Econ 301: Microeconomic Analysis

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Buying and Selling

Motivation

- For most of this class, have assumed that income comes as lump sum
- More recently, introduced idea that income comes from selling goods produced or assets accumulated
- This lecture: take this formulation of endowment income back to the single-consumer optimization problem

Setup

- Consumer starts with *endowment* (ω_1, ω_2)
- *Gross demand* noted by (x_1, x_2)
- Define *net demand* as $(d_1, d_2) = (x_1 - \omega_1, x_2 - \omega_2)$
  - If net demand for a good is negative, consumer is a *net supplier* or *net seller*
- Budget constraint is given by

$$p_1 x_1 + p_2 x_2 = p_1 \omega_1 + p_2 \omega_2$$

- Properties of budget constraint:
  - Goes through the endowment
  - Has slope $-\frac{p_1}{p_2}$

Setup Graphically

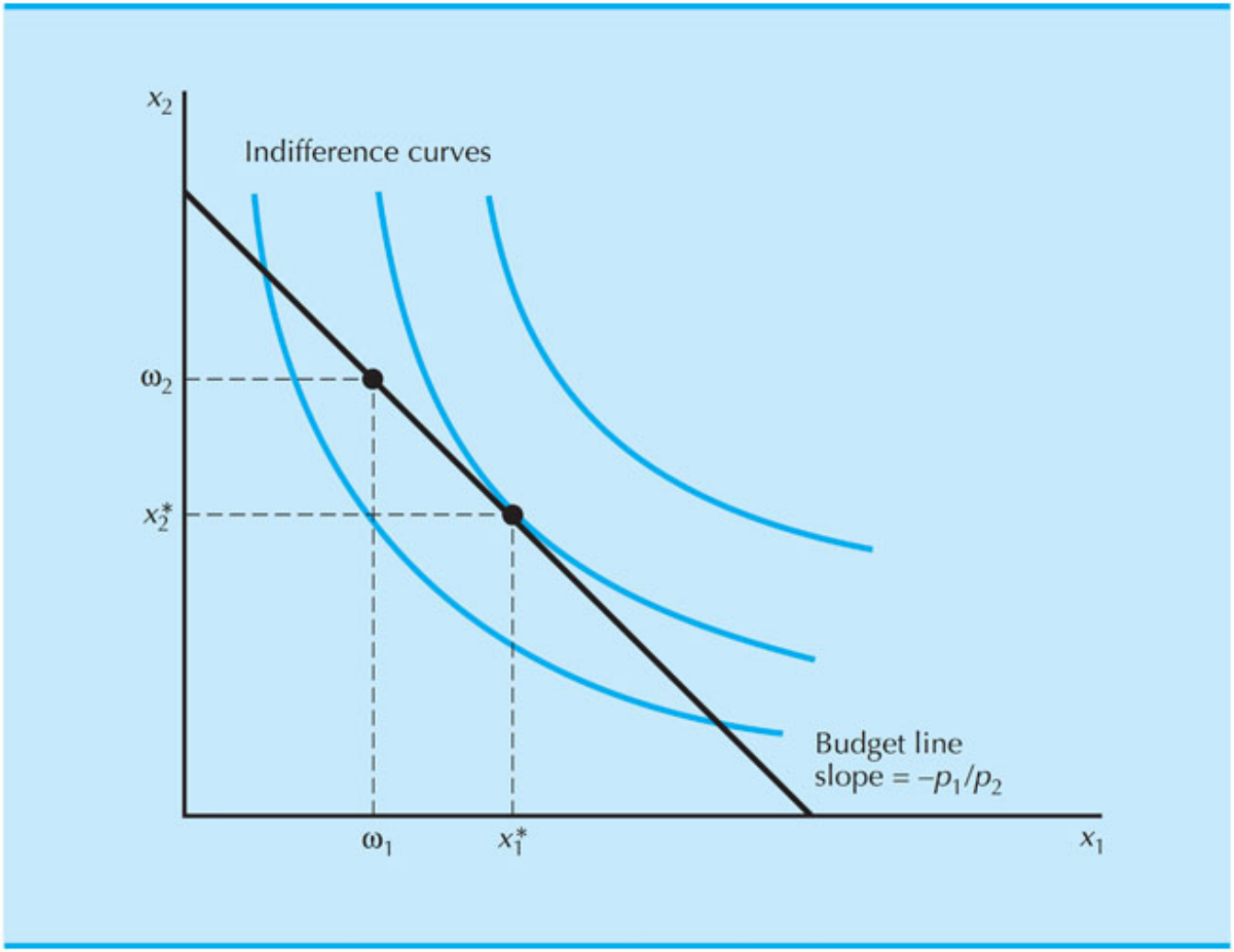
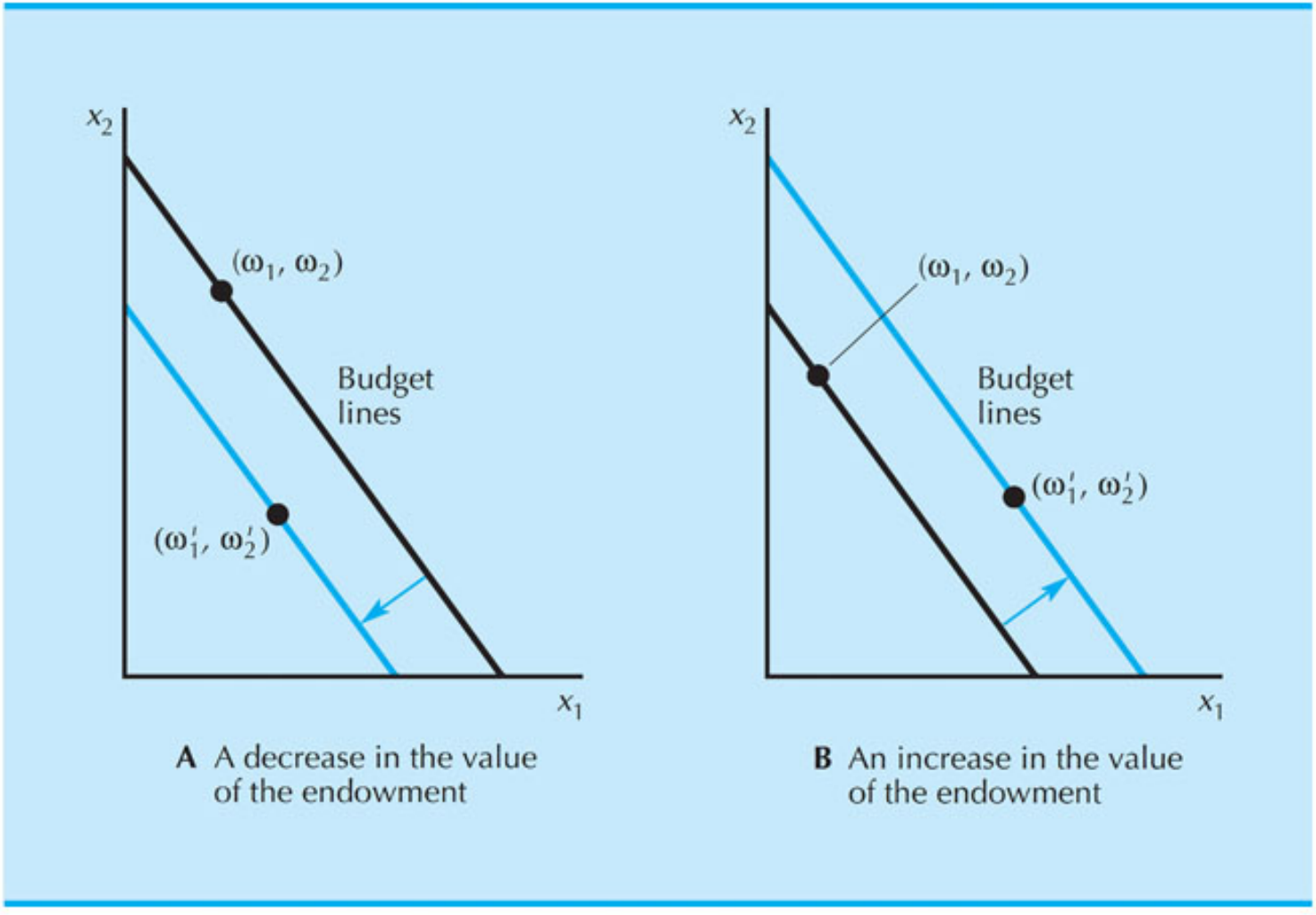


Figure 9.1

Change in the Endowment

- Suppose the endowment changes to (ω_1', ω_2')
- Three possibilities:
  1. $p_1\omega_1' + p_2\omega_2' < p_1\omega_1 + p_2\omega_2$
     - Budget line shifts in
     - Consumer is worse off
     - Change in consumption depends on whether good inferior or normal
  2. $p_1\omega_1' + p_2\omega_2' > p_1\omega_1 + p_2\omega_2$
     - Budget line shifts out
     - Consumer is better off
     - Change in consumption depends on whether good inferior or normal
  3. $p_1\omega_1' + p_2\omega_2' = p_1\omega_1 + p_2\omega_2$
     - Budget line does not change
     - No change in consumption

