Economic Policy Analysis: Lecture 1

Theoretical Foundations of Economic Policy Analysis

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Outline

Imagine: Life after Stanford

- You graduate from Stanford and land a sweet job at the California Health and Human Services Agency (HHS), which oversees Temporary Assistance for Needy Families (TANF)
- The current governor is considering reducing TANF benefits, in order to induce work among recipients
- The secretary of HHS disagrees, arguing that reduced benefits will only hurt stay at home mothers

Economic Policy Analysis

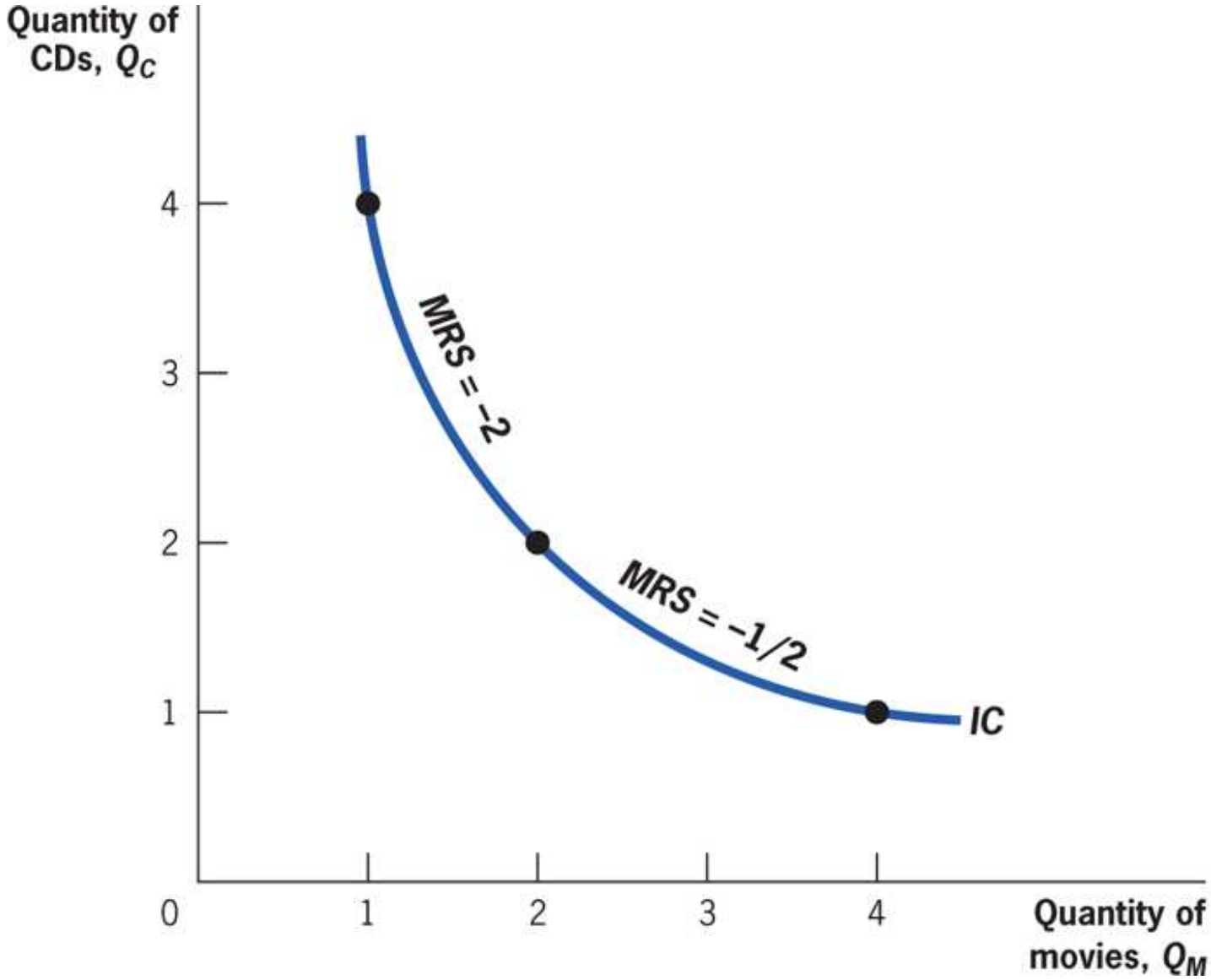
You are asked to evaluate the situation:

- Theoretical Tools & Empirical Tools
- Positive Analysis: What will happen?
- Normative Analysis: What should happen?

Constrained Utility Maximization

- **indifference curves** = consumer preferences
- non-satiation
  - Consumers prefer higher indifference curves
  - Indifference Curves are downward sloping
  - Example: CDs and Movies

Figure 1: Indifference Curves & Marginal Rate of Substitution



Utility Functions

- $U = f(X_1, X_2, ..., X_N)$
- **marginal utility**: the incremental utility gained by an additional unit

$$MU_{X_1} = \frac{\partial U}{\partial X_1}$$

- diminishing marginal utility
  - Example: $U = \sqrt{Q_C \times Q_M}$

Utility Functions

- **Marginal Rate of Substitution** (MRS): the rate at which consumers are willing to trade one good for another

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

  - Example: CDs and Movies

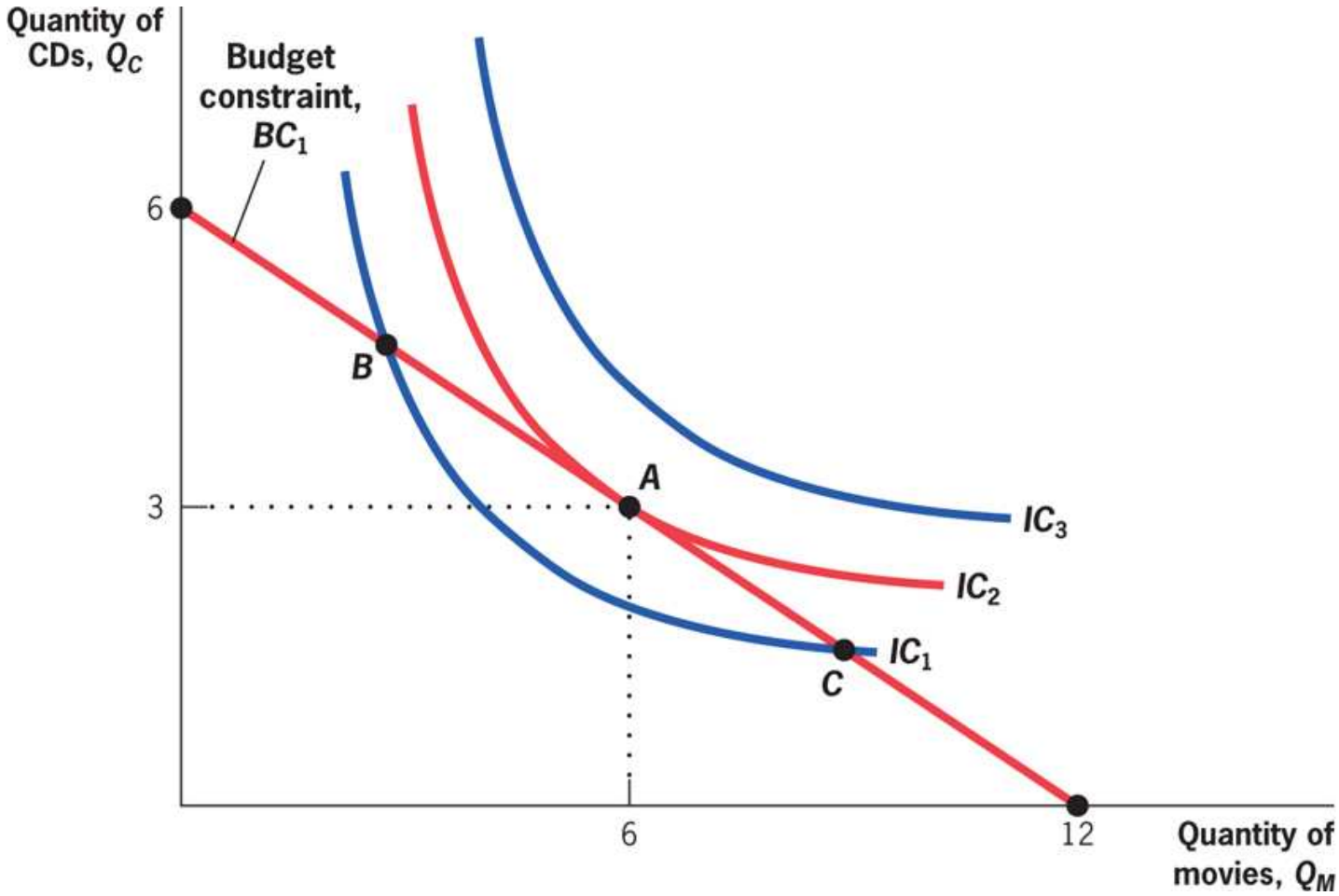
Budget Constraints

- Key contribution of economics: resources are limited
- **budget constraint**: mathematical representation of all affordable combinations of goods

$$Y = P_C Q_C + P_M Q_M$$

  - Example: CDs and Movies

Figure 2: Budget Constraint & Utility Maximization



Constrained Choice

- Using indifference curves and budget constraints, we model consumer choice
- Optimal Bundle:

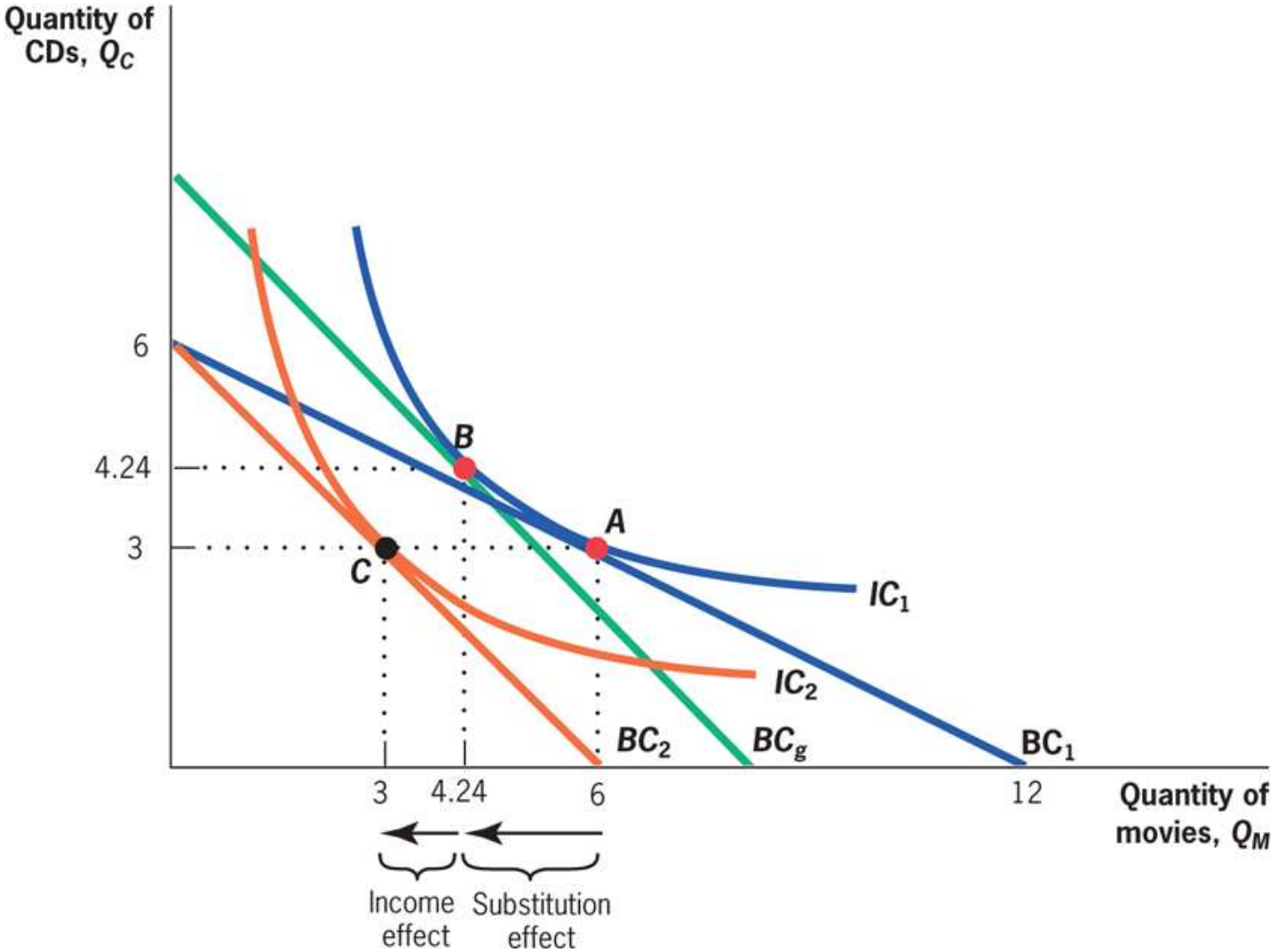
$$MRS = \frac{-MU_M}{MU_C} = \frac{-P_M}{P_C}$$

  - Example: CDs and Movies

Comparative Statics

- We can also analyze the effects of changes in prices or income
- A change in price creates a **substitution effect** and an **income effect**
  - Example: CDs and Movies

