LECTURE 3

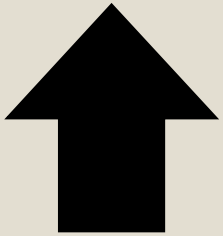
TOOLS OF NORMATIVE ANALYSIS

Basic questions that all economic systems must answer

- What is to be produced and in what quantities ?
- How is the desired output to be produced ?
- How is the desired output to be distributed ?
- How does the economy provide for cyclical stability ?
- How does the economy sustain economic growth overtime ?

Basic questions that all economic systems must answer

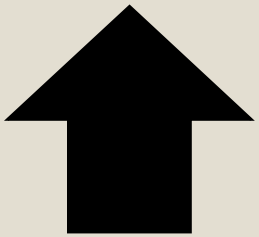
- What is to be produced and in what quantities ?
- How is the desired output to be produced ?



RESOURCE ALLOCATION QUESTIONS

Basic questions that all economic systems must answer

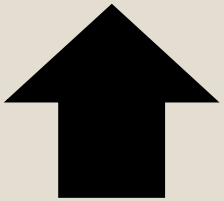
- How is the desired output to be distributed ?



DISTRIBUTION QUESTION

Basic questions that all economic systems must answer

- How does the economy provide for cyclical stability ?
- How does the economy sustain economic growth overtime ?



STABILIZATION QUESTIONS

MARKET SYSTEM

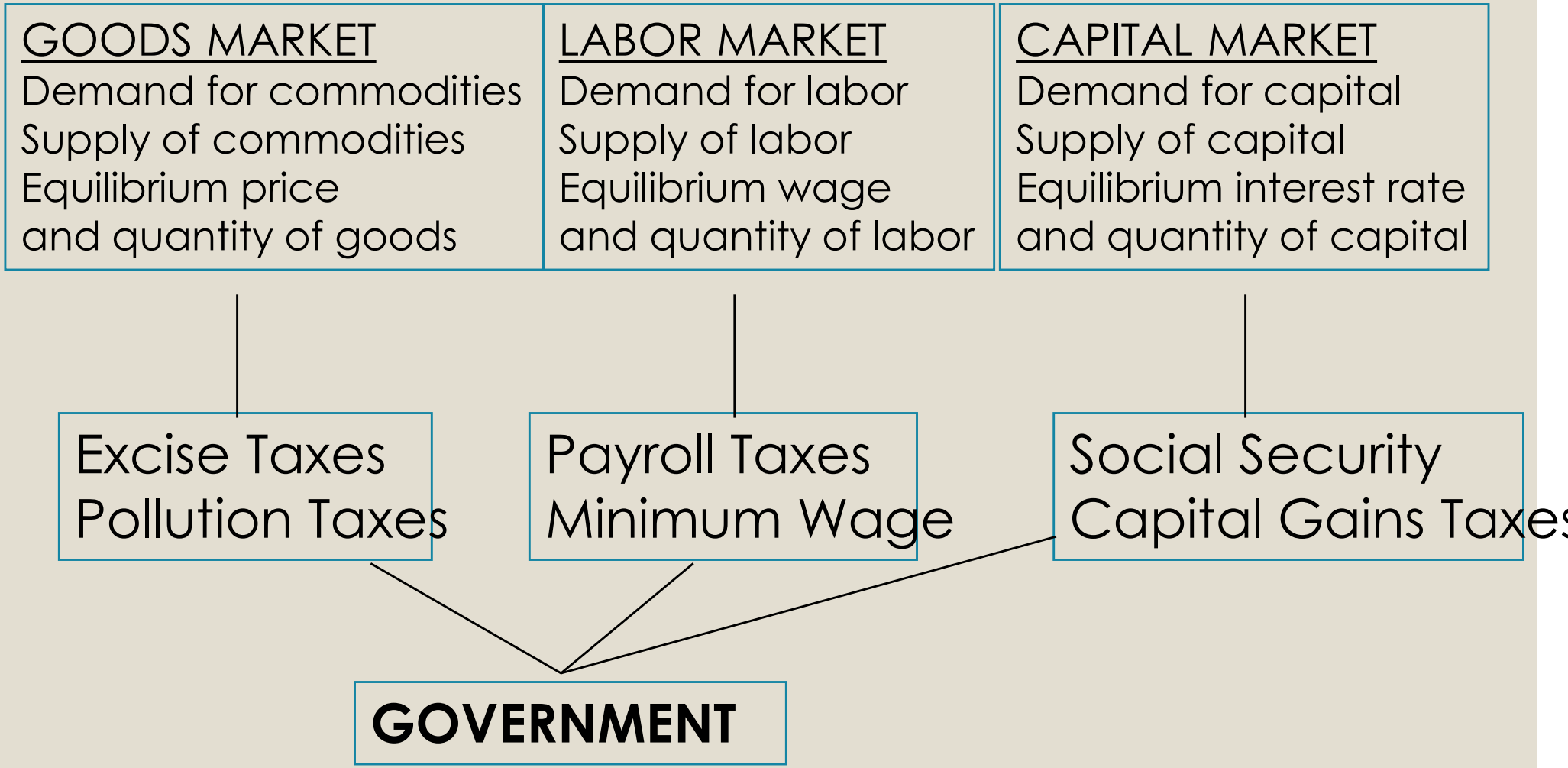
- A price system is a social economic organization based on **individual choices** and **property rights**.
- Understanding the price system is important because:

1. The market is the alternative to government intervention and control.
2. Tax and expenditure policies impact decisions in the private markets.
3. The concept of economic efficiency needs to be defined more specifically.

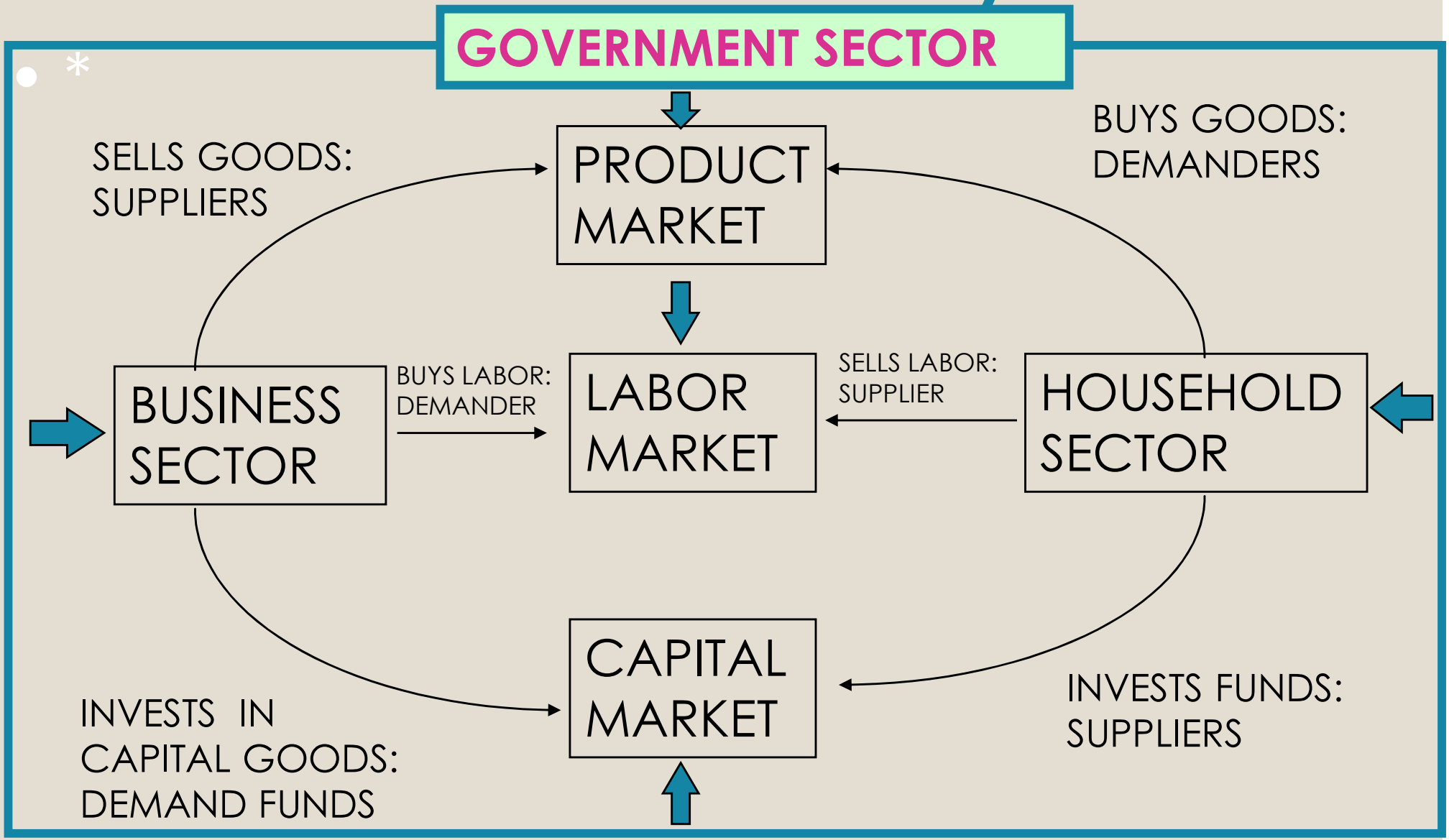
OVERVIEW OF THE PRICE *SYSTEM*

GOODS MARKET	LABOR MARKET	CAPITAL MARKET
Demand for commodities	Demand for labor	Demand for capital
Supply of commodities	Supply of labor	Supply of capital
Equilibrium price and quantity of goods	Equilibrium wage and quantity of labor	Equilibrium interest rate and quantity of capital

OVERVIEW OF THE PRICE *SYSTEM*



Simple characterization of a mixed economy



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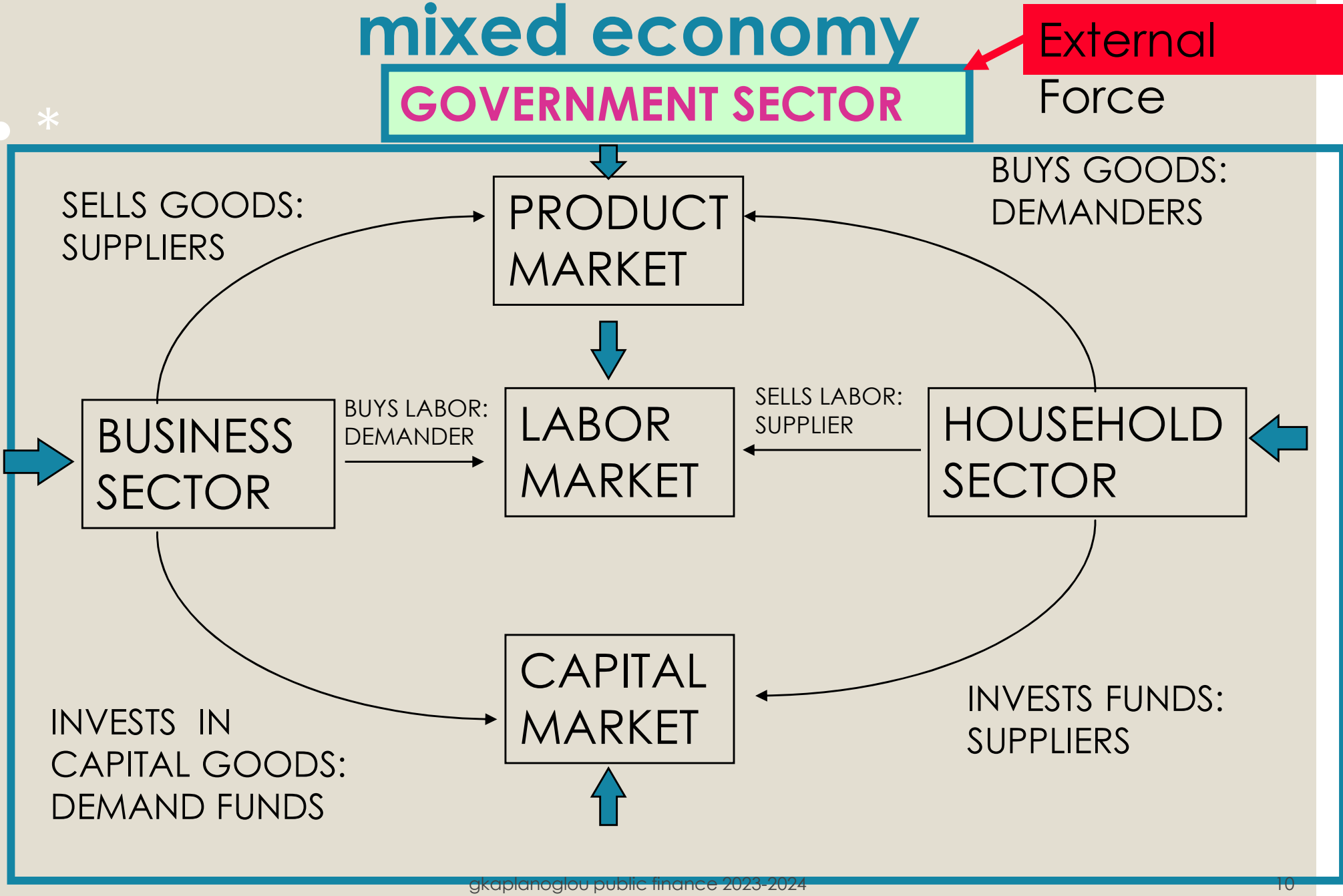

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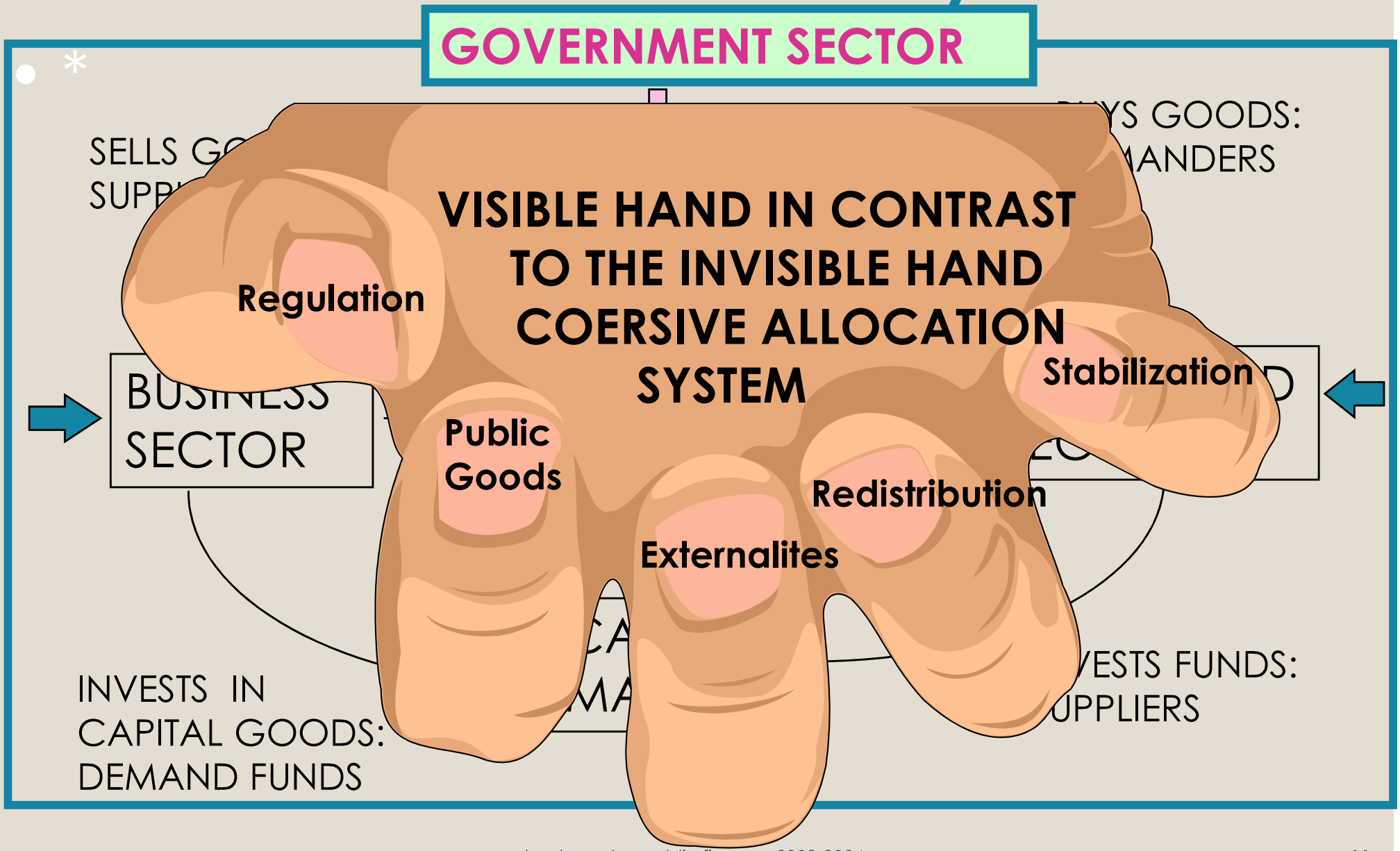


Efficiency criterion

- Positive Economics is the scientific view of economic events. It tries to find cause and effect, predictive relationships.

- Normative Economics is based on value judgments. It tries to formulate recommendations as to what should be.

- The ***efficiency criterion*** is satisfied when resources are used over a given period of time in such away as to make it impossible to increase the well-being of any one person without reducing the well-being of any other person. This situation is referred to as a ***Pareto Optimum*** state

.

