Consumption with Endowment

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January 27, 2024

Overview

1. Endowment and Budget Constraint
2. Net Demand and Changes
3. Slutsky Equation with Endowment
4. Labor Supply

Motivation

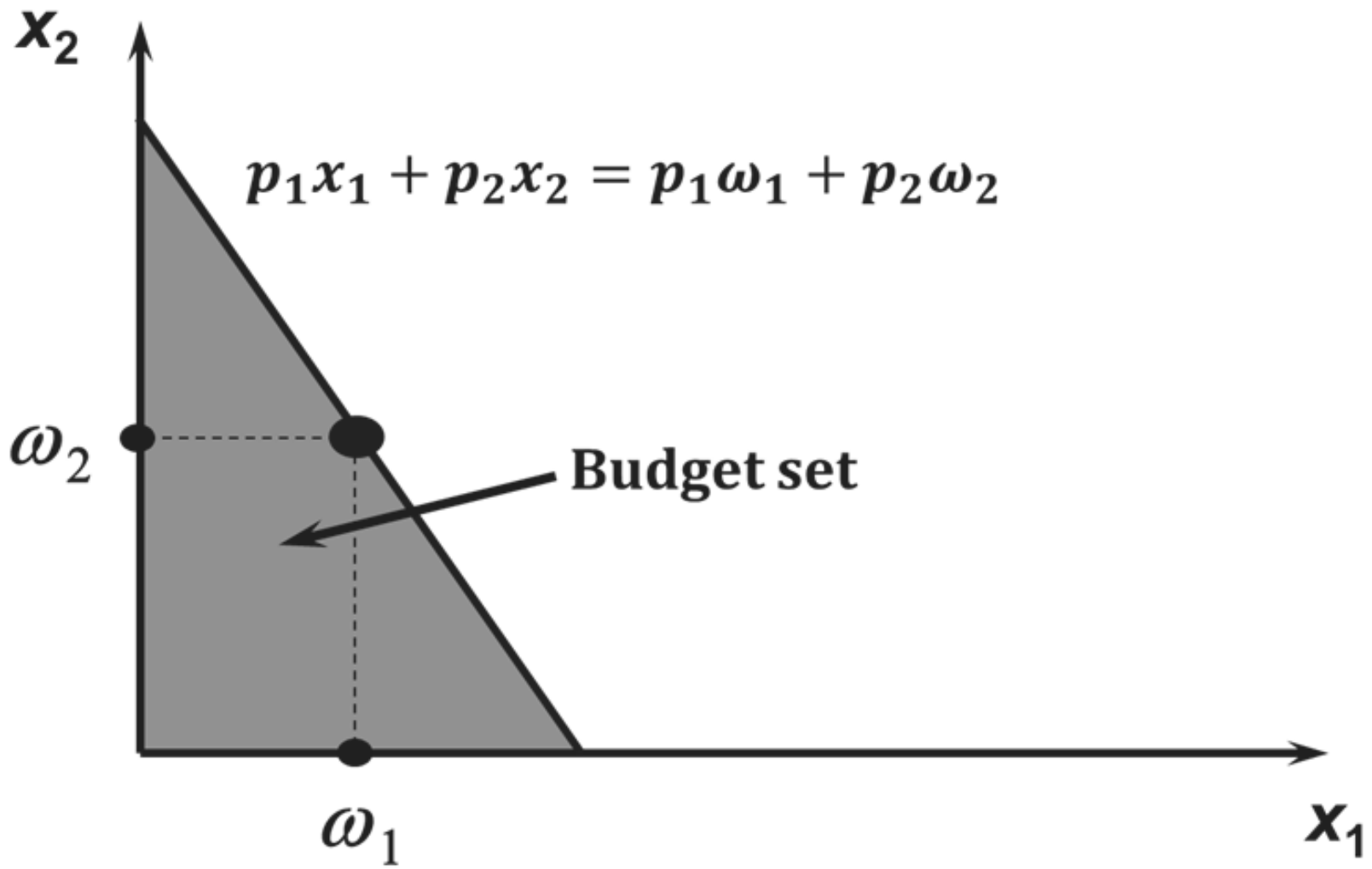
- We have so far assumed that the consumer is endowed with monetary income m
- Trade involves exchange—when something is bought something else must be sold
  - what will be bought? what will be sold?
  - who will be a buyer? who will be a seller?
- In this lecture, we assume that the consumer starts off with an endowment of the two goods
  - how are income generated?
  - how does the value of income depend upon commodity prices?
  - how can we put all this together to explain better how price changes affect demands?

