MICROECONOMICS 2

LECTURE 4

Consumer Welfare and Policy Analysis

The welfare of the people is the ultimate law

Cicero

Outline

Challenge

Child-Care Subsidies

1. **Consumer Welfare**
2. **Expenditure Function and Consumer Welfare**
3. **Market Consumer Surplus**
4. **Effects of Government Policies on Consumer Welfare**
5. **Deriving Labor Supply Curves**

Challenge Solution

Challenge:
Child-Care Subsidies

Background

- Government child-care subsidies are common throughout the world.
- Rather than subsidizing the price of childcare, the government could provide an unrestricted lump-sum payment that could be spent on childcare or on all other goods, such as food and housing.

Questions

- For a given government expenditure, does a price subsidy or a lump-sum subsidy provide greater benefit to recipients?
- Which option increases the demand for child-care services more?
- Which one inflicts less cost on other consumers of childcare?

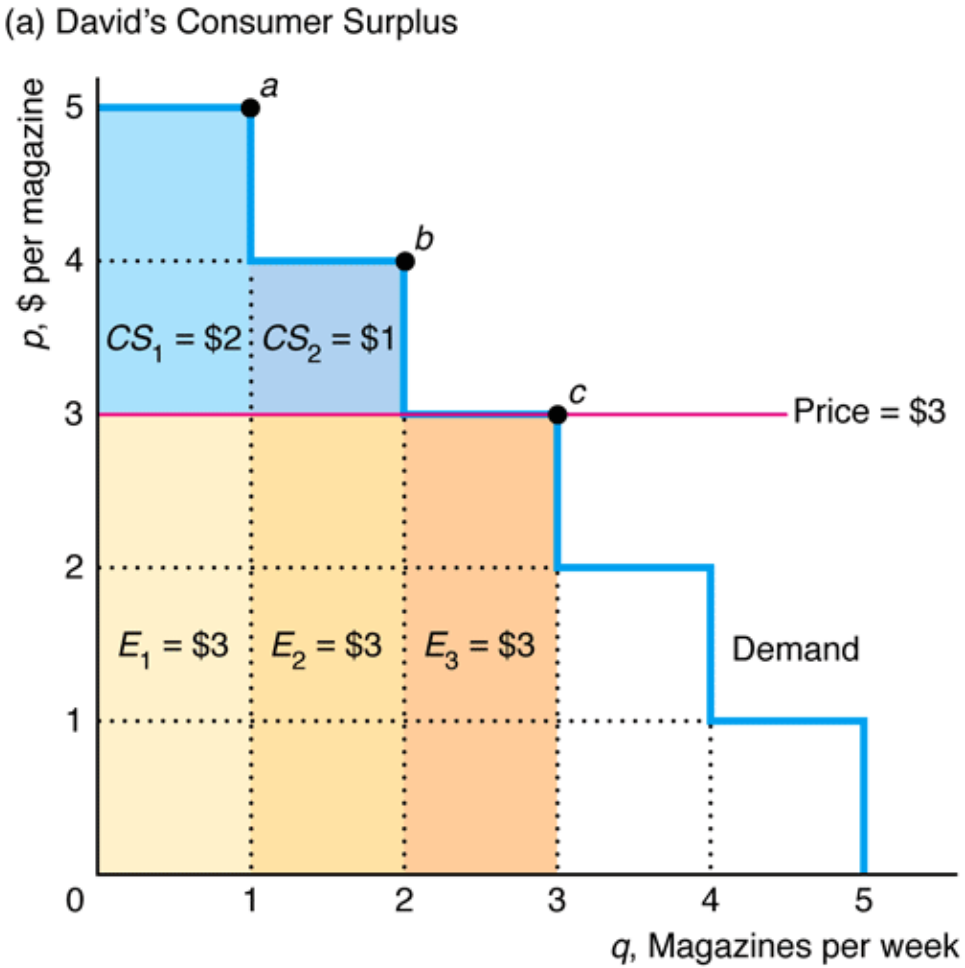
1. Consumer Welfare

- How much are consumers helped or harmed by shocks that affect the equilibrium price and quantity?
  - Shocks may come from new inventions that reduce firm costs, natural disasters, or government-imposed taxes, subsidies, or quotas.
- You might think **utility** is a natural measure of consumer welfare. Utility is problematic because:
  - we rarely know a consumer's utility function
  - utility doesn't allow for easy comparisons across consumers
- A better measure of consumer welfare is in terms of **dollars**.

Consumer Surplus

Consumer surplus (CS) is the monetary difference between the maximum amount that a consumer is willing to pay for the quantity purchased and what the good actually costs.