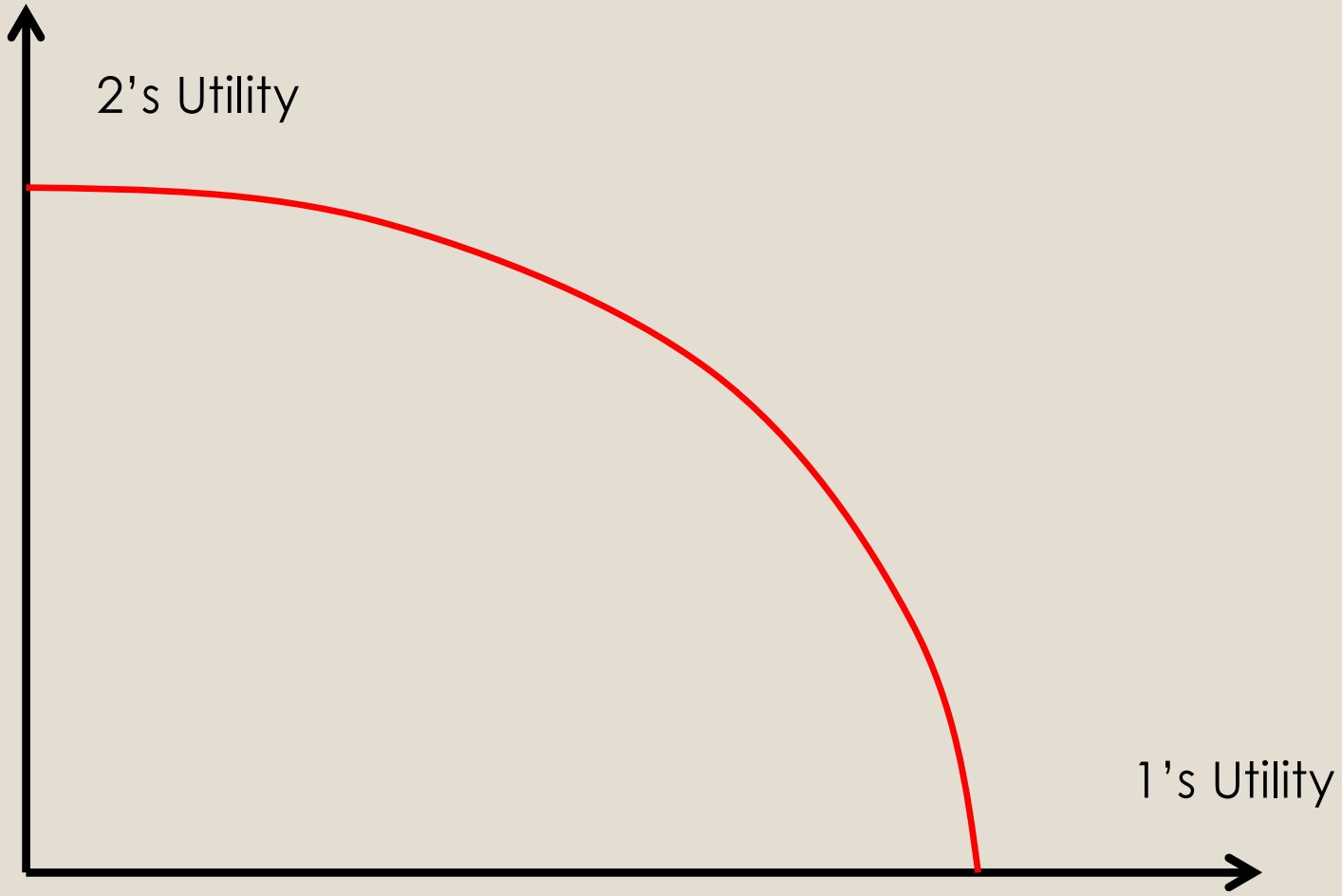
Efficiency criterion

Definition: An *allocation* of resources is *Pareto Efficient* if it is not possible to reallocate resources to make everyone better off.

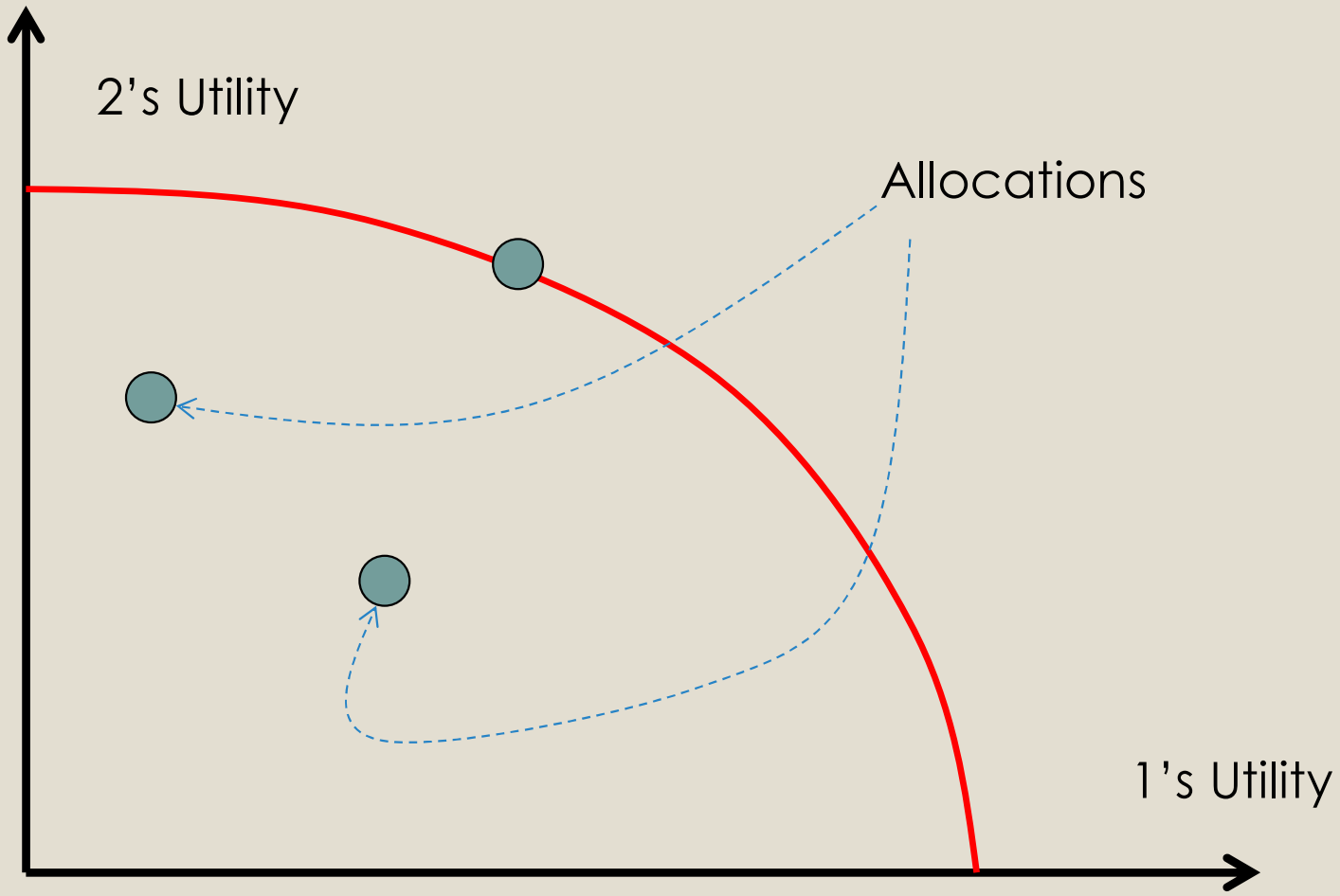
How do we measure better off?

We use *Utility* to measure welfare/happiness.

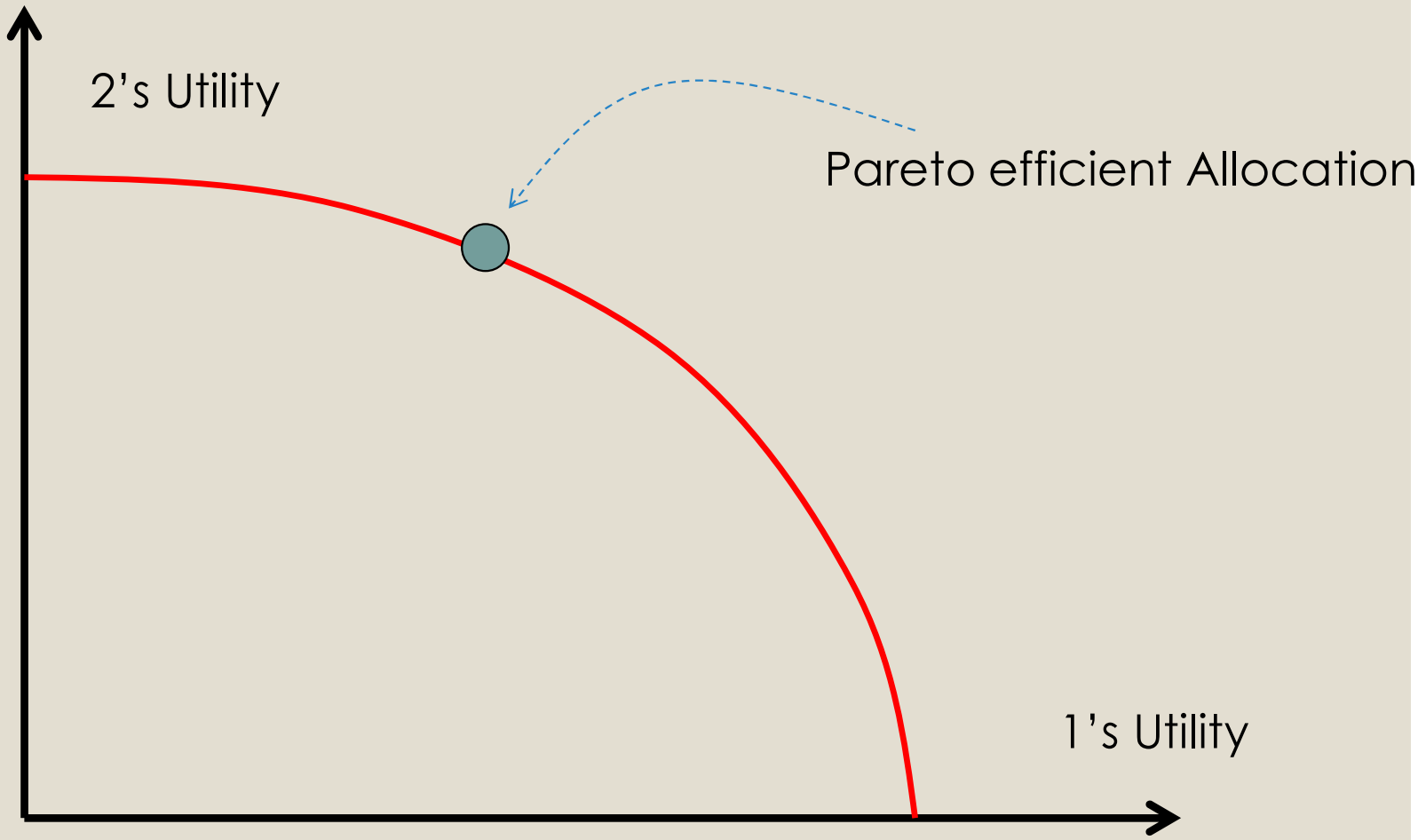
Utility Possibilities: What is Feasible



Utility Possibilities: What is Feasible

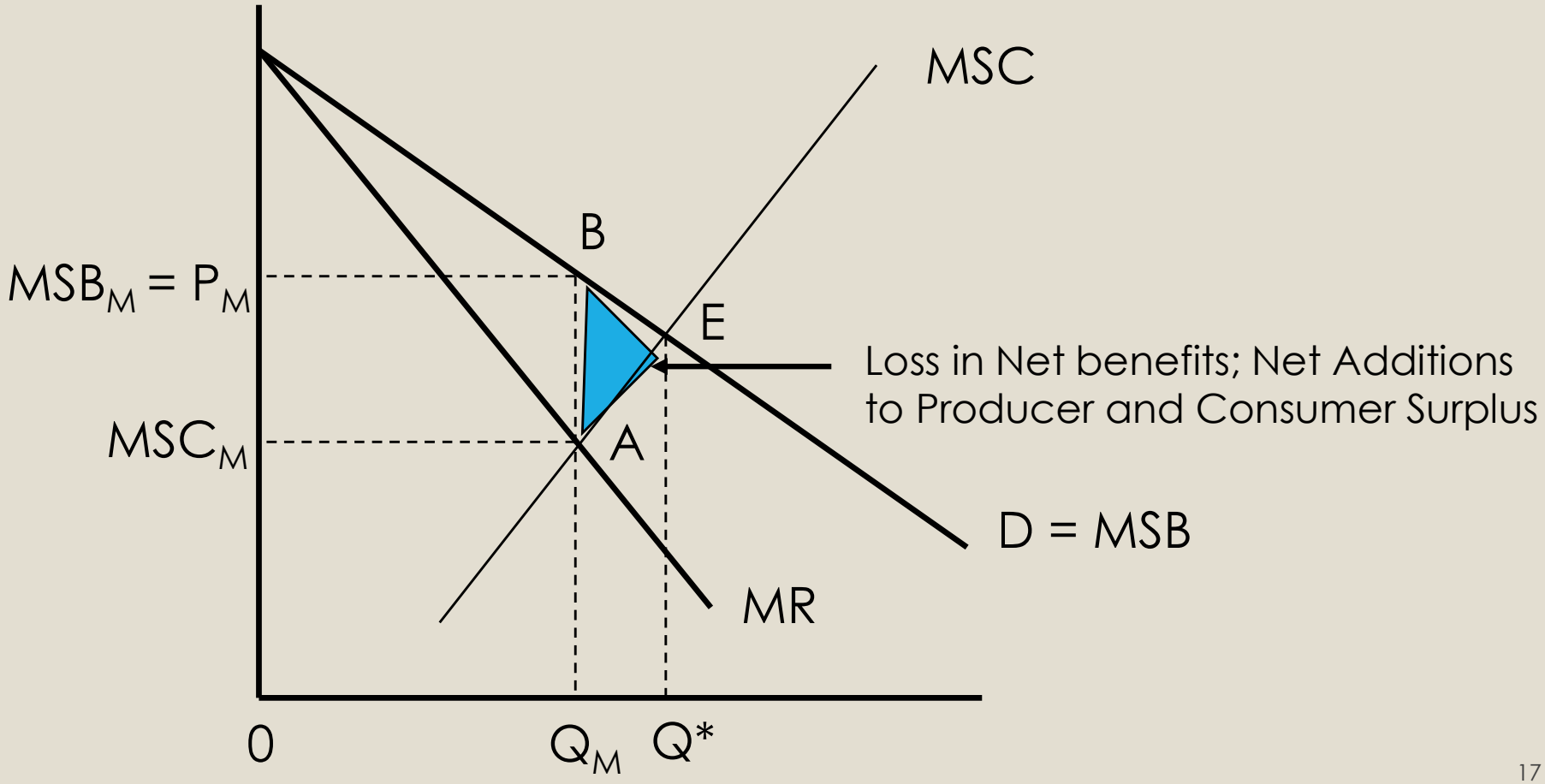


Pareto efficiency: There is no waste

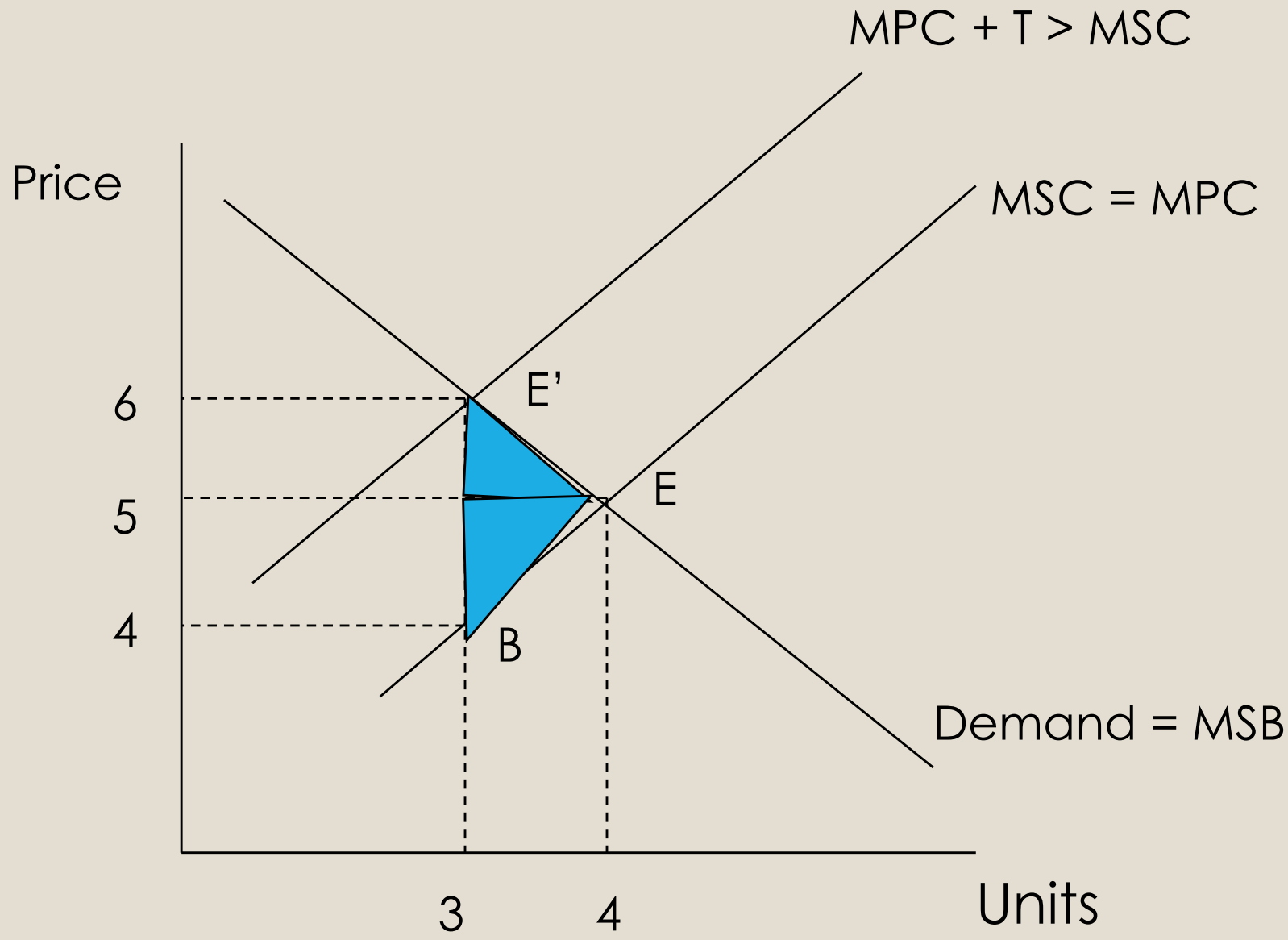


Market Failures in a Static Context

- Exercise of Monopoly Power



Excise Tax and the Loss of Efficiency



Externalities

- This case is the situation of positive and negative externalities. For example, exhaust fumes from automobiles, trucks and buses decreases air quality and impairs public health.
- This cost is not reflected in marginal private costs. Thus inefficiency arises.
- Education may create positive external benefits and in effect be under produced by the market.