Figure 3: Income & Substitution Effects



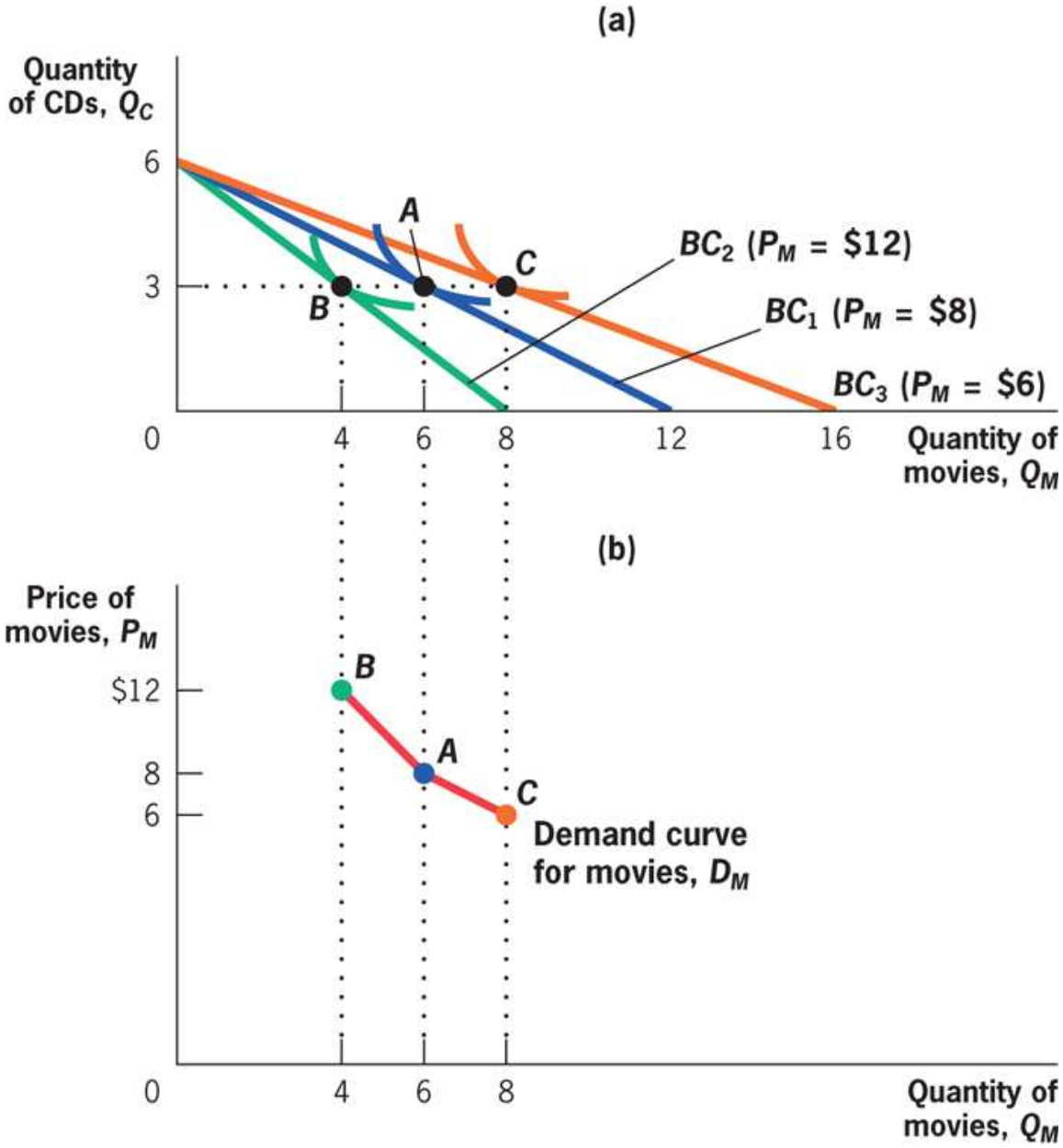
Demand Curves

- **demand Curves**: the quantity of a good consumed at each price
- Using our analysis of consumer choice, we can predict quantities consumed at different prices
- Key feature of demand curve is the **elasticity of demand**

$$\varepsilon_D = \frac{\text{Percent Change in } Q_D}{\text{Percent Change in Price}} = \frac{-\triangle Q/Q}{\triangle P/P}$$

  - Elasticity is usually not constant
  - perfectly inelastic and perfectly elastic demand curves
  - cross price elasticities

Figure 4: Demand Curves



Supply Curves

- **supply Curves**: the quantity of a good agents (or firms) are willing to supply at each price
- Built up from similar microfoundations of profit maximization
- Key concept is marginal productivity
- When this is diminishing, **marginal costs** will be increasing
- The supply curve in a competitive market is the marginal cost curve, and will therefore be upward sloping
- Firms supply until price equals marginal cost

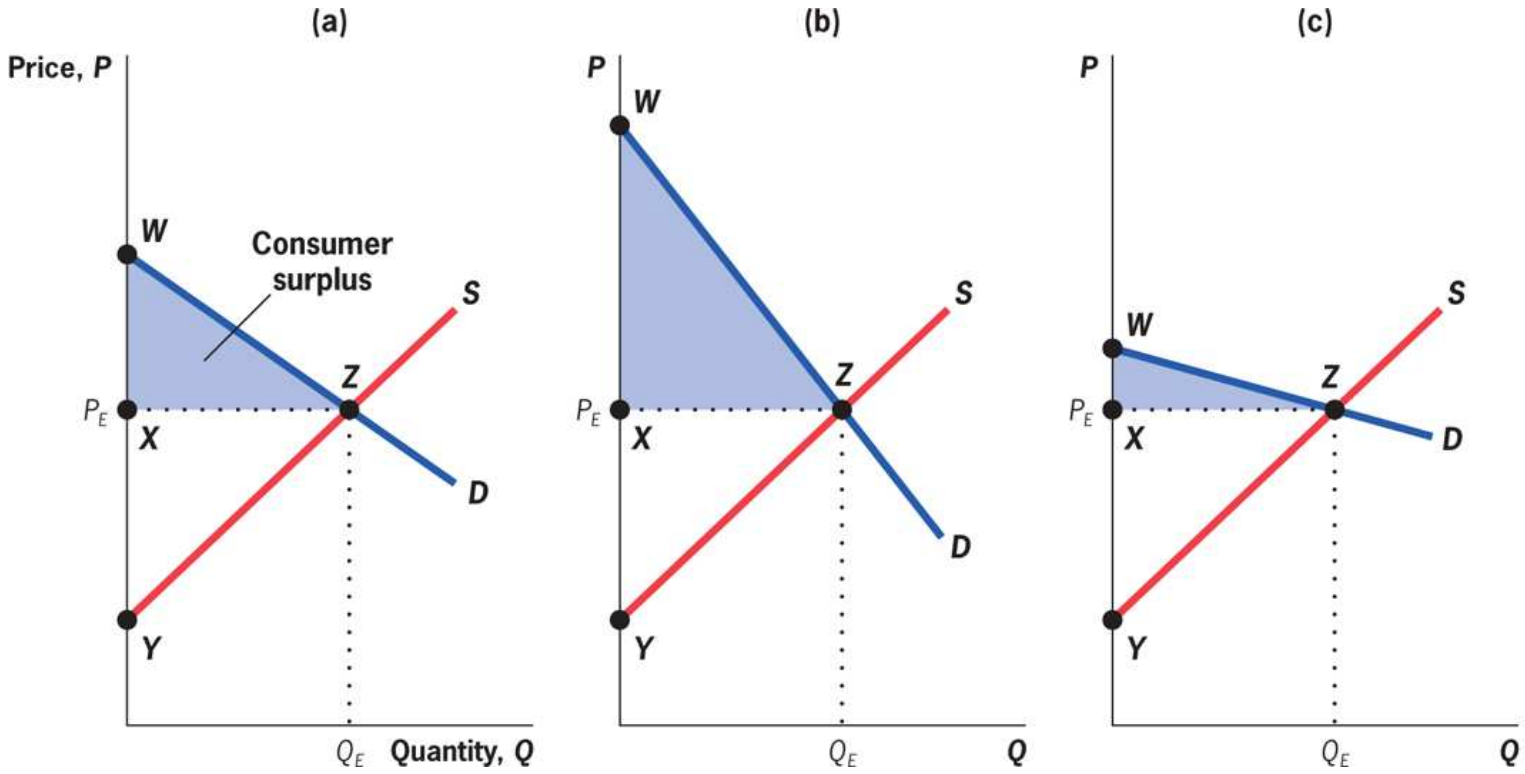
Market Equilibrium and Efficiency

- **market demand** and **market supply** are the horizontal sums of individual curves
- **market equilibrum:** the combination of price and quantity that satisfies both demand and supply
- competitive markets reach an equilibrium that is socially efficient (size of the pie)

Consumer and Producer Surplus

- **consumer surplus:** benefit to consumers beyond what they pay
- **producer surplus:** benefit to producers beyond the costs of production
- price elasticity partly determines the amount of surplus

Figure 5: Consumer Surplus



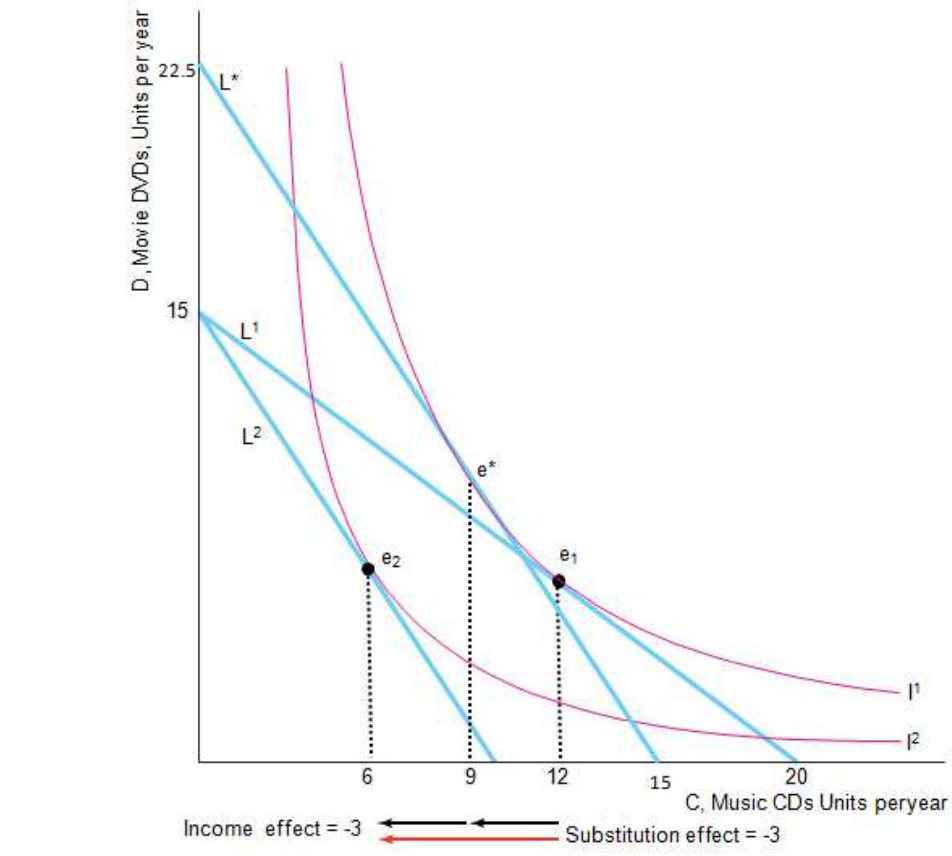
From Surplus to Welfare

How can we link the effects of price changes to consumer's welfare? 3 key concepts

- Compensating variation (CV): what change in income would restore the consumer's well-being to what it was before the price change
- Equivalent variation (EV): what change in the consumer's income would have an equal effect on the consumer's well-being as the price change
- Change in consumer's surplus (ΔCS): area to the left of the demand curve between the before and after prices. We can go from willingness-to-pay to surplus to welfare as well

These are 3 possible money metric measures of the effect of a price change on welfare

Figure 6: Compensating Variation



L^1 and I^1

P_D = price of DVDs = \$20

P_C = price of CDs = \$15

M = Income = \$300.

Choice: e_1

L^2 and I^2

P_D = price of DVDs = \$20

P_C = price of CDs = \$30

M = Income = \$300.

Choice: e_2

L^* and I^1

P_D = price of DVDs = \$20

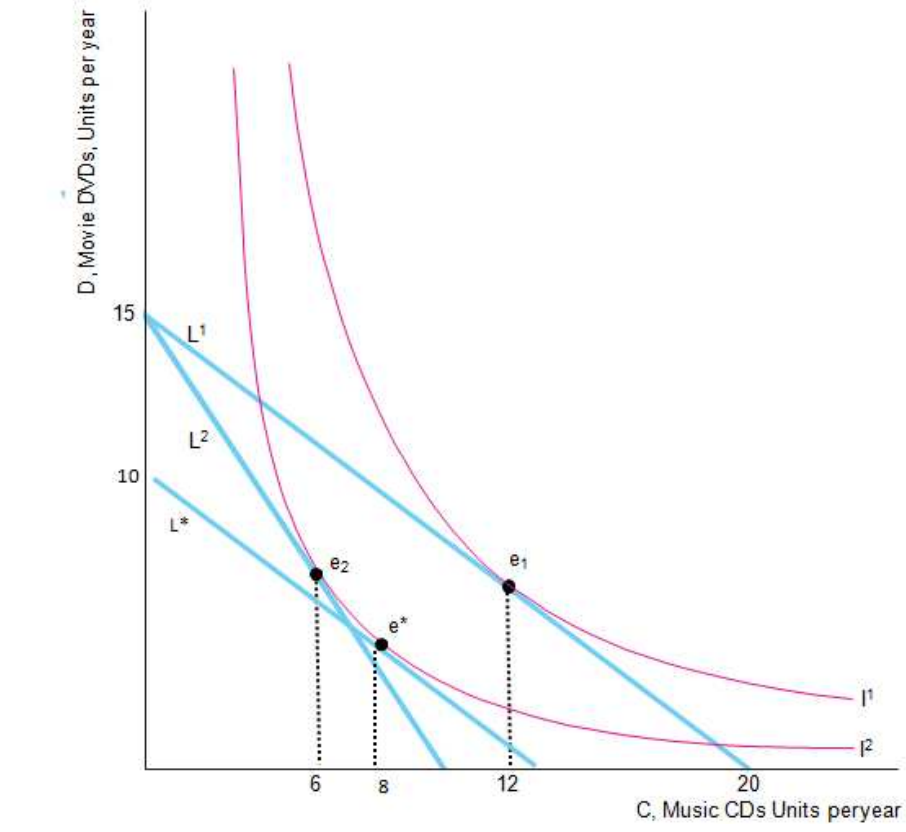
P_C = price of CDs = \$30

M = Income = \$450.

Choice: e*

CV = 450 – 300 = \$150

Figure 7: Equivalent Variation



L¹ and I¹

P_D = price of DVDs = \$20

P_C = price of CDs = \$15

M = Income = \$300.

Choice: e_1

L² and I²

P_D = price of DVDs = \$20

P_C = price of CDs = \$30

M = Income = \$300.