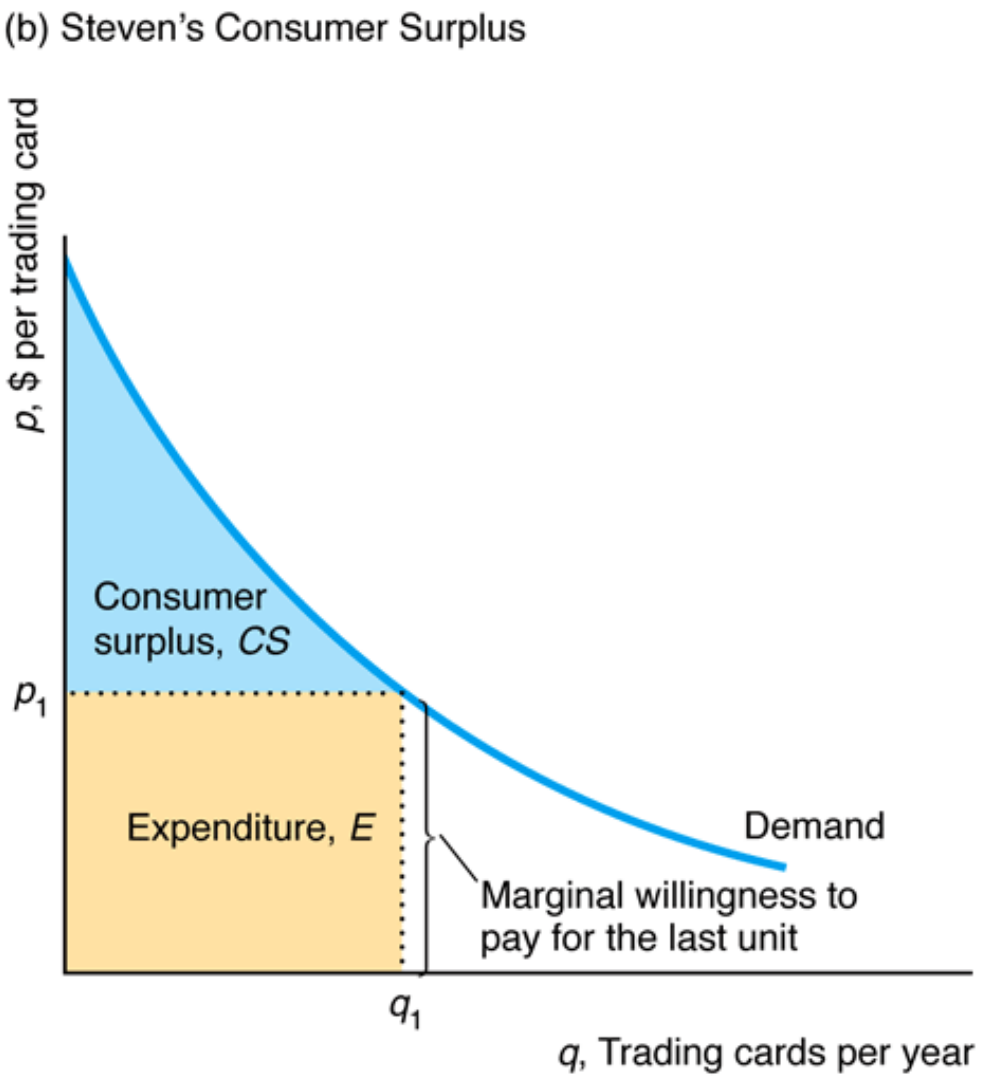
- Step function



Consumer Surplus

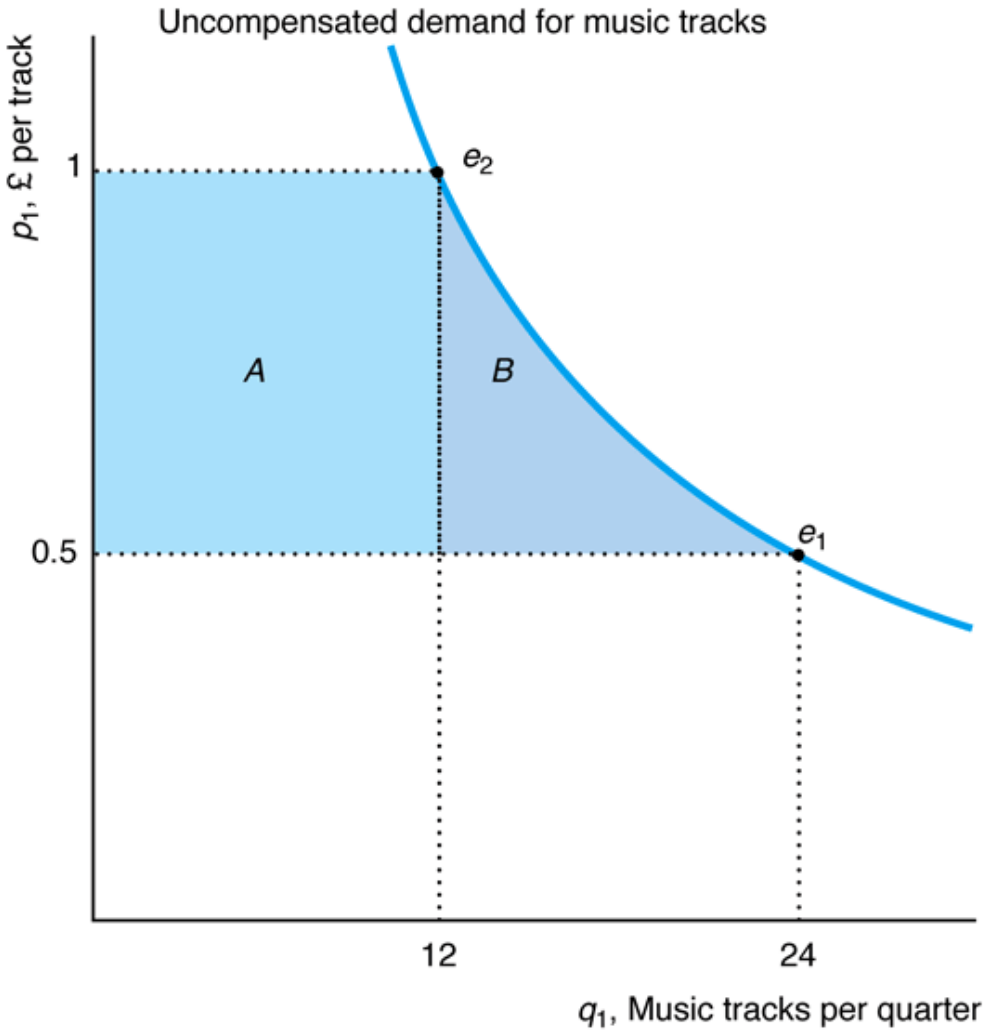
Consumer surplus (CS) is the area under the inverse demand curve and above the market price up to the quantity purchased by the consumer.

- Smooth inverse demand function



Effect of a Price Change on Consumer Surplus

- If the price of a good rises (e.g. £0.50 to £1), purchasers of that good lose consumer surplus (falls by *A* + *B*)
  - This is the amount of income we would have to give the consumer to offset the harm of an increase in price.



2. Expenditure Function and Consumer Welfare

- One measure of the harm to a consumer of a price increase is an increase in the consumer's income needed to maintain the consumer's utility.
- Cannot use an uncompensated demand curve because utility varies along the curve
- Can use compensated demand and the expenditure function because both hold utility constant
- Recall that the minimal expenditure necessary to achieve a specific utility level and given a set of prices is: $E = E(p_1, p_2, \bar{U})$
- Welfare change associated with price increase to p_1^*:

$$\text{welfare change} = E(p_1, p_2, \bar{U}) - E(p_1^*, p_2, \bar{U})$$

Expenditure Function and Consumer Welfare

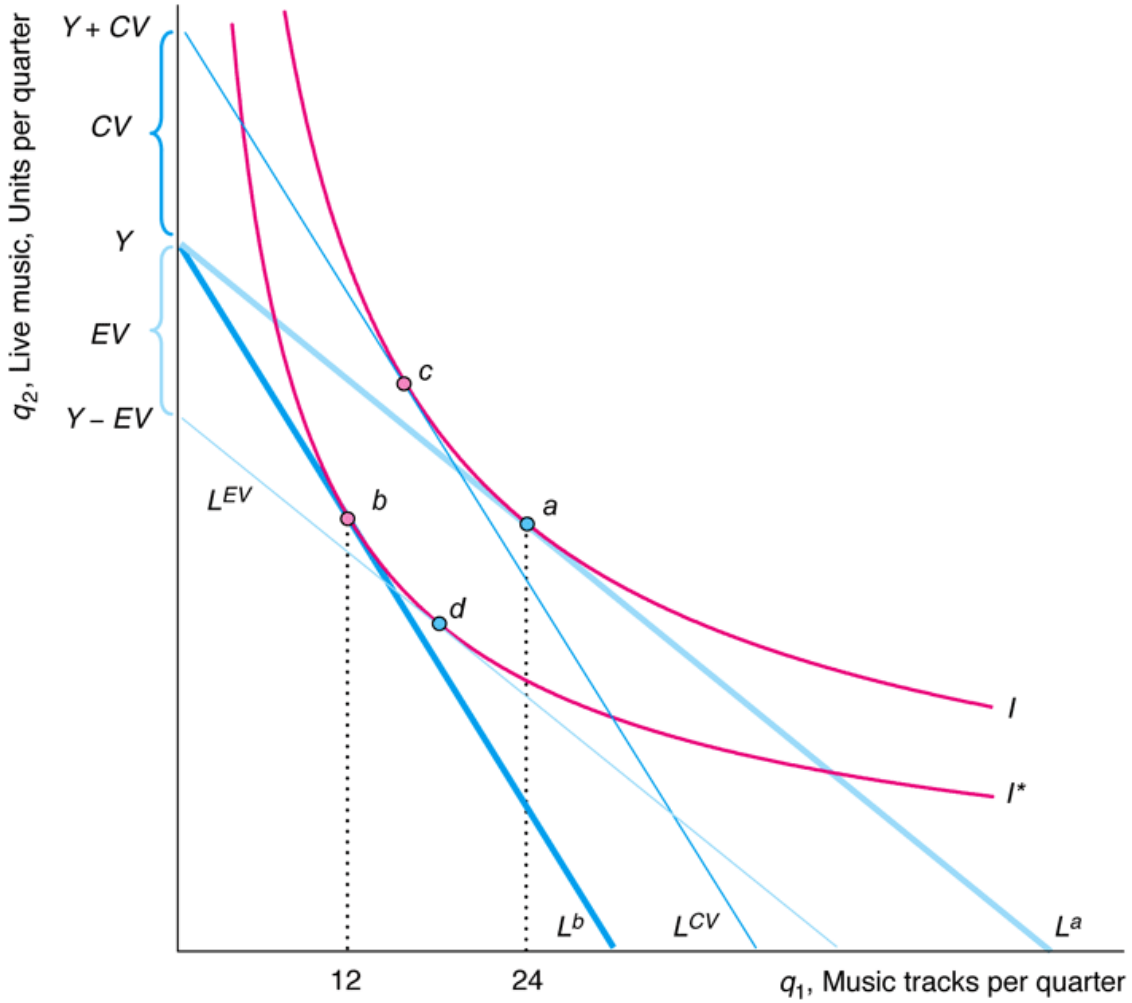
- Which level of utility should be used in this calculation?

$$\text{welfare change} = E(p_1, p_2, \bar{U}) - E(p_1^*, p_2, \bar{U})$$

- Two options:
  - ***Compensating variation*** is the amount of money we would have to give a consumer after a price increase to keep the consumer on their original indifference curve.
  - ***Equivalent variation*** is the amount of money we would have to take away from a consumer to harm the consumer as much as the price increase did.

Compensating Variation and Equivalent Variation

Indifference curves can be used to determine compensating variation (CV) and equivalent variation (EV).