Public goods

- In many cases, useful goods and services cannot be provided efficiently through markets, because it is impossible or difficult to sell the good by the unit.
- The benefits of such goods can be shared only.
- Public goods are collective in consumption and can not be priced in the market.

Public goods

- "**Public**" goods are distinguished from private goods in that private goods are consumed by individuals and whose benefits are not shared with others who do not make the purchase.
- A distinguishing characteristic of public goods is that a given quantity of such goods can be enjoyed by additional consumers at no reduction in benefits to existing consumers.

Public goods

- ***National defense*** is an example of a public good having this property. Increases in population occur daily; and the additional population can be defended without any reduction in benefits to the existing population.
- Another characteristic of public goods is that their benefits cannot be easily withheld from persons who choose not to contribute to their finance.

Public goods:
Free-Rider Issue in Public Goods

- Even if you refuse to pay the costs of national defense, you still will be defended. This means that firms selling public goods like national defense will have great difficulty collecting revenue necessary to finance costs of production for such goods.
- In many cases, government provision of goods is justified because of a conviction that the marginal social benefit of the good exceeds the marginal social cost at quantities that would result if the good were supplied through markets.
- For example, government provision of health insurance, deposit insurance, and flood insurance are common because many persons believe that these are useful services that cannot be provided profitably in efficient amount by profit-maximizing firms.

Incomplete Information

- Whenever private markets fail to provide a good or service even though the cost of providing it is less than what individuals are willing to pay
- Examples: insurance and capital markets
- Reasons: innovation, transaction costs, asymmetry of information and enforcement costs
- The reason why markets do not exist may have implications for how governments might go about remedying the market failure

Incomplete Information

- A number of government activities are motivated by imperfect information on the part of the consumers, and by the belief that the market, by itself, will supply too little information (e.g. regulations on information disclosure)
- Information is, in many respects, a *public good*: the private market will often provide an inadequate supply of information, just as it supplies an inadequate amount of other public goods.

Macroeconomic failures

- Unemployment
- Inflation

Optimality conditions

- ***Marginal Condition for Exchange.***
- To attain a ***Pareto Maximum***, the marginal rate of substitution (MRS) between any pair of goods must be the same for all individuals who consume both goods.

Optimality conditions

- ***Marginal Condition for Factor Substitution***.
- To attain ***Pareto Maximum***, the marginal rate of technical substitution (MRTS) between any pair of inputs must be the same for all producers who use both inputs.

Optimality conditions

- ***Marginal Condition for Product Substitution***.
- To attain a ***Pareto Maximum***, the marginal rate of transformation (MRT) in production must equal the marginal rate of substitution in consumption for every pair of commodities and for every individual who consumes both.

Optimality conditions

- ***Corollary Proposition***.
- If the political organization of a society is such to accord paramount importance to its individual members -- mechanistic approach to government -- social welfare will be maximized if every consumer, every firm, and every input ***market*** is perfectly competition.

CONSTRAINED UTILITY MAXIMIZATION

- ***Constrained utility maximization*** means that all decisions are made in order to maximize the well-being of the individual, subject to his available resources.
- Utility maximization involves *preferences* and a *budget constraint*.
- One of the key assumptions about preferences is *non-satiation*–that "more is preferred to less."

Constrained Utility Maximization: Preferences and indifference curves

- *Figure 1* illustrates some preferences over movies (on the x-axis) and CDs (on the y-axis).
- Because of non-satiation, bundles *A* and *B* are both inferior to bundle *C*.

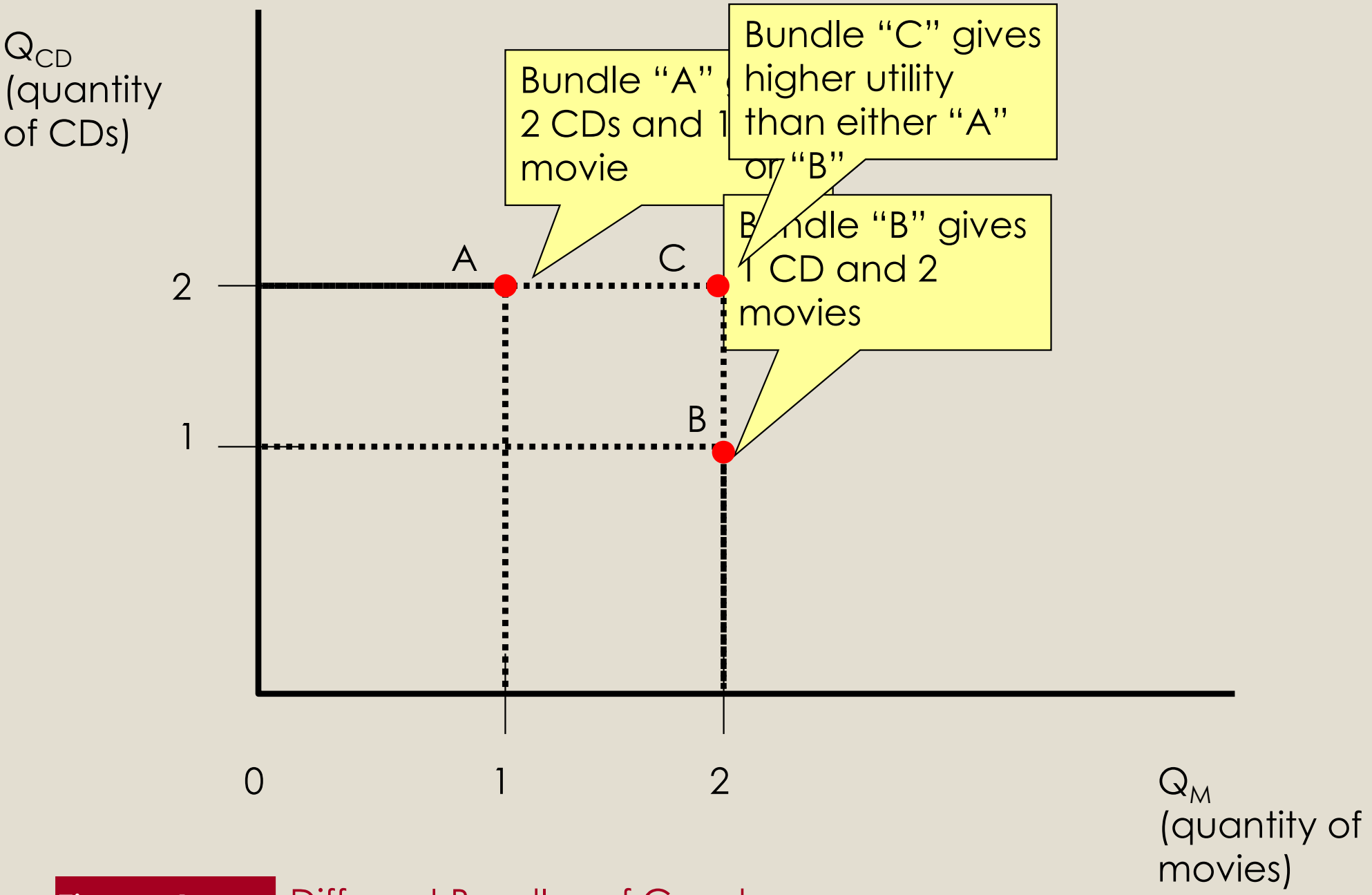


Figure 1 Different Bundles of Goods

Constrained Utility Maximization: Preferences and indifference curves

- A ***utility function*** is a mathematical representation
- $U = f(X_1, X_2, X_3, \ldots)$
  - Where X_1, X_2, X_3 and so on are the *goods* consumed by the individual,
  - And $f(\bullet)$ is some mathematical function.

Constrained Utility Maximization: Preferences and indifference curves

- One formulation of a utility function is

  $U(Q_M,Q_C) = Q_M Q_C$, where Q_M = quantity of movies and Q_C = quantity of CDs.
- The combinations {1, 2} (bundle *A*) and {2,1} (bundle *B*) both give 2 "utils."
- The combination {2, 2} (bundle *C*) gives 4 "utils."
- With these preferences, *indifferent* to *A* or *B*.
- **Figure 2** illustrates this.

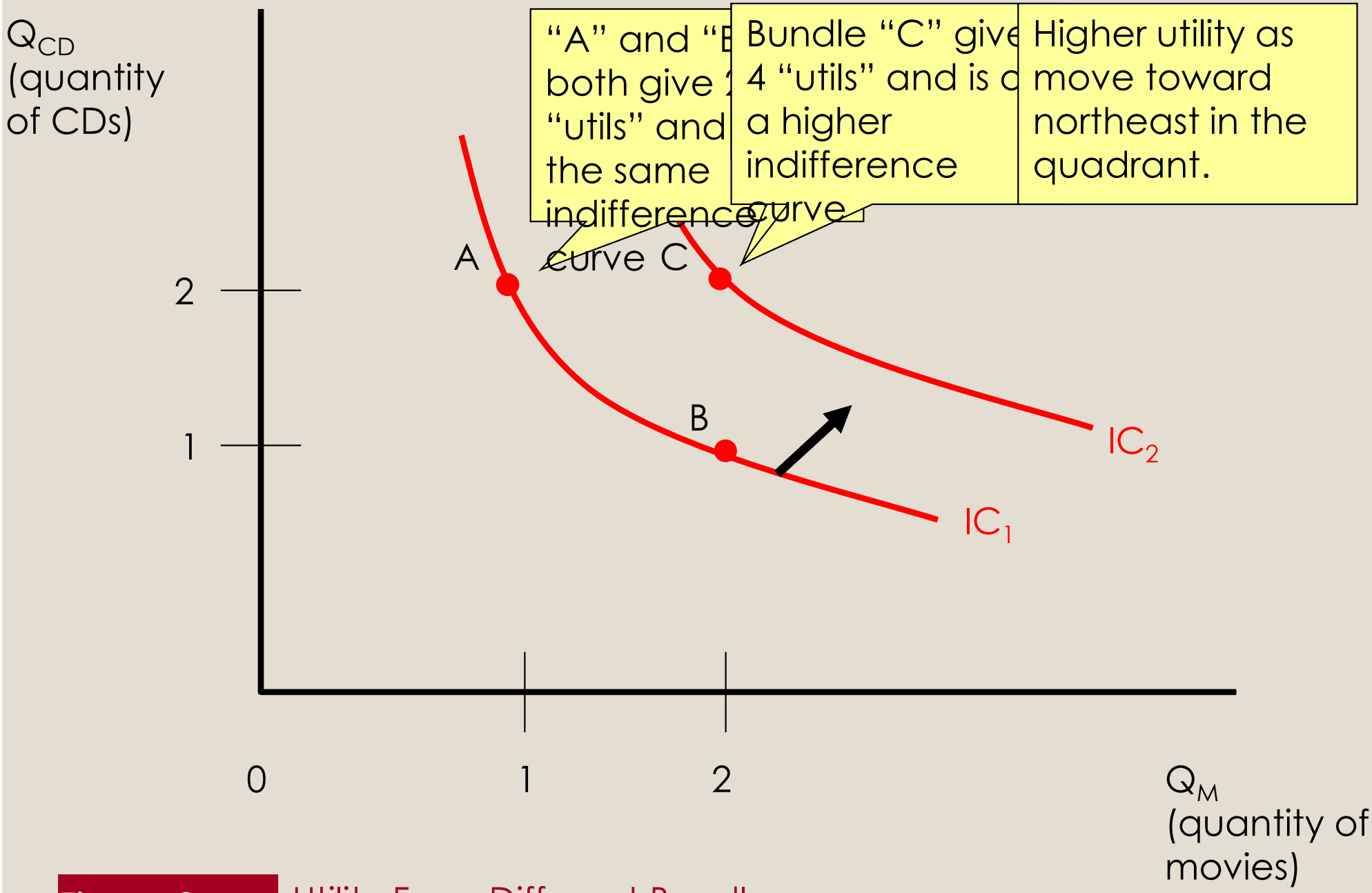


Figure 2 Utility From Different Bundles

Constrained Utility Maximization: Utility mapping of preferences

- How are indifference curves derived?
- Set utility equal to a constant level and figure out the bundles of goods that get that utility level.
- For $U = Q_M Q_C$, how would we find the bundles for the indifference curve associated with 25 utils?
  - Set $25 = Q_M Q_C$,
  - Yields $Q_C = 25/Q_M$,
  - Or bundles like {1,25}, {1.25,20}, {5,5}, etc.

Constrained Utility Maximization: Marginal utility

- ***Marginal utility*** is the additional increment to utility from consuming an additional unit of a good.
- ***Diminishing marginal utility*** means each additional unit makes the individual less happy than the previous unit.

Constrained Utility Maximization: Marginal utility

- With the utility function given before, $U = Q_M Q_C$, the marginal utility is:

$$MU_{Q_M} = \frac{\partial U}{\partial Q_M} = Q_C$$

- Take the partial derivative of the utility function with respect to Q_M to get the marginal utility of movies.

Constrained Utility Maximization: Marginal utility

- Evaluating the utility function $U = (Q_M Q_C)^{1/2}$, at $Q_C = 2$ allows us to plot a relationship between marginal utility and movies consumed.
- **Figure 3** illustrates this.

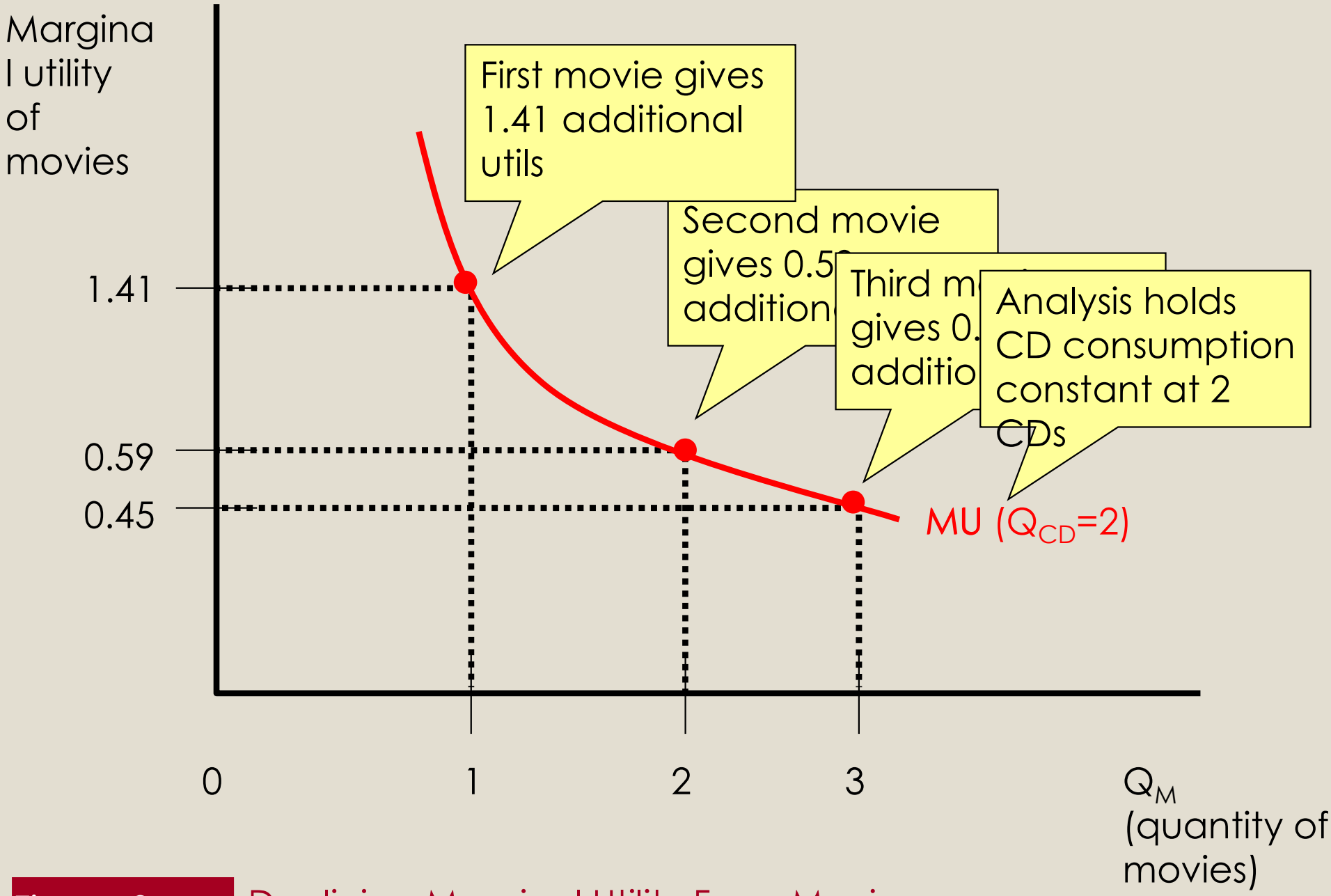


Figure 3 Declining Marginal Utility From Movies

Constrained Utility Maximization: Marginal utility

- Why does diminishing marginal utility make sense?
  - Most consumers order consumption of the goods with the highest utility first.

