelevant as internal supply and consumption equate each other. In free-trade the countries are exchanging goods and internal demand and supply is not necessarily matched!* In the Ricardian Model, **a country gains from trade only if it fully specializes**, otherwise its welfare will be the same as under autarky.



The model also doesn't make prescriptions regarding **wage equalization** following price equalization: relative wages depend on **productivity levels** (technology) and **terms of trade** (relative prices):

$$\frac{w^H}{w^F} = \frac{P_y^W / a_y^F}{P_x^W / a_x^F}$$

Also, by the fact that H is more specialized in producing y, we have that:

$$\frac{a_x^F}{a_x^H} \leq \frac{w^H}{w^F} \leq \frac{a_y^F}{a_y^H}$$

And if H has an absolute advantage in both markets, then $w^H > w^F$, leading to higher per-capita welfare: F has a comparative advantage even if has two absolute disadvantages **because its wages are cheaper**.

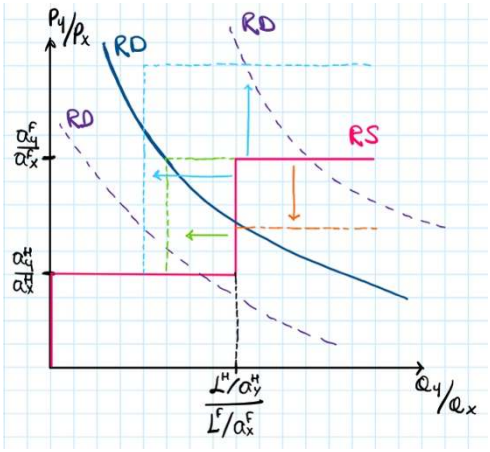
Common misconceptions about trade through the lenses of the Ricardian Model include:

- **Free trade is beneficial only if countries are strong enough to stave-off foreign competition**, which is limited because what matters is comparative, not absolute advantage;
- **Low-wage foreign labor hurts domestic labor in the same industry**, which is limited because countries that specialize gain from trade or remain in autarky-like equilibrium;
- **Free-trade exploits low-income countries**, which is limited because of the gains from trade and the even lower alternative under autarky.

However, it is true that **Ricardo doesn't dive into redistribution of the gains from trade**, which can create problems if the workforce doesn't adapt fast enough. This will be relevant in later models.

Applications and Extensions to the Model

To evaluate shocks to the equilibrium we must focus on the **terms of trade**, or relative prices: if they increase for H, **its welfare will increase** and vice-versa.



- If $\Delta L^F > 0$, then RS shifts backwards and the ToT for H either stay the same or improve (additional labor decreases the relative price of imported goods in H. *Larger countries are likely to specialize imperfectly*);
- If $\Delta a_y^F = \Delta a_x^F < 0$, the effect is analogous to the previous case and H's ToT are likely to improve, but this **benefits F as well** more than the simple population increase (even if some gains spill over).
- If $\Delta a_y^F \neq \Delta a_x^F < 0$, the benefit for H is even stronger as RS shifts upwards as well. This is synonymous with *import-biased productivity growth* in F, potentially leading to the disappearance of jobs in the import-substituted industry due to **perfect specialization**.
- The opposite happens if $\Delta a_x^F \neq \Delta a_y^F < 0$ and the RS curve shifts downwards.

Certain changes **may benefit more some countries than others** whilst maintaining that **trade benefits all in aggregate**.

Empirical Evidence and Limitations

It is observed that **countries export the good they more productive are in** and that **wages are higher the higher the country's productivity is** due to the fact that export prices are higher under free trade than under autarky for consumption of the same good. Even if the basic model is generally true and instructive, it can be **very unrealistic**: this has been fixed by economists like Samuelson and Kortum by expanding the model to include more countries and more goods. The main findings remain true (gains from trade and specialization), but in a world with multiple countries **complete specialization doesn't occur**. Moreover, differences in education and institutional development can lead to **asymmetries in productivity for the same good in comparable economies**, alongside artificial and natural barriers to trade.

Specific Factors Model (SFM)

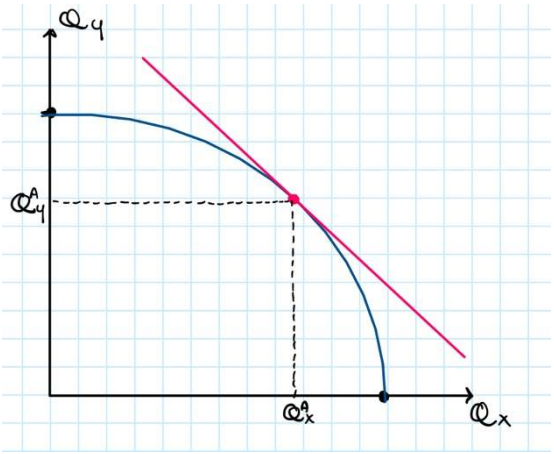
Trade might generate inequality in trading economies. The SFM postulates that **factors don't move seamlessly between sectors** in the short run. Consider the following:

- Two goods in two countries, same as Ricardian Model;
- Same consumer utility-maximizing behavior;
- Two **factors of production**: L(abor) and K(apital);
- **One factor is fixed and doesn't move across industries** (usually labor), while another moves seamlessly and equalizes its rate of return across all countries.

Production Technology

Consider now that $Q_{x,y} = K_{x,y}^{0.5} * L_{x,y}^{0.5}$, where $\overline{L}_{TOT} = \overline{L}_x + \overline{L}_y$ and $\overline{K}_{TOT} = K_x + K_y$ are exogenously determined. The main properties of the **Cobb-Douglas Production Function** are:

- *Constant Returns to Scale*: $f(\lambda L, \lambda K) = (\lambda L)^{0.5} * (\lambda K)^{0.5} = \lambda f(K, L)$;
- *Diminishing Marginal Product of each Factor* ($f_{KK} < 0 \wedge f_{LL} < 0$):
  - $\frac{\partial^2 Q}{\partial L \partial L} = 0.5 * (-0.5) * L^{0.5} * K^{-1.5}$
- *Increasing Marginal Product if there are more inputs* ($f_{LK} > 0 \wedge f_{KL} > 0$):
  - $\frac{\partial^2 Q}{\partial K \partial L} = 0.5 * (+0.5) * L^{-0.5} * K^{-0.5}$



The PPF in the SFM model represents the **maximum amount produced given K and L**: the slope of the frontier is still the MRT between y and x, but now there are different assumptions than the Ricardian Model. Combining the previously cited **resource constraint with the CD Production Function**:

$$\overline{K} = K_x + K_y \quad \text{and} \quad Q_i = K_i^{0.5} * L_i^{0.5} \rightarrow K_i = \frac{Q_i^2}{\overline{L}_i^{0.5}}$$

We get the following PPF (through a *linearization* of the final result):

$$\overline{K} = K_x + K_y = \frac{Q_x}{\overline{L}_x^{0.5}} + \frac{Q_y}{\overline{L}_y^{0.5}} \rightarrow Q_y = \left(\frac{\overline{L}_y^{0.5}}{K_y^{0.5}}\right)\overline{K} - \left(\frac{\overline{L}_y K_x}{\overline{L}_x K_y}\right)^{0.5} Q_x$$

And $MRT = -\frac{MPK_y}{MPK_x} = -\left(\frac{\overline{L}_y K_x}{\overline{L}_x K_y}\right)^{0.5}$. The model differs from the Ricardian one because it doesn't imply constant returns to scale: the PPF is curved and not just linear, and one **must choose the profit-maximizing combination of labor and capital** in a competitive market.