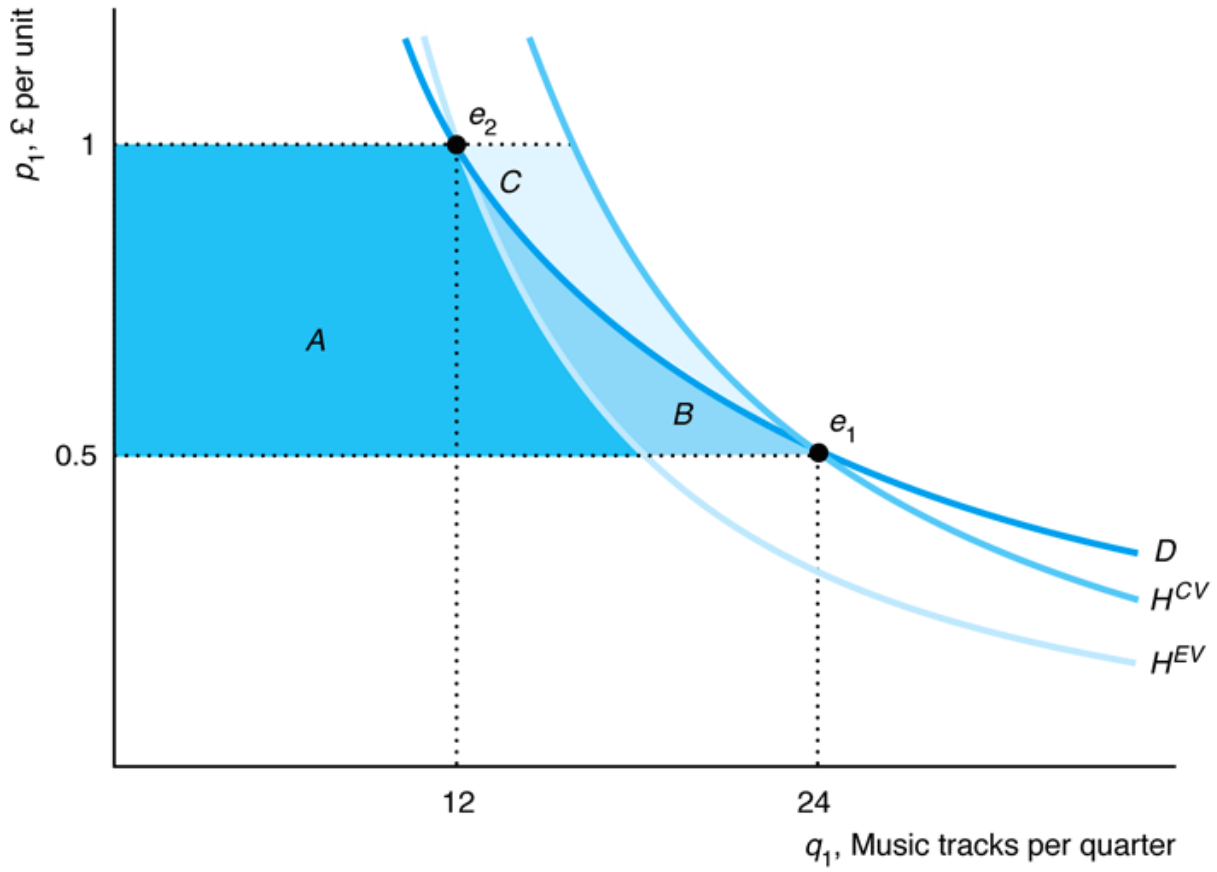


Three Measures: CS, CV, and EV

- Relationship between these measures for normal goods:

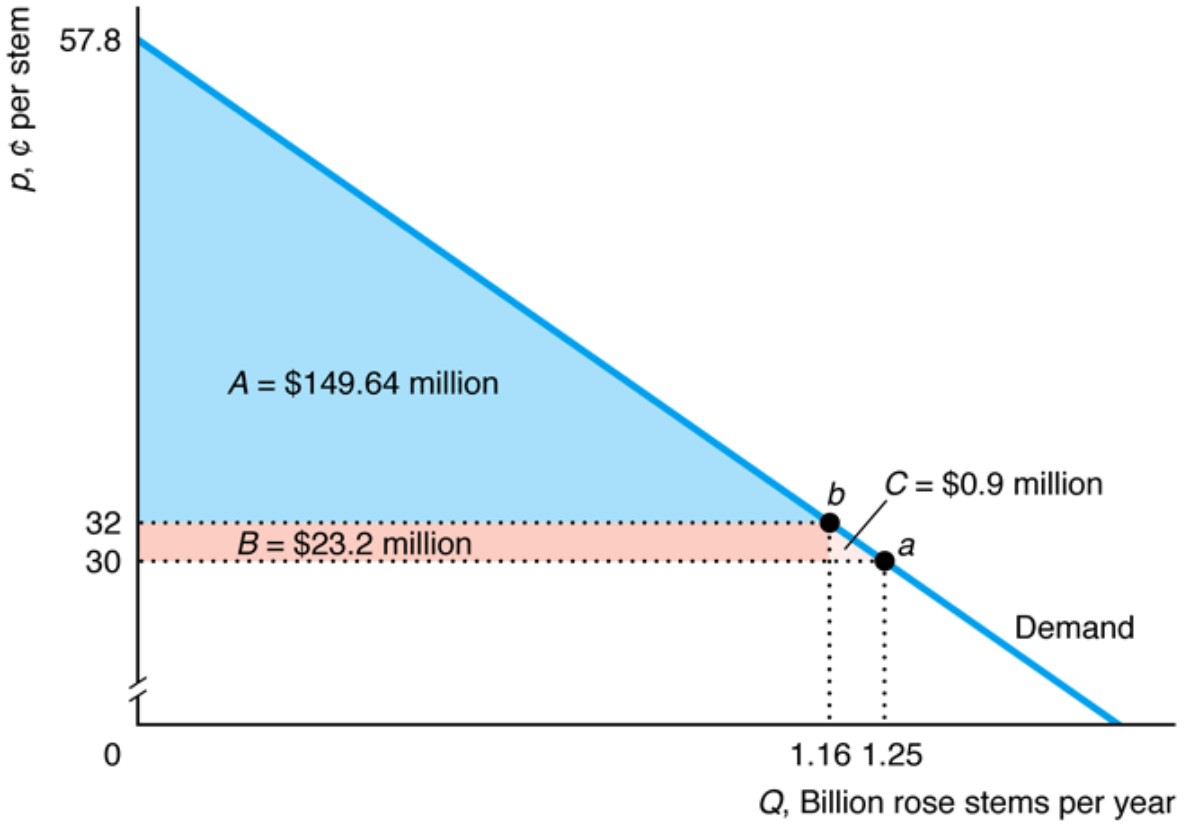
  $|CV| > |\Delta CS| > |EV|$

- For small changes in price, all three measures are very similar for most goods.



3. Market Consumer Surplus: CS, CV, and EV

- Market demand is the (horizontal) sum of individual demand curves; market CS is the sum of each individual's consumer surplus.
- CS losses following a price increase are larger:
  - the greater the initial revenue ($p \cdot Q$) spent on the good
  - the less elastic the demand curve at equilibrium



Effect of a 10% Price Increase on Consumer Surplus

Revenue and Consumer Surplus in Billions of 2008 Dollars

	Revenue	Elasticity of Demand, ε	Change in Consumer Surplus, ΔCS
Medical	1,554	−0.604	−151
Housing	1,543	−0.633	−149
Food	669	−0.245	−66
Clothing	338	−0.405	−33
Transportation	301	−0.461	−29
Utilities	308	−0.448	−30
Alcohol & tobacco	192	−0.162	−19

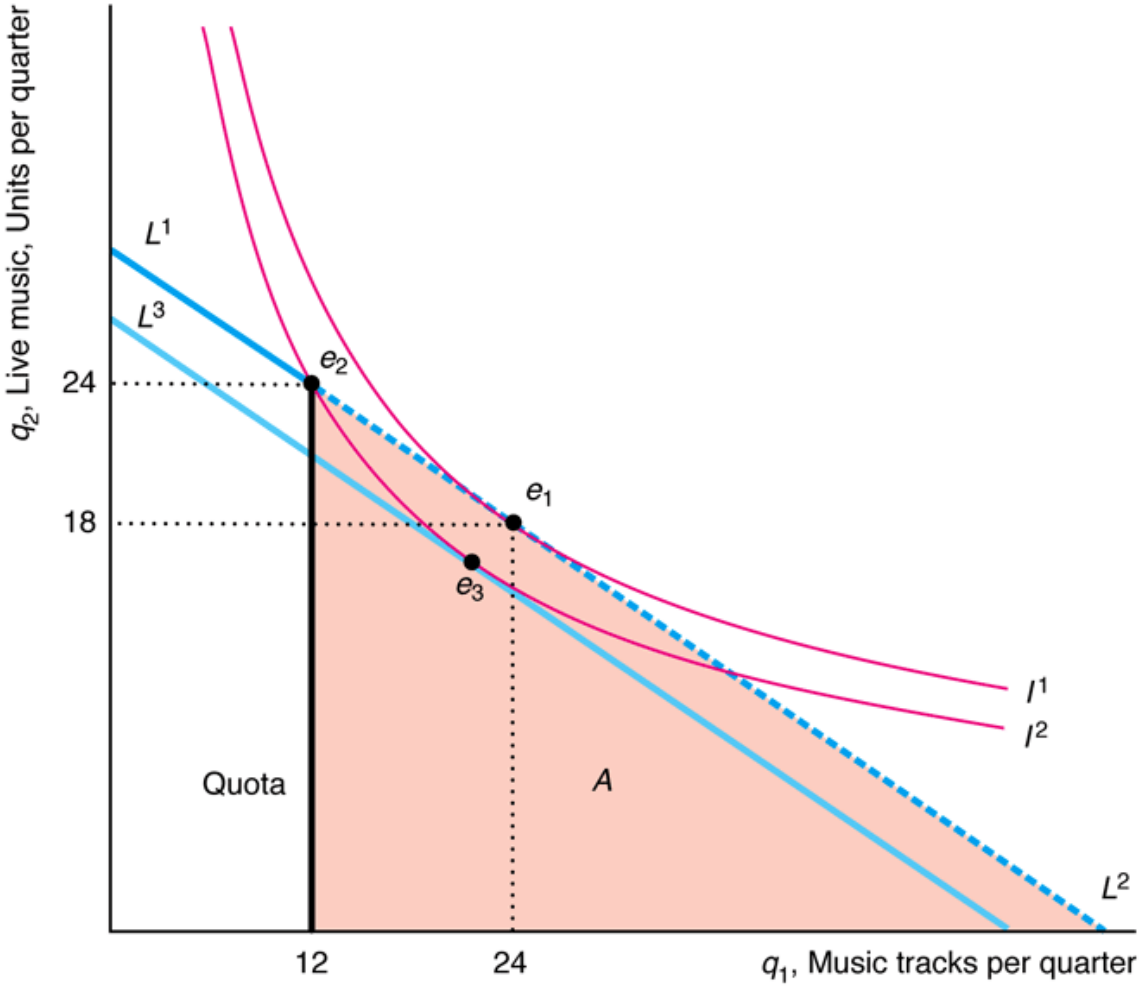
4. Effects of Government Policies on Consumer Welfare