Constrained Utility Maximization: Marginal rate of substitution

- ***Marginal rate of substitution***—slope of the indifference curve is called the ***MRS***, and is the rate at which consumer is willing to trade off the two goods.
- Returning to the (CDs, movies) example.
- **Figure 4** illustrates this.

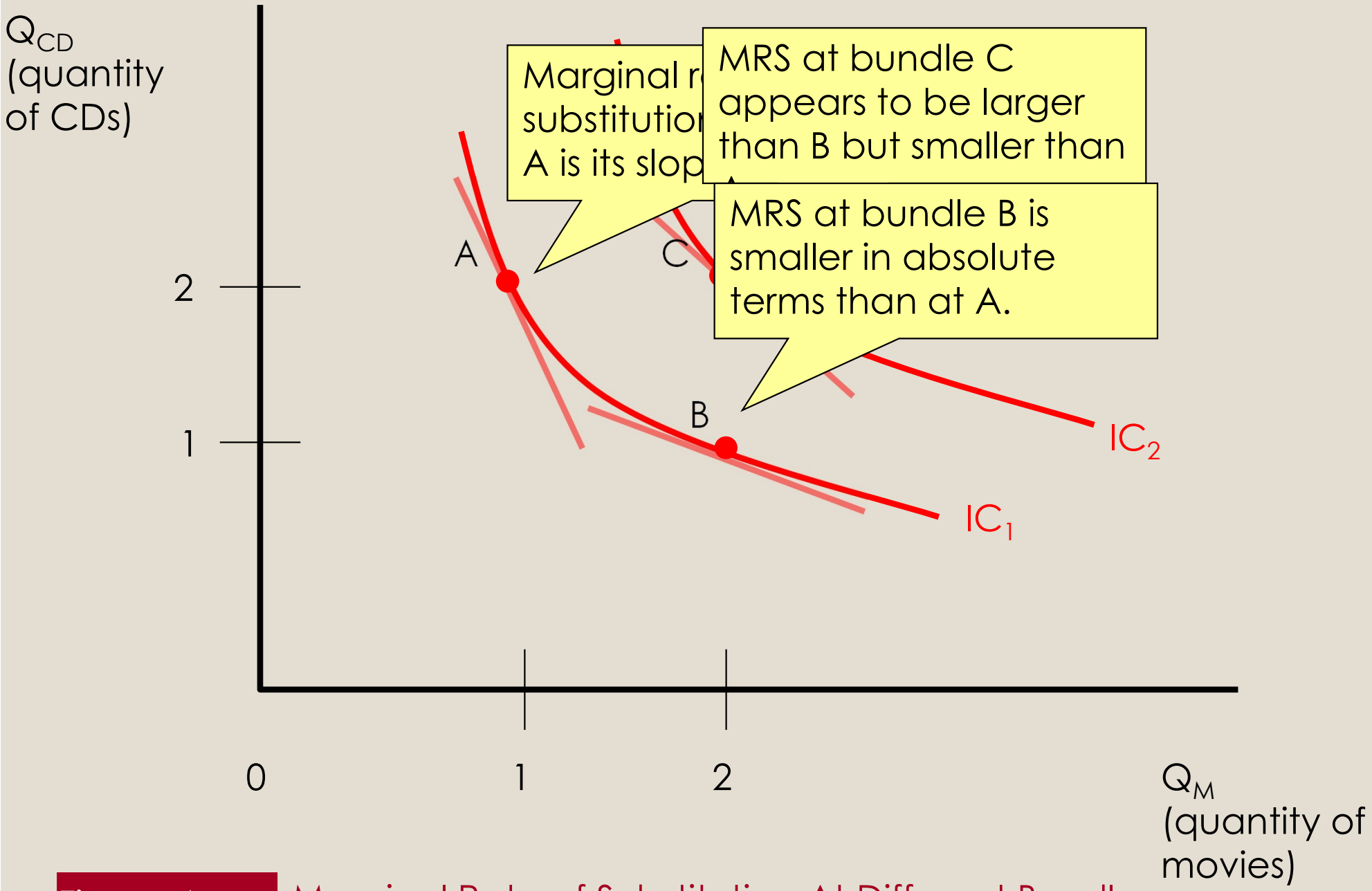


Figure 4 Marginal Rate of Substitution At Different Bundles

Constrained Utility Maximization: Marginal rate of substitution

- ***MRS*** is diminishing (in absolute terms) as we move along an indifference curve.
- This means that Andrea is willing to give up fewer CD's to get more movies when she has more movies (bundle *B*) than when she has less movies (bundle *A*).
- **Figure 5** illustrates this.

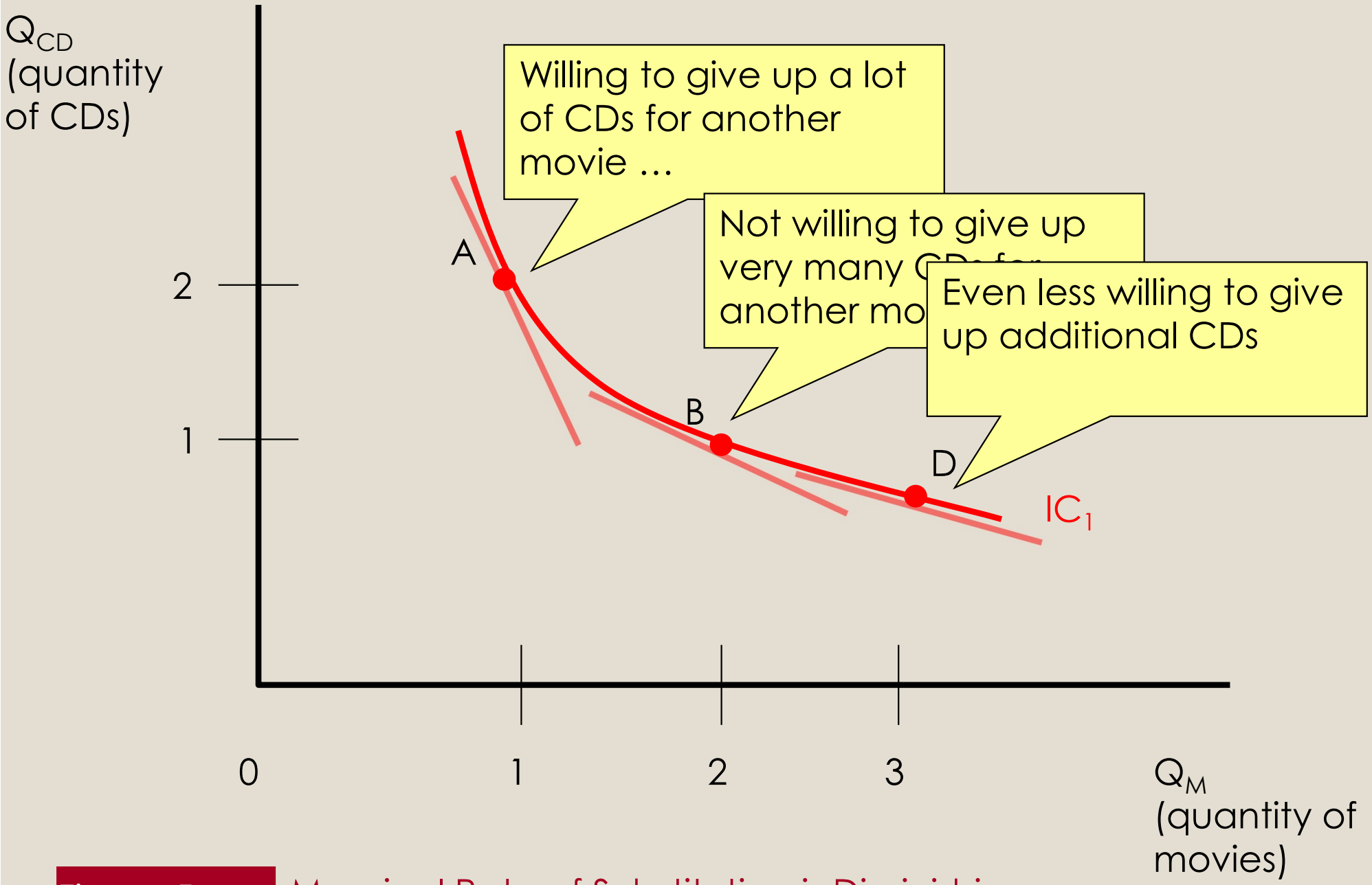


Figure 5 Marginal Rate of Substitution is Diminishing

Constrained Utility Maximization: Marginal rate of substitution

- Direct relationship between *MRS* and marginal utility.

$$MRS = -\frac{MU_M}{MU_C}$$

- *MRS* shows how the relative marginal utilities evolve over the indifference curve.
- Straightforward to derive this relationship graphically, as well.
- Consider the movement from bundle *A* to bundle *B*. **Figure 6** illustrates this.

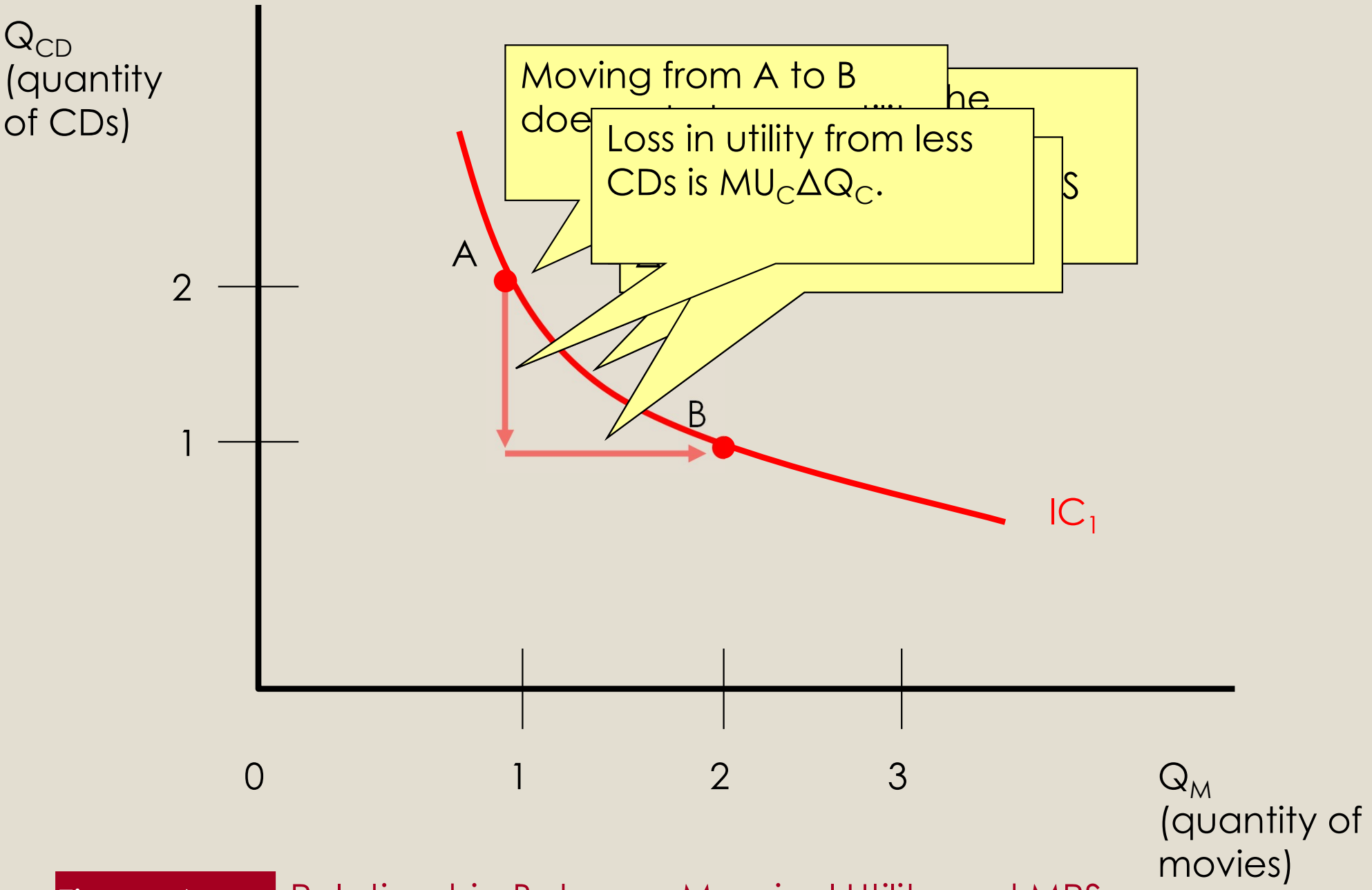


Figure 6 Relationship Between Marginal Utility and MRS

Constrained Utility Maximization: Budget constraints

- The ***budget constraint*** is a mathematical representation of the combination of goods the consumer can afford to buy with a given income.
- Assume there is no saving or borrowing.
- In the example, denote:
  - Y = Income level
  - P_M = Price of one movie
  - P_C = Price of one CD

Constrained Utility Maximization: Budget constraints

- The expenditure on movies is:

$$P_M Q_M$$

- While the expenditure on CDs is:

$$P_C Q_C$$

Constrained Utility Maximization: Budget constraints

- Thus, the total amount spent is:

$$P_M Q_M + P_C Q_C$$

- This must equal income, because of no saving or borrowing.

$$Y = P_M Q_M + P_C Q_C$$

Constrained Utility Maximization: Budget constraints

- This budget constraint is illustrated in the next figure.
- **Figure 7** illustrates this.

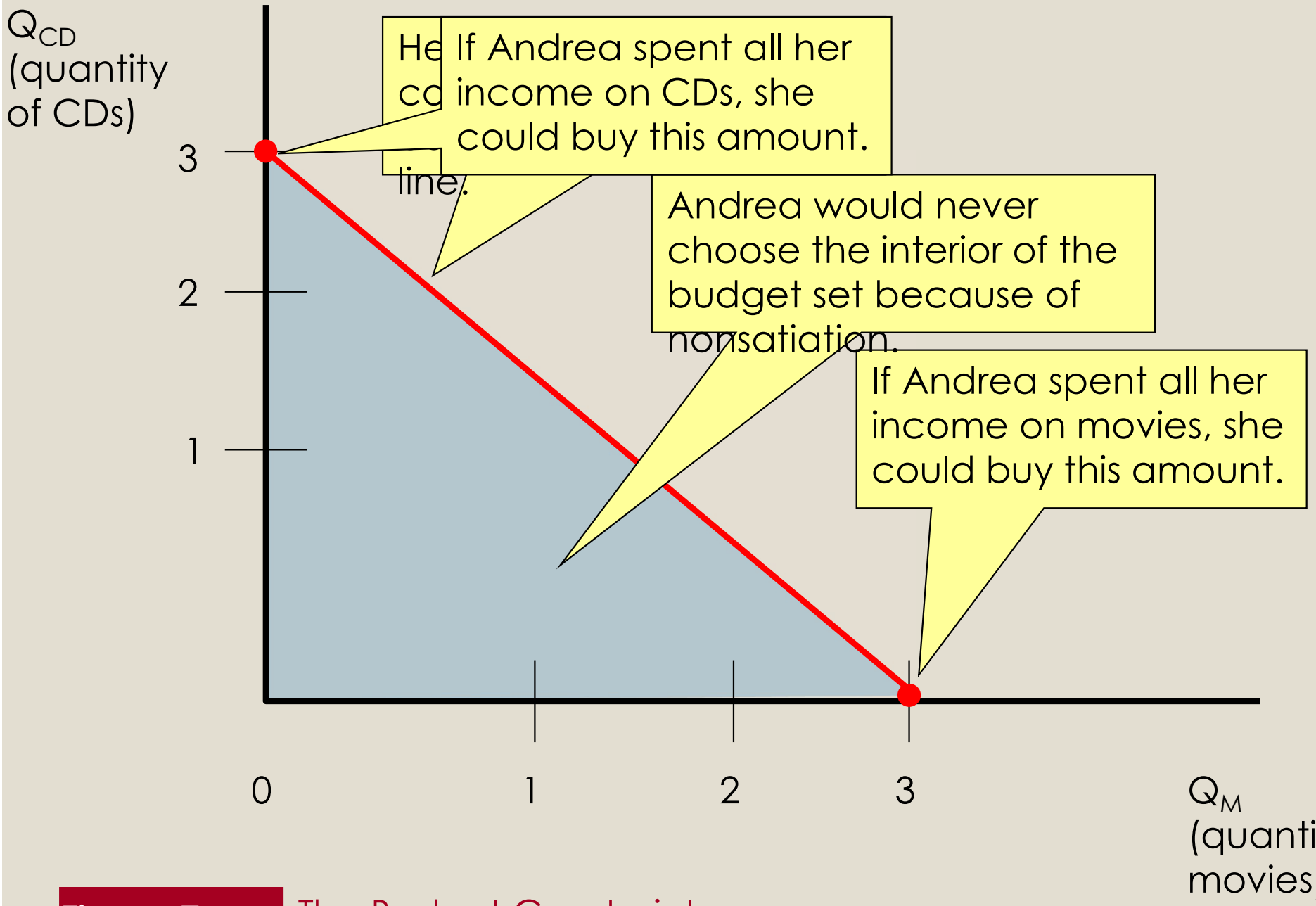


Figure 7 The Budget Constraint

Constrained Utility Maximization: Budget constraints

- The slope of the budget constraint is:

$$-\frac{P_M}{P_C}$$

- It is thought that government actions can change a consumer's budget constraint, but that a consumer's preferences are fixed.

Constrained Utility Maximization: Putting it together: Constrained choice

- What is the highest indifference curve that an individual can reach, given a budget constraint?
- Preferences tells us what a consumer wants, and the budget constraint tells us what a consumer can actually purchase.
- This leads to utility maximization, shown graphically, in **Figure 8**.