By FOCs, we see that $max_{K_i,\overline{L}_i}\pi = P_i * f\left(K_i, \overline{L}_i\right) - RK_i - W_i\overline{L}_i$ is solved by:

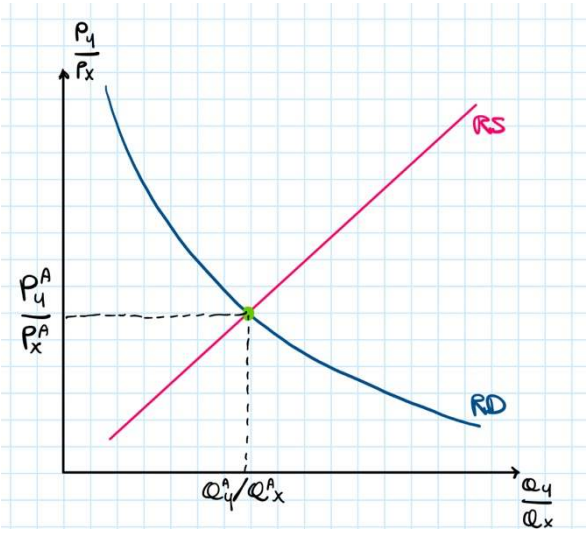
$$R = P_i * f_K\left(K_i, \overline{L}_i\right) \text{ and } W_i = P_i * f_{\overline{L}_i}\left(K_i, \overline{L}_i\right)$$

Autarky Equilibrium

Consumer RD is the same as in the Ricardian Model. Relative supply now depends on the allocation of the **mobile asset across sectors**, like capital. In perfect competition, marginal cost is equal to price, hence it holds that:

$$P_x * MPK_x = P_y * MPK_y \rightarrow \frac{P_y}{P_x} = \frac{MPK_x}{MPK_y} = \frac{0.5 * \left(\overline{L}_x/K_x\right)^{0.5}}{0.5 * \left(\overline{L}_y/K_y\right)^{0.5}}$$

$$\rightarrow \frac{\left(\overline{L}_x/\left(Q_x/\overline{L}_x^{0.5}\right)\right)^{0.5}}{\left(\overline{L}_y/\left(Q_y/\overline{L}_y^{0.5}\right)\right)^{0.5}} = \frac{\overline{L}_x * Q_y}{\overline{L}_y * Q_x} \quad (RS)$$



In the current Cobb-Douglas example. In equilibrium, it holds that $RS = RD$, hence: $\frac{P_y}{P_x} = \left(\frac{\overline{L}_x}{\overline{L}_y}\right)^{0.5}$ which corresponds to the **tangency point between PPF and the highest attainable indifference curve**, and the autarky relative price, or **Marginal Rate of Substitution** is equivalent to the **Marginal Rate of Transformation**. Moreover, given the relative prices we can find the *wages in autarky*.

By perfect mobility of capital across sectors, the **rental rate must be the same in all sectors**:

$$R = P_{x,y} * MPK_{x,y}$$

And is hence given by the intersection of two curves:

$$\frac{R}{P_x} = MPK_x = 0.5 * \left(\frac{\overline{L}_x}{K_x}\right)^{0.5} = \left(\frac{P_x}{P_y}\right) MPK_y = 0.5 * \frac{P_x}{P_y}\left(\frac{\overline{L}_y}{K_y}\right)^{0.5}$$

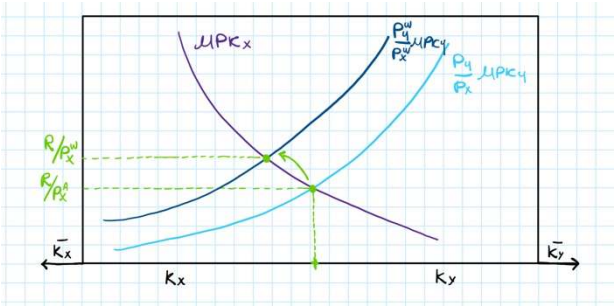
Which determines the per-sector allocation of capital. From this we find in an analogous way the **sector-specific wage**:

$$\frac{W_x}{P_x} = MPL_x = 0.5 * \left(\frac{K_x}{\overline{L_x}}\right)^{0.5} = \left(\frac{P_x}{P_y}\right) MPL_y = \left(\frac{P_x}{P_y}\right) * 0.5 * \left(\frac{K_y}{\overline{L_y}}\right)^{0.5}$$

Analytical Solution to the Model [**Optional**]

By combining the ratio of required capital for each good and the EQ relative prices, we get that: $K_y = K_x \rightarrow Q_i = \frac{1}{\sqrt{2}} * \overline{K}^{0.5} * \overline{L_i}^{0.5}$ due to the equal weights in the CD function.

Free Trade Equilibrium



Assume now the country in question opens its economy to trade and becomes a **relative price taker** and will begin exporting the goods that have a lower relative price under autarky, hence having $\left(\frac{P_y}{P_x}\right)^A < \left(\frac{P_y}{P_x}\right)^T$. By this, $\Delta K_y > 0 \rightarrow \Delta Q_y > 0$ and the opposite occurs for good x. Under the Ricardian assumptions, countries either perfectly specialize or they do not, but here **the more capital flows to the exported good, the more il will be produced but at a lower marginal benefit** and the opposite happens for the good designated for internal consumption. *Countries always produce at least some of each good*.

By the autarky capital market EQ, we find that there will be **aggregate gains from trade**, but **unequal distributional effects**, both relative and absolute and where will be *losers from trade*:

- If $W_{x,y}/P_{x,y}$ increases and $W_{x,y}/P_{y,x}$, then workers in a specific market will be better off;
- If $R/P_{x,y}$ increases, then capital owners will be better off;
- If the ratio of wage in a market and either rental cost of capital or another wage increases, then workers in that markets are relatively better off than capitalists or other workers.

Distributional Effects

In the example for this dissertation, we have the following effects:

- Since $K_y \uparrow$, we know that $MPL_y \uparrow$ and $\frac{P_y}{P_x} MPL_y \uparrow\uparrow$ and y workers are better off under free trade;
- The opposite is true for x workers, which are worse-off under free trade;

- Effects on capital owners are more complex. The increase in capital allocation in market y reduces the marginal product of capital of the same industry, hence rental rate. The opposite happens in the x market, *leading to an ambiguous effect overall*;
- What it's certain is that **y workers are relatively better off than capital owners** under free-trade and the opposite is true for x workers.

In general, as long as a country will open its trade with the world and/or **have its terms of trade improve**, we'll observe:

- A gain in the specific factors of the exported industry and a loss in the other;
- An ambiguous effect on rental rates and capital owner welfare;
- A reduced effects on mobile factors in general.

Heckscher-Ohlin Model

To further explain distributional problems in the basic Ricardian Model, we can use the Heckscher-Ohlin model to introduce the concept of **factor endowment** in international trade.

Production Technology

Consider the simple CD production function: $Q_i = K_i^{\alpha_i} * L_i^{1-\alpha_i}$ with $\alpha \in (0,1)$ representing the importance of capital in production. The main properties of this function are i) **constant returns to scale overall**, but ii) **decreasing returns to factor of production**. Now assume that $\alpha_y < \alpha_x$: allocating two factors across two sectors the PPF is more complex to derive due to increasingly complex math (which is unimportant for the exam).

The key takeaway is that there are **exogenous resource constraints** such that:

$$\overline{L} = L_x + L_y \quad \text{and} \quad \overline{K} = K_x + K_y$$

And the slope of the PPF (downward-sloping and concave) represents the cost of **producing y in terms of x** and such opportunity cost increases the more a factor is allocated to y and taken away from x. Without loss of generalization, the opportunity cost is **not constant** and increasing in one good the more a country focuses on its production.

By the assumptions of **perfect competition in the goods and factors market**, the price must be equal to marginal cost for both, and the firms act in a profit maximizing way:

$$\mathcal{L} = wL_i + rK_i - \lambda_i\left(K_i^{\alpha_i} * L_i^{1-\alpha_i} - Q_i\right)$$

And by FOCs we get that:

$$r = \lambda_i \alpha_i \frac{Q_i}{K_i} \quad \text{and} \quad w = \lambda_i (1 - \alpha_i) \frac{Q_i}{L_i}$$

Which yields the **marginal cost of production** if plugged back in the Lagrangian:

$$\lambda_i = \left(\frac{r}{\alpha}\right)^{\alpha} \left(\frac{w}{1-\alpha}\right)^{1-\alpha}$$

Which are deemed to be constant due to CRS, hence it holds that $\lambda_i * Q = TC(Q)$.

Autarky Equilibrium

Let's begin in the goods market. RD is the usual one from SFM and Ricardo, RS is determined by the $P = MC$ condition of competitive markets and by the **full allocation of all factors**:

$$R = P_x * MPK_x = P_y * MPK_y$$
$$W = P_x * MPL_x = P_y * MPL_y$$

The economy naturally gravitates to a point in which the **value of production is maximized**, hence at the point in which an **isovalue line is perfectly tangent to the PPF**.

They are defined as:

$$V = Q_x P_x + Q_y P_y \rightarrow Q_y = \frac{V}{P_y} - \frac{P_x}{P_y} Q_x$$

By this, we notice that an increase in the relative price of a good **increases its supply**, and the RS curve is now **upwards sloping** because the PPF is nonlinear.