Changes in Endowment



A A decrease in the value of the endowment

B An increase in the value of the endowment

Figure 9.2

Price Decrease of Good 1

- Suppose p_1 decreases
- What happens to budget line?
  - Pivots around endowment, becomes shallower
- Suppose consumer is net seller of good 1
  - Will consumer be net seller or buyer of good 1 after price increase?
  - Can't say whether consumer will be net seller or buyer of good 1 after price decrease
  - If still net seller at new price, must be worse off by revealed preference
  - If becomes net buyer, welfare effect is ambiguous
- Suppose consumer is net buyer of good 1
  - Will consumer be net seller or buyer of good 1 after price increase?
  - Consumer will remain net buyer by revealed preference

Net Seller of Good 1 with Price Decrease

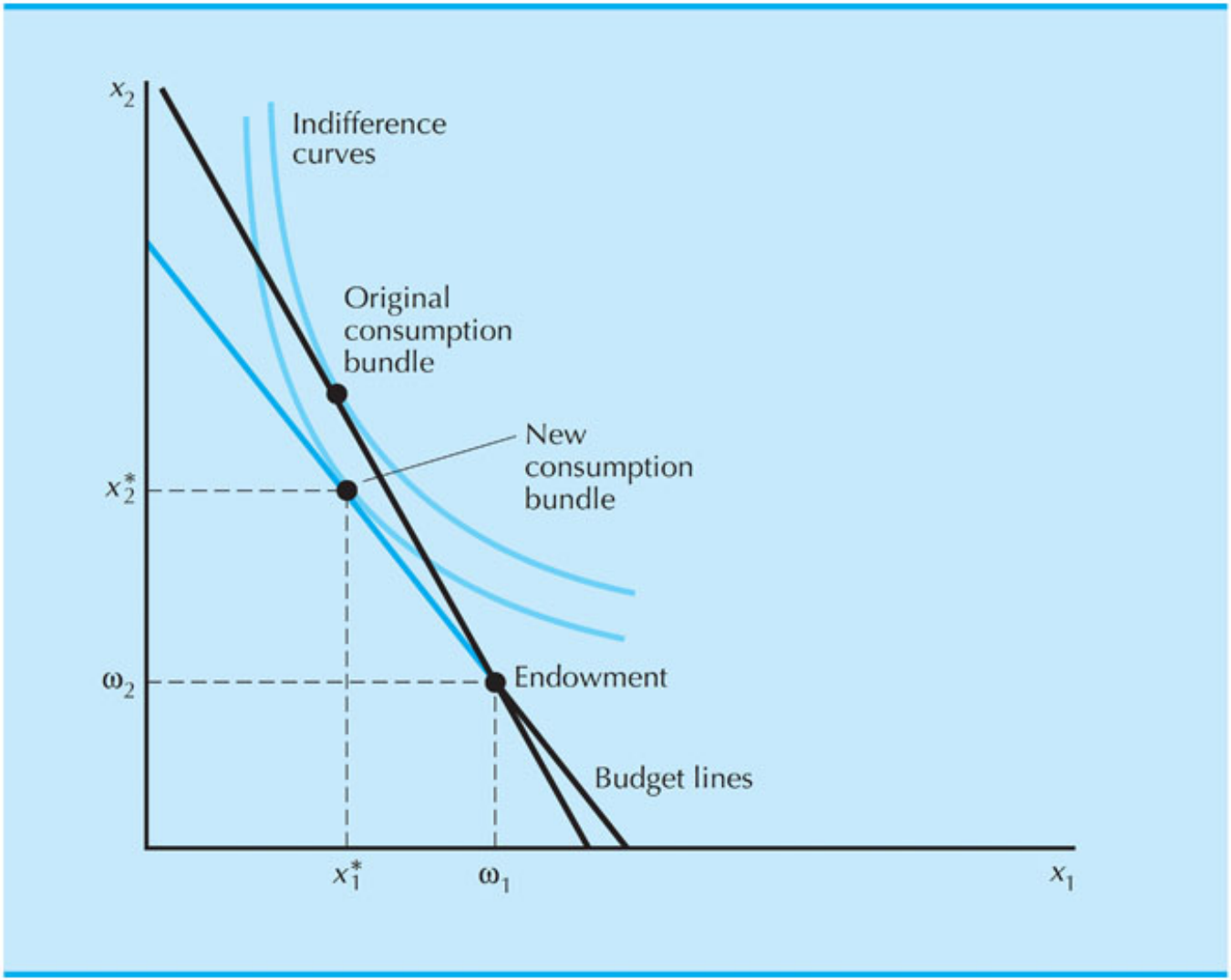


Figure 9.3

Net Buyer of Good 1 with Price Decrease

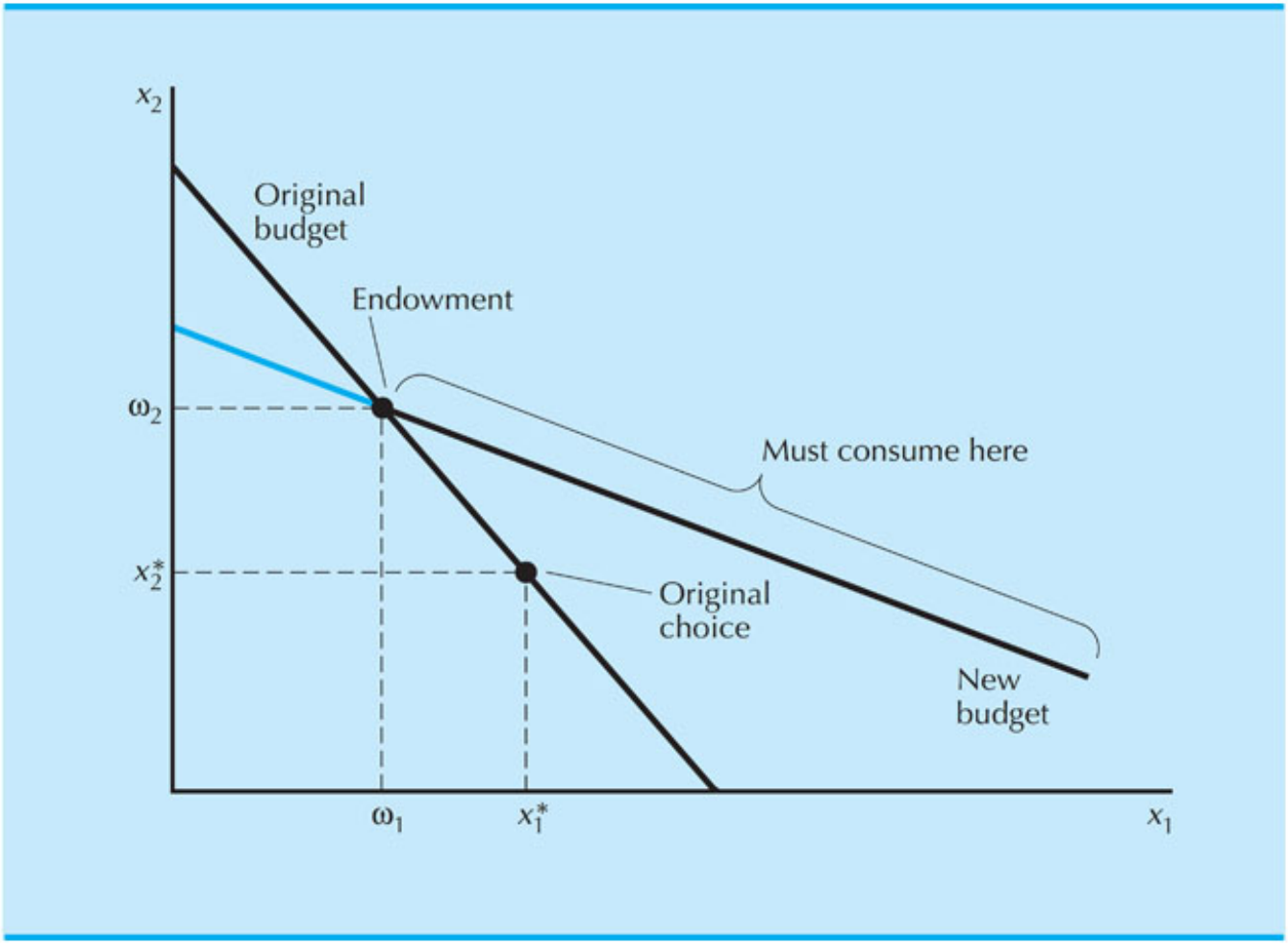


Figure 9.4

Price Increase of Good 1

- Suppose p_1 increases
- What happens to budget line?
  - Pivots around endowment, becomes steeper
- Suppose consumer is net buyer of good 1
  - Will consumer be net seller or buyer of good 1 after price increase?
  - Either is possible
  - If still net buyer at new price, must be worse off by revealed preference
  - If becomes net seller, welfare effect is ambiguous
- Suppose consumer is net seller of good 1
  - Will consumer be net seller or buyer of good 1 after price increase?
  - Consumer will remain net seller by revealed preference