Choice: e_2

EV = 300 – 200 = \$100

Figure 8: Consumer Surplus

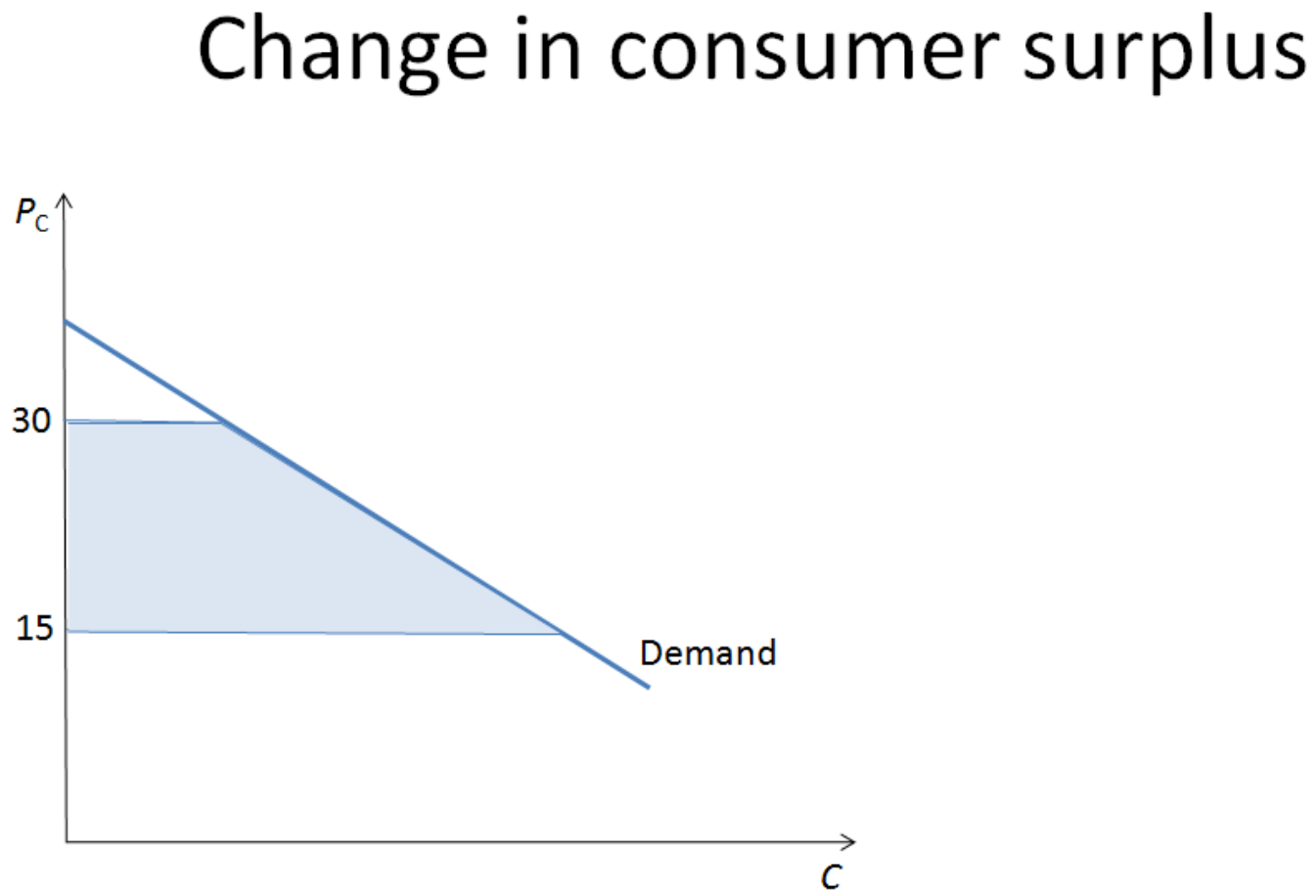
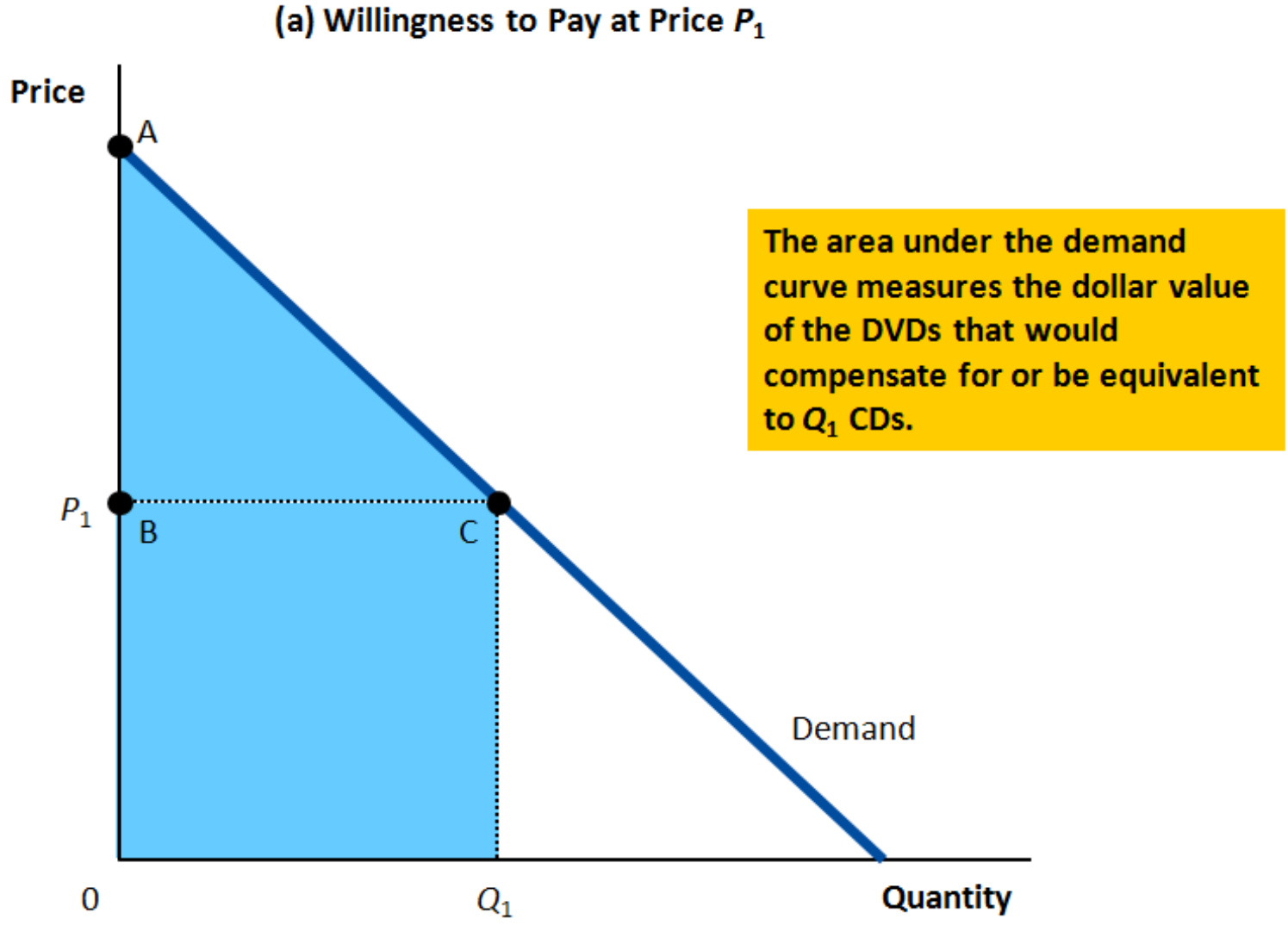


Figure 9: Consumer Surplus and Preferences



From Surplus to Welfare (2)

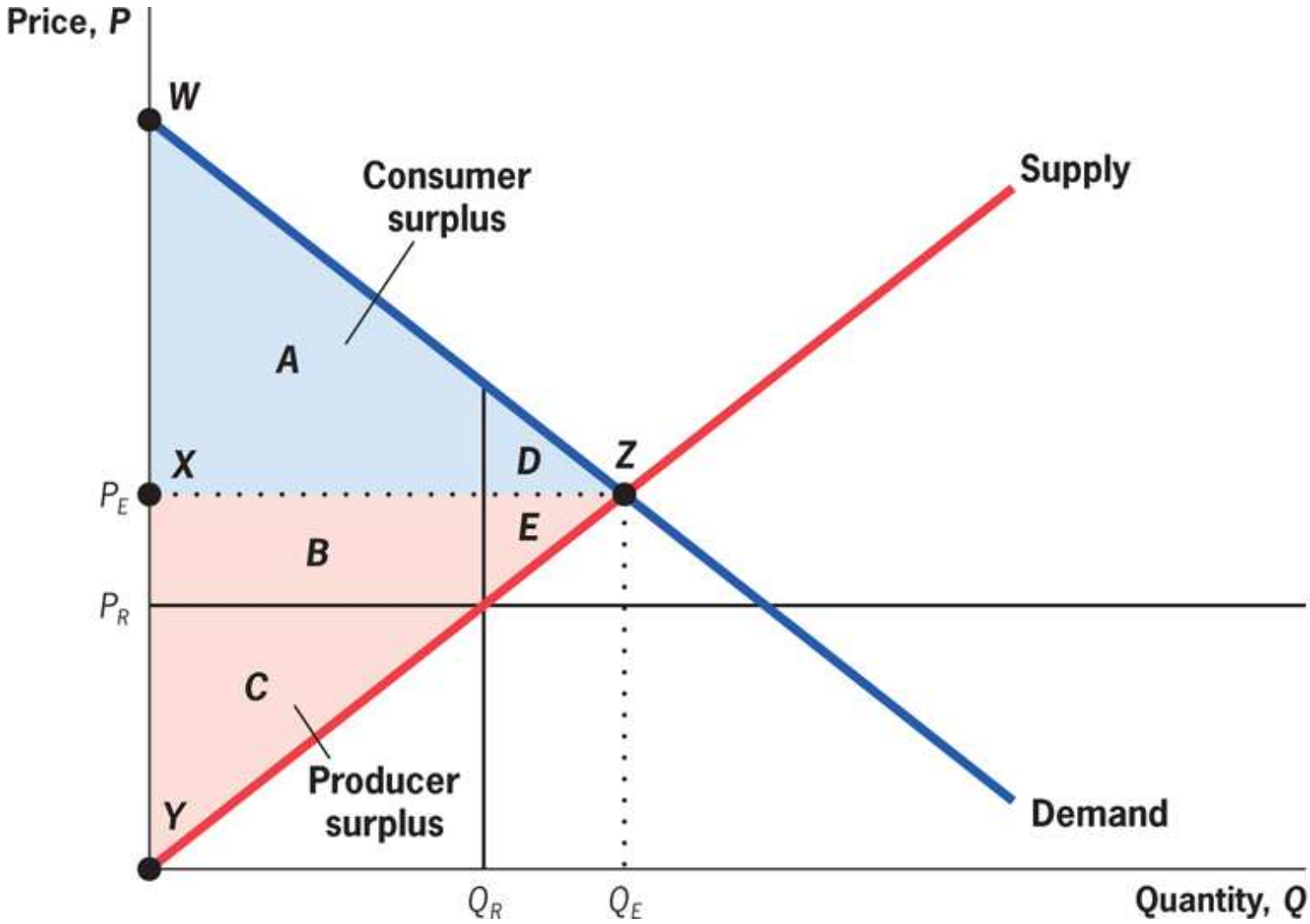
- When no income effects, CV, EV and ΔCS are equivalent
  ex: Quasi Linear Utility functions
  ΔSurplus=consistent dollar measures of the effect of the price change on the well-being of the consumer

- Advantage of surplus analysis: only 2 parameters to estimate (elasticity of demand, and elasticity of supply)

- When income effects are small (IO cases for instance), rely on surplus for welfare analysis is fine

- When income effects are potentially big (cf. UI, taxes, etc.), rely on utility and try to estimate parameters of the utility function.

Figure 10: Market Efficiency



Back to TANF

- TANF created in 1996 after overhaul of "cash welfare" programs
- Monthly support to low-income families (about $679 in 2003)
- Use micro tools to analyize TANF
- Need to model labor supply, using leisure as a good

Back to TANF

- Consider Amy who makes \$10/hr
- TANF supplies \$5,000 gaurantee
- Benefit reduced at a rate of 50% (implicit tax)
- What happens if benefit guarantee is cut to \$3,000?

Effect of Change in TANF

- Remember income and substitution effects
- Depends on previous earnings
- What will the magnitude of the effect be?
- Consider Amy and Natalia

$$\begin{aligned} U_{Amy} &= 100 \times \ln(C) + 175 \times \ln(L) \\ U_{Natalia} &= 75 \times \ln(C) + 300 \times \ln(L) \end{aligned}$$

