

Partial and General Equilibrium

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In this topic we examine how producers and consumers come together and interact in markets. We first return to the partial equilibrium supply-demand model. Then we examine the general equilibrium model which examines several markets together.

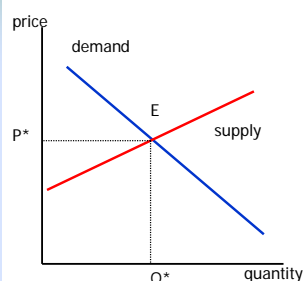
Partial and General Equilibrium

- Partial equilibrium
- Factor markets
- Production possibilities frontier and profit maximization
- Indifference curves and utility maximization
- General equilibrium

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Partial Equilibrium

- Once we obtain supply and demand curves for a perfectly competitive market (for the run of interest) we can put them together to examine a model of a market.
- Equilibrium is attained in the market in the way discussed earlier: the price rises if there is excess demand and falls if there is excess supply. Equilibrium in the market occurs at E.
- We can then examine how the equilibrium is affected by changes of various kinds, including changes in government policies
- Behind the supply and demand curves is the behavior of producers and consumers. Note how we now have a fuller understanding of the effects of changes in income, prices of other goods, tastes, technology, input prices, etc.



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Partial Equilibrium, cont.

- The model of **partial equilibrium** shows equilibrium in one market, taking given prices of other goods and inputs, income, etc.
- Equilibrium in the economy as a whole requires **equilibrium in all markets**. Otherwise some price will change, which will affect other markets. There is **interdependence**. Why? Examples:
 - Changes in prices of substitutes, complements
 - Changes in input prices
 - Changes in production of goods affects wage income and profit income and therefore income of consumers
- This makes it somewhat misleading to examine equilibrium in only one market. So we consider **general equilibrium** – equilibrium in all markets at the same time taking into account the interdependence of markets
- We will examine a **simple** general equilibrium model with **one input, labor, and two goods**, to examine their interdependence. It will give us the basic idea of general equilibrium analysis we will discuss later. All markets perfectly competitive – price takers

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Factor Markets

- Market for labor**, only input, can be analyzed with usual **supply-demand** model.
- Consider **supply and demand** for labor to a **particular industry**. Only a brief discussion here; more detail in next topic.
- Who demands labor? Firms or producers. How much labor will firms **demand**? The quantity that maximizes a firm's profit.
- Who supplies labor? Households or consumers. Assume for now that there is a fixed **supply** of labor to the industry.

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Factor markets

Demand for labor

- To maximize profits we have seen that firm produces at the output at which $P = MC$.
- What is **marginal cost** if labor is the only factor of production? $MC = W (\Delta L / \Delta Q)$ = additional labor required to produce additional output multiplied by the cost of one unit of labor. This implies that $MC = W / (\Delta Q / \Delta L) = W / MPL$.
- Profit maximization implies:
 $P = MC = W / MPL$.
- We can also write this condition as $W = P \times MPL$.
Says that the marginal cost of employing one more worker (W) is equal to the marginal benefit ($P \times MPL$).
 $P \times MPL$ is called the **value of marginal product of labor, VMPL**.

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Factor markets

Demand curve for labor

Profit maximization implies

$$W = P \times MPL = VMPL$$

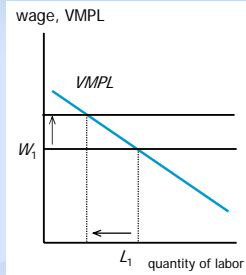
VMPL curve is downward sloping because MPL is downward sloping (diminishing returns) and P is fixed.

Given the wage, firm will decide to employ workers up to where $P = VMPL$.

For a higher wage firm will hire fewer workers.

VMPL curve gives the demand curve for labor

Add up demand curves for labor of all firms in the industry (horizontally) – gives demand curve for labor of industry. Downward sloping line

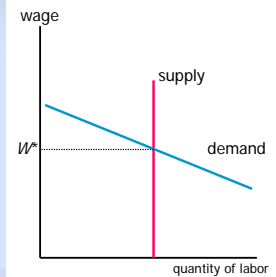


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Factor Markets

Labor market equilibrium

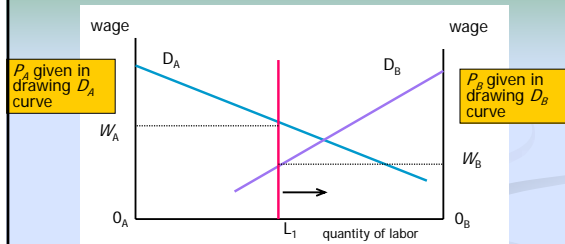
- Assume that the supply of labor for the industry is given. Supply curve is vertical line
- Demand curve for labor is a downward-sloping line which sums up the firm demand curves (or VMPL curves).
- Equilibrium in this labor market is determined at the intersection, with the equilibrium wage being W^*
- For higher wages there is excess supply of labor and the wage will fall. For lower wages there is excess demand for labor and the wage will fall.
- The total value of output for the industry is given by the area under the VMPL curve. Add up the value of marginal product for each worker.