In the factor market, recall the optimal demands of labor and capital:

$$r = \mathrm{P}_i \alpha_i \frac{Q_i}{K_i} \quad \text{and} \quad w = \mathrm{P}_i (1 - \alpha_i) \frac{Q_i}{L_i}$$

Which gives us the **relative price of labor over capital**, leading to the **Wage-Rental Ratio**:

$$\frac{w}{r} = \frac{K_i(1-\alpha_i)}{L_i \alpha_i} \rightarrow \frac{L_i}{K_i} = \frac{(1-\alpha_i)}{\alpha_i} * \frac{r}{w}$$

Hence:

- When the wage-rental ratio increases, **firms reduce the labor-capital ratio** as now the former costs more:
  - $\partial \frac{L_i}{K_i} / \partial \frac{w}{r} < 0$;
- *For every level of the w-r ratio* a firm with a lo wer α_i will have a higher labor-capital ratio:
  - $\frac{L_x}{K_x} > \frac{L_y}{K_y} \Leftrightarrow \alpha_x > \alpha_y$

Given the production function, we derive that:

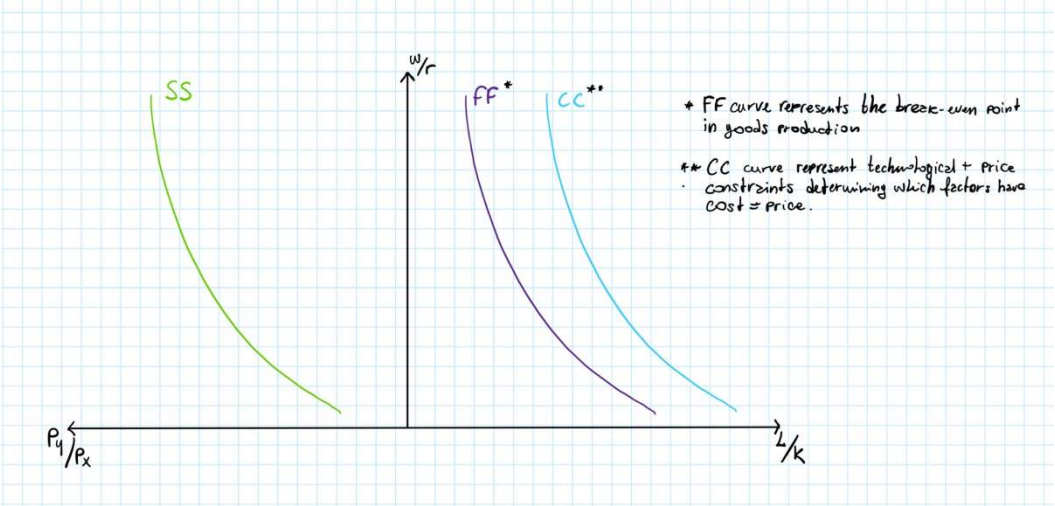
$$L_i = \left[\frac{(1-\alpha_i)r}{\alpha_i w}\right]^{\alpha_i} Q_i \quad \text{and} \quad K_i = \left[\frac{\alpha_i w}{(1-\alpha_i)r}\right]^{1-\alpha_i} Q_i$$

To link goods and factors market, recall that i) **price is equal to marginal cost**, and that ii) **combining both sectors yields**:

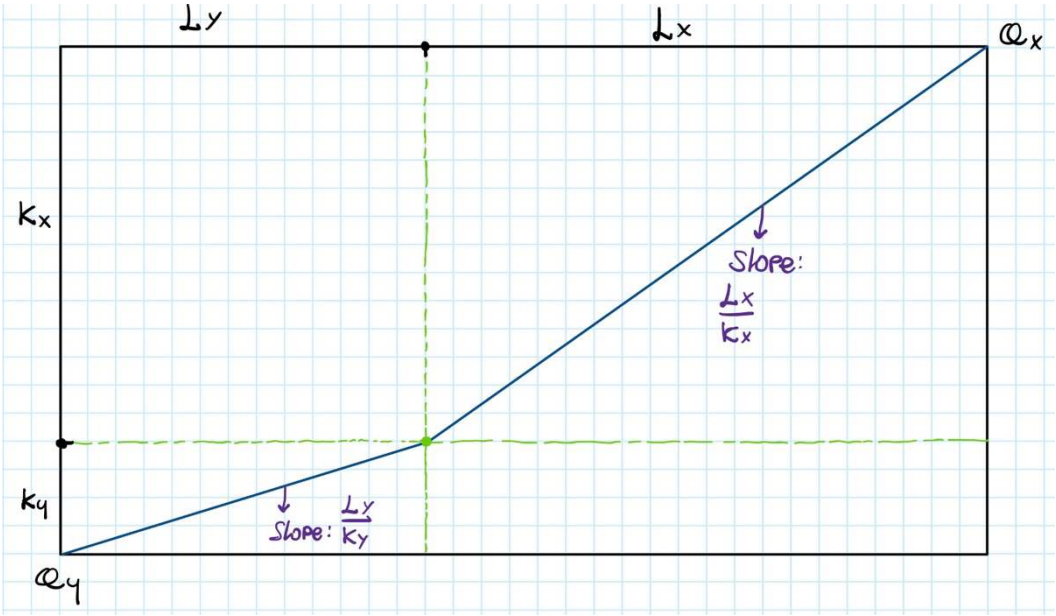
$$SS: \quad \frac{P_y}{P_x} = \left(\frac{w}{r}\right)^{\alpha_x - \alpha_y} * \frac{\alpha_x^{\alpha_x}(1-\alpha_x)^{1-\alpha_x}}{\alpha_y^{\alpha_y}(1-\alpha_y)^{1-\alpha_y}}$$

Showing that *relative goods prices pin down relative factor prices and endowments*.

This relation is called **Stolper-Samuelson Curve,** and it shows how prices in the goods market affect wages and capital return in the factor market. If the price of y relative to x increases, since it is the *more labor intensive good*, labor will become **relatively more expensive than capital** and the opposite will happen to capital. In the factors market, an increase in the wage-to-rental ratio **causes a fall in the relative use of labor over capital**, but the more labor-intensive industry sees a lesser fall in its labor endowment and *can hence tolerate higher wages*.



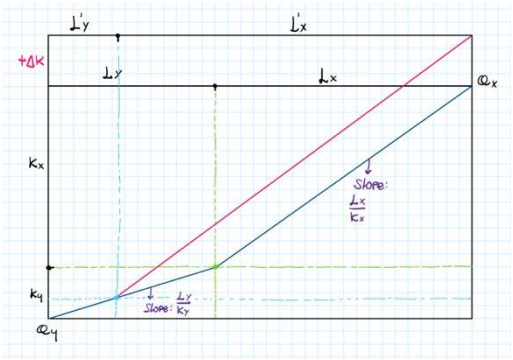
By assuming **full employment,** we can say that the **unit-factor requirements (a_L and a_K) correspond with the capital and labor allocations** discussed prior under the same core assumptions. By this we identify the *factor market-clearing conditions* by stating that at EQ **both goods are produced** and for that to happen, both the resource constraints $\overline{L} = a_{L_x} * Q_x + a_{L_y} * Q_y$ and $\overline{K} = a_{K_x} * Q_x + a_{K_y} * Q_y$. This produces a kink in the Edgeworth Box-Styled Diagram below. **At the kink, the economy produces both goods** and shocks to the terms of trade affect the slopes of the constraints, influencing production.



Free Trade Equilibrium Properties

Under free trade, the HO Model makes derivation of the following theorems possible:

Rybczynski Theorem



For given relative goods prices, an increase in the endowment of a factor will increase the output of the industry using it intensively and reduce the output in the other. This is equivalent to say that **an increase in factor prices will increase output in the industry using them** as both are intertwined.

Heckscher-Ohlin Theorem

A country has a comparative advantage in the good which utilizes its abundant factor intensively. If there is a country F different from H, and which is more labor abundant, then this country will have a **higher relative price for labor intensive goods under autarky**. H will export the labor-intensive goods to F at a profit and import capital intensive goods from F at a lower opportunity cost than what would be incurred under autarky. The Ricardian assumption of aggregate gains from trade is respected.

Stolper-Samuelson Theorem

An increase in the relative price of a good will cause an increase in the real return to the factor used intensively in the production of that good, and reduce the real return in the factor used intensively for the other good. This is because **changes in goods prices are weighted averages of the changes in factor prices**. Increases in

the relative price of the goods produced using more labor will cause an increase in wages economy-wide and a fall in rental rates of capital. By using the HO theorem to identify the goods to be exported, one can **study the distributional effects of free trade on an economy**. *Other factors may impact these effects, S-S is not a panacea*.

Factor Price Equalization Theorem

When two countries engage in free trade and share technology and production levels, then their factor prices are the same across the economies. The key assumptions lead to both countries having the same BE conditions. By this theorem, **trade is a perfect substitute for international factor mobility** as it also equalizes prices. A result of this is the **factor-price insensitivity** for which, given goods relative prices, relative factor prices don't change if factor endowments change.

Empirics on SFM and HO

As said before, SFM and HO account for different timeframes while keeping the core factor-centric considerations mostly similar (i.e., countries export goods for which they employ abundantly a factor they have an endowment of). Empirically, these models can give insight into **trade-genic inequality**.