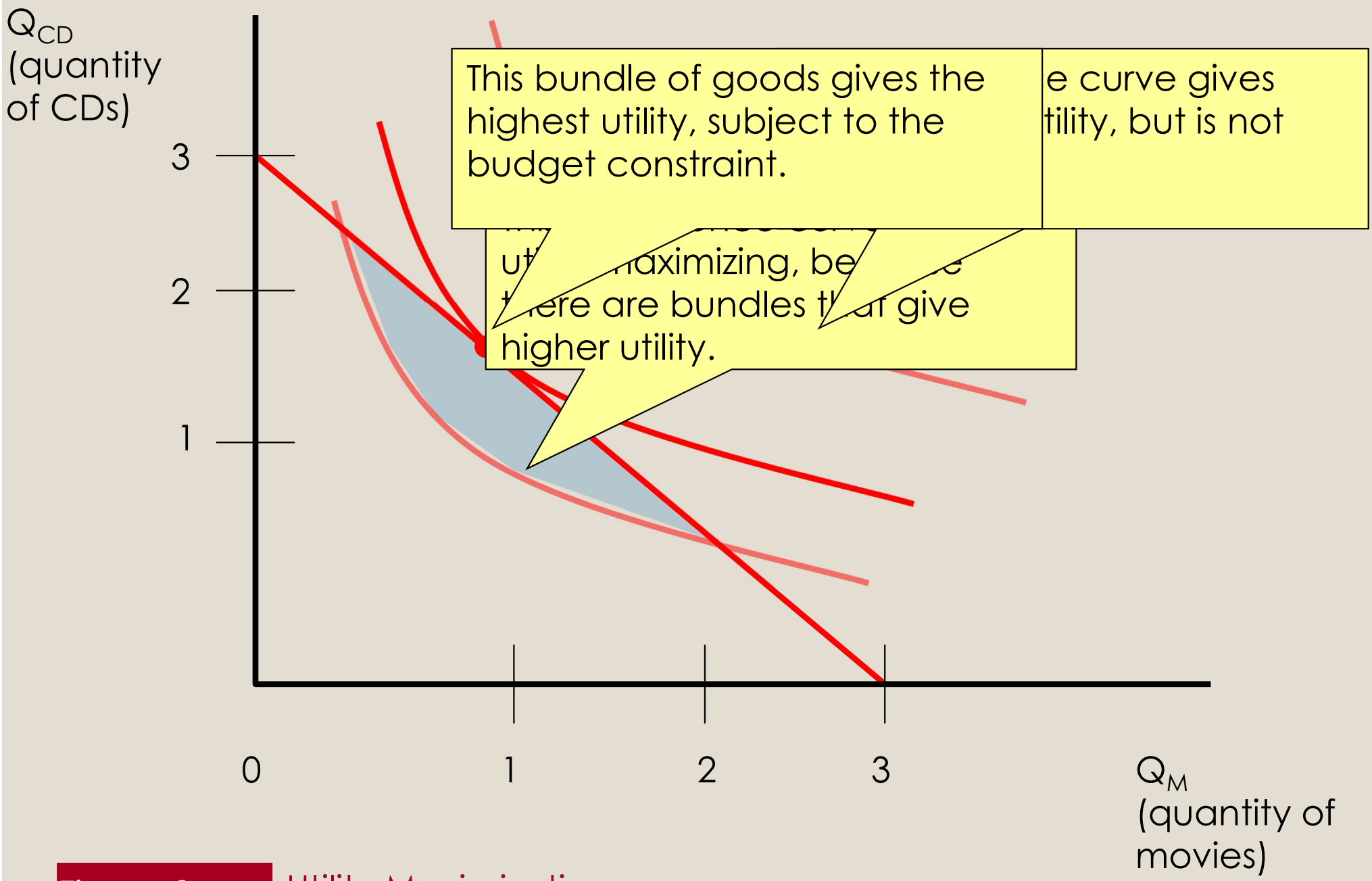


Figure 8 Utility Maximization

Constrained Utility Maximization: Putting it together: Constrained choice

- In this figure, the utility maximizing choice occurs where the indifference curve is *tangent* to the budget constraint.
- This implies that the slope of the indifference curve equals the slope of the budget constraint.

Constrained Utility Maximization: Putting it together: Constrained choice

- Thus, the marginal rate of substitution equals the ratio of prices:

$$MRS = -\frac{MU_M}{MU_C} = -\frac{P_M}{P_C}$$

- At the optimum, the ratio of the marginal utilities equals the ratio of prices. But this is not the only condition for utility maximization.
- **Figure 9** illustrates this.

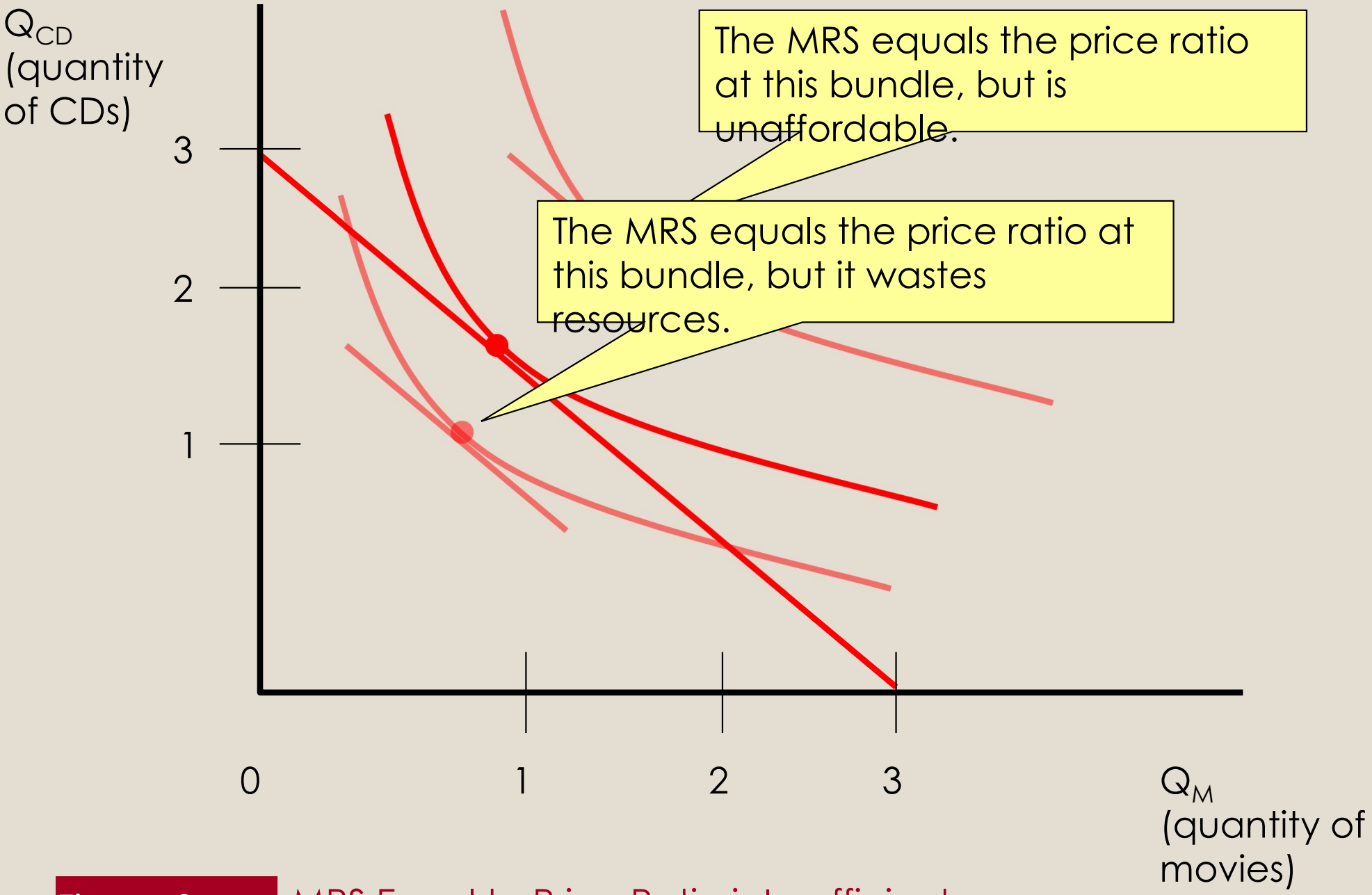


Figure 9 MRS Equal to Price Ratio is Insufficient

Constrained Utility Maximization: Putting it together: Constrained choice

- Thus, the second condition is that all of the consumer's money is spent:

$$Y = P_M Q_M + P_C Q_C$$

- These two conditions are used for utility maximization.

The Effects of Price Changes: Substitution and income effects

- Consider a typical price change in our framework:
- Increase the price of movies, P_M.
- This rotates the budget constraint inward along the x-axis.
- **Figure 10** illustrates this.

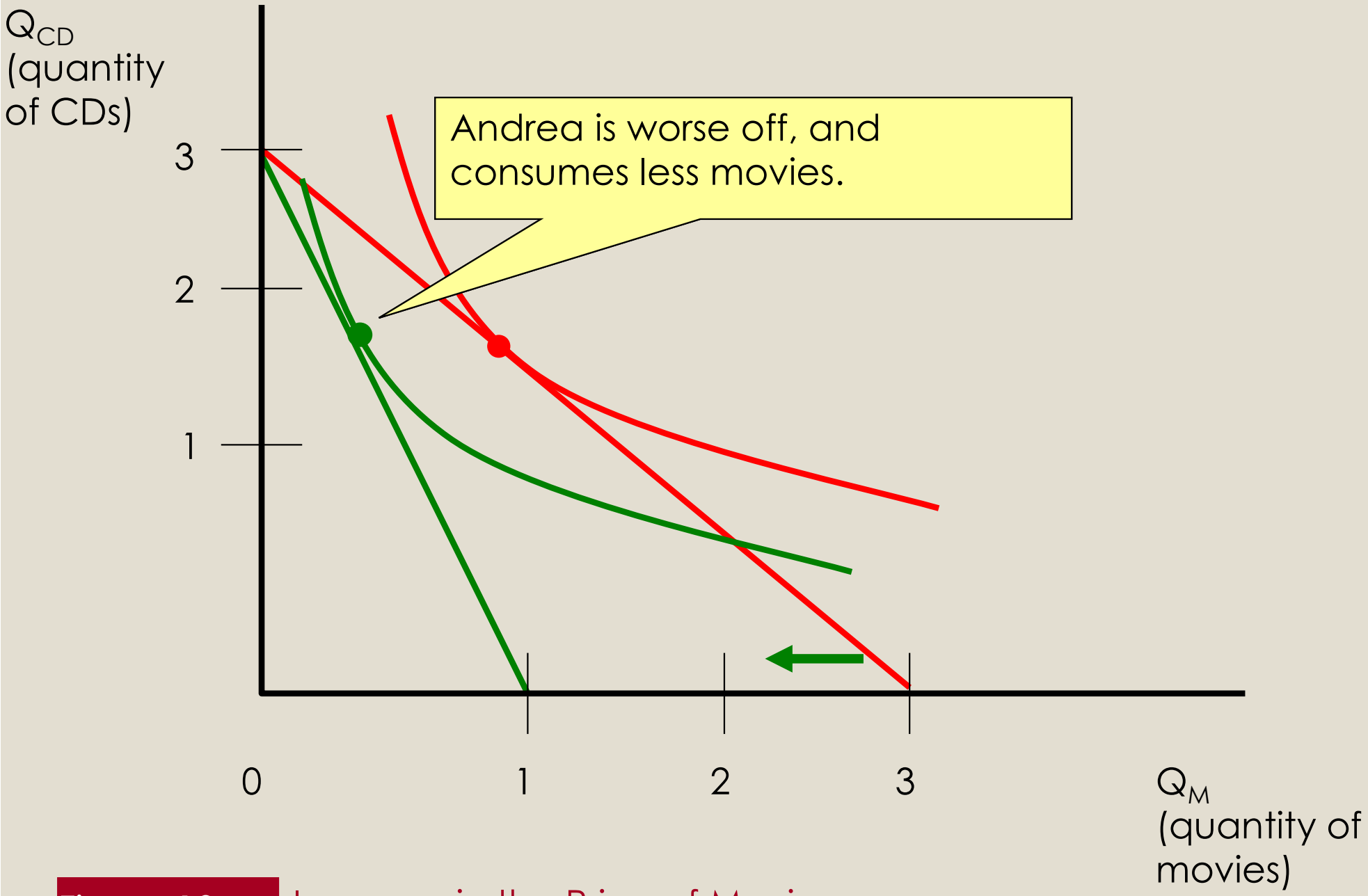


Figure 10 Increase in the Price of Movies

The Effects of Price Changes: Substitution and income effects

- A change in price consists of two effects:
- ***Substitution effect***–change in consumption due to change in relative prices, *holding utility constant*.
- ***Income effect***–change in consumption due to feeling "poorer" after price increase.
- **Figure 11** illustrates this.

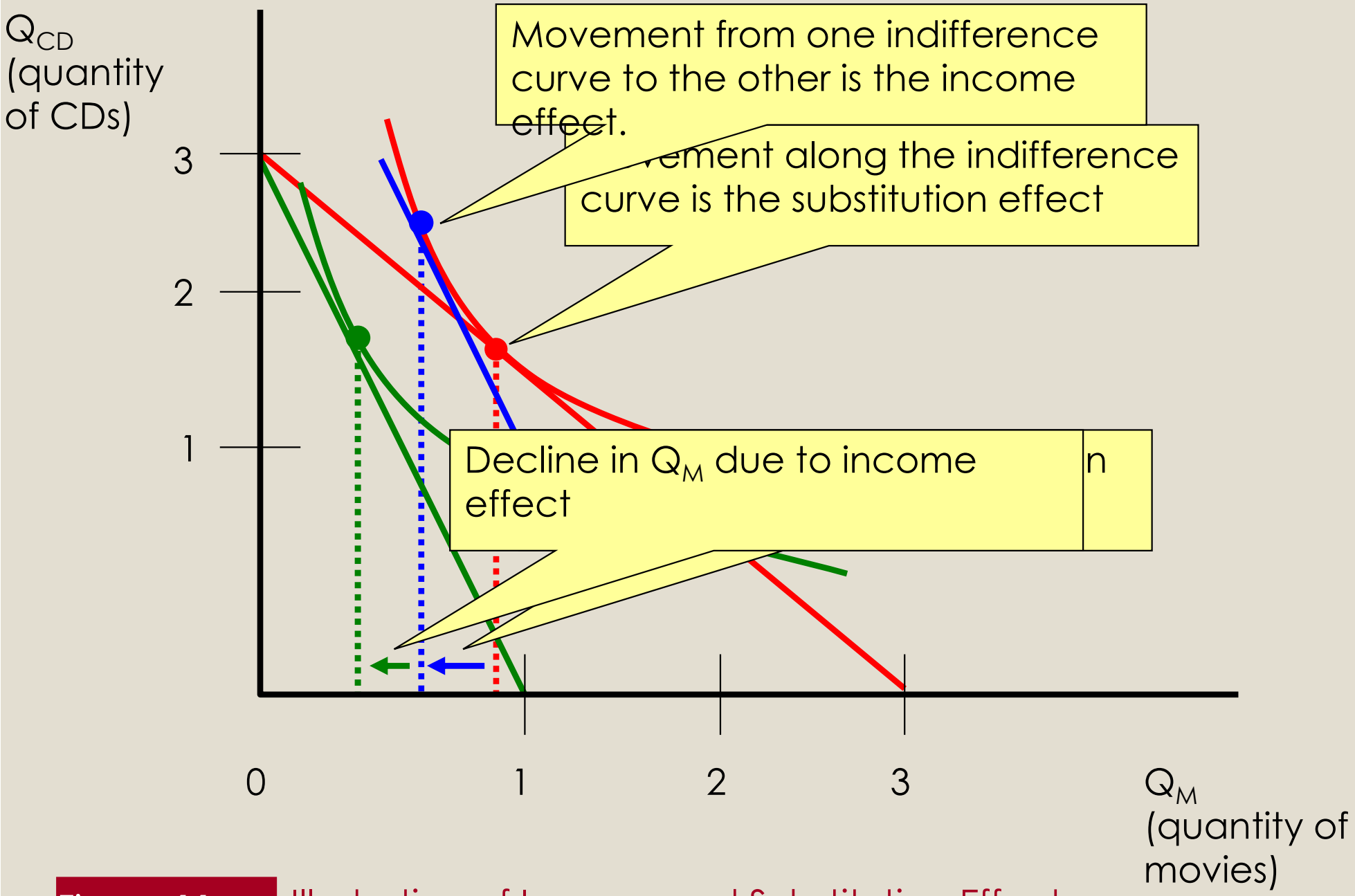


Figure 11 Illustration of Income and Substitution Effects

EQUILIBRIUM AND SOCIAL WELFARE

- ***Welfare economics*** is the study of the determinants of well-being, or welfare, in society.
  It depends on:
- Determinants of social efficiency, or size of the economic "pie."
- Redistribution.

EQUILIBRIUM AND SOCIAL WELFARE
Demand curves

- ***Demand curve*** is the relationship between the price of a good and the quantity demanded.
- Derive demand curve from utility maximization problem, as shown in **Figure 18**.