Demand Curves

- Gross demand curve is our normal downward sloping demand: $x_1(p_1)$
  - Demand for good 1 depends on p_2 and m but those variables suppressed for now
- At some price p_1^* the consumer switches from net demander to net supplier
- The net demand curve is given by

$$d_1(p_1) = \max\{x_1(p_1) - \omega_1, 0\}$$

- The net supply curve is given by

$$s_1(p_1) = \max\{\omega_1 - x_1(p_1), 0\}$$

Net Supply and Demand Graphically

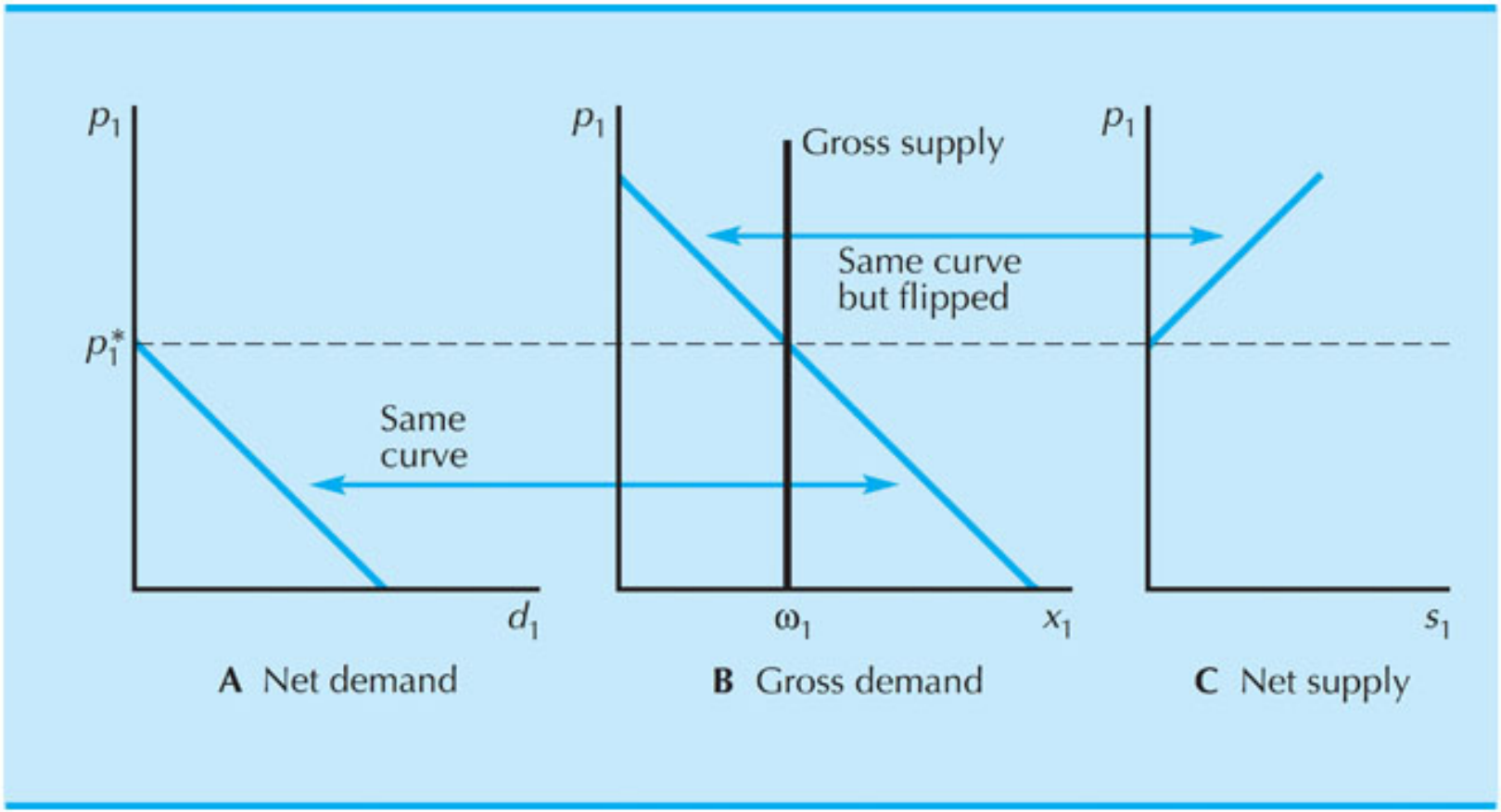


Figure 9.6

Slutsky Revisited

- Motivating question: how does demand for a good respond to a change in its price?
  - In previous analysis, had assumed income does not change
  - But now, price changes value of endowment
- We will now have two types of income effects when the price of a good falls:
  - Have already seen *ordinary income effect*, where buying same bundle as before now results in some money left over
  - Now also have *endowment income effect*, since value of endowment is now less

Revamping the Slutsky Equation

- We can write demand as $x_1(p_1, p_2, m(p_1, p_2))$ where $m(p_1, p_2) = p_1\omega_1 + p_2\omega_2$
- Taking the total derivative w.r.t. p_1:

$$\frac{dx_1}{dp_1} = \frac{\partial x_1}{\partial p_1} + \frac{\partial x_1}{\partial m}\frac{dm}{dp_1}$$

- Note that $\frac{dm}{dp_1} = \omega_1$
- Recall $\frac{\partial x_1}{\partial p_1} = \frac{\partial x_1^s}{\partial p_1} - \frac{\partial x_1}{\partial m}x_1$ from earlier form of Slutsky
- Combining everything, we get

$$\frac{dx_1}{dp_1} = \underbrace{\frac{\partial x_1^s}{\partial p_1}}_{\text{substitution effect}} - \underbrace{\frac{\partial x_1}{\partial m}x_1}_{\text{ordinary income effect}} + \underbrace{\frac{\partial x_1}{\partial m}\omega_1}_{\text{endowment income effect}}$$

Signing the Change in Demand

- Combine terms to get

$$\frac{dx_1}{dp_1} = \frac{\partial x_1^s}{\partial p_1} + (\omega_1 - x_1)\frac{\partial x_1}{\partial m}$$