- Government programs can alter consumers' budget constraints and thereby affect consumer welfare.
- Examples
  - **Quota**: reduces the number of units that a consumer buys
  - **Subsidy**: causes a rotation or parallel shift of the budget constraint
  - **Welfare programs**: may produce kinks in budget constraint

Effects of Government Policies

Quotas limit how much of a good consumers can purchase.

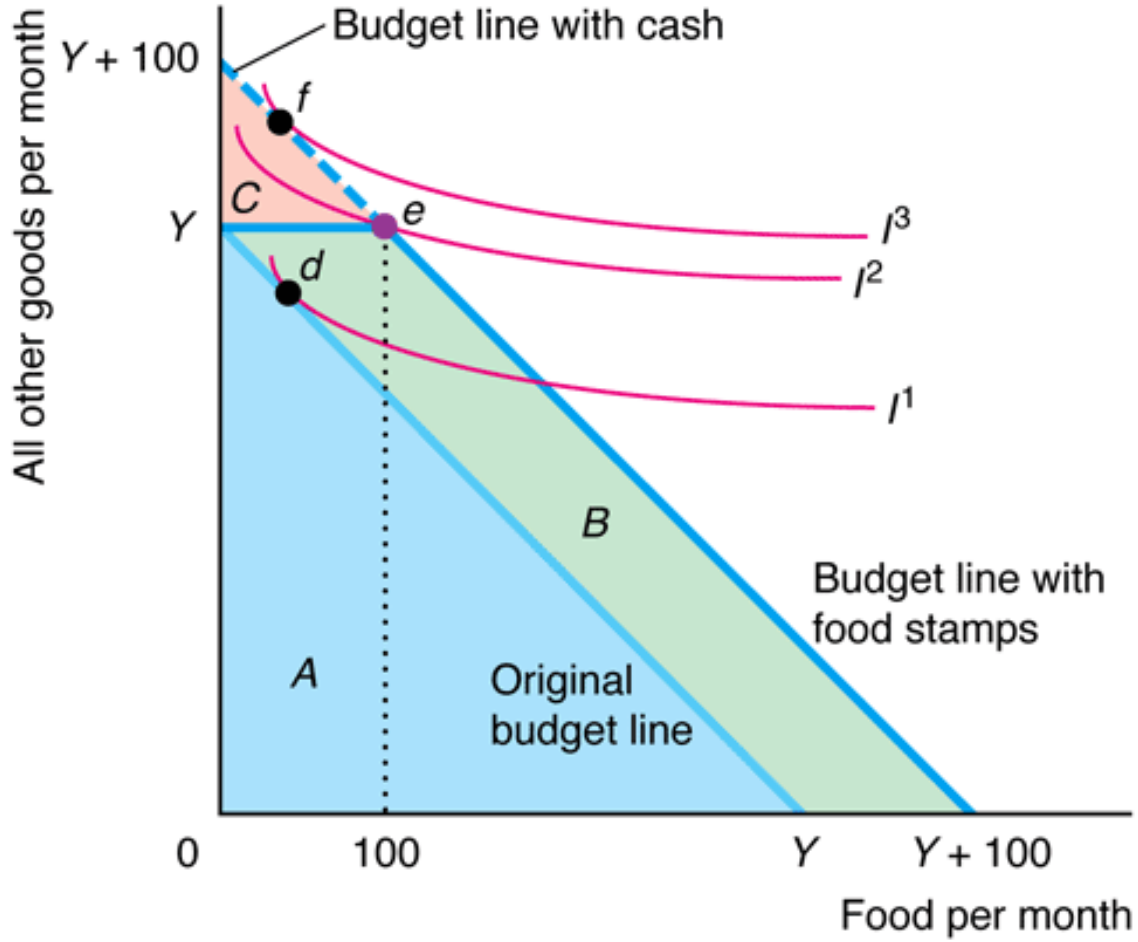
- Quota of 12 units generates kink in budget line and removes shaded triangle region from individual's choice set.
- EV of this quota is the income reduction (L^2 to L^3) that would move her onto the lower indifference curve, I^2.



Effects of Government Policies

Welfare programs provide either in-kind transfers or a comparable amount of cash to low-income individuals.

- Example: food stamps
- $100 in food stamps (in-kind) generates kinked budget line.
- $100 cash transfer increases opportunity set further.



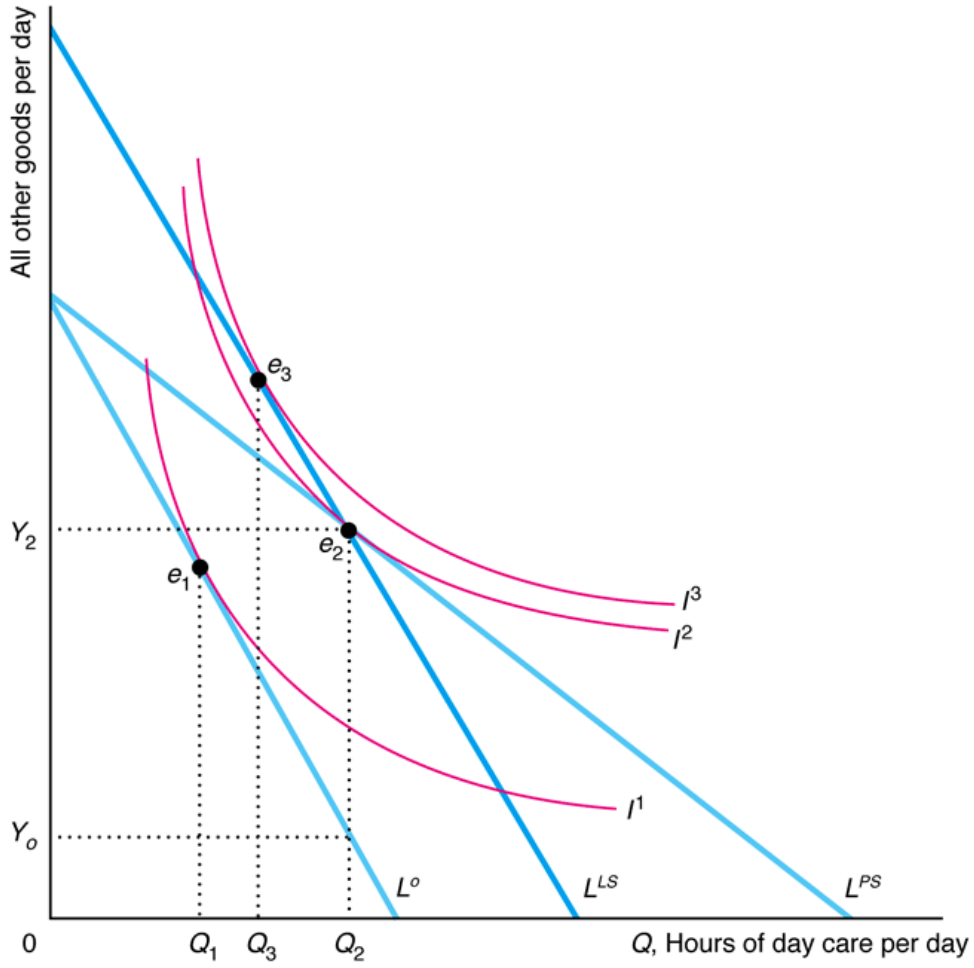
Effects of Government Policies

- Because food stamps can only be used on food, consumers are potentially worse off if they would find it optimal to consume less food and more other goods than allowed by the program.
- Despite this, food stamps are used rather than comparable cash transfers in order to:
  - reduce expenditures on drugs and alcohol
  - encourage appropriate expenditure on food from a nutrition standpoint
  - maintain program support from taxpayers, who feel more comfortable providing in-kind rather than cash benefits

Effects of Government Policies

Subsidies either lower prices or provide lump-sum payments to low-income individuals.