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Factor Markets

Labor markets for two sectors

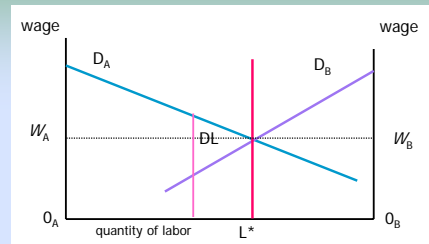


Total amount of labor for the economy is fixed and shown by distance $O_A O_B$. There are two industries, producing autos (A) and butter (B), both using labor. Draw the labor market demand curve for B 'backwards'. Suppose that initially there is $O_A L_1$ amount of labor in sector A and $L_1 O_B$ amount in sector B. Equilibrium wages in the two sectors is as shown. Where will workers wish to work assuming other conditions are same in the two sectors?

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Factor Markets

Labor allocation equilibrium



Labor will move from sector B to sector A till wages are equalized between sectors. Equilibrium labor allocation will be at L^* .

Total value of production for the two sectors is maximized at L^* . At the other allocation shown there is a deadweight loss of DL.

What happens when a price changes? Say P_A increases. D_A shifts up. Labor will move to the auto sector.

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Production Possibilities Frontier and Profit Maximization

Production Possibilities Frontier

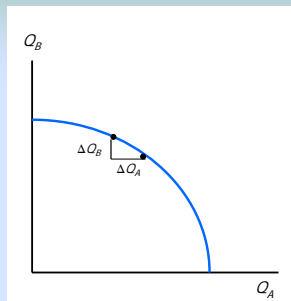
Production possibilities for butter and autos are shown with the production possibilities frontier.

The slope of the PPF shows the amount of one good the economy must give up to produce more of the other. It is called the **marginal rate of product transformation** or **MRPT**.

$$\Delta Q_B / \Delta Q_A = MRPT = -MC_A / MC_B$$

Why?

$$\begin{aligned} \Delta Q_B / \Delta Q_A &= (\Delta Q_B / W \Delta L_B) / (\Delta Q_A / W \Delta L_A) \\ &= -(\Delta Q_B / W \Delta L_B) / (\Delta Q_A / W \Delta L_A) \\ &= -(W \Delta L_A / \Delta Q_A) / (W \Delta L_B / \Delta Q_B) \\ &= -MC_A / MC_B \end{aligned}$$

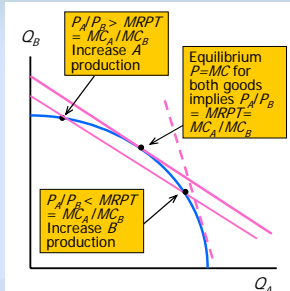


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Production Possibilities Frontier and Profit Maximization

Profit maximizing production equilibrium

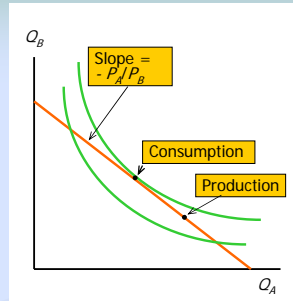
- Take prices of the two goods to be given to price-taking firms: P_A and P_B
- Given prices we can draw lines with slope $-P_A/P_B$ like budget lines. The lines show the value of total output of the two goods. Lines further out show higher values.
- Profit maximizing equilibrium:
 - where one of these lines is tangent to the PPF. $P_A/P_B = MRPT = MC_A/MC_B$
 - also where the value of output of the two goods is highest
- Also have full employment: on PPF, not inside it.
- If P_A/P_B rises, slope of value of output line rises. Equilibrium output for B will fall and A will rise



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Indifference Curves and Utility Maximization

- Given the price ratio and production point we get the value of income line which is also the budget line of all consumers: value of production = value of income
- Preferences shown with "community" indifference curves assuming all consumers have the same preferences (which also satisfy some other conditions)
- Given the budget line consumers choose consumption point to reach their highest utility level.
- Note: we don't need consumers to have identical preferences. But all consumers will set price ratio equal to MRS.

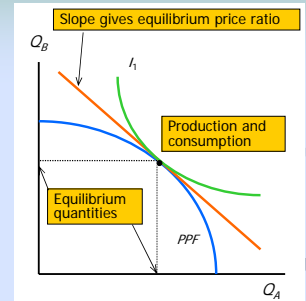


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General Equilibrium Equilibrium

General equilibrium requires:

- Full employment of resources (labor)
- Equal wages in both sectors
- Profit maximization by producers
- Utility maximization by consumers
- Quantity supplied = Quantity demanded for both goods. This is shown by having production and consumption at same point



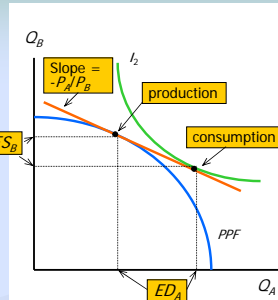
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General Equilibrium Excess demand and supply

When the economy is not in equilibrium, at least one of the equilibrium conditions not satisfied.

Here we find quantity supplied not equal to quantity demanded for both goods, although other conditions are satisfied. There is excess supply (ES) of good *B* and excess demand (ED) for good *A*.

P_A will increase and P_B will decrease, making the value of production line steeper. Production of *B* will fall and of *A* will rise, consumption of *B* will rise and of *A* will fall. Price will adjust till the economy reaches equilibrium.



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