- What is sign of $\frac{\partial x_1^s}{\partial p_1}$? negative
- What is sign of $\frac{\partial x_1}{\partial m}$?
  - Positive for normal good
  - Negative for inferior good
- What is sign of $\omega_1 - x_1$?
  - Negative for net demander
  - Positive for net supplier
- Sign of $\frac{dx_1}{dp_1}$ can be summarized like so:

	normal good	inferior good
net demander	$-$	?
net supplier	?	$-$

Example: Apples and Oranges

- Suppose a consumer grows apples and oranges in her backyard
- Eats some apples and oranges and sells the rest
- Suppose price of apples goes up
- Is it possible that consumer eats more apples?
  - Note that $\omega_a - x_a > 0$ since consumer is net supplier of apples
  - Thus if apples are normal good and $\frac{\partial x_1}{\partial m}$ large enough, the total effect will be $\frac{dx_1}{dp_1} > 0$

Example: Labor Supply

- Consumer has non-labor income M
- Consumer chooses amount of consumption good C, with unit price p
- Consumer also choose labor amount L, with wage w
- Budget constraint? $pC = M + wL$

A More Useful Formulation of Budget Constraint

- Rearrange so choice variables are on left side:

$$pC - wL = M$$

- Add wage times max hours in day $\bar{L}$ to both sides:

$$pC + w(\bar{L} - L) = M + w\bar{L}$$

- Define $\bar{C} = \frac{M}{p}$ as consumption if spend all non-labor income:

$$pC + w(\bar{L} - L) = p\bar{C} + w\bar{L}$$

- Define leisure consumption as $R = \bar{L} - L$ and note that $\bar{R} = \bar{L}$:

$$pC + wR = p\bar{C} + w\bar{R}$$

Budget Constraint Details

- Budget constraint details
  - Goes through $(\bar{R}, \bar{C})$
  - Slope $-\frac{w}{p}$
- $\frac{w}{p}$ is the called the *real wage*
  - Since it measures how much consumption good the consumer can purchase if she works one more hour
  - It is also the opportunity cost in consumption units