- Example: child care subsidy
- Reducing price of child care rotates budget line out
- Unrestricted lump-sum payment (equal to taxpayers' cost of the subsidy) shifts budget line out in a parallel fashion and increases opportunity set

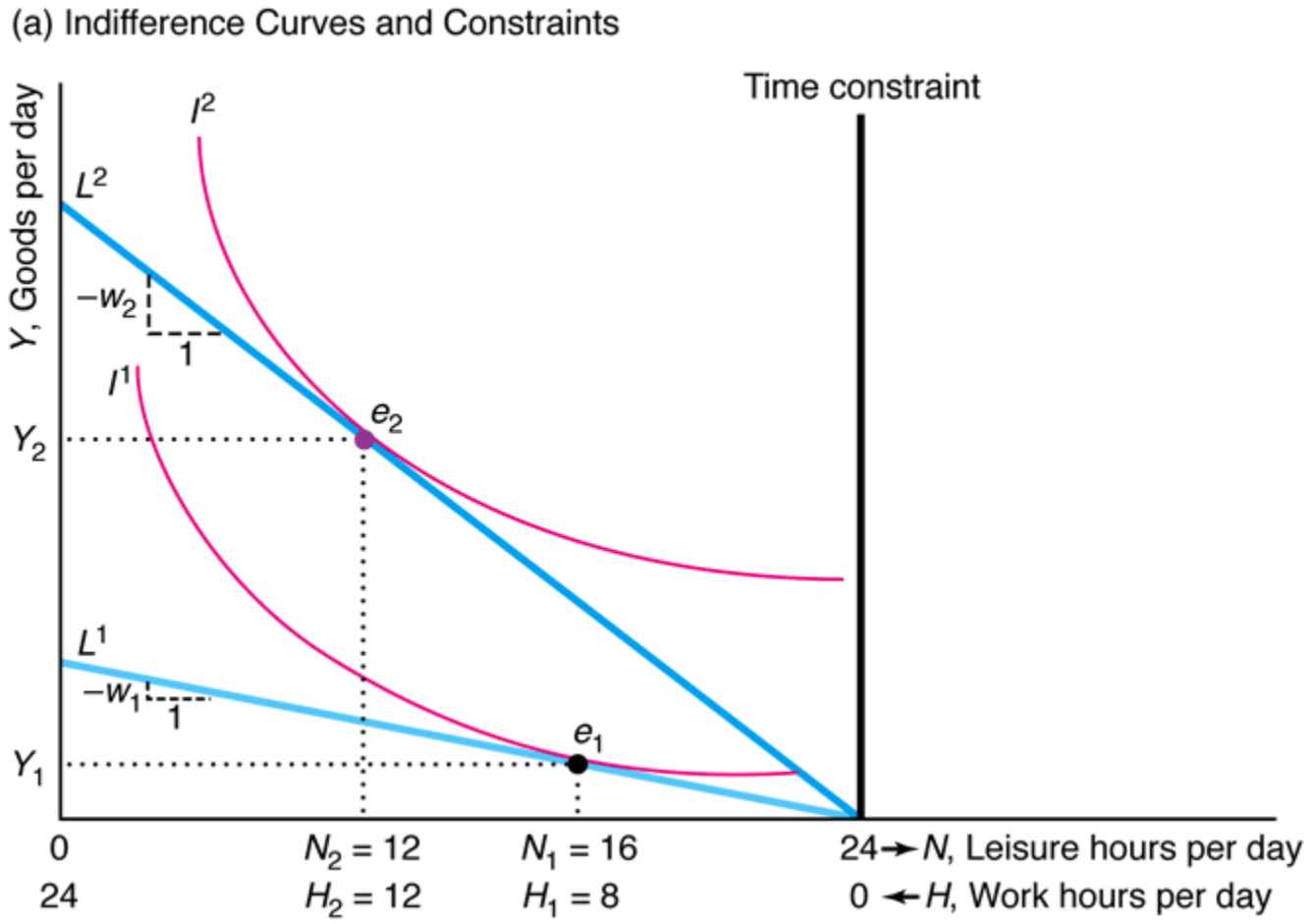


5. Deriving Labor Supply Curves

- Consumer theory is not only useful for determining consumer demand; it is useful for determining consumers' labor supply decisions.
- Labor – Leisure Choice
  - Work (*H* = hours) to earn money (*w* = wage) and buy goods
  - Don't work and consume leisure hours, *N*, and buy goods from unearned income sources, Y^*
  - Utility: $U = U(Y, N)$
  - Time constraint: $H = 24 - N$
  - Total income: $Y = wH + Y^*$
- Goal in determining labor and leisure choices is to maximize utility subject to constraints.

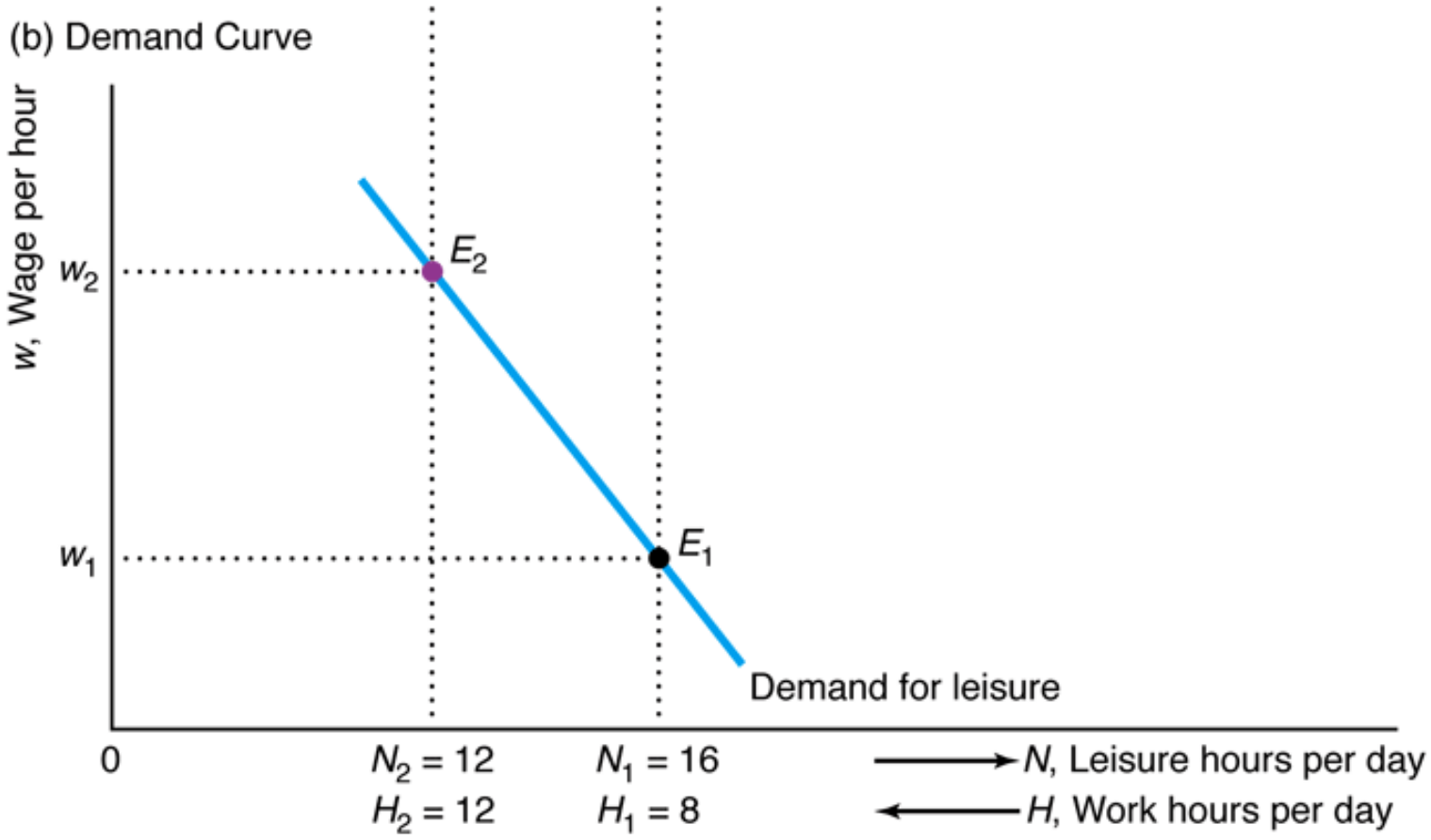
Deriving Labor Supply Curves

Graphical analysis to determine optimal work hours and leisure hours per day:



Deriving Labor Supply Curves

Graphically, when wage falls, it is optimal to work fewer hours and increase leisure:



Deriving Labor Supply Curves

- Mathematical analysis to determine optimal work hours and leisure hours per day uses calculus to find the tangency point between indifference curve and budget line.
- Maximize utility subject to constraints:

$$\max_{H} U = U\left(Y, N\right) = U\left(wH, 24 - H\right)$$

- First-order condition for an interior maximum is:

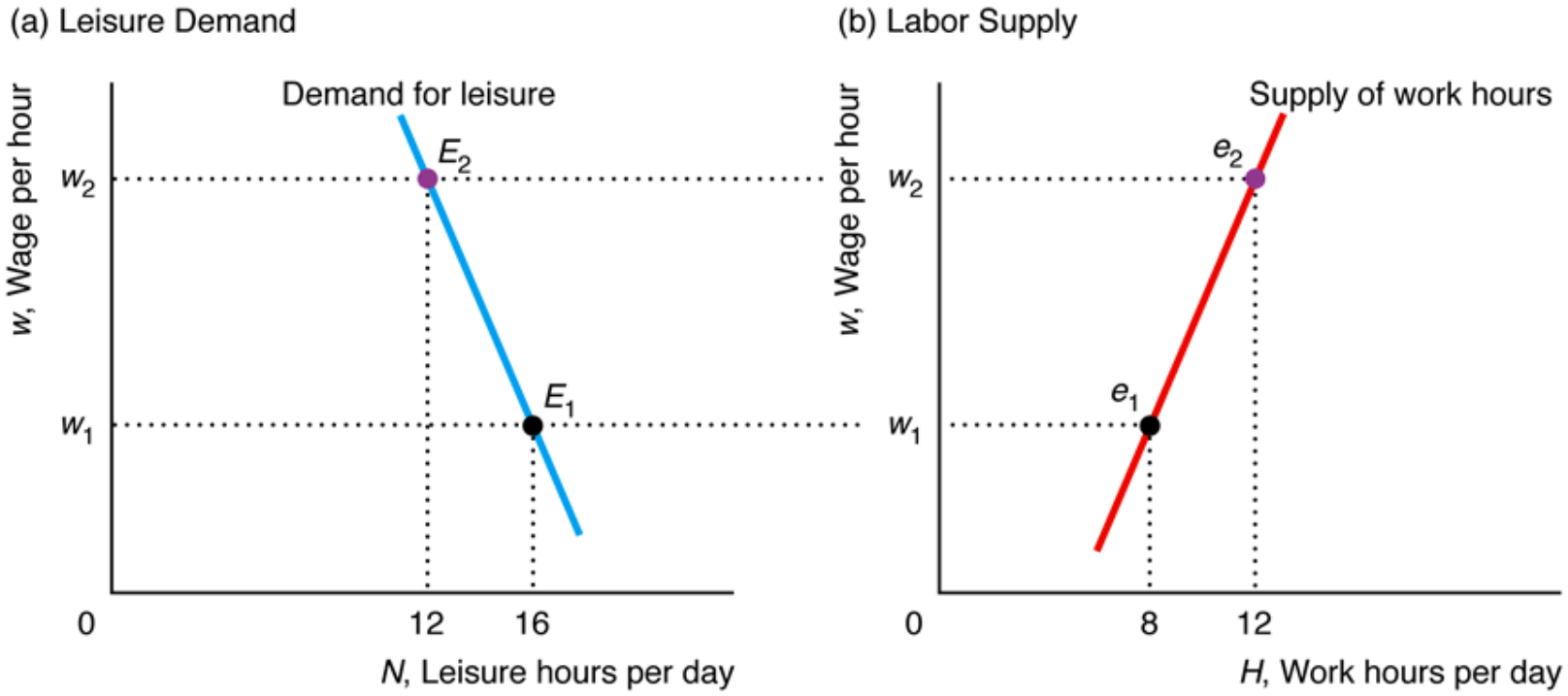
$$\frac{\partial U}{\partial Y}\frac{\mathrm{d}Y}{\mathrm{d}H} + \frac{\partial U}{\partial N}\frac{\mathrm{d}N}{\mathrm{d}H} = U_{Y}w - U_{N} = 0$$

- Slope of indifference curve = Slope of budget line:

$$MRS = -\frac{U_{N}}{U_{Y}} = -w = MRT$$

Deriving Labor Supply Curves

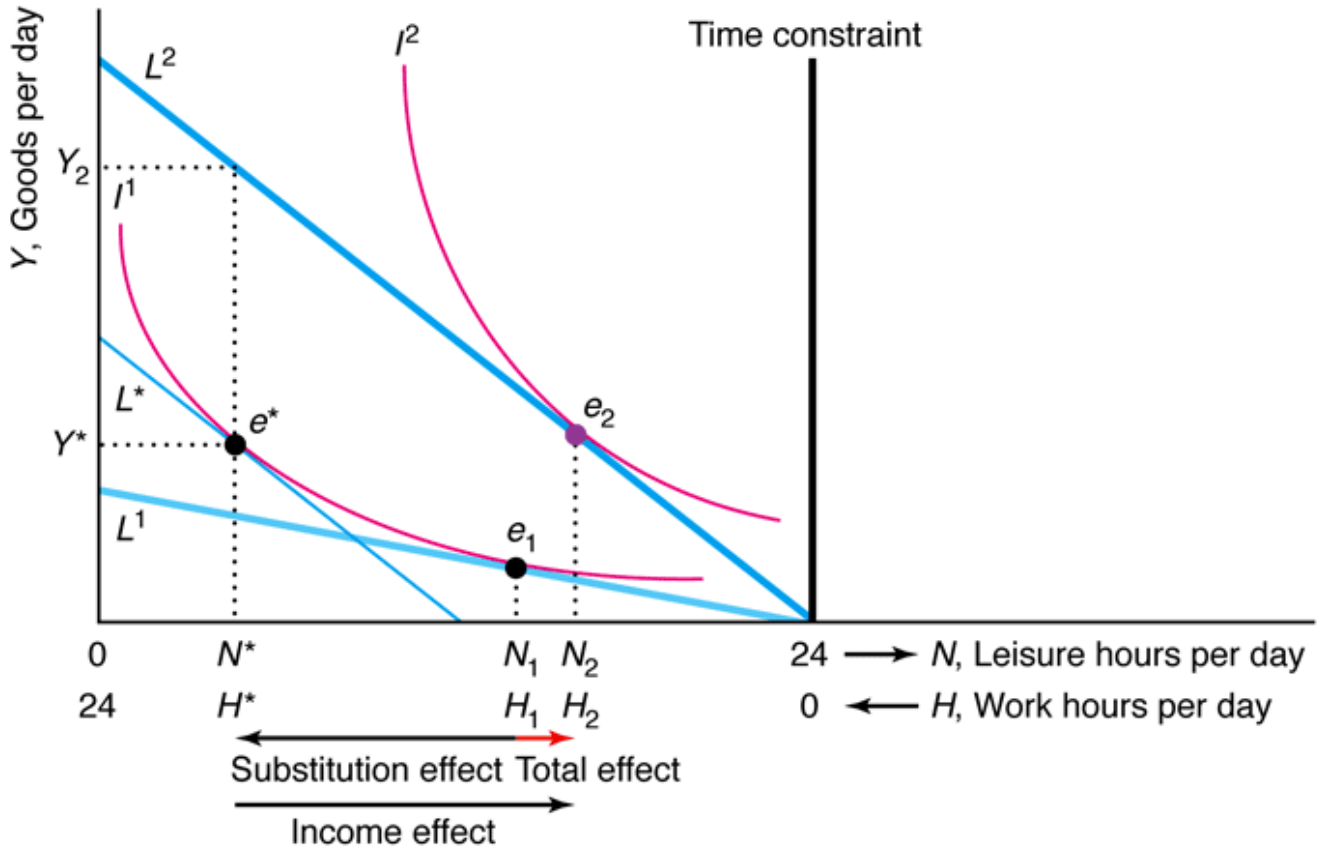
The supply curve for hours worked is the mirror image of the demand curve for leisure hours.