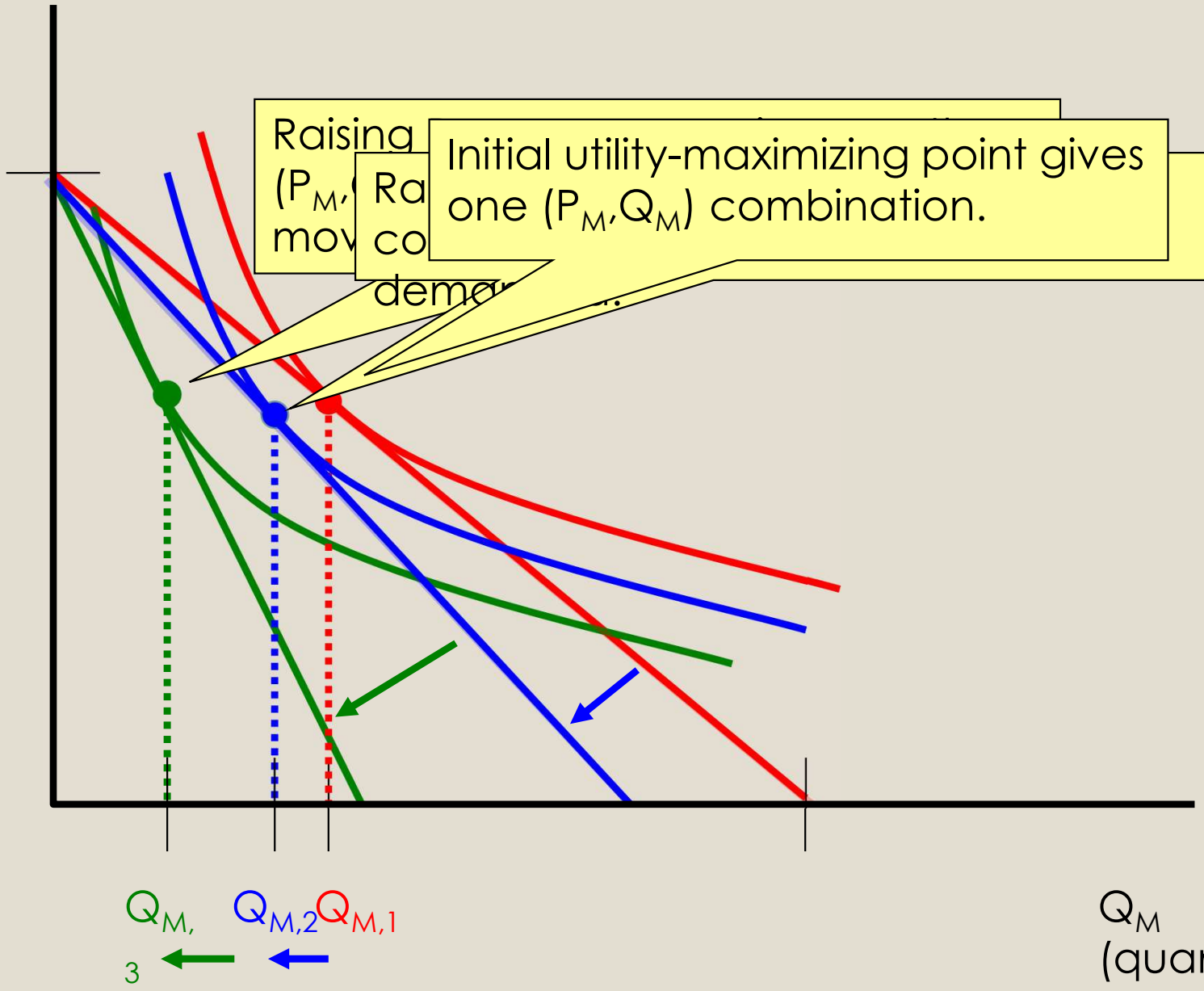


Figure 18 Increase in the Price of Movies

EQUILIBRIUM AND SOCIAL WELFARE
Demand curves

- This gives various (P_M,Q_M) combinations that can be mapped into price/quantity space.
- This gives us the demand curve for movies.
- **Figure 19** illustrates this.

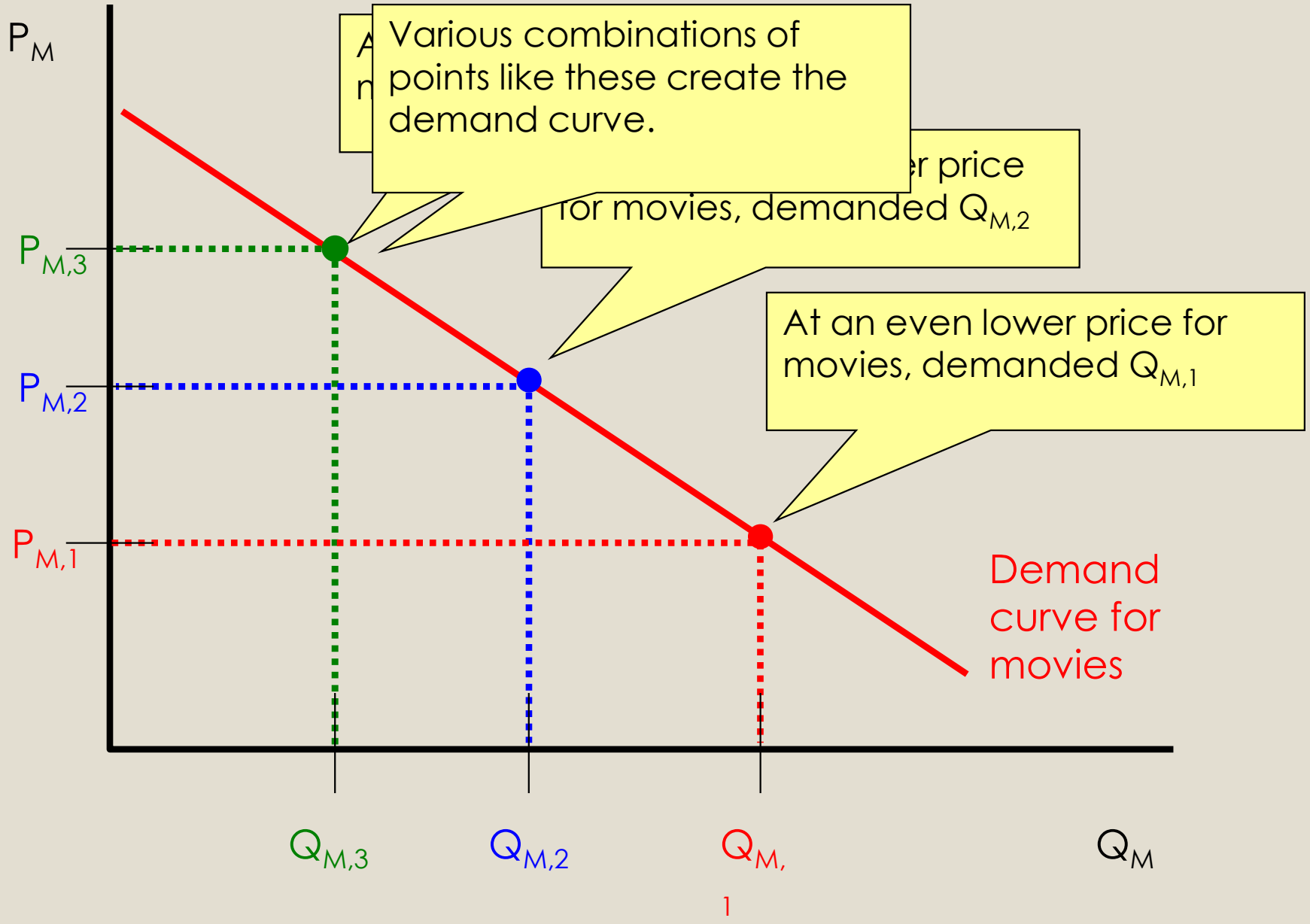


Figure 19 Deriving the Demand Curve for Movies

EQUILIBRIUM AND SOCIAL WELFARE Elasticity of demand

- A key feature of demand analysis is the ***elasticity of demand***. It is defined as:

$$\varepsilon_D = \frac{\Delta Q_D / Q_D}{\Delta P / P}$$

- That is, the percent change in quantity demanded divided by the percent change in price.

EQUILIBRIUM AND SOCIAL WELFARE Elasticity of demand

- For example, an increase in the price of movies from

  € 8 to €12 is a 50% rise in price.
- If the number of movies purchased fell from 6 to 4, there is an associated 33% reduction in quantity demanded.
  - The demand elasticity is therefore -0.67.
- Demand elasticities features:
  - Typically negative number.
  - Not constant along the demand curve (for a linear demand curve).

EQUILIBRIUM AND SOCIAL WELFARE Elasticity of demand

- For a vertical demand curve
  - Elasticity of demand is zero—quantity does not change as price goes up or down.
  - ***Perfectly inelastic***
- For a horizontal demand curve
  - Elasticity of demand is negative infinity—quantity changes infinitely for even a small change in price.
  - ***Perfectly elastic***
- **Figure 20** illustrates this.

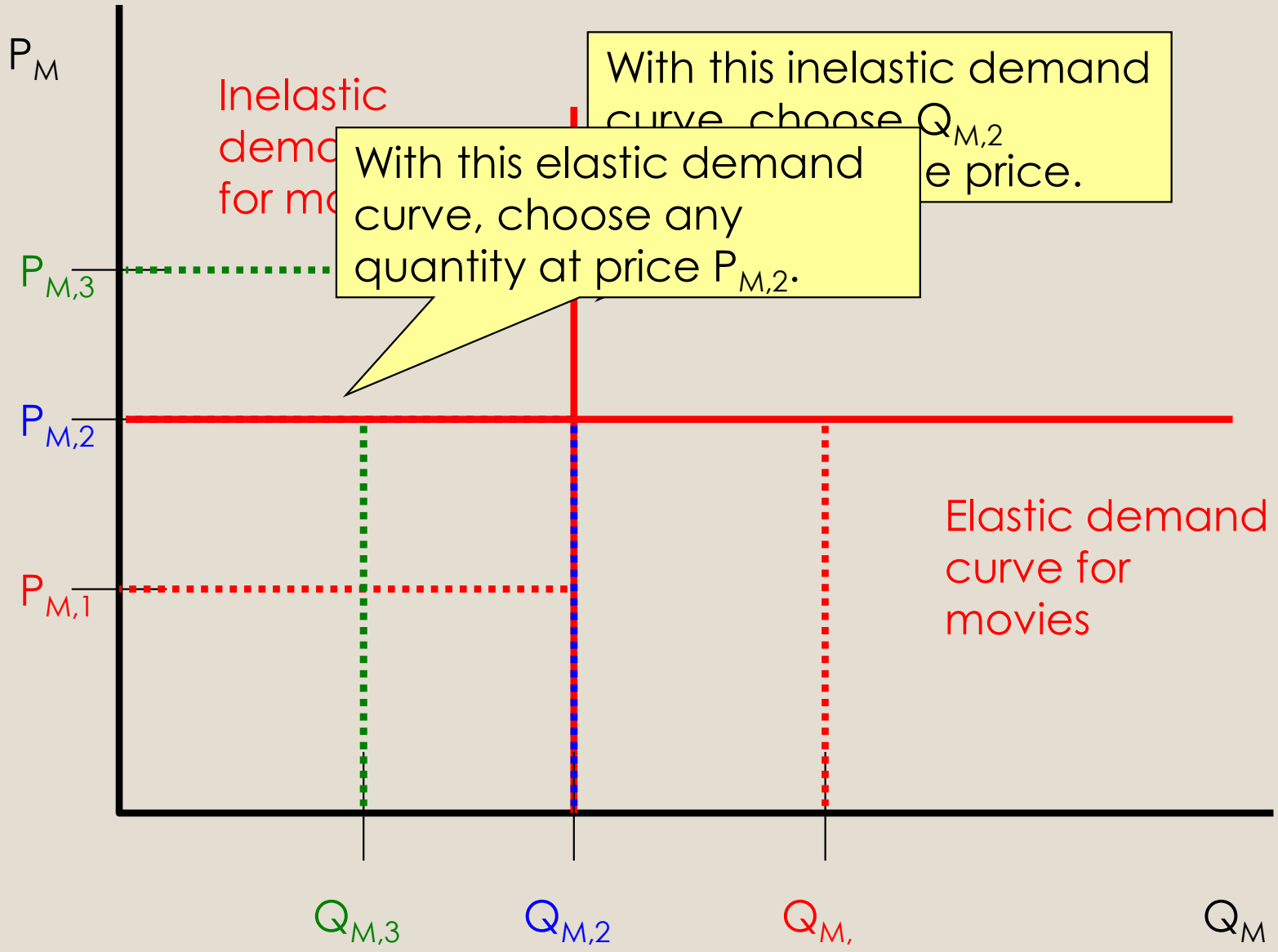


Figure 20 Perfectly Elastic and Perfectly Inelastic Demand

EQUILIBRIUM AND SOCIAL WELFARE
Elasticity of demand

- More generally, an ***elasticity*** divides the percent change in a dependent variable by the percent change in an independent variable:

$$\varepsilon = \frac{\Delta Y / Y}{\Delta X / X}$$

- For example, Y is often the quantity demanded or supplied, while X might be own-price, cross-price, or income.

EQUILIBRIUM AND SOCIAL WELFARE Supply curves

- ***Supply curve*** is the relationship between the price of a good and the quantity supplied.
  - Derive supply curve from profit maximization problem.
- The firm's ***production function*** measures the impact of a firm's input use on output levels.

EQUILIBRIUM AND SOCIAL WELFARE Supply curves

- Assume two inputs, labor (L) and capital (K). Firm's production function for movies is, in general:

$$Q_M = f\left(L_M, K_M\right)$$

- That is, the quantity of movies produced is related to the amount of labor and capital devoted to movie production.
- Similarly, there would be a production function for CDs.

EQUILIBRIUM AND SOCIAL WELFARE
Supply curves

- One specific production function is:

$$Q_M = \sqrt{L_M K_M}$$

- From a production function like this, we can figure out the *marginal productivity* of an input by taking the derivative with respect to it.

Equilibrium and Social Welfare: Supply curves

- For example, the marginal productivity of labor is:

$$\frac{\partial Q_M}{\partial L_M} = \frac{1}{2}\sqrt{\frac{K_M}{L_M}} > 0$$

- This is the partial derivative of Q with respect to L. The marginal product is positive.

Equilibrium and Social Welfare: Supply curves

- Taking the second derivative yields:

$$\frac{\partial^2 Q_M}{\partial L_M^{\,2}} = -\frac{1}{4}\sqrt{\frac{K_M}{L_M^3}} < 0$$

- This second derivative is negative, meaning that the production function features ***diminishing marginal productivity***.

EQUILIBRIUM AND SOCIAL WELFARE Supply curves

- ***Diminishing marginal productivity*** means that holding all other inputs constant, increasing the level of one input (such as labor) yields less and less additional output.

EQUILIBRIUM AND SOCIAL WELFARE Supply curves

- The total costs of production are given by:

$$TC = rK + wL$$

- In this case, *r* and *w* are the input prices of capital and labor, respectively.

EQUILIBRIUM AND SOCIAL WELFARE Supply curves

- If we assume capital is fixed in the short-run, the cost function becomes:

$$TC = r\overline{K} + wL$$

- Thus, only labor can be varied in the short run. The ***marginal cost*** is the incremental cost of producing one more unit of Q, or the product of the wage rate and amount of labor used to produce that unit.

EQUILIBRIUM AND SOCIAL WELFARE Supply curves

- Diminishing marginal productivity implies rising marginal costs.
- Since each additional unit, *Q*, means calling forth less and less productive labor at the same wage rate, costs of production rise.

EQUILIBRIUM AND SOCIAL WELFARE Supply curves

- ***Profit maximization*** means maximizing the difference between total revenue and total costs.
- This occurs at the quantity where ***marginal revenue*** equals ***marginal costs***.

EQUILIBRIUM AND SOCIAL WELFARE Equilibrium

- In a perfectly competitive market, the marginal revenue is the market price. Thus, the firm produces until:
  - $P = MC$.
- Thus, the *MC* curve is the supply curve.

EQUILIBRIUM AND SOCIAL WELFARE Equilibrium

- In equilibrium, we *horizontally sum* individual demand curves to get aggregate demand.
- We also *horizontally sum* individual supply curves to get aggregate supply.
- Competitive equilibrium represents the point at which both consumers and suppliers are satisfied with the price/quantity combination.
- **Figure 21** illustrates this.

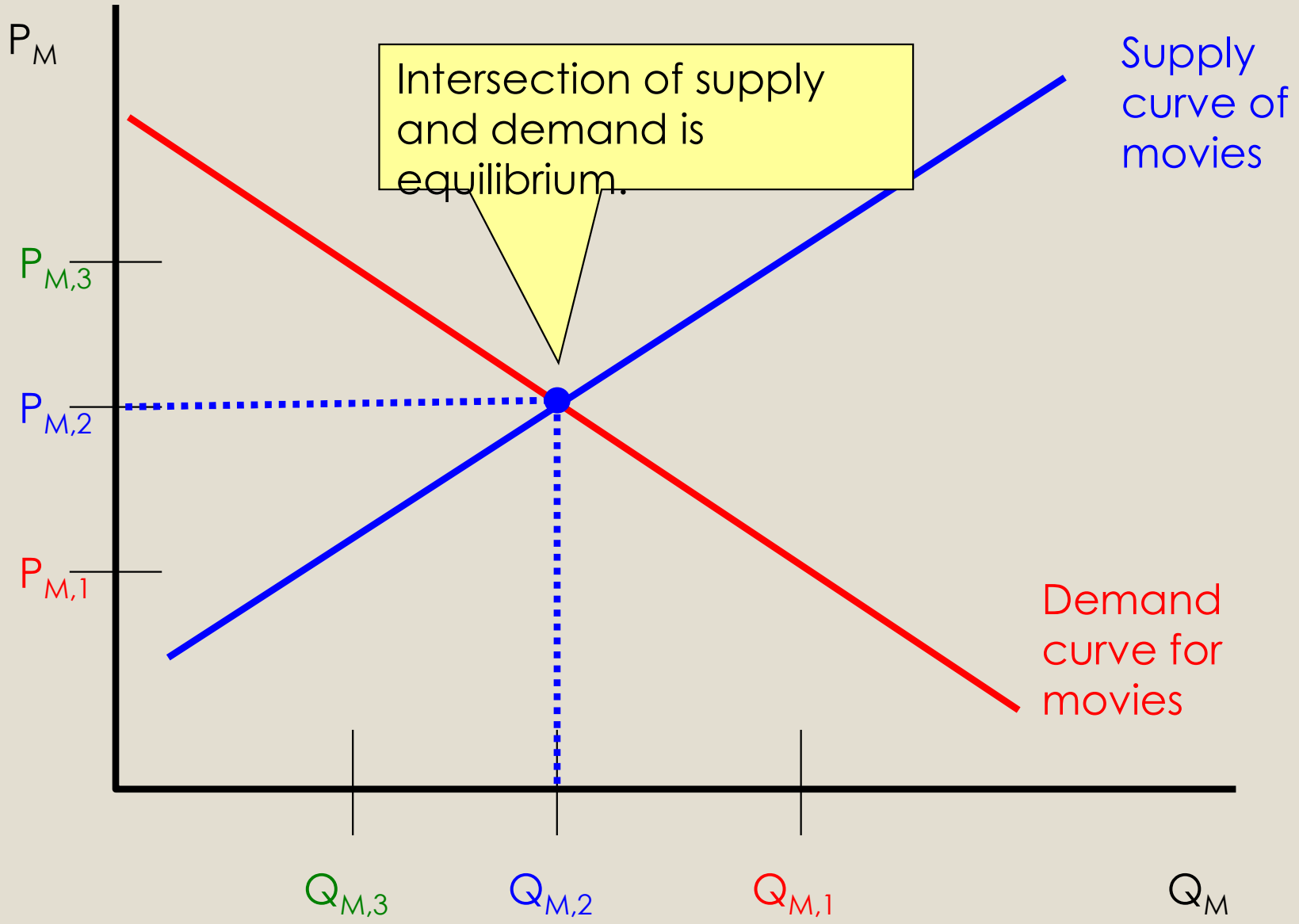


Figure 21 Equilibrium with Supply and Demand

EQUILIBRIUM AND SOCIAL WELFARE
Social efficiency

- Measuring *social efficiency* is computing the potential size of the economic pie. It represents the net gain from trade to consumers and producers.