Budget Constraint Graphically

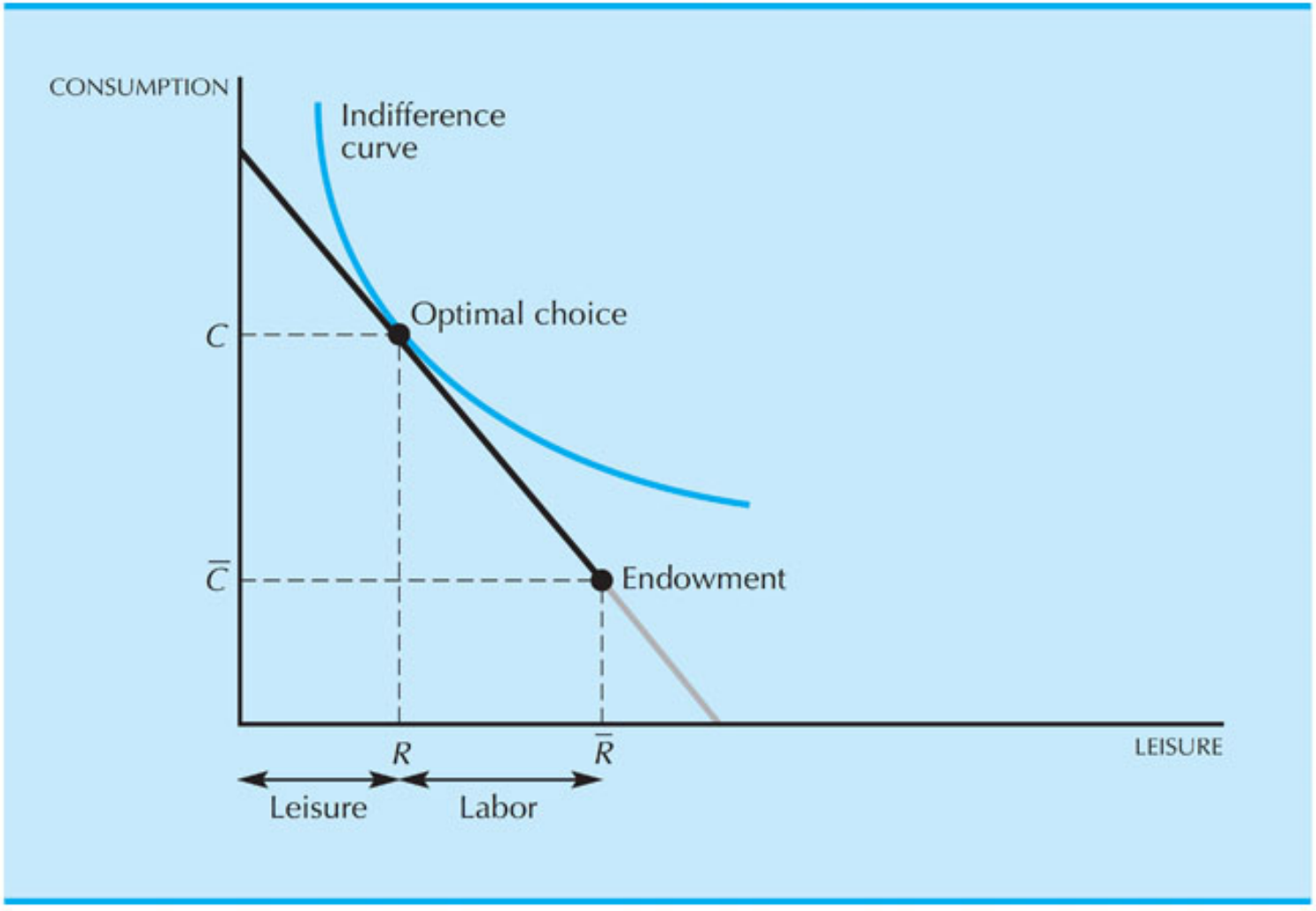


Figure 9.8

Comparative Statics of Labor Supply

- Suppose wage w increases. What happens to labor supply?
- We can use upgraded Slutsky equation:

$$\frac{dR}{dw} = \frac{\partial R^s}{\partial w} + (\bar{R} - R)\frac{\partial R}{\partial m}$$

  - Note that $\bar{R} - R > 0$ always since can't consume more leisure than hours in the day
  - Safe to assume that leisure is normal good, so $\frac{\partial R}{\partial m} > 0$
  - Thus sign of $\frac{dR}{dw}$ is ambiguous