The recent increase in US college tuition fees is not due to a fall in the supply of knowledge, but possibly from an **increase in its relative demand** following the opening of trade with China. By the SS Theorem, the **skill premium of advanced workers increased** as the US began exporting high-tech goods. This skill premium increase can lead to a market pivot towards unskilled labor regardless of an expansion of the high-tech export industry. The opposite is supposed to happen in China, which is deemed more abundant in unskilled labor.

However there may be other forces at play, especially given that **differentiation and signs of skill premium increases in China** contradict and give nuance to the model. Moreover, the aggressive increase in inequality in the US cannot be due to the SS Effect because trade is not that prevalent in the economy to begin with. The consensus stresses the validity of such results, whilst the effects of computerization on old-school analog jobs and skill upgrading industry-wide are being put in first order.

The prevalence of Global North offshoring further strengthens the authority of the results. If trade costs fall worldwide, then offshoring to China becomes more profitable and higher-skilled jobs become more prevalent in higher income economies: the offshored industries are **higher tech for China as well**, hence the skill premium increases in both countries. Bottom-line SS cannot explain everything in a dynamic trade environment. Exporters specifically hire higher-skilled workers: this can create a Stolper-Samuelson-esque effect.

Another effect can lead to a complete departure from HO and lead back to SFM: the effects of import-led labor substitution doesn't dissipate across the entire economy seamlessly but **hit the wrong sectors at the wrong time**. Certain regions may be more affected by the invasion of cheaper goods than others, leading to asymmetric effects: wages fall faster in the more affected areas and transfer payments grow alongside unemployment and retreat from the labor force. If factors were *generic*, then all sectors of the industry would react in comparable ways, but **if factors are specific, then the zone-specific shock is more intense**. In this context SFM is more representative of the reality of empirically sourced data (Autor et al, 2013).

The previous works best under very strong assumptions of exchange rate and equilibrium neutrality. This is not realistic and today the main explanation for the fall in the manufacturing share of labor is due to the **disproportionate increase in productivity growth in the manufacturing sector** compared to services.

Unemployment is not at the forefront of international trade discussions, as they are largely based on the importance of the effects on real incomes. This can be done if the **assumption of fixed unemployment is reasonable**. Unemployment can either be *cyclical*, or informed by short-term shocks or business cycles, whilst *natural unemployment* is the long-term underlying unemployment of the economic model due to search-and-matching frictions and Keynesian wage rigidities.

While trade liberalization is unlikely to cause cyclical unemployment, **adjustment frictions and factor non-mobility could explain it**. These frictions appear to be especially important in the US. An analysis on the effects of CUSFTA on wages and labor showed that all jobs lost were recuperated in the following decade. Artuc et al (2010) tries to quantify inter-sectoral employment effects using structural models of labor and trade. The mobility costs found were **six times the average annual income in the US**. Dix-Carneiro (2014) scaled back the effects and Karambourov (2009) stressed the role of labor mobility costs.

It's also important to note that the US labor market has a much-higher-than-average turnover for the developed world (20%).

Economies of Scale

Trade between similarly endowed countries is hard to explain with the previous models. These nuances can be explained through **Economies of Scale and Product differentiation**. EoS is defined as the process by which *production of a good increases more than proportionally than the increase in one of its required factors*. In real life, countries with similar factor endowments can exchange differentiated goods and reap the benefits of trade even if there is no clear factor endowment at play.

This is because **concentrating on a few goods empowers EoS** and generates trade between countries that might be almost if not perfectly identical. But *why would average production costs fall if output increases*? Economists distinguish between:

- **Internal EoS**, generated through business decisions and structure, reduce average costs through the firm's own output. However, *internal EoS are incompatible with perfect competition*:

$MC < AC \rightarrow$ EoS apply, but if $P = MC \rightarrow$ the firms has losses and is bankrupt

    - Leading to the necessity of having a model that **includes some form of market power** to allow for EoS.
- **External EoS**, which occur *when the cost-per-unit depends on the size of the industry*, are better shown through agglomeration and production clusters like the Rhineland. This can be puzzling because if you were to open a tech office in Palo Alto, you would pay more than in Grand Rapids, Montana.

In 1890 Marshall identified three sources of EoS: **specialized suppliers, labor market pooling and knowledge spillovers** from close-by competitors. These forces are stronger than ever despite the rise of faster and computerized communication (Moretti). Let us now focus on one single good and its related market (*partial equilibrium analysis*).

Consider a market in which agglomerated firms join freely and **average costs decrease in quantity**. By this, at EQ, it holds that $P = AC$. If a country like China has its average cost below the USs, then **it will prevail in the market and lower prices worldwide**. *Such advantages can be due to factor endowments or pure luck, which can lead to industries spawning in the wrong spot at the wrong time and generate losses from trade*. This is the **foundation of the infant industry argument**: if Thai watchmakers want to enter the market with a nascent industry, their costs will be above the Swiss watchmakers, and they will be noncompetitive and bankrupt. Thailand will subsidize its watch industry. Clusters can break down or weaken, such as London's financial hub post-Brexit (results are inconsistent still).

Monopolistic Competition

Paul Krugman stated that the environment in which EoS was possible was one of **imperfect competition** to be activated. This led to the rise in prominence of the **monopolistic competition model** which rests on the following assumptions:

- Each firm acts as monopolist over a variety in a market of **differentiated goods**;
- The goods are **imperfects substitutes** and firms must mind their competitiveness with other players to not alienate consumers;
- Free entry is possible with new varieties.

The key difference from the previous models is that **there is no factor market equilibrium** and there is **only one sector or good**, leading to Partial EQ Analysis. Without overcomplicating the model with the utility function, **market demand is given by**:

$$Q = S\left[n^{-1} - b\left(P - \overline{P}\right)\right]$$

S, representing total industry output, **is assumed to be fixed** (oversimplification, but useful to our ends). If each firm charges the same price, then **every firm will output S/n,** and if they charge a higher price, then their market share will fall. To quantify this, b represents the consumers' sensitivity to a spread in price with respect to average price, the higher the more consumers are sensitive.

If every firm (irrespective of the factor market) has the following cost function:

$$TC(Q) = F + cQ \rightarrow AC(Q) = \frac{F}{Q} + c \rightarrow \Delta Q > 0 \Rightarrow \Delta AC(Q) < 0$$

Firms will act in a profit-maximizing way, therefore:

$$\max_P PQ - (cQ + F) \quad \text{such that} \quad Q = S\left[n^{-1} - b\left(P - \overline{P}\right)\right] \Rightarrow$$
$$\frac{\partial \pi}{\partial P} = 0 \Rightarrow S\left[n^{-1} - b\left(2P - \overline{P}\right)\right] + Sbc = 0 \Rightarrow SbP - Q = Sbc \Rightarrow$$
$$c = P - \frac{Q}{Sb}$$

Which indicates that **marginal cost is equal to marginal revenue at optimal price**, and we assume that $\overline{P}$ will be taken as given by the competing firms.

Autarky Equilibrium

In classical trade models (Ricardo, HO, SFM) equilibrium was given by equating relative supply and relative demand, and by allocating factors across sectors to equalize the return to factors, determining prices and quantities market wide. The endogenous variables were the price and quantity for each good, alongside factor allocation and marginal product.

In the new **Krugman Model**, sector level demand is considered exogenous, and the endogenous variables are quantities, firm specific and average prices, and number of firms. In equilibrium **firms make zero profits**, so that there is no entry. In autarky, the firms are identical and choose the same market-clearing price ($q_i = S/n$). By this, average costs can be derived from the **production function**:

$$AC = \frac{nF}{S} + c \quad \text{(CC)}$$

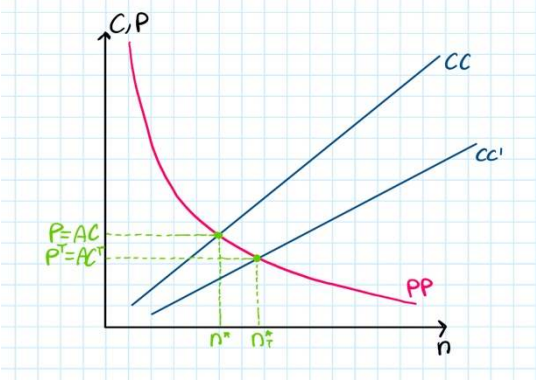
The more firms there are, the higher AC will get. On the other hand, given optimal price choice, we obtain:

$$P = c + \frac{Q}{Sb} \text{ and } Q = S/n \Rightarrow \overline{P} = \frac{1}{bn} \quad \text{(PP)}$$

More firms imply higher competition and lower average prices even with differentiation. In EQ, $P = AC$ and firms make no profits and there is no incentive to enter the market.