Income and Substitution Effects

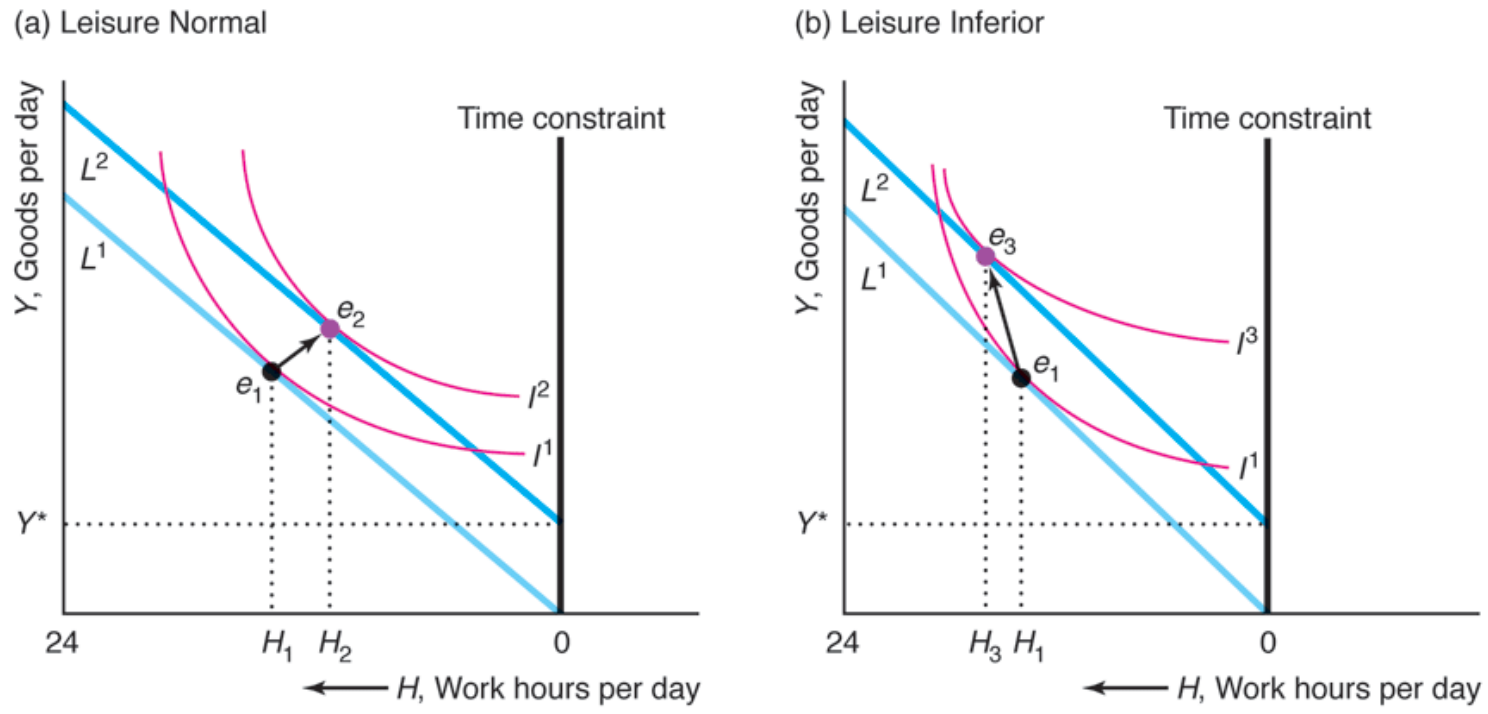
An increase in the wage causes both income and substitution effects.

- Total effect of a wage increase is move from e_1 to e_2 (work more).
- Substitution effect is e_1 to e^* (work more).
- Income effect is e^* to e_2 (work less).
- Thus, substitution effect dominates in this case.



Leisure is Either an Inferior Good or a Normal Good

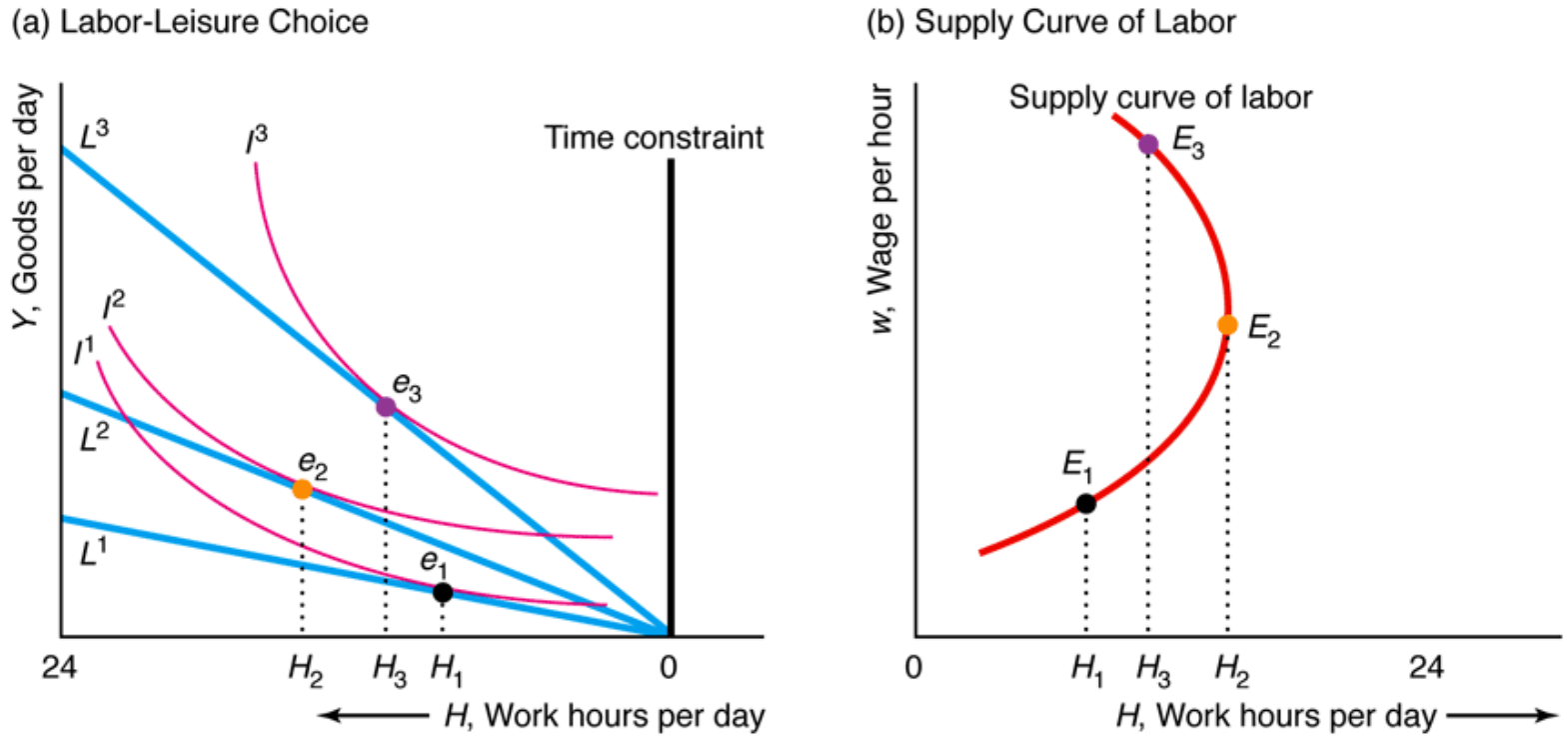
With an increase in income, leisure may increase or decrease



Shape of the Labor Supply Curve

Different effects dominate along different portions of the labor supply curve.