Figure 11: Labor Supply 1

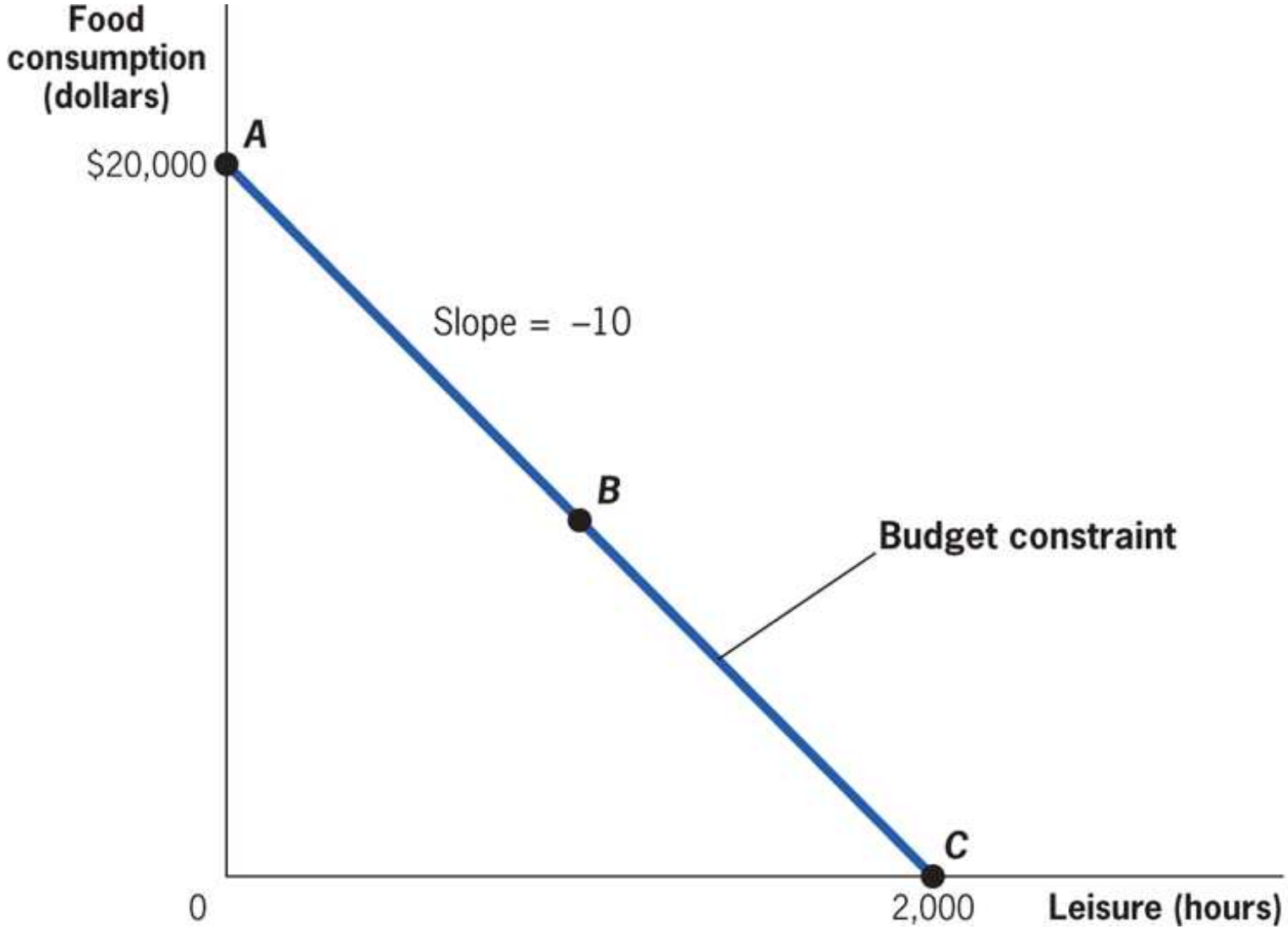


Figure 12: Labor Supply 2

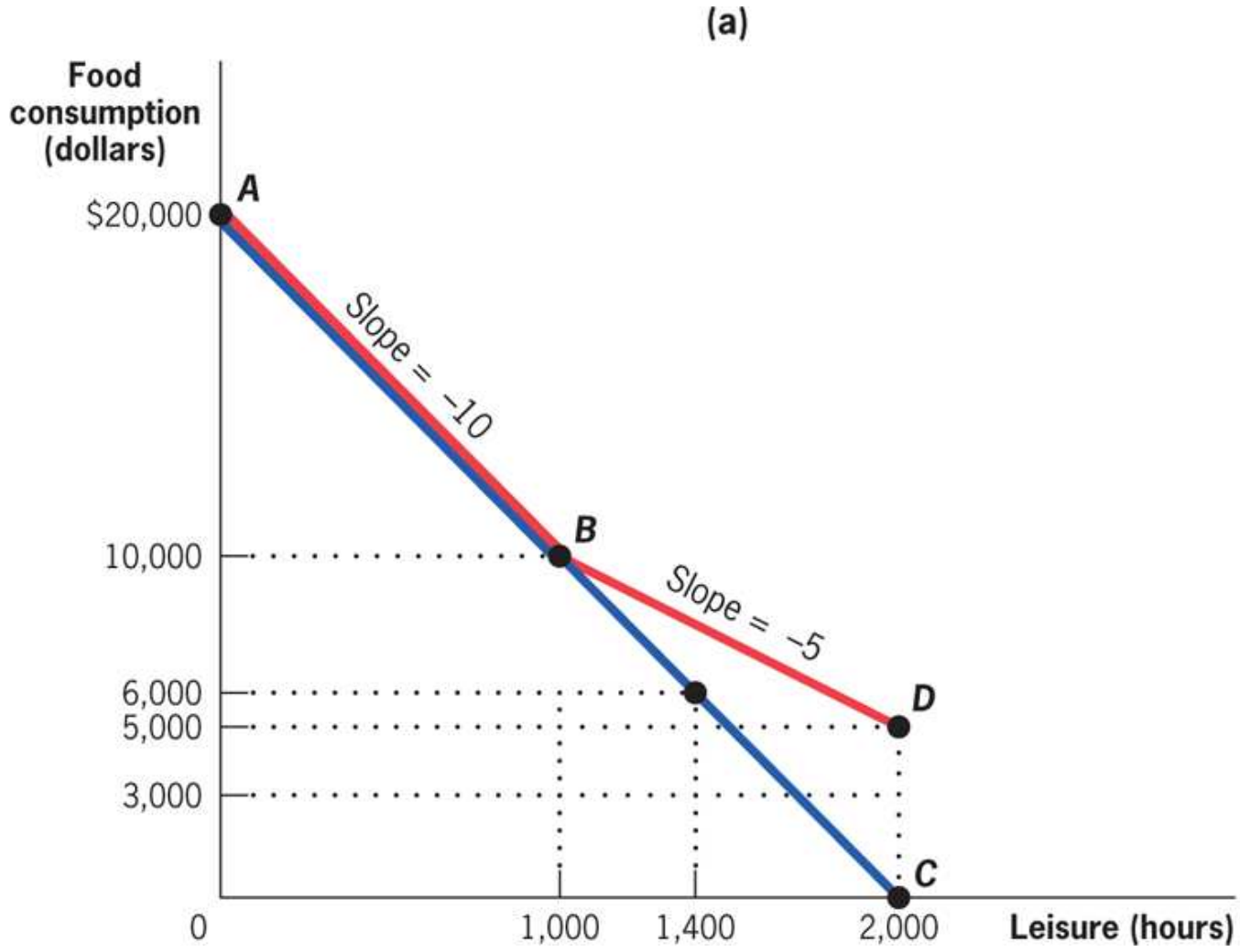


Figure 13: Labor Supply 3

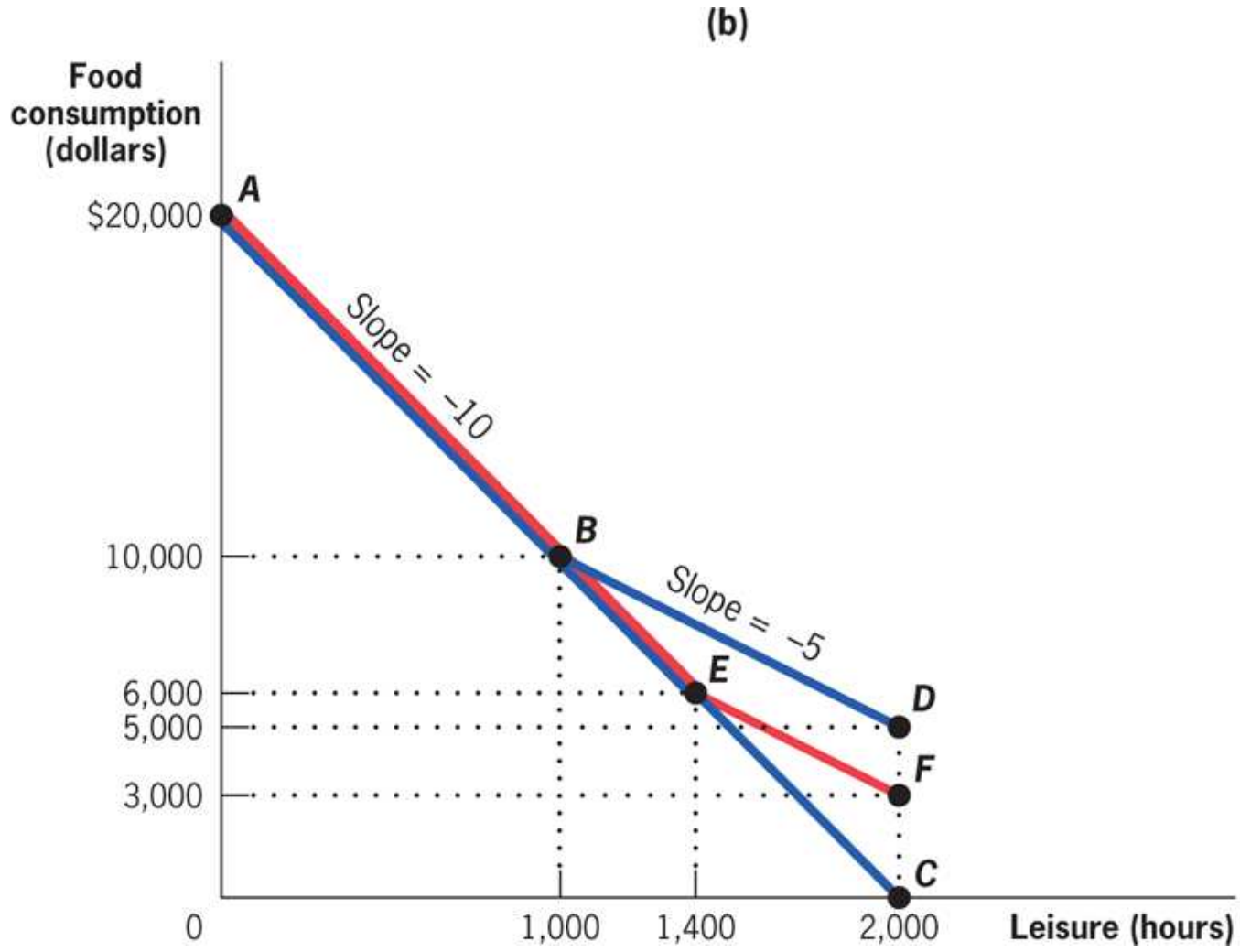


Figure 14: Labor Supply 4

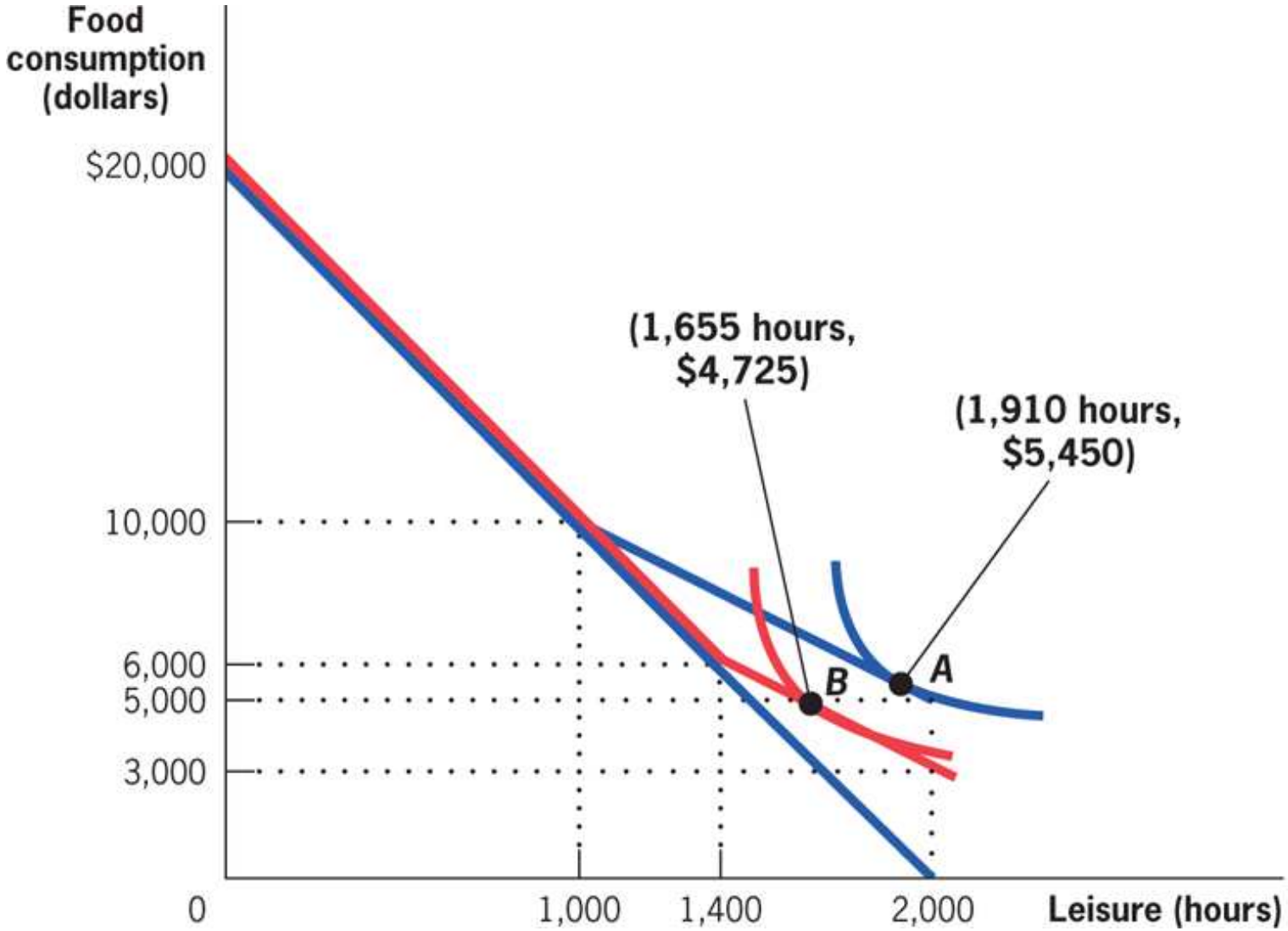
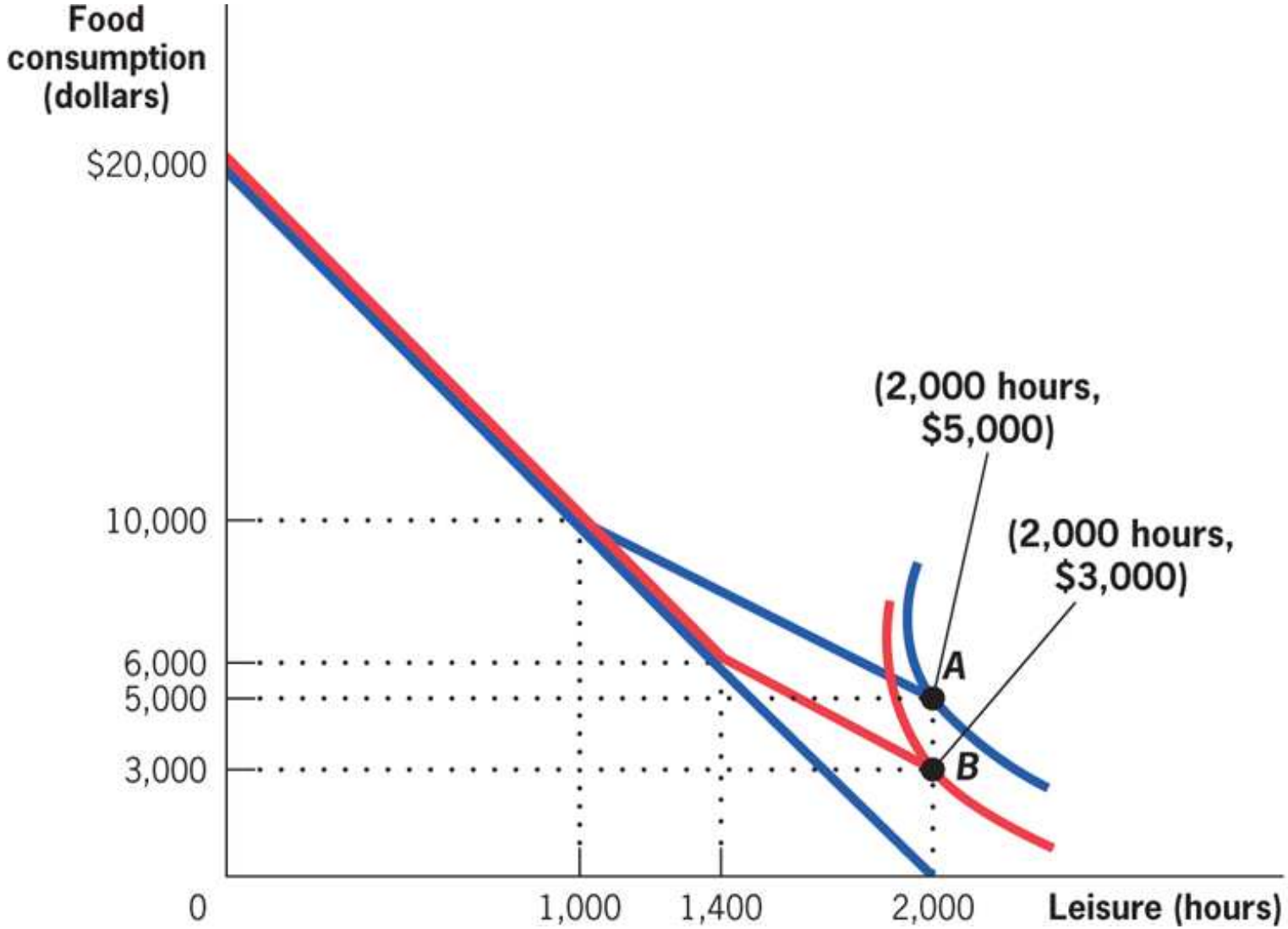