EQUILIBRIUM AND SOCIAL WELFARE Social efficiency

- ***Consumer surplus*** is the benefit that consumers derive from a good, beyond what they paid for it.
- Each point on the demand curve represents a "willingness-to-pay" for that quantity.
- **Figure 22** illustrates this.

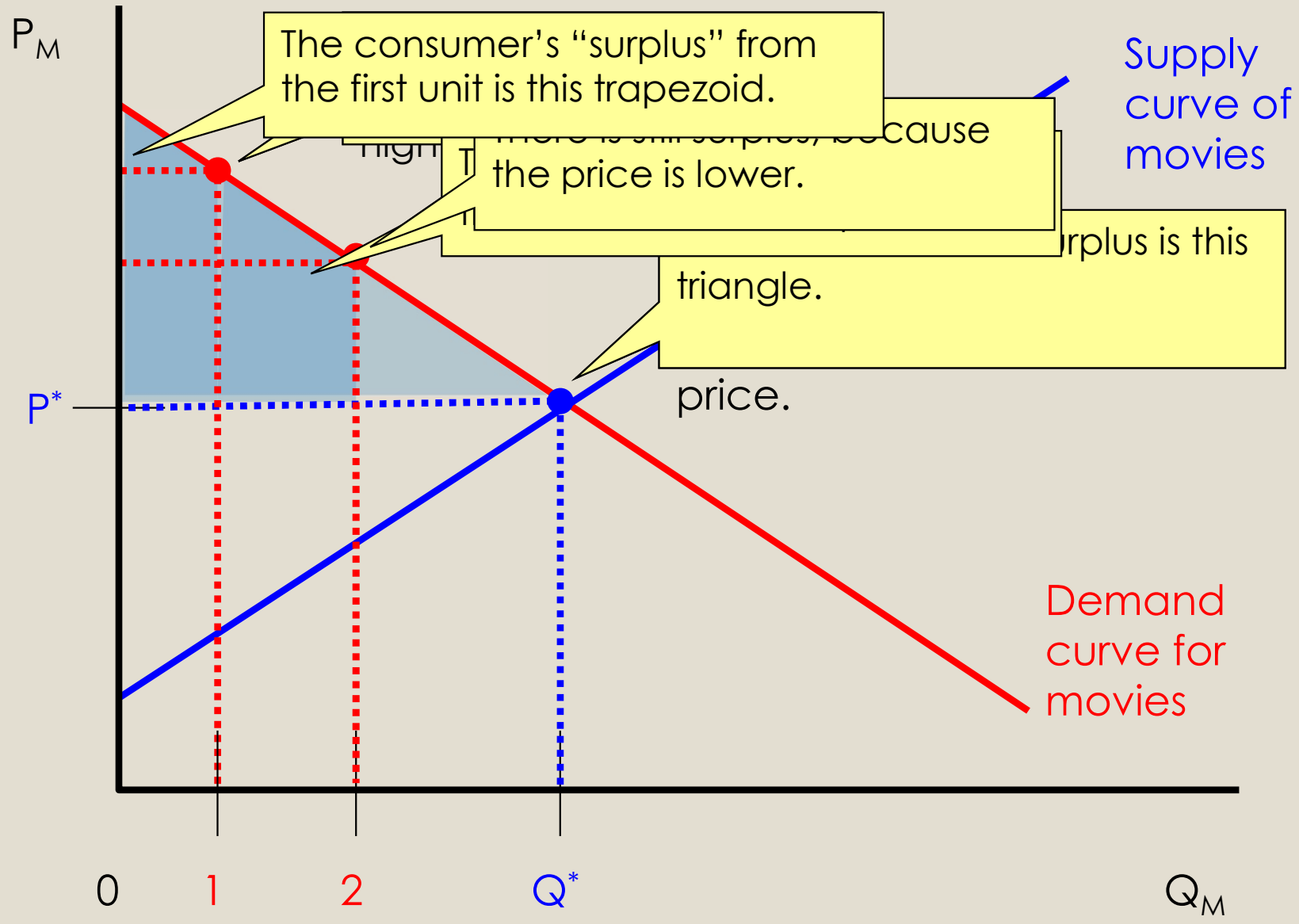


Figure 22 Deriving Consumer Surplus

EQUILIBRIUM AND SOCIAL WELFARE
Social efficiency

- Consumer surplus is determined by market price and the elasticity of demand:
  - With inelastic demand, demand curve is more vertical, so surplus is higher.
  - With elastic demand, surplus is lower.
- **Figure 23** illustrates this.

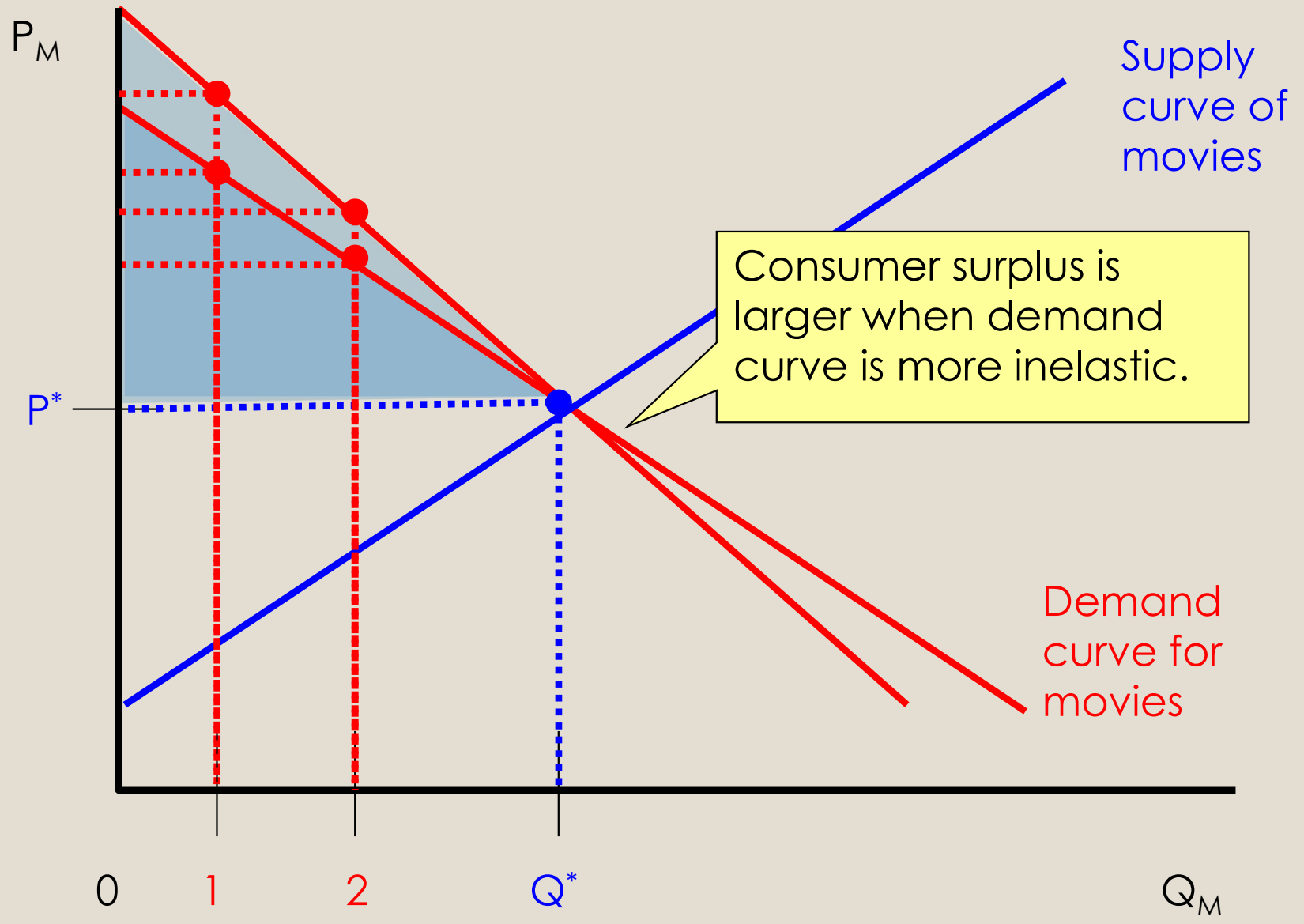


Figure 23 Consumer Surplus and Inelastic Demand

EQUILIBRIUM AND SOCIAL WELFARE
Social efficiency

- ***Producer surplus*** is the benefit derived by producers from the sale of a unit above and beyond their cost of producing it.
- Each point on the supply curve represents the marginal cost of producing it.
- **Figure 24** illustrates this.

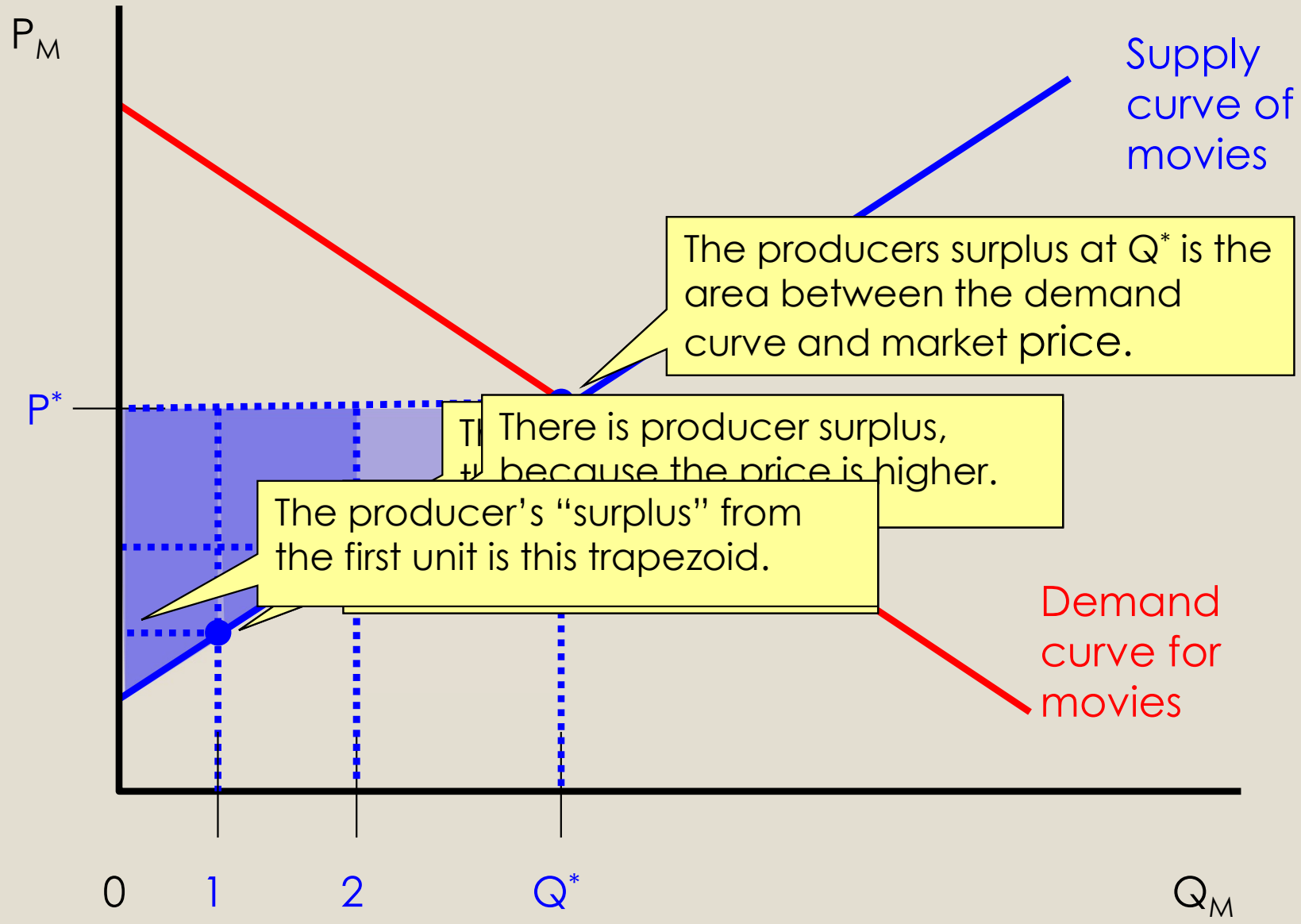


Figure 24 Producer Surplus

EQUILIBRIUM AND SOCIAL WELFARE Social efficiency

- Similar to consumer surplus, producer surplus is determined by market price and the elasticity of supply:
  - With inelastic supply, supply curve is more vertical, so producer surplus is higher.
  - With elastic supply, producer surplus is lower.

EQUILIBRIUM AND SOCIAL WELFARE
Social efficiency

- The ***total social surplus,*** also known as "social efficiency," is the sum of the consumer's and producer's surplus.
- **Figure 25** illustrates this.

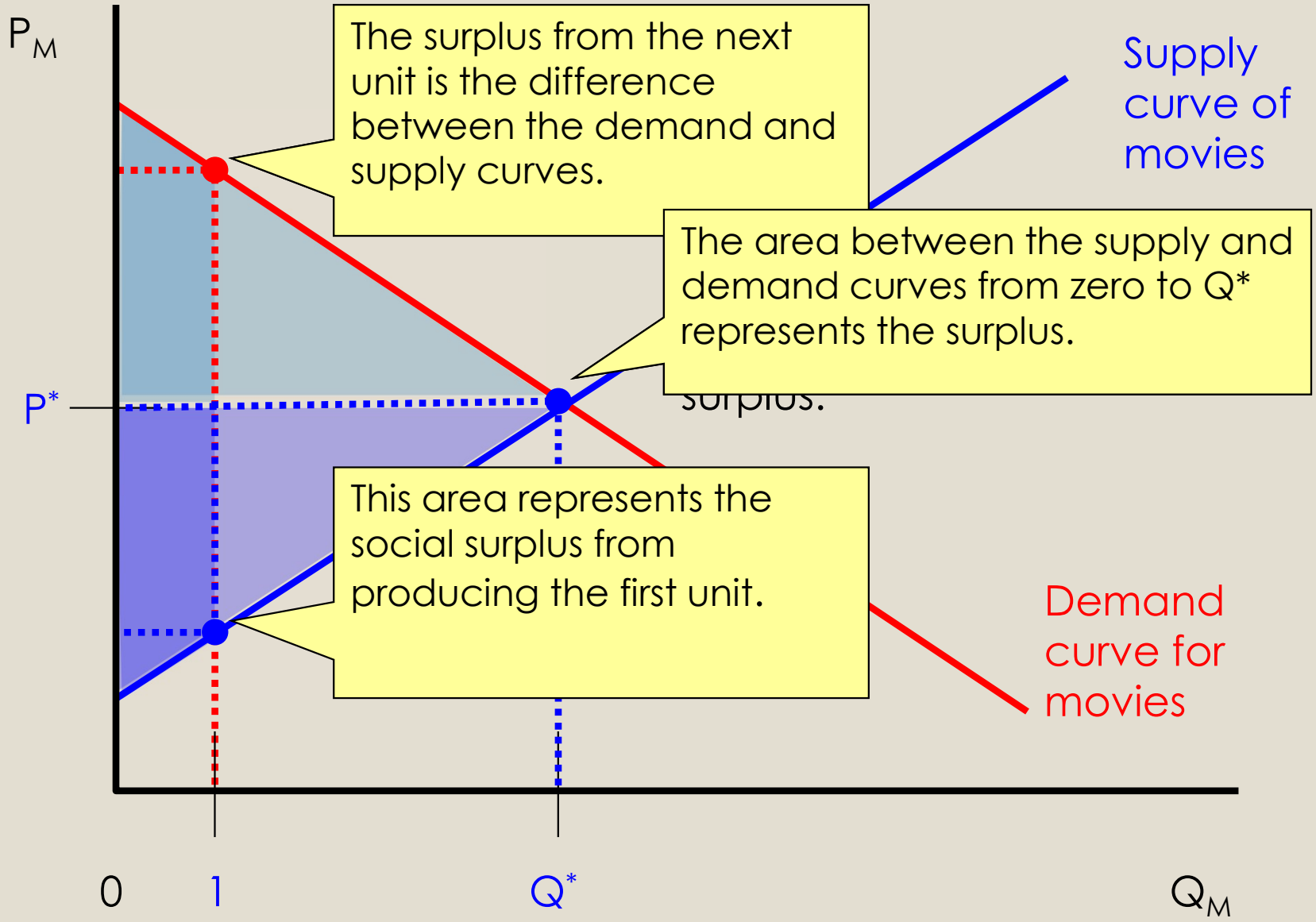


Figure 25 Social Surplus

EQUILIBRIUM AND SOCIAL WELFARE Competitive equilibrium maximizes social efficiency

- The ***First Fundamental Theorem of Welfare Economics*** states that the competitive equilibrium, where supply equals demand, maximizes social efficiency.
- Any quantity other than Q^* reduces social efficiency, or the size of the "economic pie."
- Consider restricting the price of the good to $P' < P^*$.
- **Figure 26** illustrates this.