Trade Equilibrium

In trade, the most immediate effect is the **increase in market size** $\Delta S > 0$ which



pivots downwards the CC curve: this decreases prices and increases market participants , or $\left(\Delta\overline{P} < 0 \wedge \Delta n > 0\right)$. The main effect is the birth of **intra-industry trade**, which means imports and exports of different varieties of the same good and **trade is akin to an increase in the domestic market size**. This leads consumers to obtain a *larger number of varieties* (even if homegrown varieties decrease) *at a lower price* due to increased competition from outside.

Increasing returns to scale explains intra-industry trade between countries and it represents a sizable part of total world trade (25%-50%). IIT is measured through the **Grubel-Lloyd Index**: $GL_{ij} = 1 - \frac{|X_{ij} - I_{ij}|}{X_{ij} + I_{ij}}$: if it is 0, then there is no IIT, if it is at 1, then there is only IIT.

Krugman himself however stated that this is rapidly losing relevance, as **the increased intensity of trade between high- and low-income countries can be mostly explained by classical models of comparative advantage and factor endowment**. On the other hand, agglomeration has become more important than ever. It is widely held that **monopolistic competition can help understand the role of individual firms in global trade**.

Firm Heterogeneity

The focus now shifts towards the **firm** in the industries: they are the ones that engage in trade and not the entire country. Unlike the classical models (which have no space for firms) and the Krugman model (which has no firm differentiation), modern models try to introduce firms in a better way. Firms differ both qualitatively and quantitatively and *the productivity of an industry is the weighted average of the productivity of its firms* and each weight is the individual firm's market share.

Firms are important because their entrance or exit in the market **determines productivity and factor allocation**: Marc Melitz showed that firm expansion and

collapse have ample effect in his model and perspective industry outcome becomes an endogenous outcome. As winners are more productive than the losers, all things the same, **trade can increase aggregate productivity**.

Melitz Model

It builds off Krugman's model but introduces firm **cost asymmetry**: MC is determined randomly after the firm has paid the F cost of entry (there is no explanation of the deep origins of cost).

Demand function for a single variety is the same as under classical monopolistic competition:

$$Q = S\left[n^{-1} - b\left(P - \overline{P}\right)\right]$$

Assuming that the cost function of firm j is: $TC_i(q_i) = F + c_i * Q_i$, through the usual profit maximization problem, we find that $\boldsymbol{MC = MR \Rightarrow c = P_i - \frac{Q_i}{Sb}}$, hence $P_i = 0.5 * \left(c_i + \frac{1}{bn} + \overline{P}\right)$ by substituting Q_i for demand. By this, we obtain the following **inverse demand** and **marginal revenue curve**:

$$P_i = \overline{P} + \frac{1}{bn} - \frac{1}{bS}Q_i \quad \text{(D)}$$

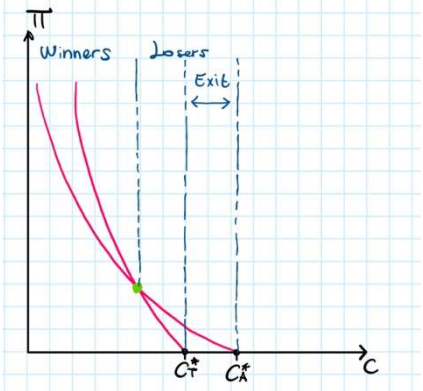
$$P_i = \overline{P} + \frac{1}{bn} - \frac{2}{bS}Q_i \quad \text{(MR)}$$

And it shows that **firms with higher marginal costs sell lower quantities at higher prices**. Moreover, they will have lower gross margins and lower profits. By this, in Melitz it is necessary to **understand which firms are active in EQ**, not only their number.

The maximum marginal cost a firm can incur in this model before incurring losses is $c^{MAX} = \overline{P} + \frac{1}{bn}$ at which $Q_i = 0$ (*zero profit cut-off condition*). By this, under autarky equilibrium, the main endogenous variables are **average price, number of firms and the marginal cost cut-off**.

Trade Equilibrium

The effects on market size and mean prices are the same as under Krugman, but now they **influence the D curve as well**: given an increase in S and a decrease in mean prices, leads to a *lowering of the intercept and an outwards pivot*. Selling little quantities becomes insufficient and the **zero profit cut-off condition tightens** ($\Delta c^{MAX} < 0$) and its curve's slope steepens. There are now winners and losers in trade, which can generate **downward pressure on certain sectors' wages** or hikes in



unemployment. *People can rarely relocate seamlessly to another employer once fired, giving credibility to the hypothesis that labor is a specific factor, if not a firm-specific one*.

Moreover, some unproductive firms may never go out of business if they provide preferred varieties on the domestic market. Moreover, trade costs (i.e., tariffs and marketing) are going to influence the lifespan of less productive competitors. Only a minority of firms act as exporters and **they are the most productive in the economy**: indeed, considering trade costs shows that many companies will never export as it is completely unprofitable for them to do so.

Multinational Firms

A multinational company is a *firm that controls and manages production establishments located in at least two countries*. This happens either due to **horizontal motives** (it is better to sell through a foreign subsidiary to reach a foreign market), or **vertical motives** (it is better to offshore production to lower costs).

Such activities are concentrated in developed countries, whilst developing countries are more the **destinations of such activities**. Subsidiaries usually sell to their host countries and geographically close markets. Finally, multinational firms are the **largest and most productive**, and are usually the ones paying higher salaries (as per the Melitz model's results).

Exporting to a different country is more beneficial than FDI if **there are significant set-up costs for a subsidiary and if there are significant EoS that leverage firm concentration**. The opposite is true if the **savings from avoiding trade costs** make it worthwhile to open a subsidiary in a foreign country. Brainard found that to be relatively true in the US, as high tariffs from foreign countries empower expansion through subsidiaries unless PPE costs are so high it is better to leverage EoS.

By this it is also explained why **only the most productive firms become multinationals**: if trade costs τ are such that any additional profits to serve a foreign market are $(1-\tau)Sales$ and the profits of setting-up a subsidiary are $Sales - F$, only firms whose $Sales > F/\tau$ will be able to set up a subsidiary and be profitable.

Offshoring

It is the practice of *changing the geographic assignment of a mix of tasks necessary to produce a single final good or service*. This is similar to international, **intra-firm trade** in intermediate goods: Firms offshore when they can leverage a comparative advantage or a factor endowment. The effects are similar to those of the classical trade models: gains emerge from specialization but are unlikely to be **distributed evenly**.

However, offshoring can also be done to **reduce per-task costs**: cars require high- and low-skilled labor to be produced, hence firms are more likely to engage in **tasks trading** and only shift parts of them (Grossman and Rossi-Hansberg, 2006). By this there are both **Heckscher-Ohlin effects** in which offshoring low-skilled labor from an economy reduces its low-skill wage, but there are also **gains in productivity**, allowing the offshoring company to hire other low-skilled workers (reduce factory mechanics, increase salespeople). The local effects of the rise of offshoring since the 2000s are important and like those of international trade.

But why would a firm want to **own its foreign subsidiary**? Franchising is a way of creating semi-independent subsidiaries that shield the mother company from the eventual cost of liquidation but *may expose trade secrets to competitors if franchisees are corrupt*. On the other hand, **outsourcing** (*process by which an independent party is contracted to produce a company's goods*) may allow firms to leverage faraway EoS, but resolving conflicts may become incredibly difficult or costly.

Trade Policy

Free trade exists only in theory, as governments constantly intervene in the economy to obtain certain outcomes. Currently (at least until last year), intervention is much more limited than in the past, but it still has a sizable effect on trade.

Tariffs

Tariffs are the most classical instrument of trade policy: they can either be **specific or ad valorem** and have the objectives of:

- Raise revenues and finance government spending;
    - This was much more relevant before VAT or income taxes were introduced in the 20th century and countries' budgets depended on trade levies.
- Protect domestic industries (especially in their infancy).