Endowment

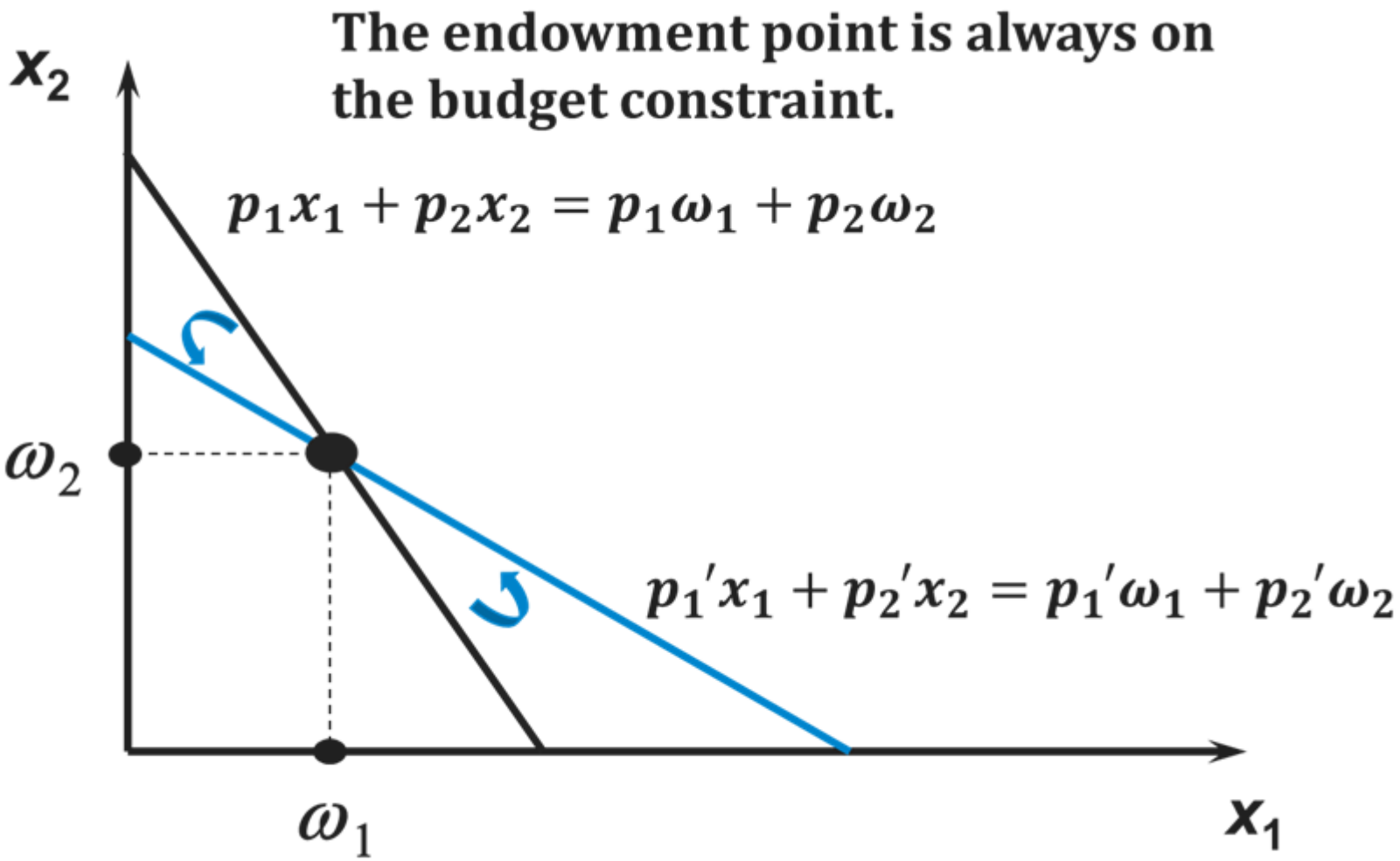
- A consumer's endowment will be denoted by a vector ω
  - $\omega = (\omega_1, \omega_2) = (10, 2)$
  - the consumer is endowed with 10 units of good 1 and 2 units of good 2
- What is the endowment's value? For which consumption bundles may it be exchanged?
  - if $p_1 = 2$ and $p_2 = 3$, the value is $p_1\omega_1 + p_2\omega_2 = 26$
  - any bundle costing no more than the endowment's value
- Given p_1 and p_2, the budget constraint for a consumer with an endowment (ω_1, ω_2) is