Figure 15: Labor Supply 5



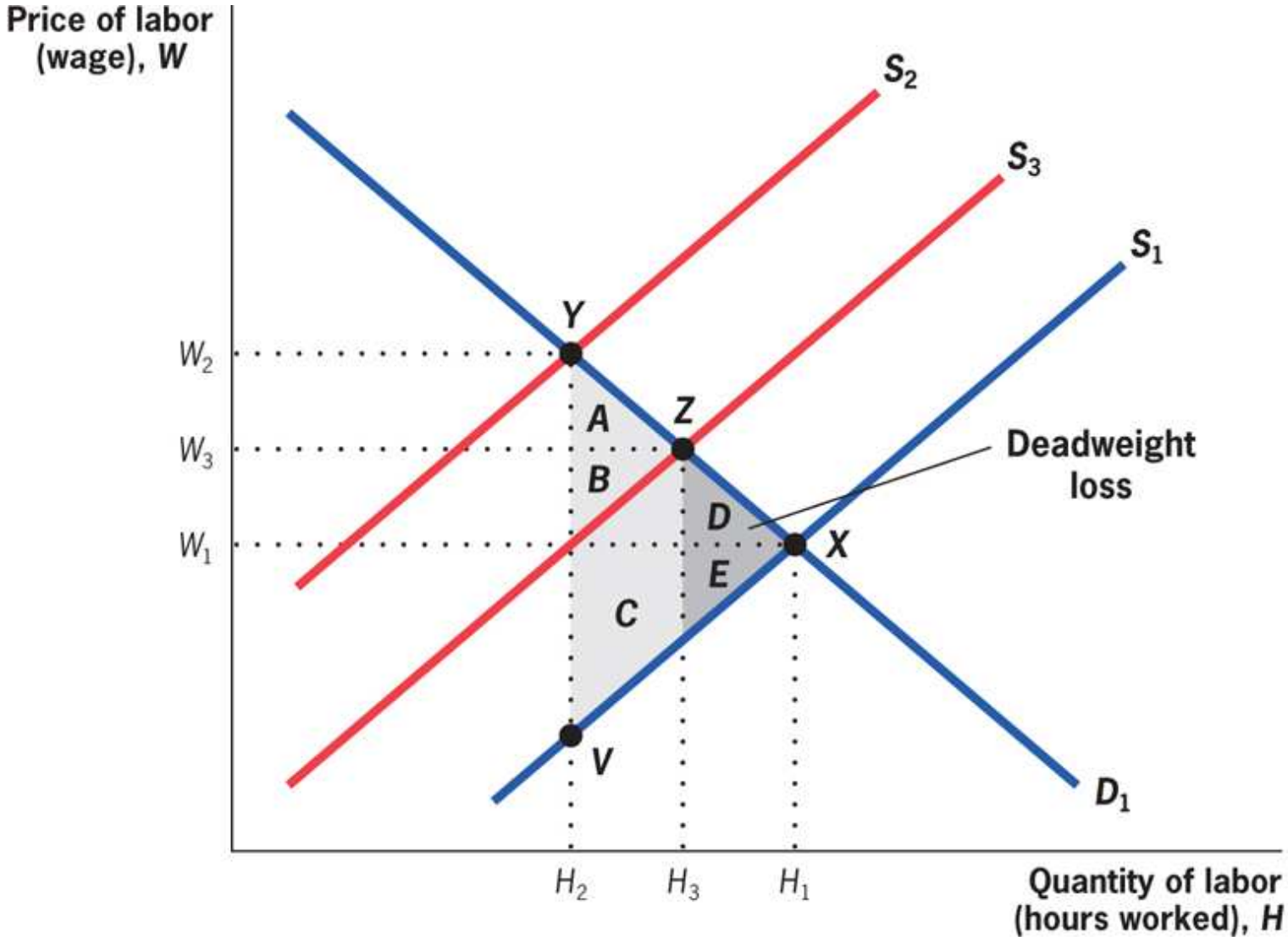
Beyond the Effects of TANF Change

- Once we have decided what happens as a result of a change in TANF, we want to know the net gain or loss of this change
- This will take us from the realm of **positive** analysis to **normative** analysis

Effect of TANF on Market

- Workers are the suppliers of labor
- Firms are the buyers of labor
- The wage is the price paid for a unit of labor
  - Example: Introducing TANF and Reducing TANF
- Net social gain due to efficiency
- Need to consider equity

Figure 16: Efficiency Gains from TANF Reduction



Outline

Fundamental Theorems of Welfare Economices

- Simple intuition of the 2 theorems in a basic Edgeworth framework
- Discuss implications for public intervention
- See how welfare function approach can fit in