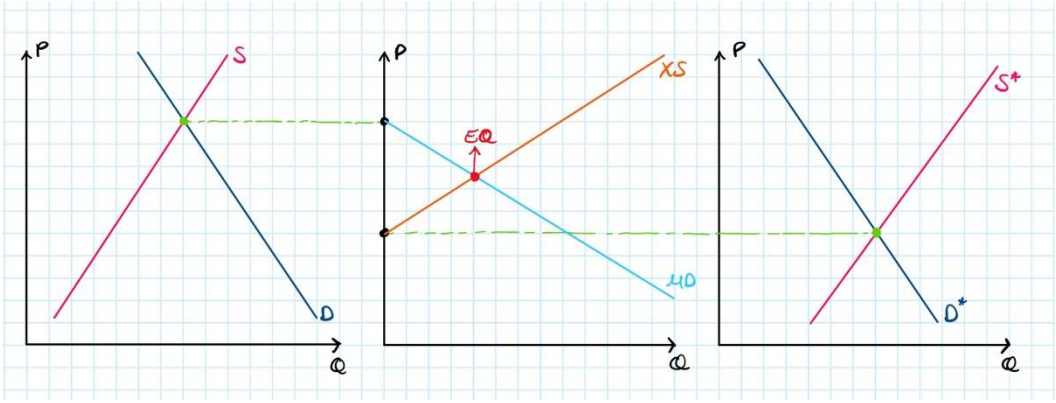
Today, introducing undue tariffs can lead to fines from the WTO, like with Bush Jr. in 2002 and his tariffs on EU steel.

Through this example we can set up our model for analyzing the effects of trade policy on trade:

- Consider two countries, H and F;
    - They deal with only one good x;
    - All prices are in common currency and there are no transport costs.
- Demand and supply follow the usual laws;
- In autarky, each country equalizes internal supply and demand;

- Let's suppose that $P_x^H > P_x^F$ and F exports its good x to H.

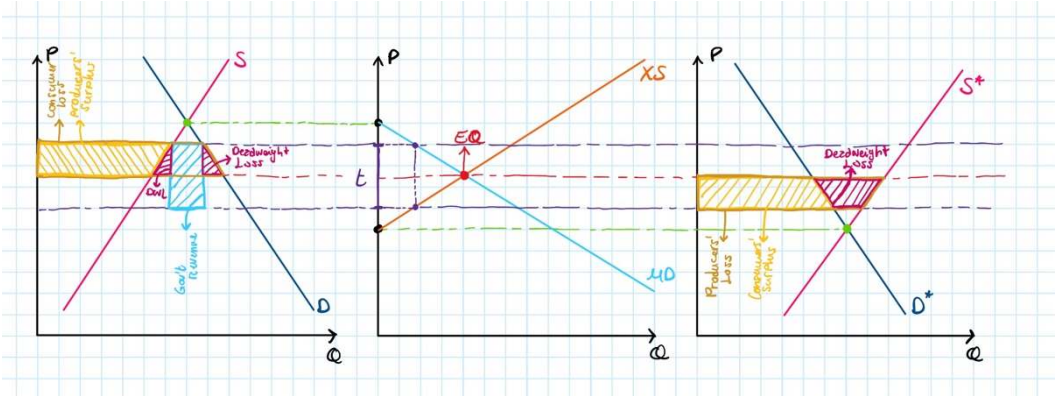
We need to introduce the concepts of **import demand function and export supply function**. The former depends on H, and it is decreasing in price as it holds that $H_{ID} = H_D - H_S$ and the latter depends on F, and it is increasing in price: $F_{XS} = F_S - F_D$. At EQ, both must be matched: $F_{XS} = H_{ID}$ and the world market for good x clears.



Once H imposes tariffs on F, $P_x^H = P_x^F + t$ by the no arbitrage condition. Quantity in the global market will decrease and prices will increase market wide. However, since under trade import demand must match import supply, **the price of good x in H grows and it falls in F**.

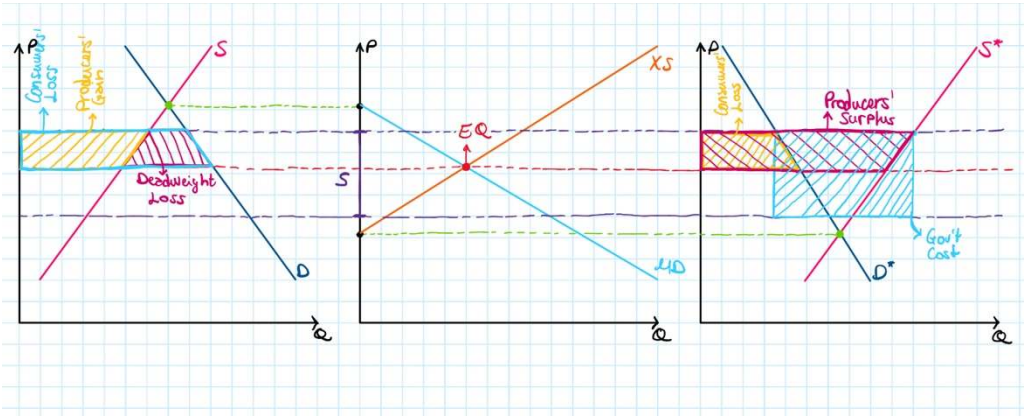
This is because now F's firms will receive a lower price and the supply of x in H will shrink, causing a price hike. Higher internal supply in F due to unsold items causes price drops until the difference between the two prices is exactly t. *The prices will grow less than t in the country imposing the tariff unless the country is so small it has a perfectly elastic supply*. In H, **prices will increase, hurting consumers and improving firms' surplus**.

In particular, the country suffers a loss in efficiency (DWL) and consumers register a direct hit to their welfare. The government and internal firms increase their surplus at expense of good x's consumers. The final effect is quantifiable through Net Effect $= e - DWL$ in which e is the **gain from the betterment of the H's terms of trade**. Small countries have negligible terms of trade increases and unambiguous losses, whilst larger countries might weather the storm better (if retaliatory tariffs from F are not too intense).



Export Subsidies

The effect of a subsidy on an export economy is aimed at increasing the local price and depressing the foreign one: $P_x^H = P_x^F + s$. The effects are like those of tariffs (lower consumer welfare and higher producer welfare), but now **there are no revenues for the government**, which instead incurs losses to subsidize its industry. By this, often the benefits of a subsidy are outweighed by their cost.



The European Common Agricultural Policy is a Union-wide subsidy based on "*support prices*", meaning that once a good falls under the Commission-mandated price, then it will start buying the good in question to maintain stability in the market. It has been harshly criticized because it suffers from substantial side effects: world prices are usually lower than EU prices hence leading to high costs for taxpayers to maintain high subsidies. The policy has also sizable effects on developing countries that would benefit from a market freer from EU tampering. The CAP has been reformed to move away from support prices in the 2000s and now hinges on subsidies independent of volume.

Other Instruments of Protection

- Trade quotas are just the same as a tariff for consumers, but the government does not reap any surplus. Usually, quota rights are dished out to producers that can afford them and those who can't are worse off than under free trade. Once the Multi Fiber Agreement was lifted in 2004, China accepted self-imposed quotas to avoid a united trade barrier amidst the explosion of textile exports to the country.
- Local content requirements force a portion of production in the destination country to avoid a higher tariff rate.
- Regulations can be barriers to trade, like in the EU with the CE certification for health and safety.
- Countries can give other forms of financial or credit support to exporters.

Usually tampering with trade **hurts consumers and benefit producers**, but the overall effect is negative: this is not surprising, as free trade creates unambiguous aggregate gains. However, sometimes free trade can be not-the-best choice and

with this, political economic considerations can lead to the formation of small and successful protectionist lobbies.

Economic and Political Arguments for Protectionism

Even though they are overwhelmingly favorable to it, most economists recognize that there are cases in which free trade can cause **loss or market failure**. Small tariffs imposed by large economies on free markets can create social welfare if the tariff is small enough not to swing too hard production paradigms and **if the country can act as a price maker**. The core idea is that **DWL will be lower than government's revenues**.

Moreover, if no retaliation is enacted **there is an optimal level of tariffs** allows for maximum national welfare before it starts carving into it through market inefficiency. Naturally, countries do retaliate, and this fundamentally breaks such logic. Imports are not the only ones that can be taxed, as **tariffs on exports improve terms of trade for the tariffing country** and make goods more expensive on global markets. Countries acting as cartels for commodities (OPEC) can impose such measures to maximize profits.

However, if **markets fail** the cost-benefit analysis becomes flawed. Markets can fail due to externalities, inefficient labor dynamics and inability for innovating firms to reap the benefit of their own increased efficiency. This leads to the application of the **Theory of Second Best**, or the *idea that introducing corrective distortions to an already distorted system can ameliorate its shortcomings*. But if that's the case in reality, why do economists believe that free trade is most preferable?

There are **limits to the extent one can both detect and fix market failures** without addressing internal issues. Moreover, trade protectionism can be more favored (or less disliked) by consumers because it introduces a **very limited disutility to their consumption**, whilst giving an enormous utility to the protected firms' owners, prompting **differences in lobbying and political advocacy**. However, the Melitz Model also states that **only the most productive and efficient firms will benefit the most from trade liberalization**, leading them to spearhead the lobbying campaigns for it. This is backed up by empirical data showing that the greatest contributors to trade protectionism were not small or large firms, but **trade unions worried about the status of employment in their country**.