Backwards-Bending Labor Supply

- First, suppose w is small and consumer barely working
- Does labor supply increas if wage increases?
  - $\bar{R} - R$ is very close to zero
  - So even if $\frac{\partial R}{\partial m}$ very large, increase in wage is likely to decrease leisure consumption
  - And hence increase labor supply
- Next, suppose w is large and consumer working nearly around the clock
- Does labor supply increas if wage increases?
  - $\bar{R} - R$ is very large
  - So even if $\frac{\partial R}{\partial m}$ very close to zero, increase in wage is likely to increase leisure consumption
  - And hence decrease labor supply
- This pattern of increasing wage causing increase, then decrease in labor supply is called *backwards bending labor supply*
  - Where it actually bends backwards is empirical question

Labor Supply Graphically

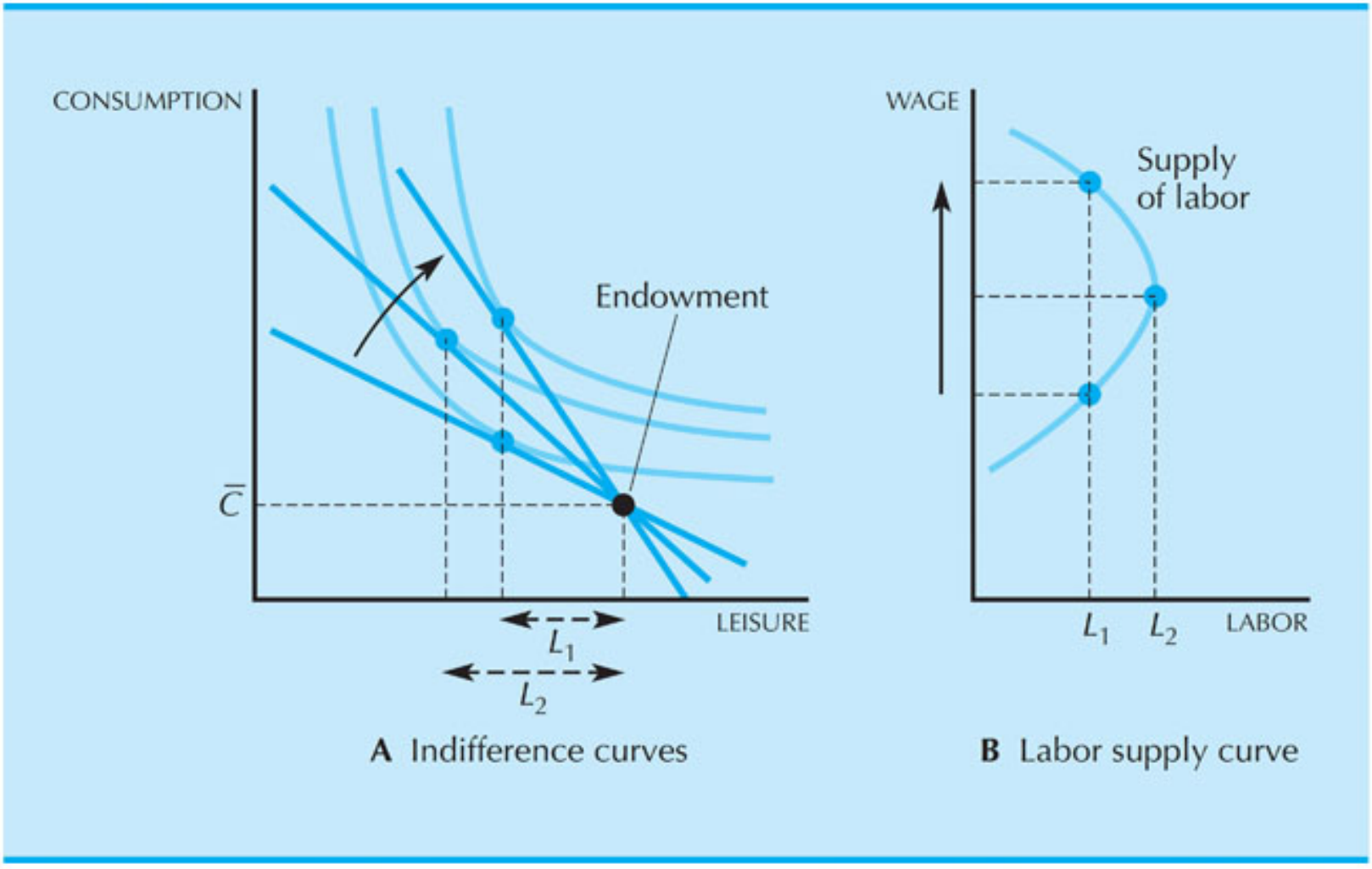


Figure 9.9