Figure 17: Edgeworth Box

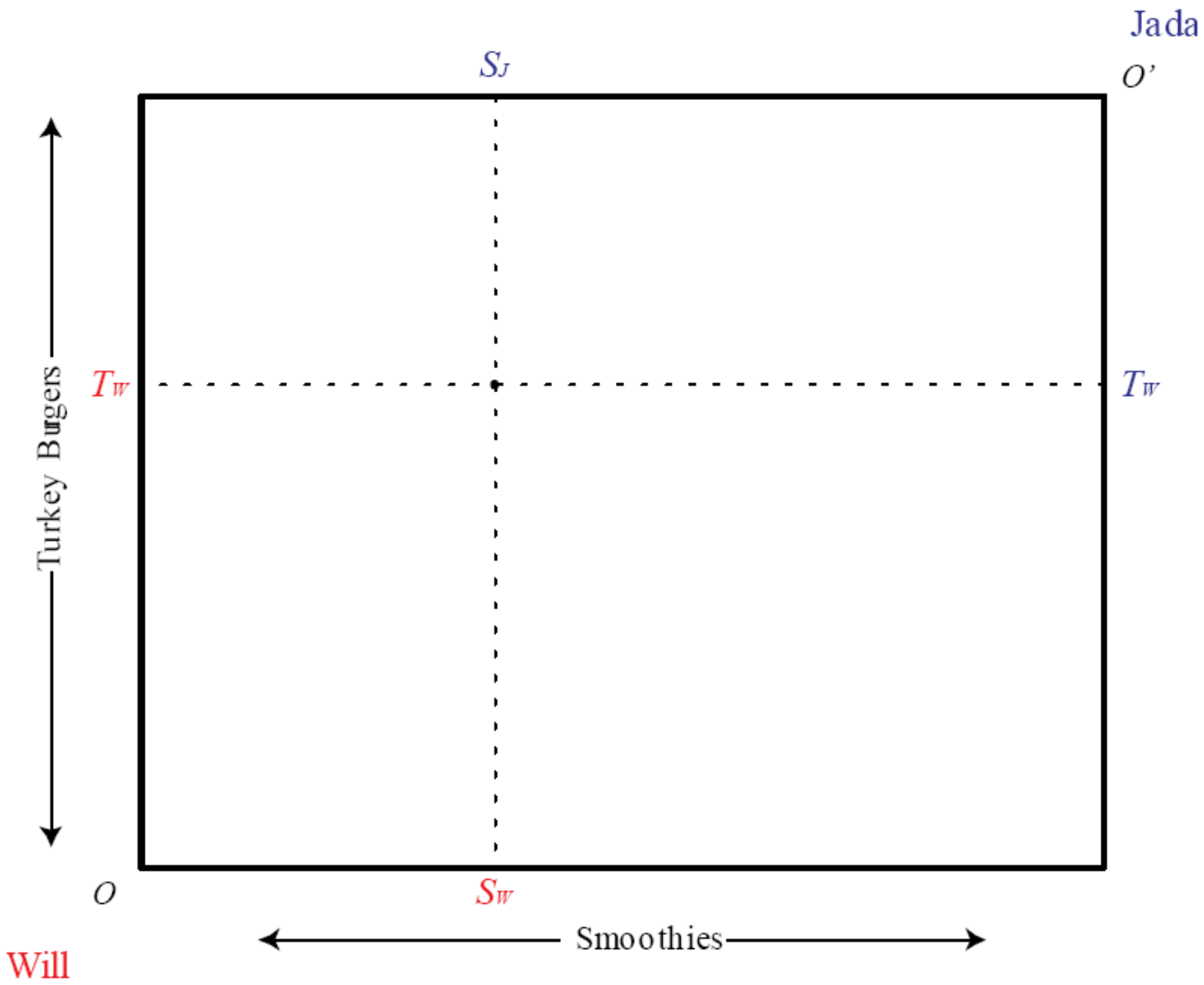


Figure 18: Edgeworth Box

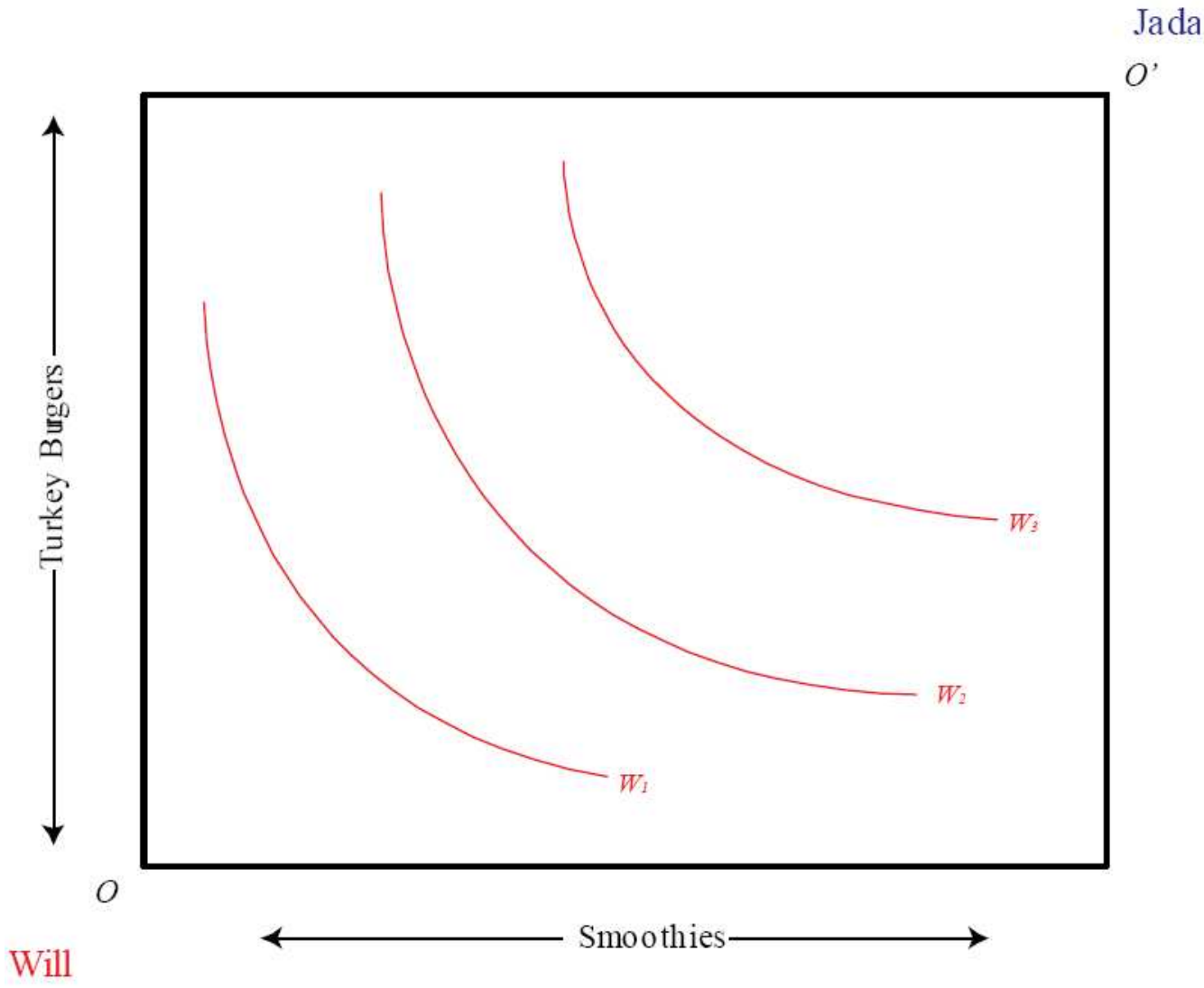


Figure 19: Edgeworth Box

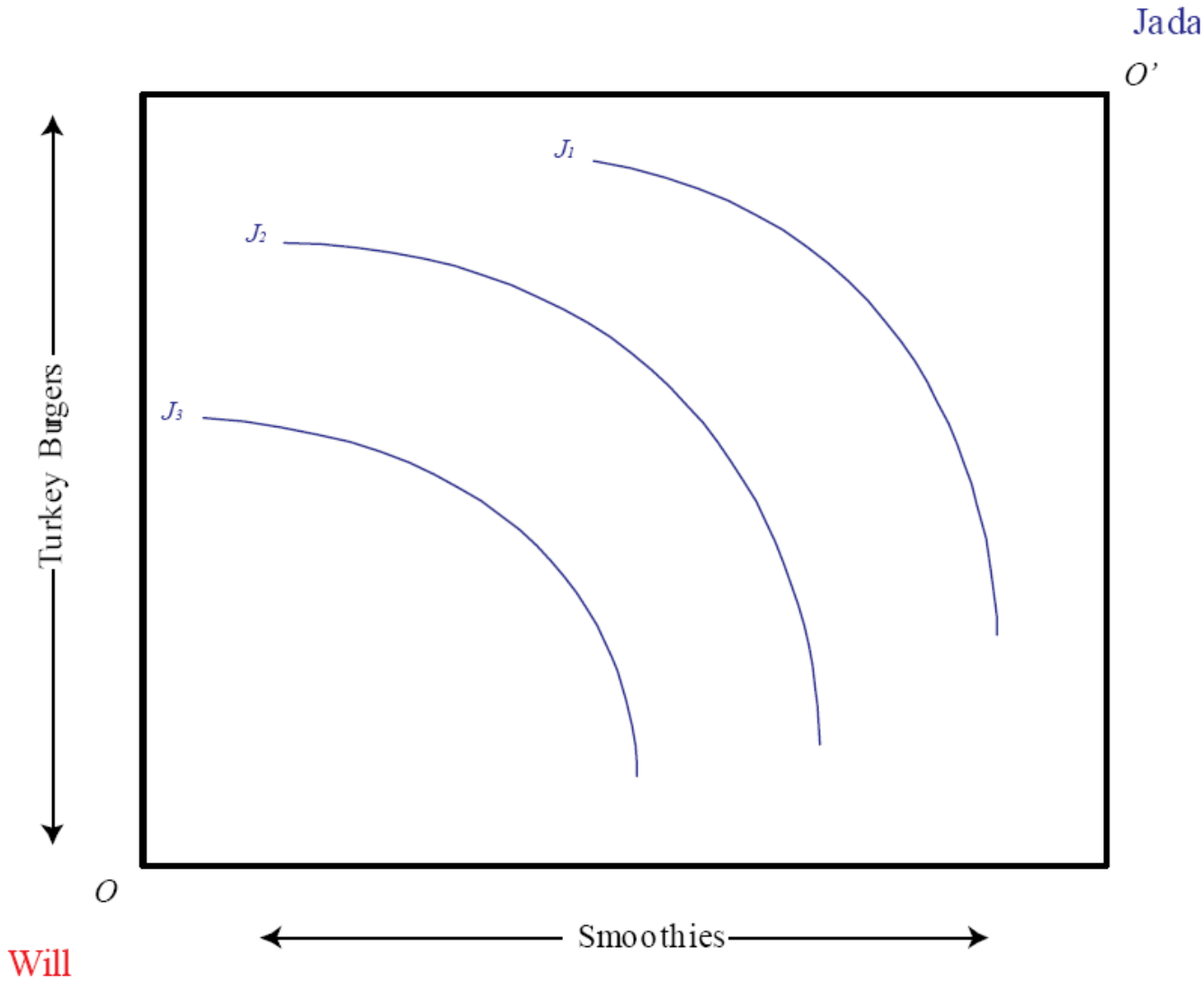


Figure 20: Pareto Efficiency

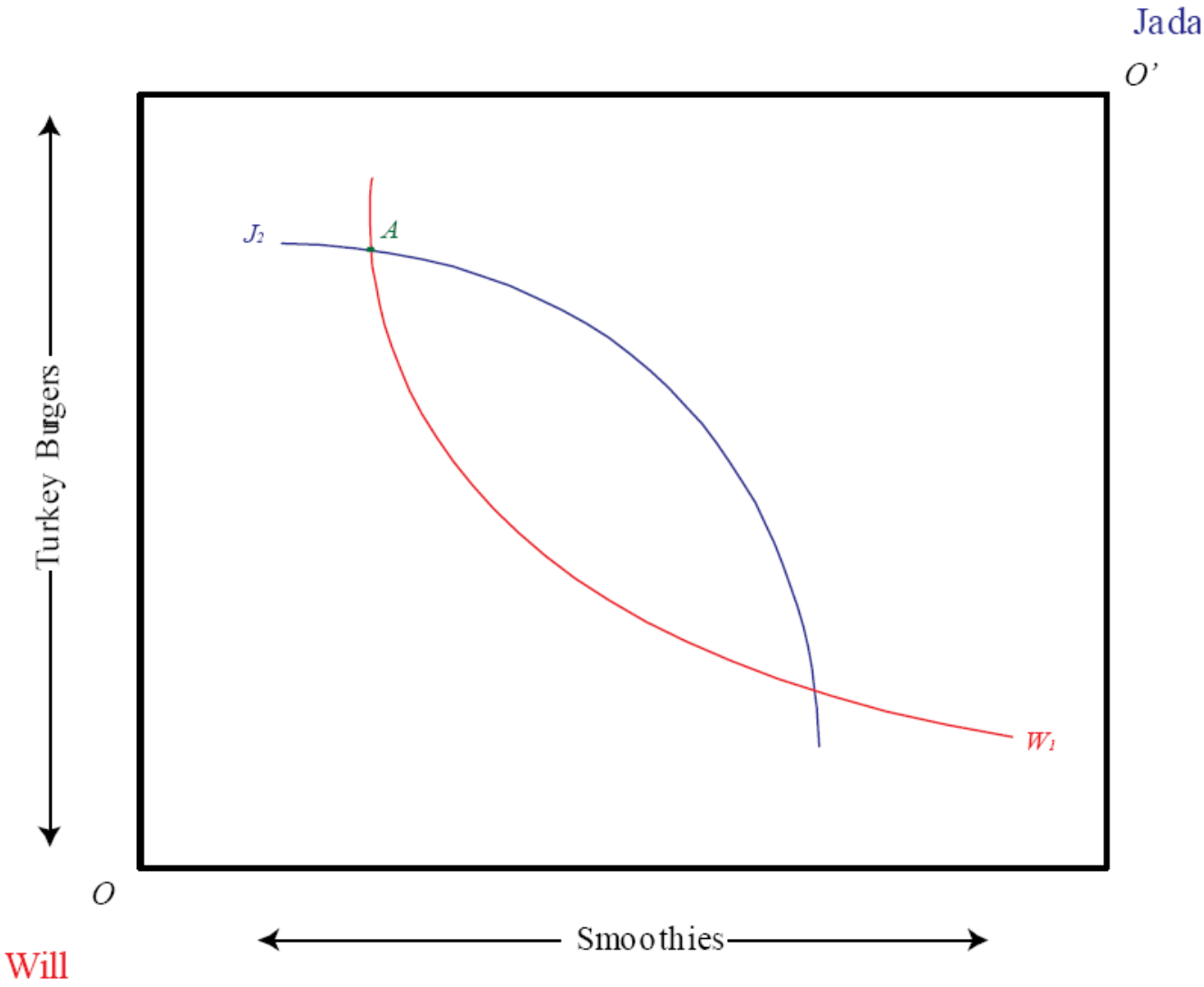


Figure 21: Pareto Efficiency

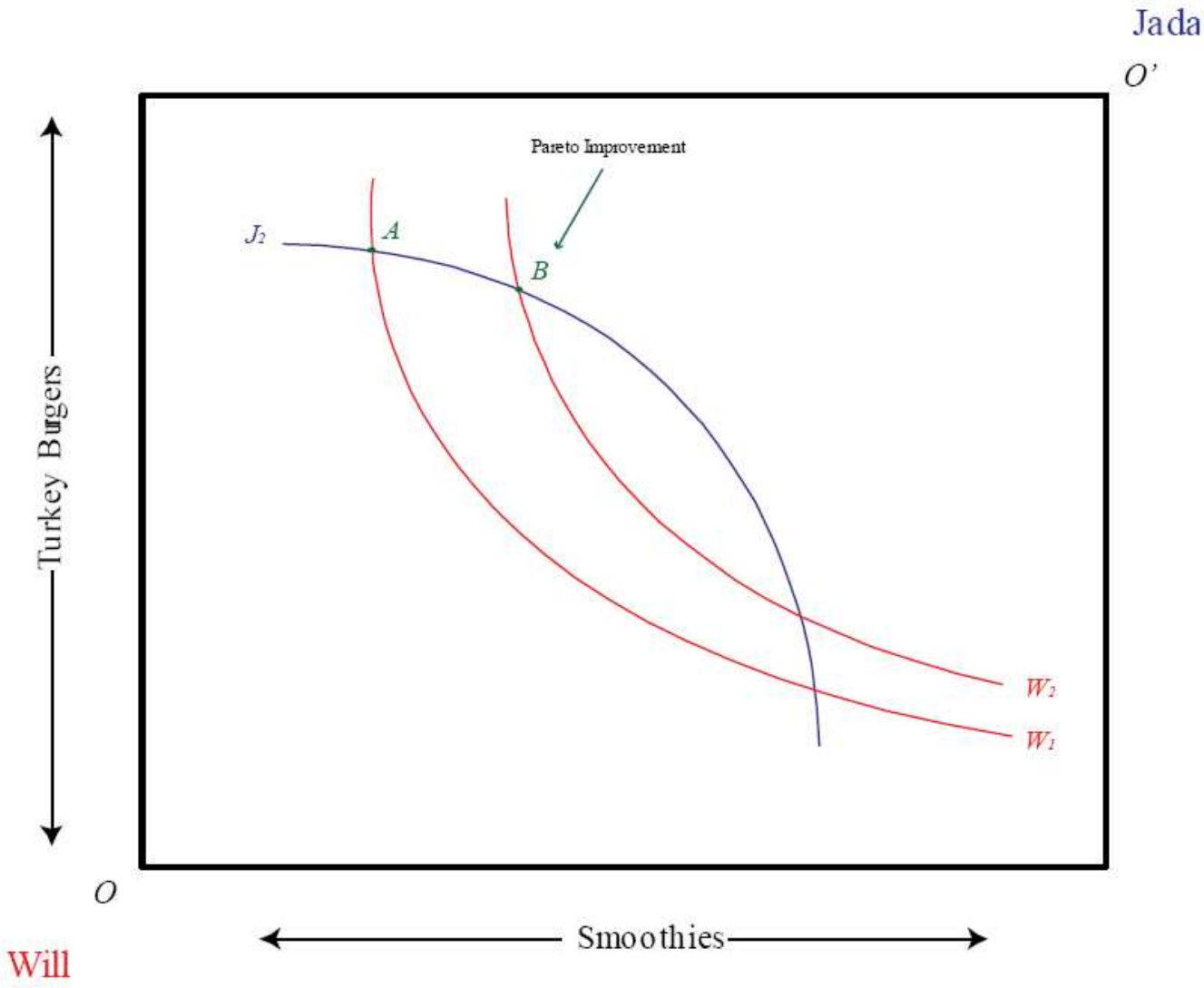
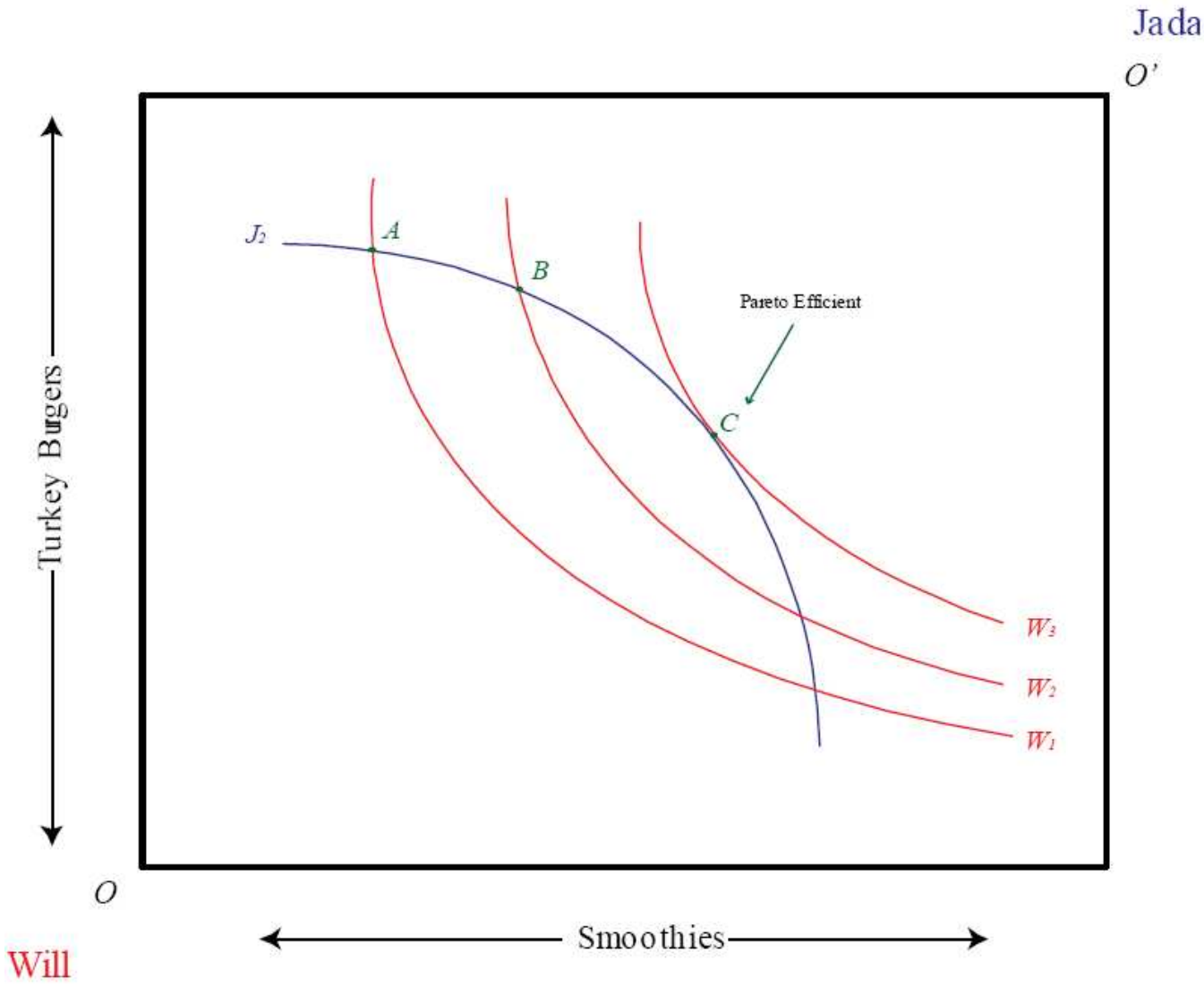


Figure 22: Pareto Efficiency



Pareto Efficiency

- At a **Pareto Efficient** allocation indifference curves are tangent, and therefore:

$$MRS_{ST}^{Will} = MRS_{ST}^{Jada}$$

- There are multiple Pareto efficient allocations along the **contract curve**

Figure 23: The Contract Curve

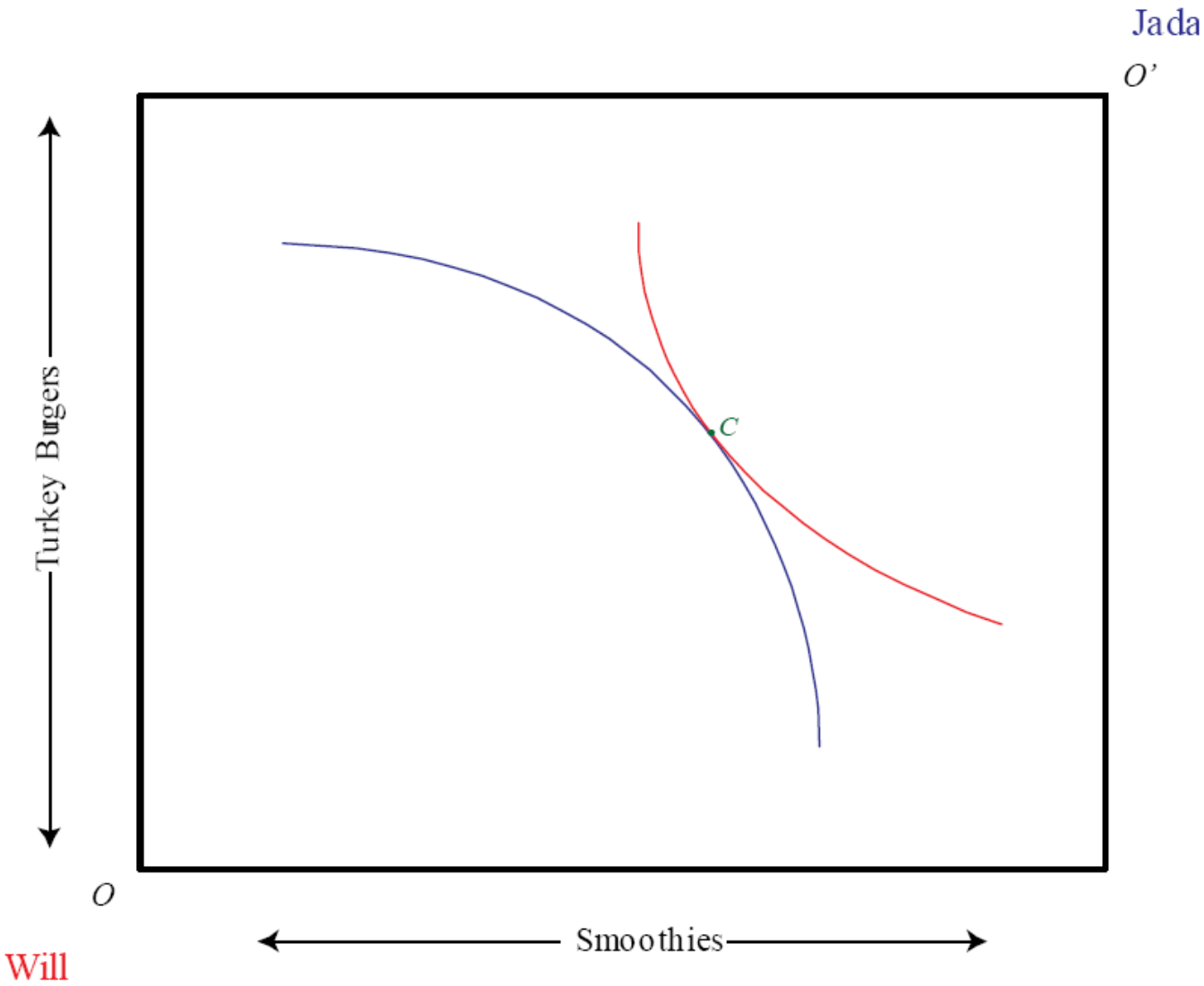


Figure 24: The Contract Curve

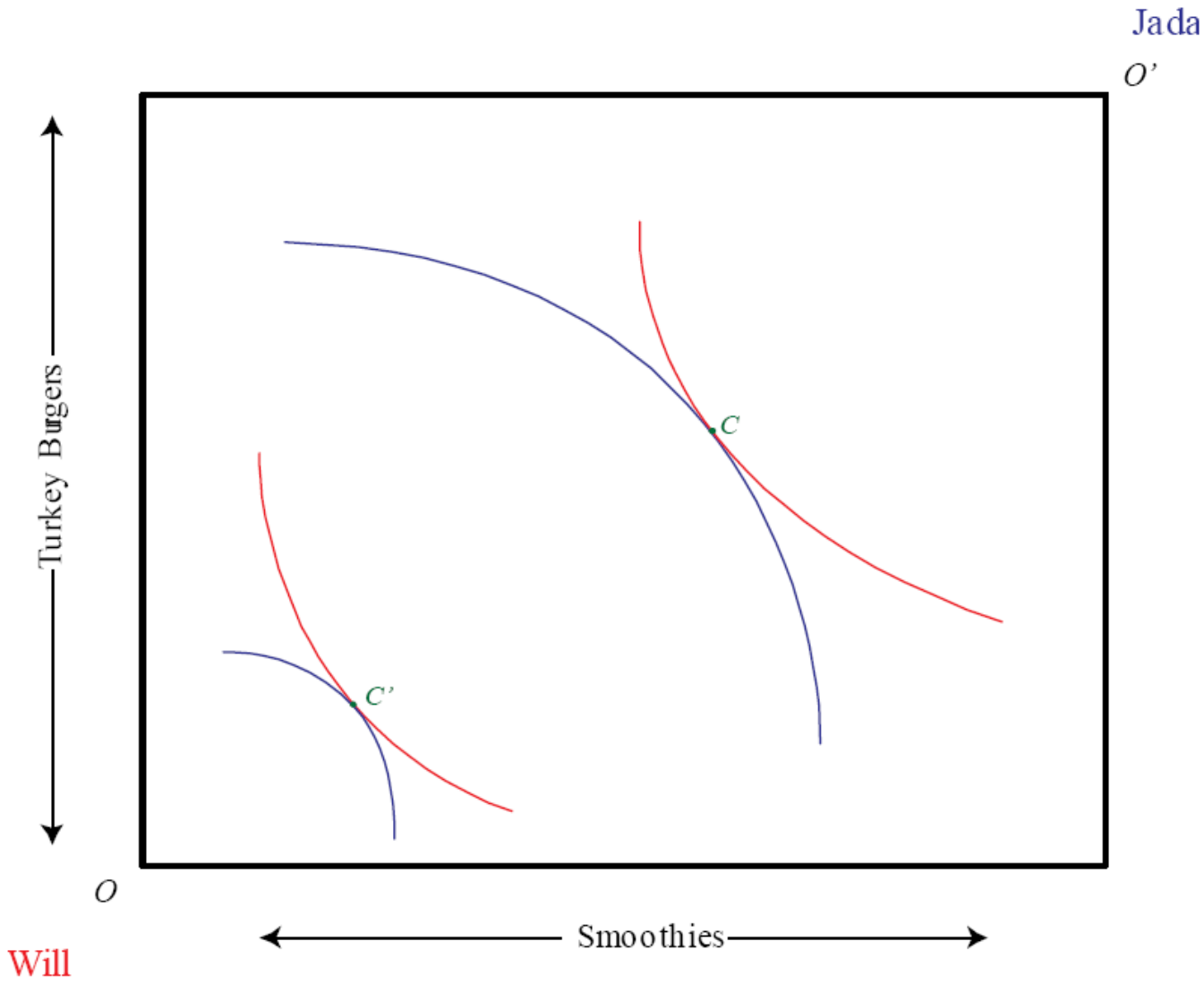


Figure 25: The Contract Curve

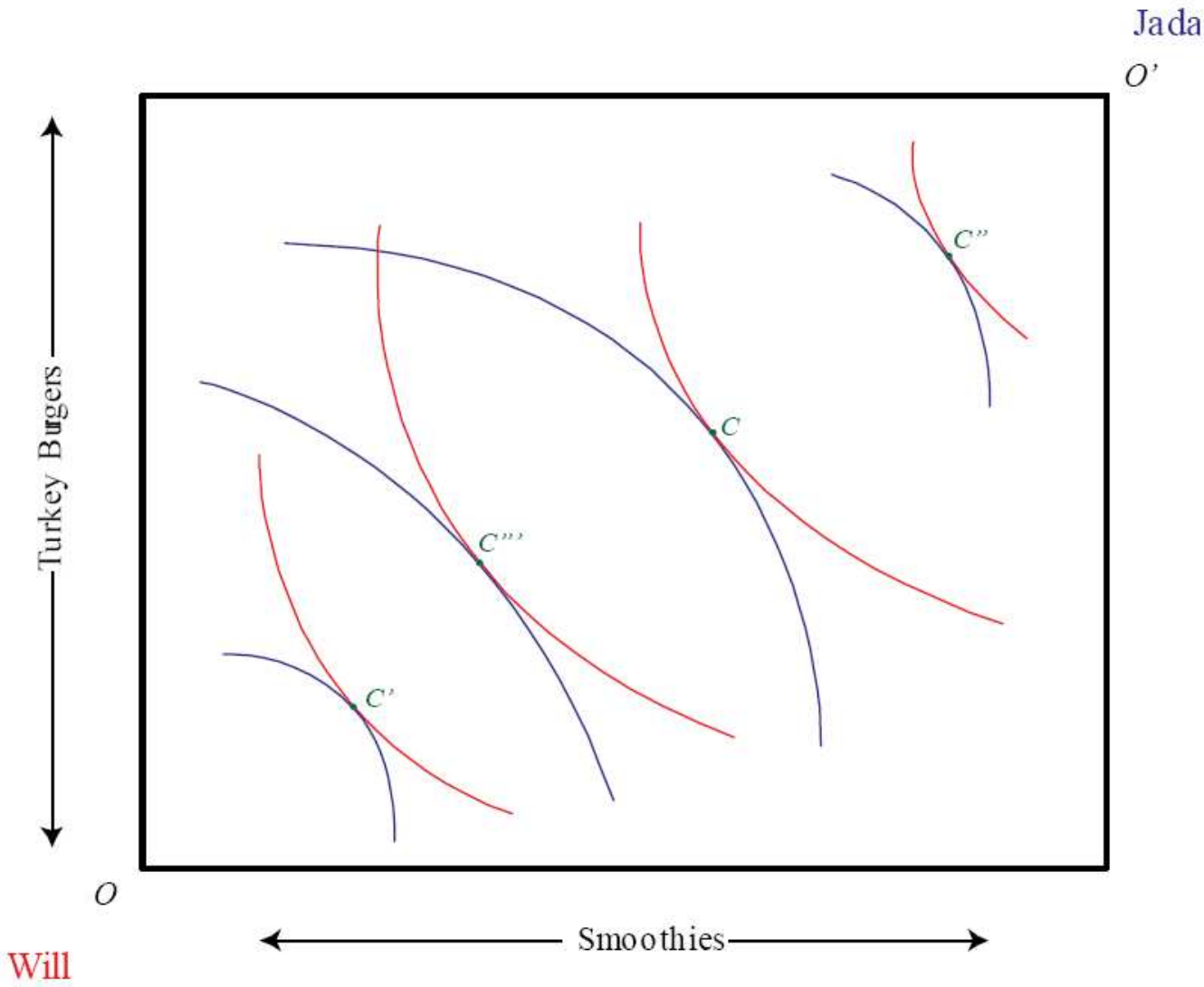
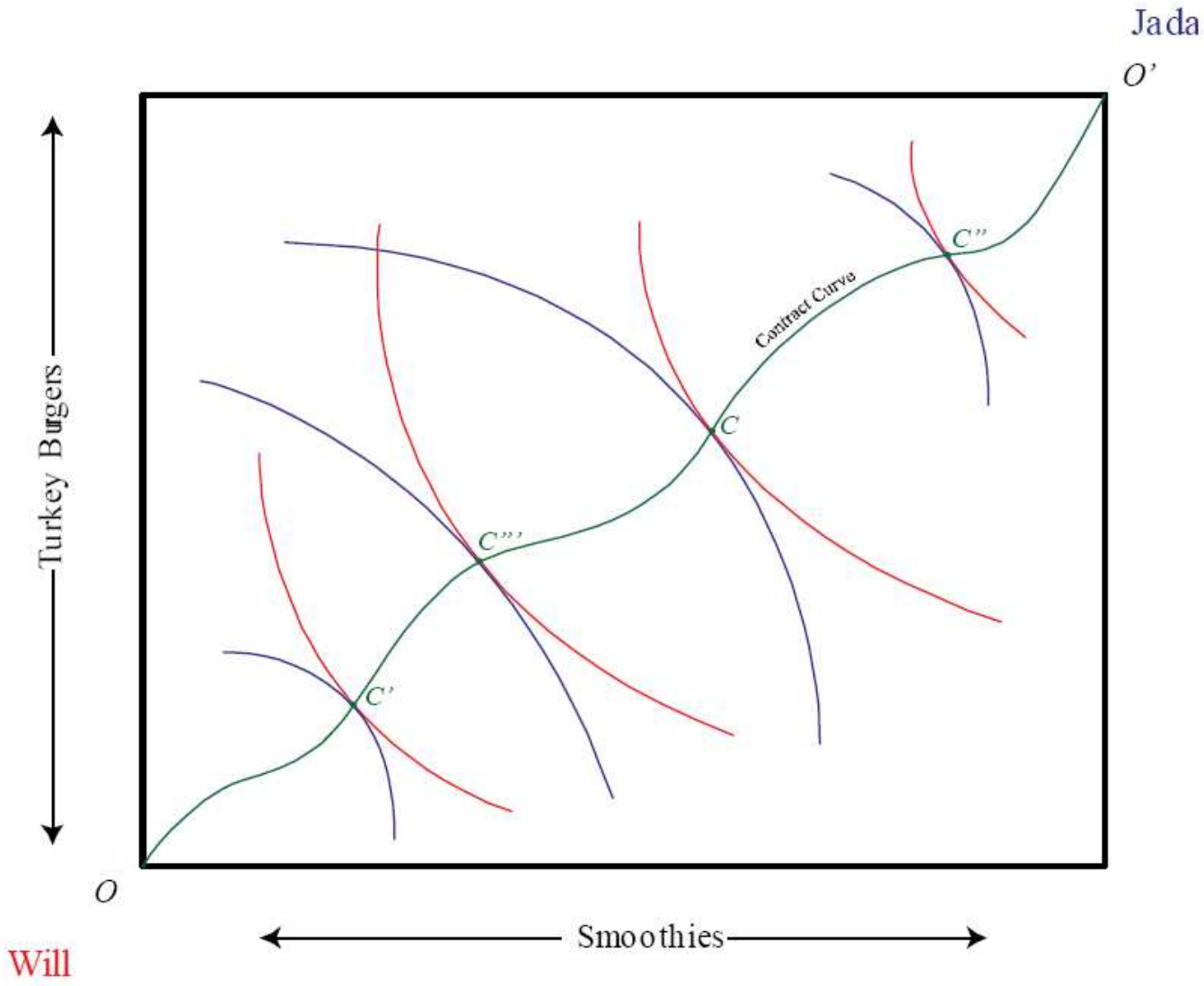


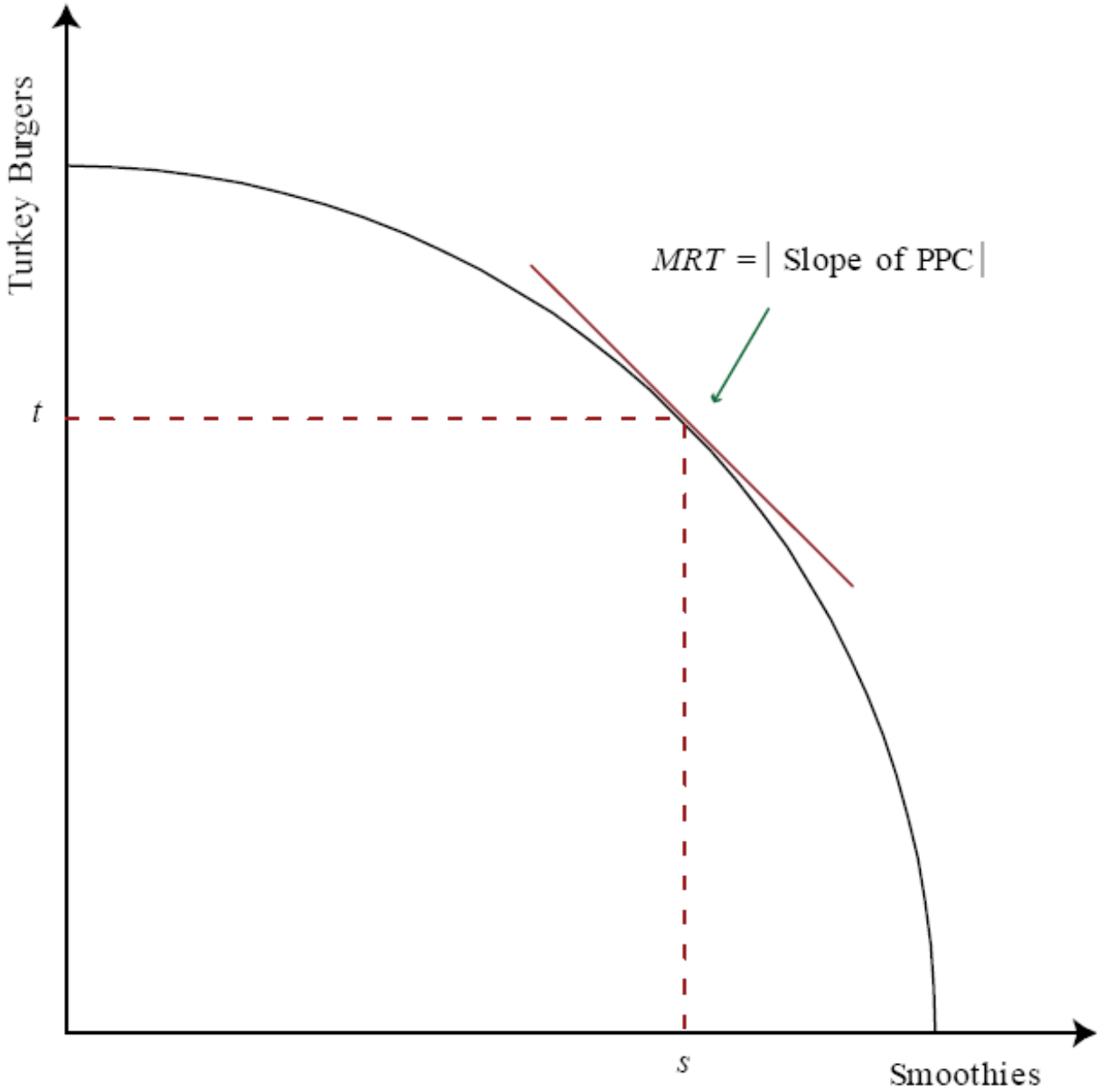
Figure 26: The Contract Curve



Production Economy

- In a simple Edgeworth box the amount of goods are fixed or **exogenously** determined
- Alternatively, the economy may use inputs to produce turkey burgers and smoothies
- The production technology will be captured by the **production possibilities curve** and the **marginal rate of transformation** (MRS)

Figure 27: Production Possibility Curve



Pareto Efficiency with Production

- The marginal rate of transformation is the ratio of marginal costs of producing an additional unit of each good:

$$MRT_{ST} = \frac{MC_S}{MC_T}$$

- At a Pareto efficient allocation, the marginal rate of is aligned with the marginal rates of substitution:

$$MRT_{ST} = MRS_{ST}^{Will} = MRS_{ST}^{Jada}$$

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First Fundamental Theorem of Welfare Economics (FFTWE)

- A competitive market will reach a Pareto efficient allocation of goods if:
  1. All producers and consumers are price takers
  2. Markets are complete (i.e. a market exist for all commodities)

First Fundamental Theorem of Welfare Economics

- From consumer theory we have:

$$MRS_{ST}^{Will} = \frac{P_S}{P_T} \text{ and } MRS_{ST}^{Jada} = \frac{P_S}{P_T}$$

- From producer theory we have:

$$MRT_{ST} = \frac{P_S}{P_T}$$

- Therefore, we have:

$$MRT_{ST} = MRS_{ST}^{Will} = MRS_{ST}^{Jada} \implies \frac{P_S}{P_T} = \frac{MC_S}{MC_T}$$

- So, should government just get out of the way?