- Potentially backward-bending labor supply curve at higher wages

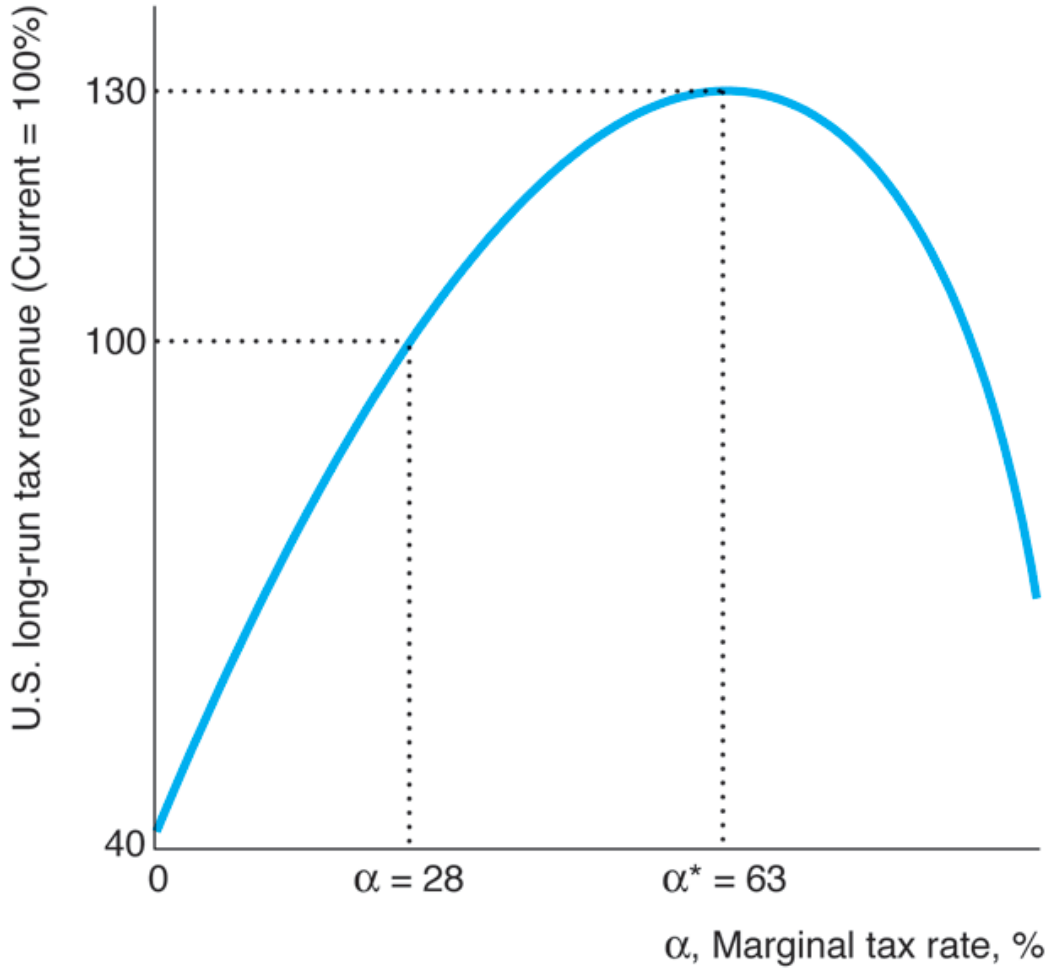


Income Tax Rates and the Labor Supply Curve

- An increase in the income tax rate – a percent of earnings – lowers workers' after-tax wages and may increase or decrease hours worked.
  - If labor supply is backward bending, lowering wages through higher income taxes will increase hours worked.
  - If labor supply is upward sloping, lowering wages through higher income taxes will decrease hours worked.
- The effect of imposing a marginal tax rate of τ is to reduce the effect wage from w to $(1 - \tau)\, w$
  - This rotates a worker's budget constraint in and downward.

Income Tax Revenue and Labor Supply

Income tax revenue is τwH, which has a non-linear relationship to the marginal tax rate:



Income Tax Revenue and Labor Supply

- The government's tax revenue from an income tax is:

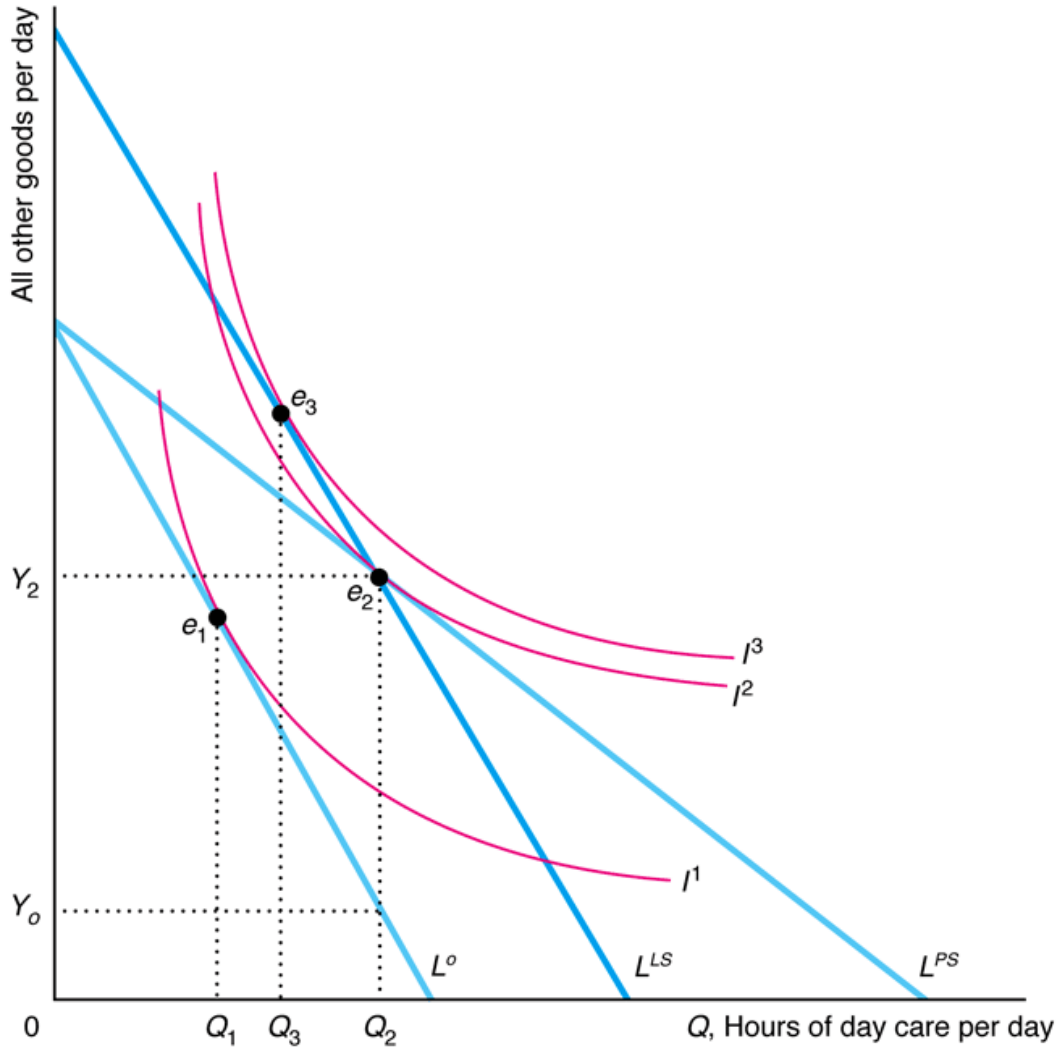
$$T = \tau wH\,[(1-\tau)w] = \tau wH\,(\omega)$$

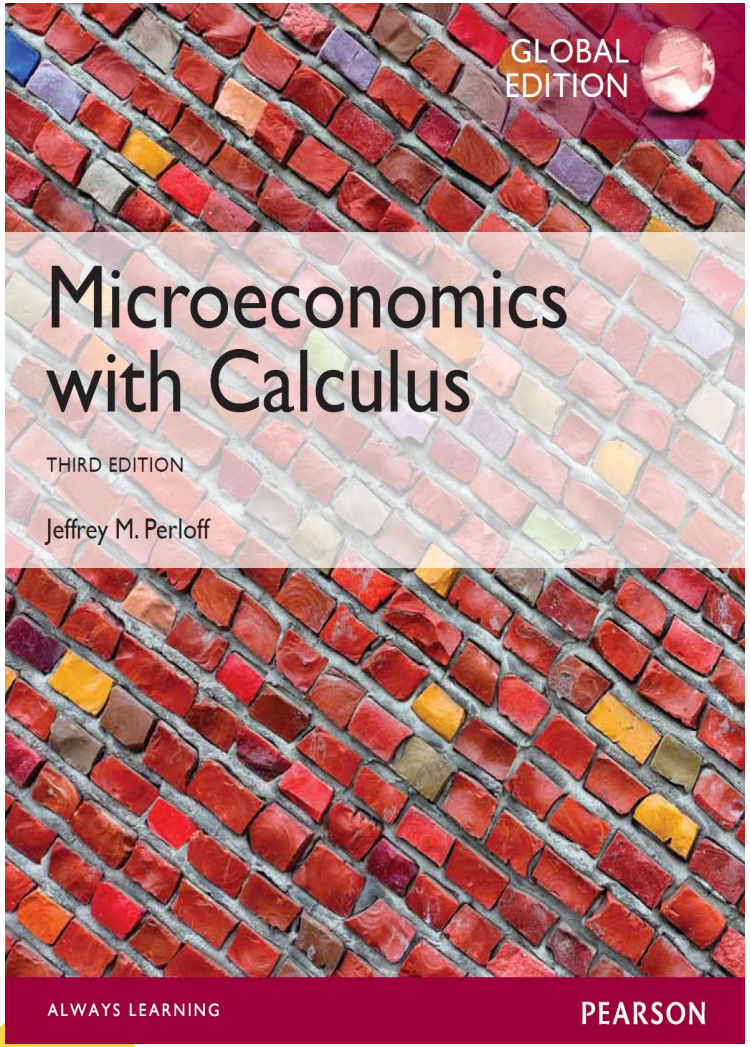
  - Where $H(\omega)$ is the hours of work supplied by an individual given the after tax wage, $\omega = (1-\tau)w$.

- By differentiating the equation above, we can show how income tax revenue changes as the tax rate increases: $\frac{dT}{d\tau} = wH(\omega) - \tau w^2 \frac{dH}{d\omega}$
- Two effects from a change in the marginal tax rate:
  1. Government collects more revenue from higher tax rate.
  2. Change in tax rate alters hours worked (and direction cannot be predicted by theory alone).

Challenge Solution

- Child-care subsidy or lump-sum subsidy?
- Original budget constraint is L^O
- If child-care subsidy, budget constraint is L^{PS}. Family chooses e_2 and utility is I^2.
- If lump-sum subsidy so that e_2 is affordable, budget constraint is L^{LS}. Family chooses e_3 and utility is I^3.
- Taxpayer costs for the two programs are the same, but family is better off with the lump-sum subsidy.





REFERENCE

Chapter 5 - Microeconomics: Theory and Applications with Calculus, 3rd Edition. By Jeffrey M. Perloff. 2014 Pearson Education.