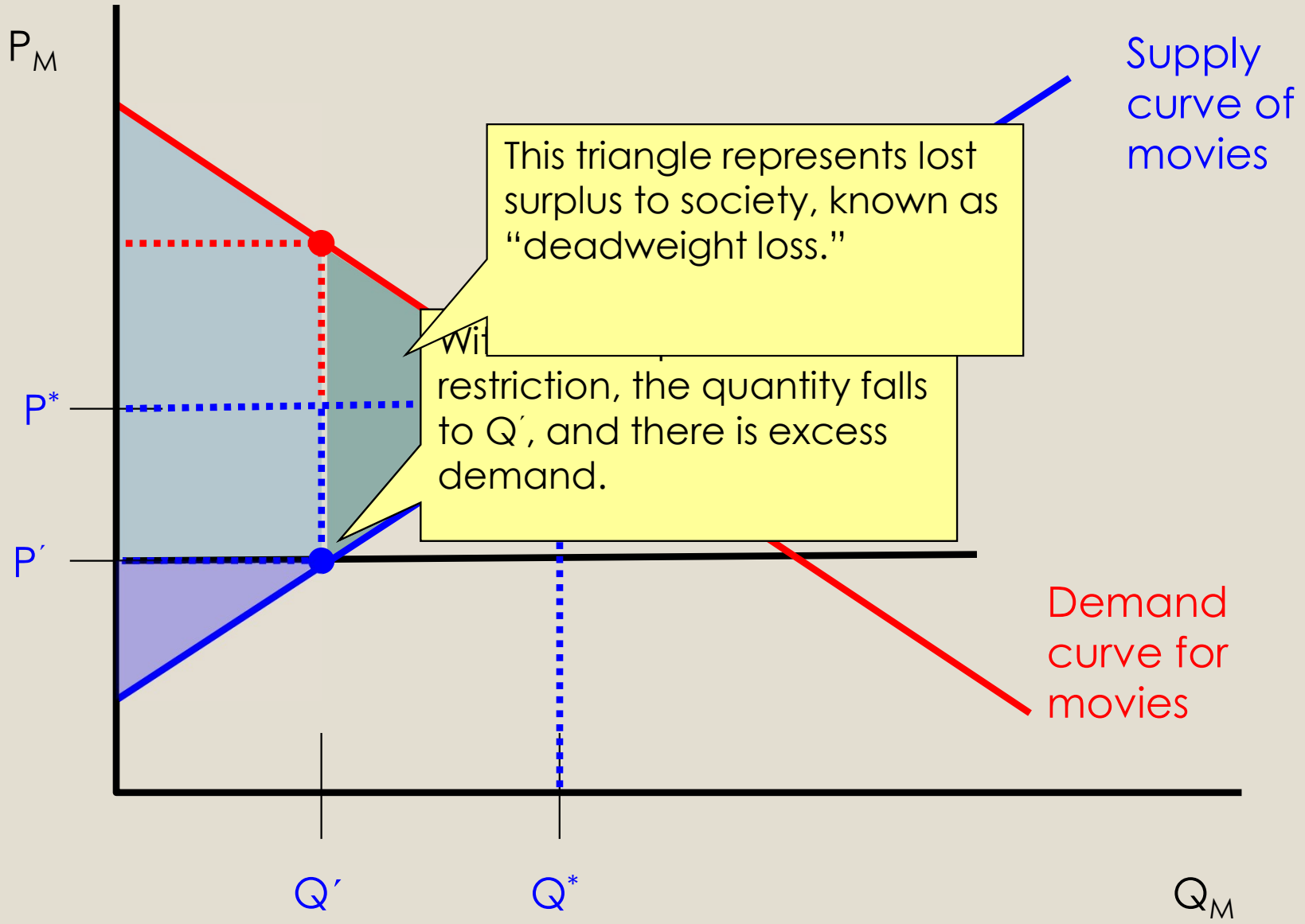


Figure 26 Deadweight Loss from a Price Floor

EQUILIBRIUM AND SOCIAL WELFARE Competitive equilibrium maximizes social efficiency

- A policy like price controls creates ***deadweight loss***, the reduction in social efficiency by restricting quantity below the competitive equilibrium.

EQUILIBRIUM AND SOCIAL WELFARE
The role of equity

- Societies usually care not only about how much surplus there is, but also about how it is distributed among the population.
- ***Social welfare*** is determined by both criteria.
- The ***Second Fundamental Theorem of Welfare Economics*** states that society can attain any efficient outcome by a suitable redistribution of resources and free trade.
- In reality, society often faces an equity-efficiency tradeoff.

EQUILIBRIUM AND SOCIAL WELFARE
The role of equity

- Society's tradeoffs of equity and efficiency are models with a ***Social Welfare Function***.
- This maps individual utilities into an overall social utility function.

EQUILIBRIUM AND SOCIAL WELFARE
The role of equity

- The *utilitarian* social welfare function is:

$$SWF = \sum_i U_i$$

- The utilities of all individuals are given equal weight.
- Implies that government should transfer from person 1 to person 2 as long as person 2's gain is bigger than person 1's loss in utility.

EQUILIBRIUM AND SOCIAL WELFARE
The role of equity

- Utilitarian SWF is defined in terms of utility, not euros.
- Society not indifferent between giving €1 of income to rich and poor; rather indifferent between one *util* to rich and one util to poor.

EQUILIBRIUM AND SOCIAL WELFARE
The role of equity

- Utilitarian SWF is maximized when the marginal utilities of everyone are equal:

$$MU_1 = MU_2 = \ldots = MU_i$$

- Thus, society should redistribute from rich to poor if the marginal utility of the next euro is higher to the poor person than to the rich person.

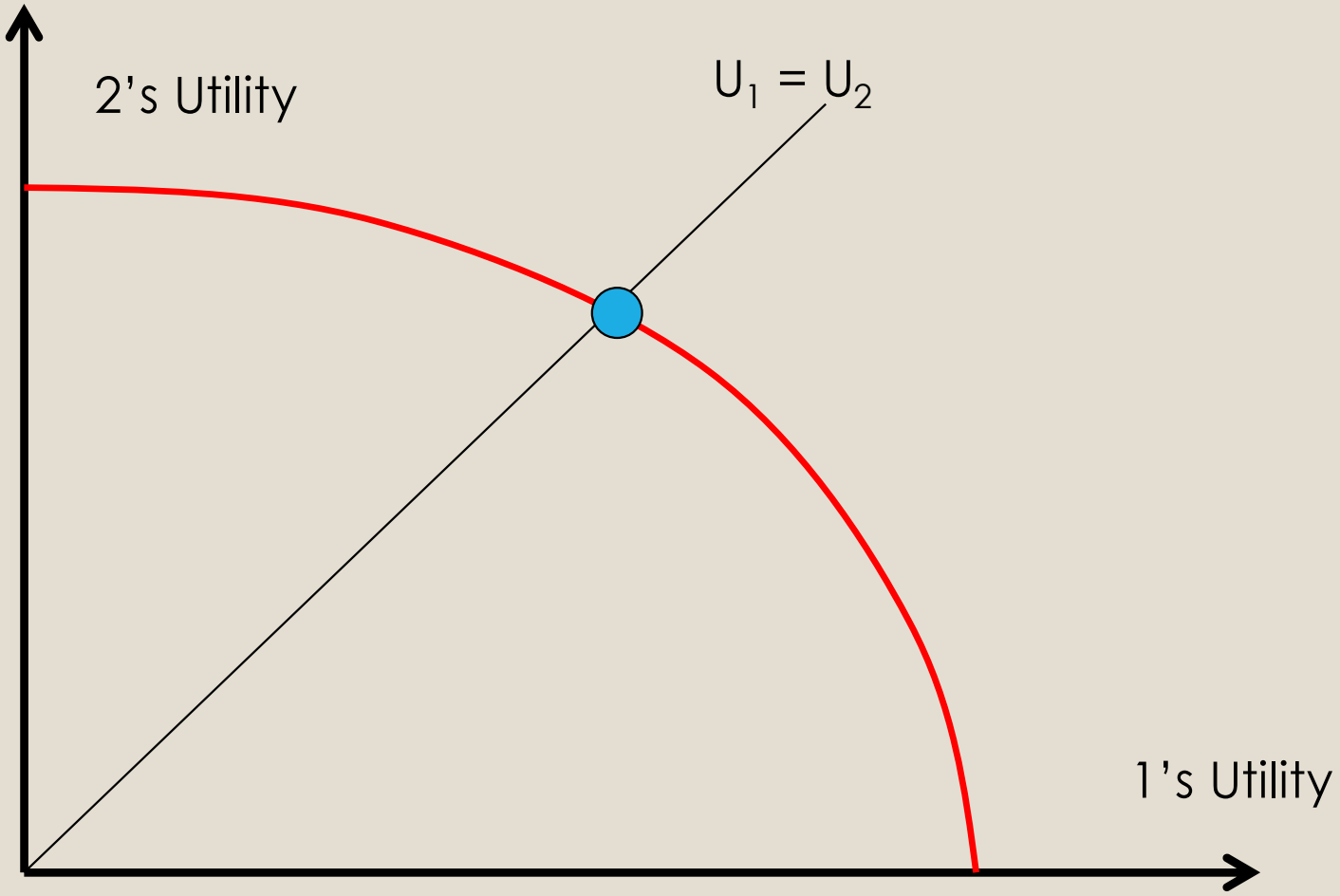
EQUILIBRIUM AND SOCIAL WELFARE
The role of equity

- The *Rawlsian* social welfare function is:

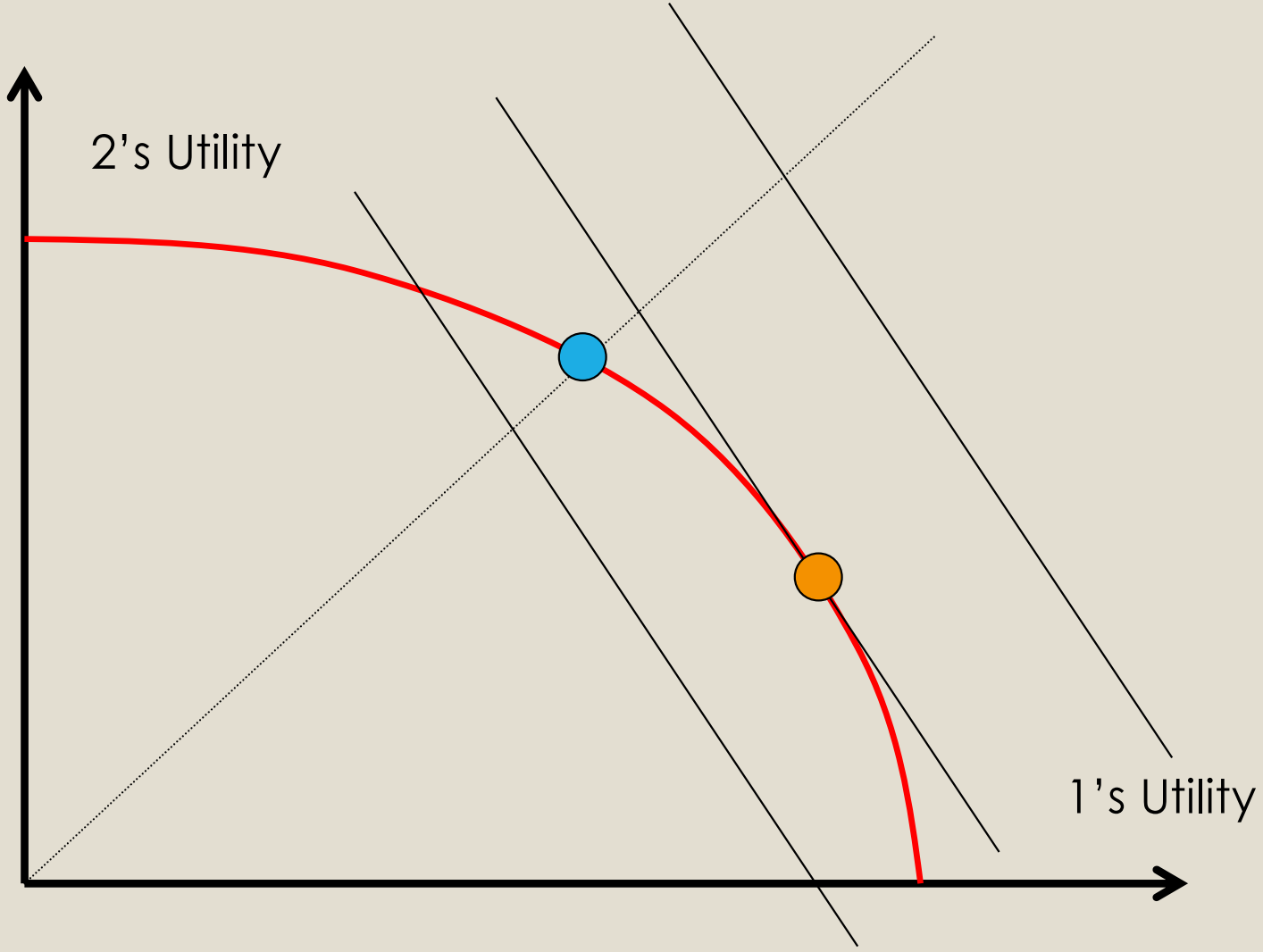
$$SWF = \min\left(U_1, U_2, \ldots, U_N\right)$$

- Societal welfare is maximized by maximizing the well-being of the worst-off person in society.
- Generally suggests more redistribution than the utilitarian SWF.

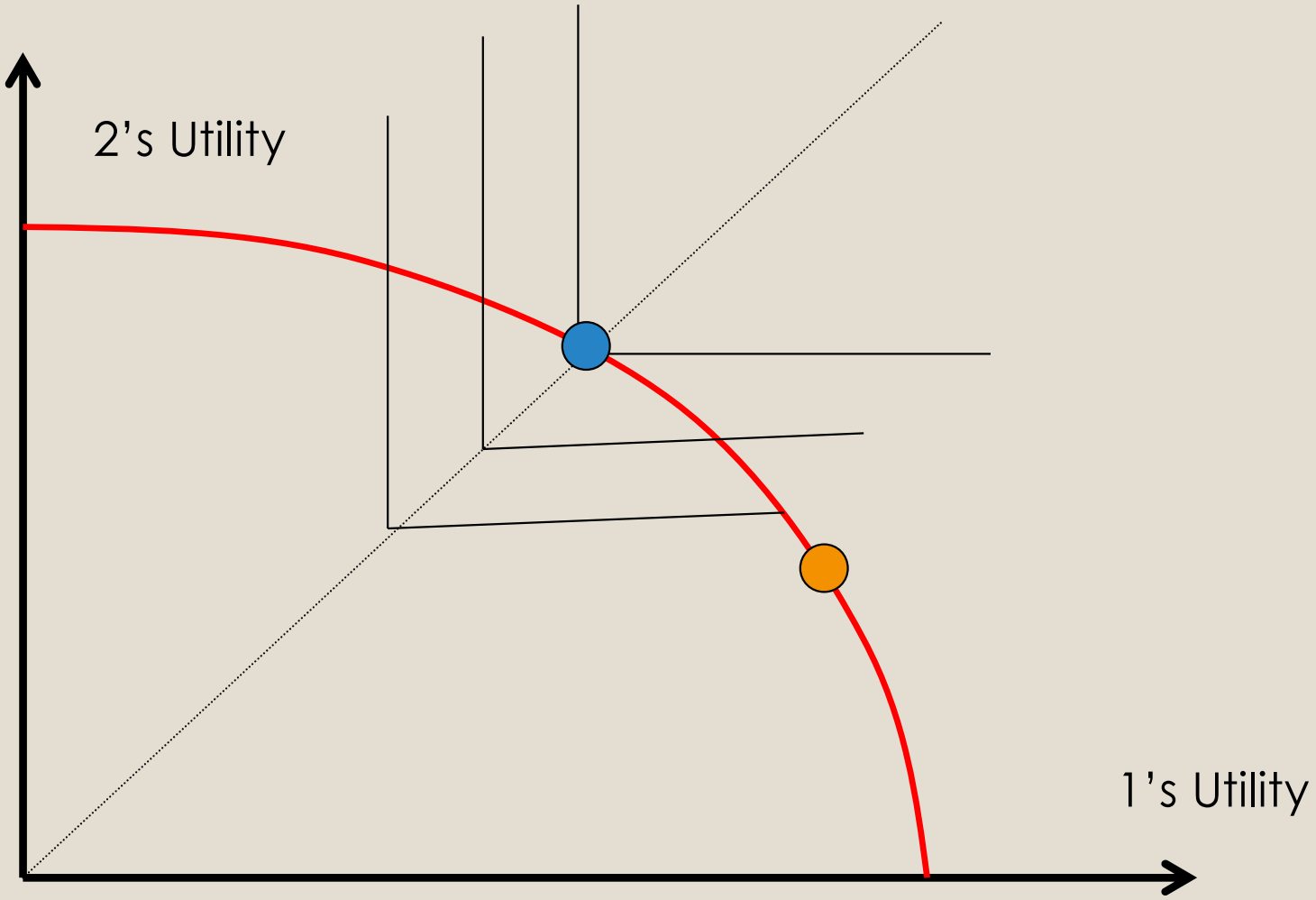
Equity: equal shares



Utilitarianism: Maximize U(1)+U(2)



Rawls: Maximize min{U(1),U(2)}



Recap of Theoretical Tools

- Utility maximization
- Labor supply example
- Efficiency
- Social welfare functions