Mechanisms of Trade Liberalization

Trade liberalization is usually carried out through negotiations, as the dilemma of imposing retaliatory tariffs or keeping trade free **is akin to a prisoner's dilemma game**. Conflicting interests will result to undermining each other to maintain their balance without direct and effective diplomacy.

In 1945, pushed by the will to tie Western Europe's economies together and by the conviction that isolationism created fertile ground for increased economic harm and then fascism in the 1930s, 23 countries chose to abide by the **General Agreement on Tariffs and Trade (GATT)** which mandated:

- The use of tariffs and quotas as a **protective method**;
- The binding of tariffs and quotas to a **permanent and unchanging level** unless disruptive shocks occurred;
- The **Most Favorite Nation Clause** disallowed special trading relationships *except for multilateral and regional FTAs*;
- Negotiations had to be **carried out in rounds** that should end with a successful agreement on trade policy.

The latest successful round (Uruguay, 1994) led to the creation of the **World Trade Organization**, headquartered in Geneva and now handling all GATT-related matters plus **agreements on services trade and IP rights**. It's dispute mechanism functions by petitioning the organization through expert-reviewed complaints. If a country is found in violation of WTO rules, then the affected countries **obtain the right to retaliate tit-for-tat**.

The current Doha Round has completely stalled in 2001 and the Bali Package to it has failed to restart or conclude negotiations. Moreover, the WTO is now focusing on IP law and agricultural protectionism after **driving manufactured goods tariffs to effectively 0**, but countries are invested in weakening the organization. Many bilateral FTAs have risen, and the US is blocking the appointment of potentially unfavorable judges.

Regional FTAs might reduce tariffs between partner countries, but their effects on the wider market can be more ambiguous. If the UK imports butter from NZ because it's the most efficient producer, then when it joins the EU, it will have to lift tariffs on Denmark (most efficient producer in the bloc, but less so than NZ). Denmark doesn't have to change production methodologies to lower prices and be more attractive for the British market. It gets the largest import share in the UK because its tariff-free price is lower than the tariffed price of NZ. That is an example of **trade diversion followed by trade creation**: most of the countries involved either lose like NZ or gain less than they would under a free trade regimen. Both effects must be evaluated to estimate an FTA's effect.

The EU and Brexit

Countries can organize in different ways their trade relationships. Countries with no special agreement are regular WTO members, then they can create FTAs like the USMCA and set **individual policies towards non-members** but hold a common internal trade policy. Then there are **customs unions** that strip members of their political tools for independent trade policymaking in order to protect a

common interest together. Then there is the **EU Single Market**, which is even more integrated than a customs union.

The Treaty of Rome in 1957 formed a 6 nations customs union. The Treaty of Maastricht of 1992 extended the Single Market to the four fundamental economic freedoms: movements of **goods, services, people and capitals**. Ideally everything can be bought, sold and employed equally in every country and the joint force of Commission and CJEU surveil the market integration. **No country is allowed to discriminate goods based on country of origin**, just like the EC v. Italy case of 2009. The EC has also tried to integrate further the Single Market through **the Bolkestein Directive, the EU Banking Union and the Digital Single Market**. Posted workers like construction contractors were also integrated deeply.

The EU is cited as an example of **deep trade agreement** aimed at reducing all barriers to trade, including the "*non-tariff barriers*", and to common regulation. Deep FTAs also include investment treaties in order to protect IP and promote FDI, often based on **Investor-State Dispute Settlement (ISDS) Courts**. The EEC and the EU have struck significant deals, such as **extending the Single Market via the EEA** to key partners like Norway, integrating Switzerland and Turkey into de-facto customs unions and to have **created FTAs with South Korea and Canada**.

The UK joined the EEC in 1973 after a failed entry in 1961 that was **vetoed by Gaullist France**. In 1975 the British had voted in a referendum to **remain in the EEC**, but that changed once in 2016 a **new referendum pushed by the conservative Cameron Government yielded a 52% victory for Leave**. On February 1st, 2020, the Uk officially left and on January 1st, 2021, **the exit became effective**.

The years between the referendum and Brexit were mired in **government changes and tense negotiations**. The 2020 final agreement left Northern Ireland in the Single Market not to reignite tensions with Ireland, an FTA for goods and restrictions on service trading and financial movements. The effects were very adverse, as British exports slumped in the entire global market and **trade density of GDP fell for Britain**. This choice of leaving was largely shaped by an *independence vs economics dialectic* characterized by the Leave Campaign's Slogan **"Take Back Control"**. It rallied the votes from the poorest, least educated and **areas of the country that were more impacted by import competition**. Immigration was definitely a wedge issue, but its relevance is still debated.

International Macroeconomics & Finance

The models in this file imply **balanced trade** hence **national spending and expenditure stand equal**, but in reality trade is very rarely balanced (i.e., the US has a notorious deficit in trade). International finance will here hinge on the assumption that **countries spending equals their income**, or that countries pay

with assets (claims on future goods) to acquire goods. Trade balance is the fulcrum of many discussions on its validity as an economic indicator.

Let's establish the following trade model:

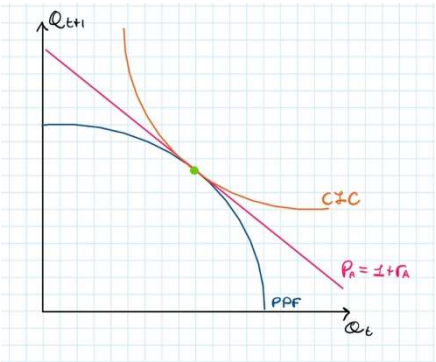
- **Community Indifference Curves (CICs)** representing different preferences over goods.
- **Production Possibility Frontiers (PPFs)** to represent options to produce mixes of goods.
- **World Relative Prices** determined by supply and demand.
- **Optimization by Households and Firms** leading to an EQ outcome.

By this, **comparative advantage corresponds to the export of a good which has a lower domestic relative price** compared to international markets. The intersection of the **economy's isocost line** with the CIC shows the good the country will likely import, and the intersection with the PPF will likely represent the country's preferred export product. In this model, trade is balanced, and the value of good x's trade is equal to the value of good y's trade.

Countries pay and get paid for their trade through the exchange of **assets** which are claims to goods and services to be fulfilled in the future. Essentially, **holding assets is like trading goods now for goods tomorrow**.

Intertemporal Model of Trade

Preferences between goods now and goods tomorrow are easily representable via a utility-production model that uses the CIC and the PPF. The shape of the two is given by empirically observed features of consumers' behavior: **present and future consumption do not show patterns of extreme substitutability or complementarity**; hence the curve will likely always be a Cobb-Douglas convex and downward sloping line. Production-wise, substituting, say, **consumption now with consumption tomorrow** increases future output at a **marginally decreasing rate**; hence the PPF is downward sloping and concave.



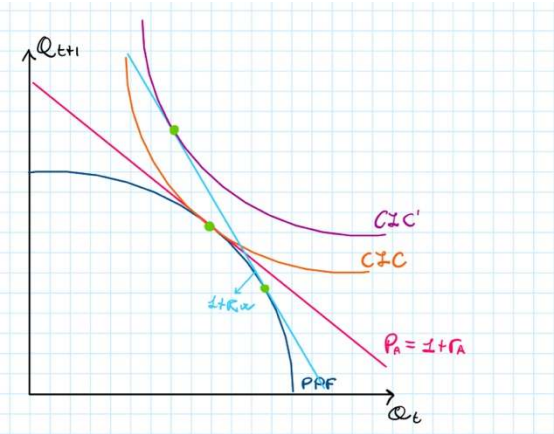
At the autarky equilibrium, the **Intertemporal Budget Constraint** line running through the intersection point between CIC and PPF has a slope showing the **real rate of return** of postponing current consumption/production to the "*next period*". In short, *lifetime consumption is split between present and future* and this creates the separation between **investment and consumption in production ($Y_i = C + I$) and between consumption and saving in the current income ($Y_p = C + S$)**. The relative price is the **real rate of return**, or $1 + R$. R is the real

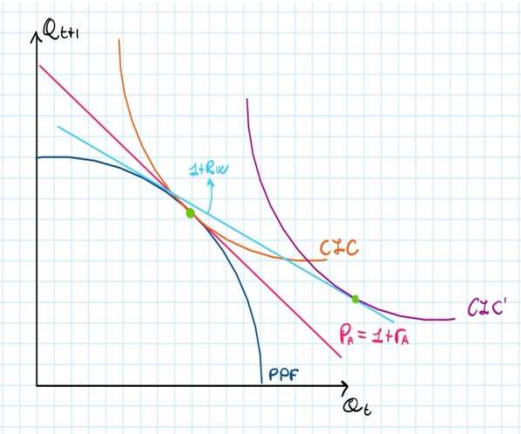
interest rate; hence it is **certain and long-run**, with no expected changes in future yield.