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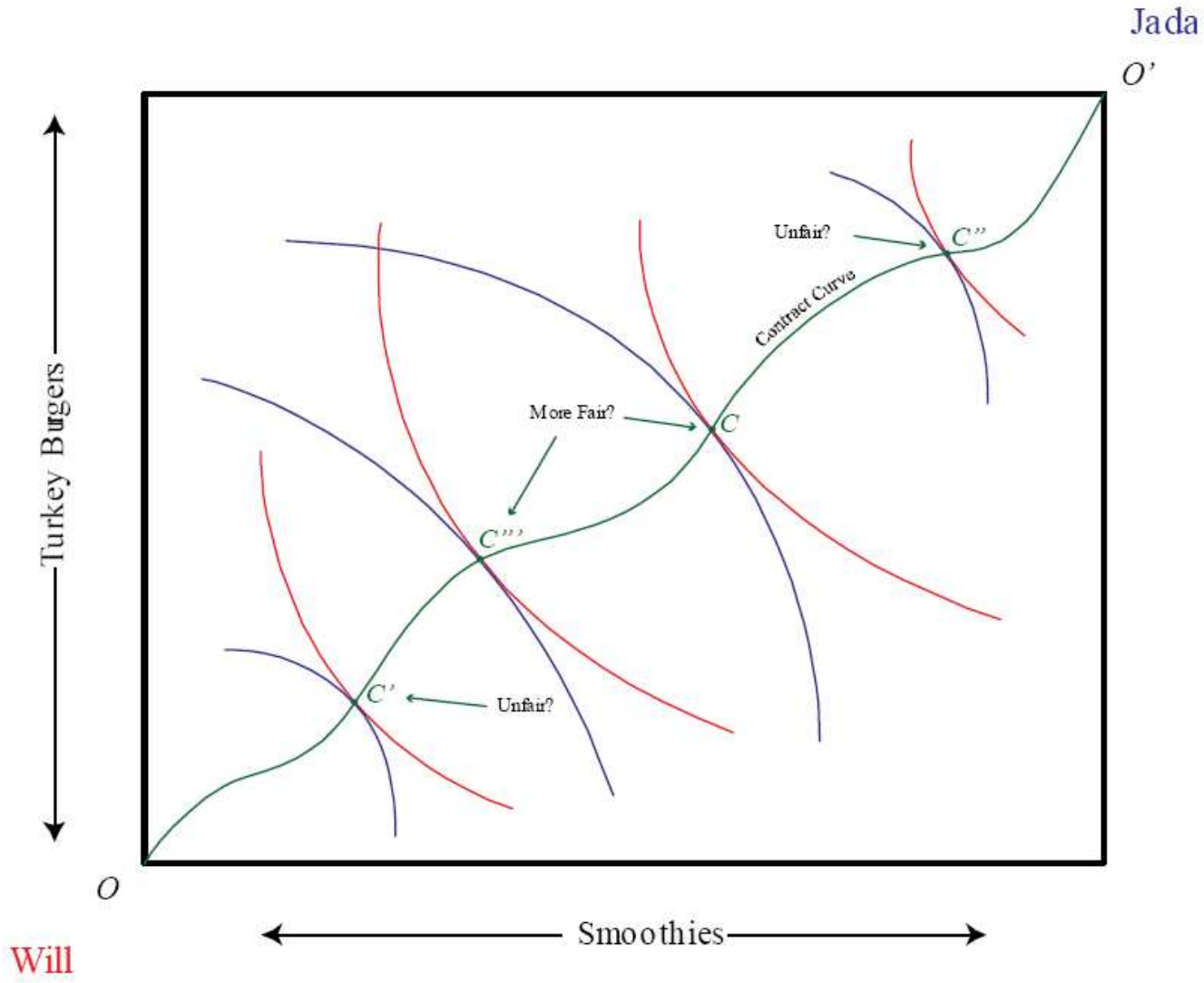
- So, should government just get out of the way?

Fairness versus Efficiency

- The FFTWE may imply that there is little role for government in the economy
- Competitive markets lead to Pareto efficient allocations
- However, efficiency may not be the only goal for society
- We may also have a desire for some sort of equitable distribution of goods

Figure 28: Distribution and Pareto efficiency



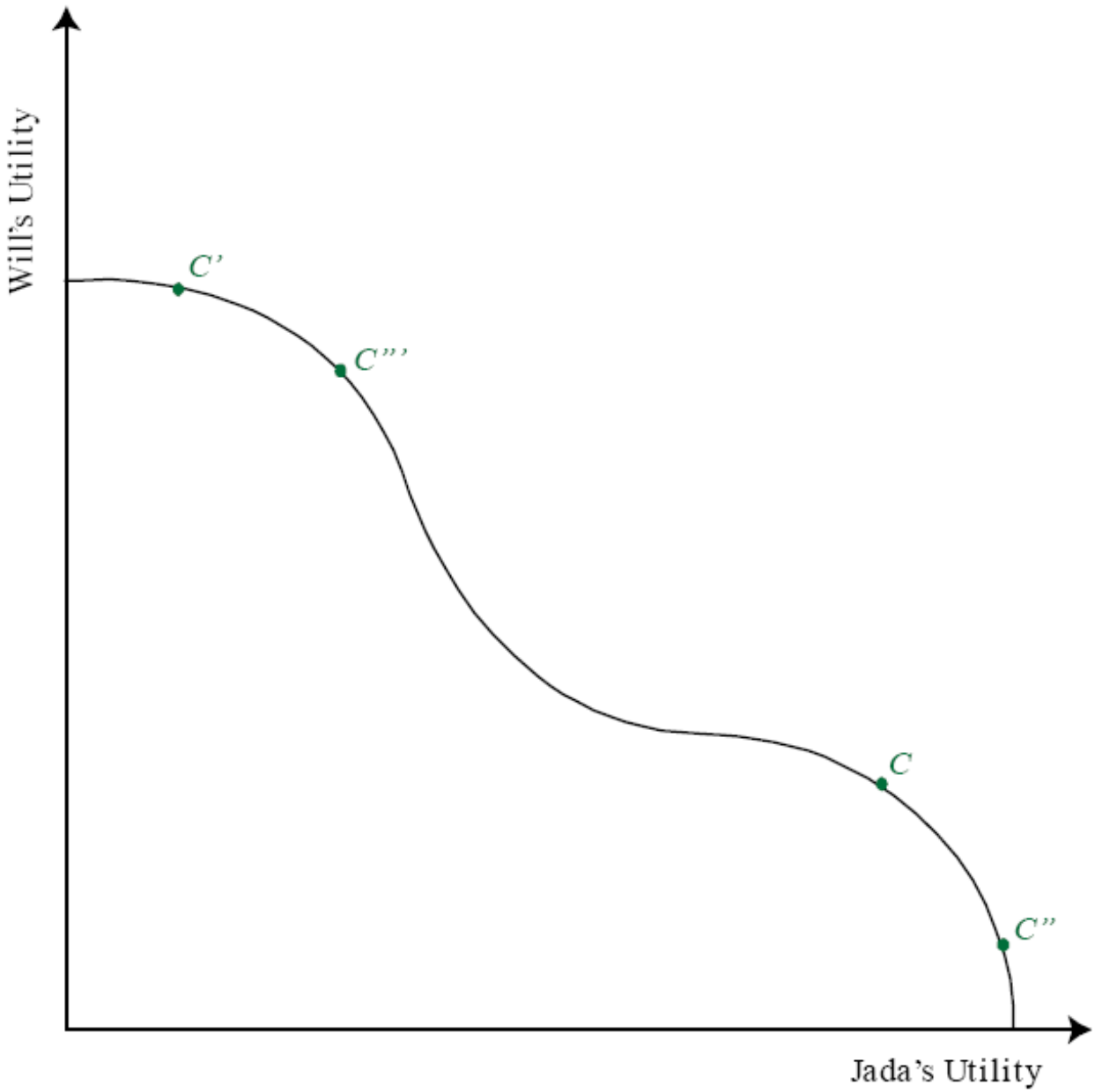
Second Fundamental Theorem of Welfare Economics (SFTWE)

- How do we arrive at different efficient allocations
- The SFTWE states that we can reach any Pareto efficient allocation by altering the initial endowments of resources. In other words, we just have to redistribute income and from there the market will do the rest.
- Thus, in theory, efficiency and equity issues can be addressed separately
- In practice, these "lump sum" redistributions are not feasible, leaving us with an efficiency-equity trade-off
- In that case, we need a framework for deciding how much of a trade-off society should make

Utility Possibility Curve

- The contract curve defines a set of possible utility combinations
- We can plot these combinations on the **utility possibility curve (upc)**
- Note that this curve serves much the same purpose as a production possibilities curve or budget constraint, capturing the trade-off inherent in different utility outcomes

Figure 29: Utility Possibility Curve



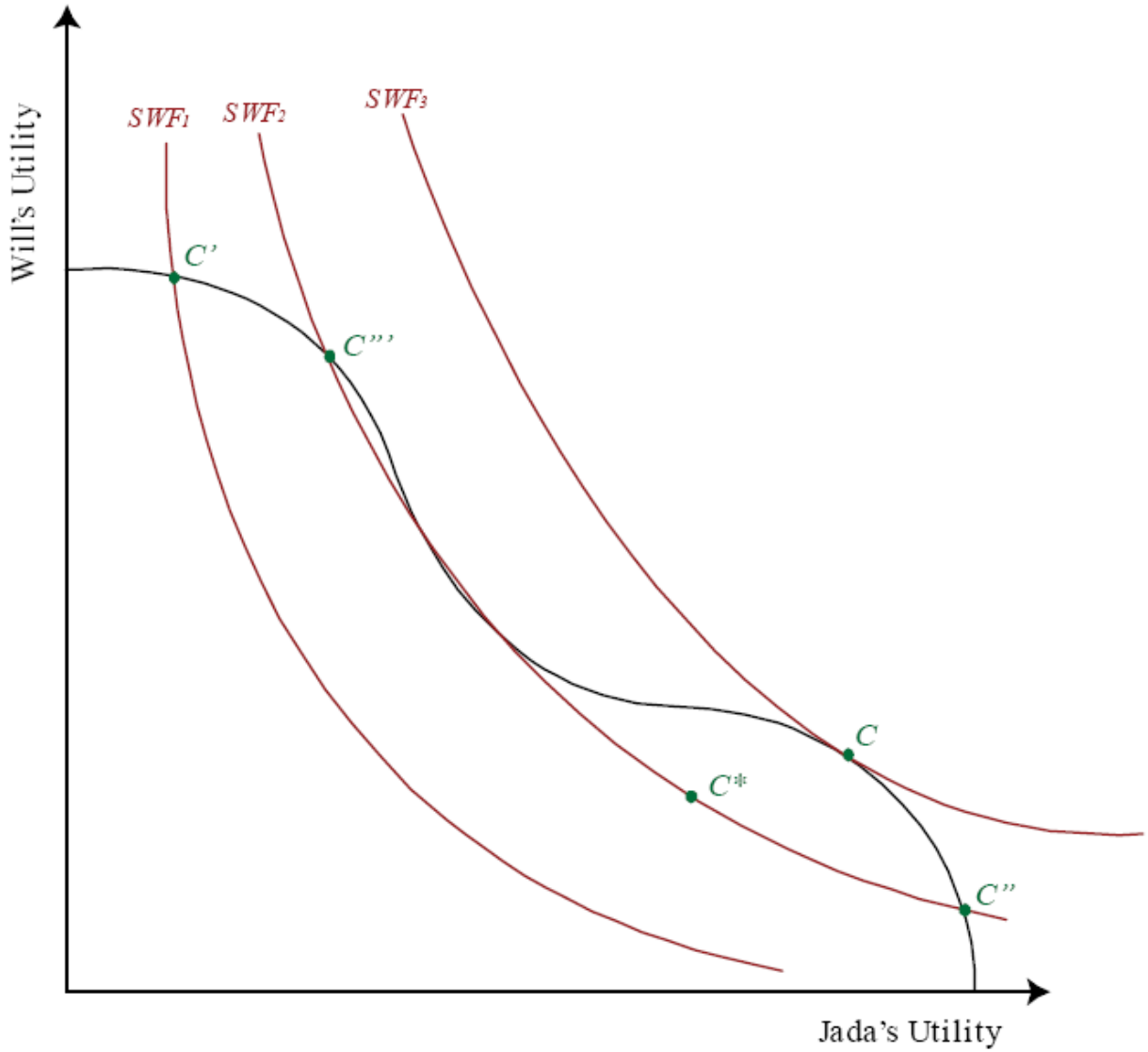
Social Welfare Function

- How do we rank the possible utility outcomes?
- One way is to define a **Social Welfare Function (SWF):**

$$W = f\left(U_{Will}, U_{Jada}\right)$$

- The SWF behaves as a utility function for society, and, for example, has indifference curves
- This combined with the upc directs us toward the social optimum

Figure 30: SWF Maximization



Social Welfare Function

- What are the features of the SWF?
- Typically the SWF is an increasing function of all of its arguments:

$$\frac{\partial W}{\partial U_{Will}} > 0$$

- A **Utilitarian SWF** is linear in form:

$$W_{Utilitarian} = U_{Will} + U_{Jada}$$

- A **Rawlsian SWF** places more weight on society's worse off:

$$W_{Rawlsian} = \min\left(U_{Will}, U_{Jada}\right)$$

- Concavity in the SWF leads to a preference for equality
- Usually it is not possible to build up a coherent SWF using individual's utilities (Arrow's Impossibility Theorem)

Outline

Violations of the FFTWE and Public Policies

- Aside from distributional concerns, there are other reason why one might consider a larger role for government intervention
- When the assumptions underlying the FFTWE breakdown, we have what is called **Market Failures**
- There are three major types of breakdowns
  1. **Market Power:** The assumption of perfect competition may not always hold. In that case, firm may not set price equal to marginal costs, violating our conditions of Pareto Efficiency
  2. **Under or overprovision of goods because of positive or negative externalities**
  3. **Non provision of goods:**It may not be the case that a market exists for every commodity. Some examples include:
     - Asymmetric information and the collapse of insurance markets
     - Public good for that no one entity is willing to supply to the market

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- When the assumptions underlying the FFTWE breakdown, we have what is called **Market Failures**
- There are three major types of breakdowns
  1. **Market Power:** The assumption of perfect competition may not always hold. In that case, firm may not set price equal to marginal costs, violating our conditions of Pareto Efficiency
  2. **Under or overprovision of goods because of positive or negative externalities**
  3. **Non provision of goods:**It may not be the case that a market exists for every commodity. Some examples include:
     - Asymmetric information and the collapse of insurance markets
     - Public good for that no one entity is willing to supply to the market