Trade Equilibrium

This model is very **similar to the two countries two goods model**. It holds true that Trade Surplus = Asset Deficit and that countries **i) prefer consuming now than consuming tomorrow** and that **ii) borrow today to fund today's consumption**. On the flip side, the PPF of a country shows that **production possibilities in the future are relatively better** and that **the sale of future claims on goods and services is key to fund today's production**.

If world prices differ from the autarky prices, then the countries will benefit from trade and claims to future consumption are secured by assets. If $R^H > R^W$, then the country is better off **purchasing credit to fuel immediate consumption on the international markets** and exporting claims on future consumption. This will be quantified by the **decrease in the Current Account (CA) balance** and the improvement of the **Capital Account (KA) one**. The opposite happens if $R^H < R^W$.





International trade in assets facilitates the offloading of present consumption through asset-based claims. CA imbalances emerge once **domestic interest rates differ from international ones**, leading to the rise of trade imbalances: this is largely due to real-world preferences and expectations (**negative economic outlooks can lead consumers to consume now to prevent a fall in aggregate utility once their income falls**).

Features Driving High Pre-Trade Interest Rates

The US is a perfect example of an economy that under free trade **tends to have an important CA deficit due to high autarky interest rates**. This can be attributed to two factors:

- The increase in high-tech, high VA industries accelerates productivity increases and **could lead to high expectations of growth for the future**.

- The US's population is aging slower than other economies, leading people to prefer **future consumption** due to higher growth expectations and lower retiree dissaving.

The combination of these factors ("**New Economy**") creates a naturally favorable environment to postpone consumption through **very high interest rates** (quantitatively speaking, the PPF is very steep). Taking trade into account, the **American Consumers will pivot towards consuming now and foreign investors will exchange goods and services for claims on fast-appreciating assets** ($\Delta CA < 0 \ \& \ \Delta KA > 0$).

National Accounts and Payment Balance

There are two main definitions of Gross Domestic Product: it's either the **total income received by all factors of production in a country** (Income definition), or the **final value of all goods and services produced by all factors of production in a country** (Expenditure definition). Definitions are equivalent because **markets operate under assumed perfect competition**.

To avoid double counting, GDP doesn't include **intermediate goods, used gods and non-market production**. The Gross National Product (GNP) measures the value of all **final goods and services** produced by the nation's factors *no matter where their location inside or outside national borders*. To calculate GDP we focus on the **spending approach**: $Y = C + I + G$ that is an accounting identity that holds by default and represents the spending on all final goods produced in the economy **under autarky**.

In an open economy, the identity becomes:

$$Y = C + I + G + (X - M)$$

In which $X - M = NX$ is the **trade balance of the country**, or the **current account balance**. By this, if under autarky the national savings are defined as **part of income that has not been consumed** ($S = Y - G - C = I$, under autarky the only way to accumulate capital is through saving), in an open economy it holds that:

$$S = I + NX$$

By this, an open economy can either:

- **Invest more than its savings**, borrowing from abroad and running a CA deficit;
- **Save more than it invests**, lending abroad and running a CA surplus.

You can either have a trade surplus or capital inflows, **not both at the same time** (paradoxical for the general public).

Moreover, **taxes are the primary way through the government finances spending**: $S^P = Y - T - C$ is private saving, while $S^G = T - G$ is government saving. Their sum is **total national saving**. Private saving is therefore split between:

- Financing private investment,
- Financing foreign investment (which is equal to the CA balance),
- Financing the government deficit.

It holds then that the **trade balance of a country is equal to the change in Net Foreign Assets of that country** (difference of assets held by nationals and by foreigners):

$$X - M = S - I = \Delta NFA$$

This is not perfect, as it doesn't consider gifts like debt forgiveness and exchange-driven valuation. The key takeaway is that **a country running a CA deficit owes assets to foreigners due to intense consumption today**, and vice versa for a country running a CA surplus.

The Balance of Payments Calculation

National accountants record entries in two separate and symmetrical accounts (**their sum must be 0**):

- **In the Current Account**:
  - Exports are credited as positive entries;
  - Imports are debited as negative entries;
- **In the Capital Account**:
  - Foreign acquisitions of national assets (imports) are credited as positive entries;
  - National acquisitions of foreign assets (exports) are debited as negative entries;

Their sum is never exactly zero, as there are always small **wealth transfers between countries** that happen on a pro-bono basis.

Exchange Rates

An exchange rate is the **price of a country's currency in terms of another one's**. Currencies can depreciate or appreciate against one another: a Euro appreciation against the US increases purchasing power of European consumers on the American market. By this a depreciation is surely bad for importers but can be very beneficial to exporters. They also influence foreign investment decisions: if I wanted to buy a US stock I'd want my currency to be **strong against the dollar** to limit the expense. If I already hold a US stock, a weak domestic currency **amplifies the returns on the equity I own**.

Currently, major exchange rates are **determined by the market** and are called *floating interest rates*, contrary to what historically was the norm of *fixed exchange rates*, usually to commodities like gold. Post-WW1 the **gold standard system came under intense pressure**, whilst during the Vietnam War the US suspended gold convertibility indefinitely. Both events led to the **end of fixed exchange rates in their times**. Some countries still retain a fixed exchange regimen, but they are usually pegged to **stronger currencies like the USD or EUR**.

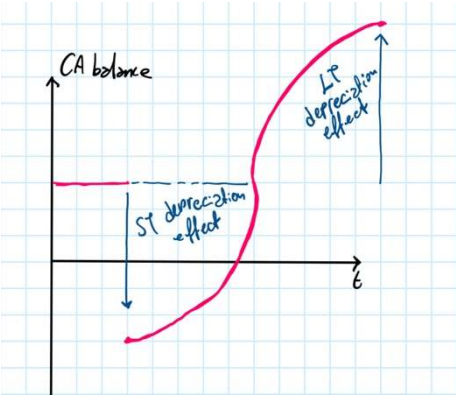
Forex Markets

There are four main actors in modern Forex markets (which shift more than $6bn per day):

- **Banks on behalf of clients**;
- **Investment Funds invested in speculative activities**;
- **Non-financial firms purchasing foreign currencies directly**;
- **Central Banks engaged in monetary policy actions**.

The USD is treated as a **reserve currency** (most instruments are denominated in USD) and the EUR is the closest alternative. Due to the immense trade volume, prices **very quickly equalize through LOP**, but what determines the supply, demand and value of currency?

David Hume in 1752 argued that **a mercantilist economy wishing to maintain ad infinitum a trade surplus was just deluding itself**: the demand for its currency would have grown in response to increased exports, the currency would have appreciated, and this would have facilitated imports, damaging the trade surplus.



It is also true that **decreasing the price of exports through currency depreciation is beneficial only if the quantity demanded increases more than proportionally**. The same holds for imports. Studies show that this is true long term, and quantities adjust naturally over time to higher levels following a currency depreciation. However, in the short-run the **price effects dominates, and the current account balance deteriorates** (J-Curve effect).

Interest Parity

The evidence on this is relatively shaky and not really applicable to modern times, in which exchange rates are shaped by expectations, reserve currencies and imports of intermediate inputs to skirt tariffs. According to Keynes, **the demand for a currency depends on the investment opportunities in the corresponding**

country: in equilibrium, exchange rates will **equalize to equalize the returns to investments made in different countries** (*Interest Parity Condition*).

Consider the following example: an investor in Home wishes to buy a Foreign denominated asset. The return is calculated in the following way:

- **Take the required amount of Home currency and exchange it for Foreign currency**,
- **Invest said currency at the rate of return in Foreign**,
- **Convert Foreign currency in Home currency upon ending the investing activity**.

By this, the expected return of an asset in Foreign is given by:

$$E_r = E_{F/H}^{Current} * (1 + r_F)/(E_{F/H}^{Future})$$

If returns on Home's assets are lower than in Foreign following exchange rate conversion, then **capitals will flow to Foreign until there are no arbitrage opportunities left**. That is called *Interest Rate Parity*. Moreover, the key implication lies in the fact that **if ROI is high in Home, then there will be the expectation of Home's currency to depreciate** and vice versa. This also holds for **expectations of future rates** (falling expectations on future rates make the current rates fall as well).

Monetary policy is key in influencing the interest rates, especially in times of crisis through **open market operations**, however if monetary policy is non coordinated worldwide it can easily lead to **currency wars**. It holds that **exchange rates cannot fall all at the same time**.

End of the Summary. Now go Forth and Conquer! – Piergiulio Fasciani

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