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

Budget Constraints Revisited



Budget Constraints Revisited



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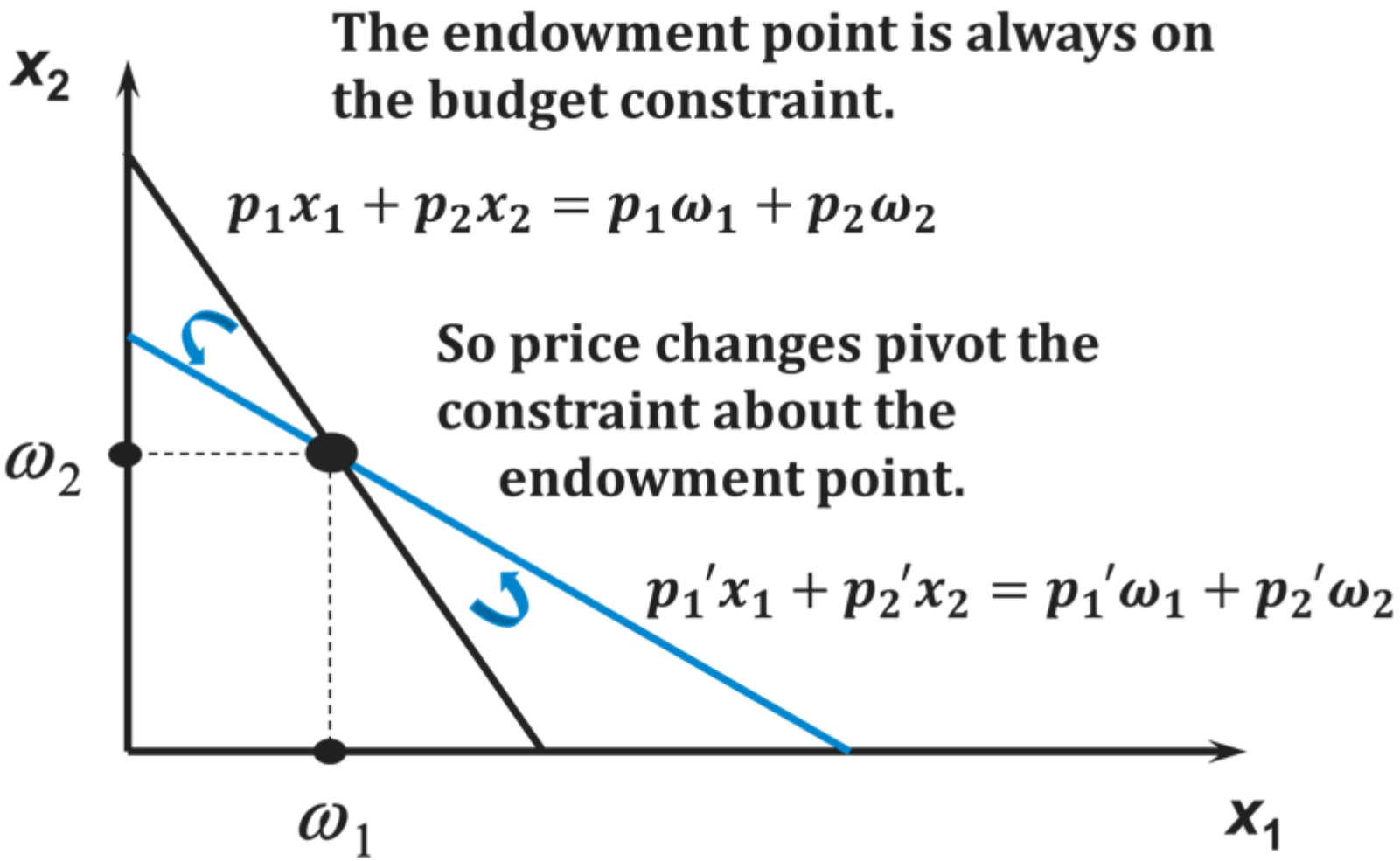
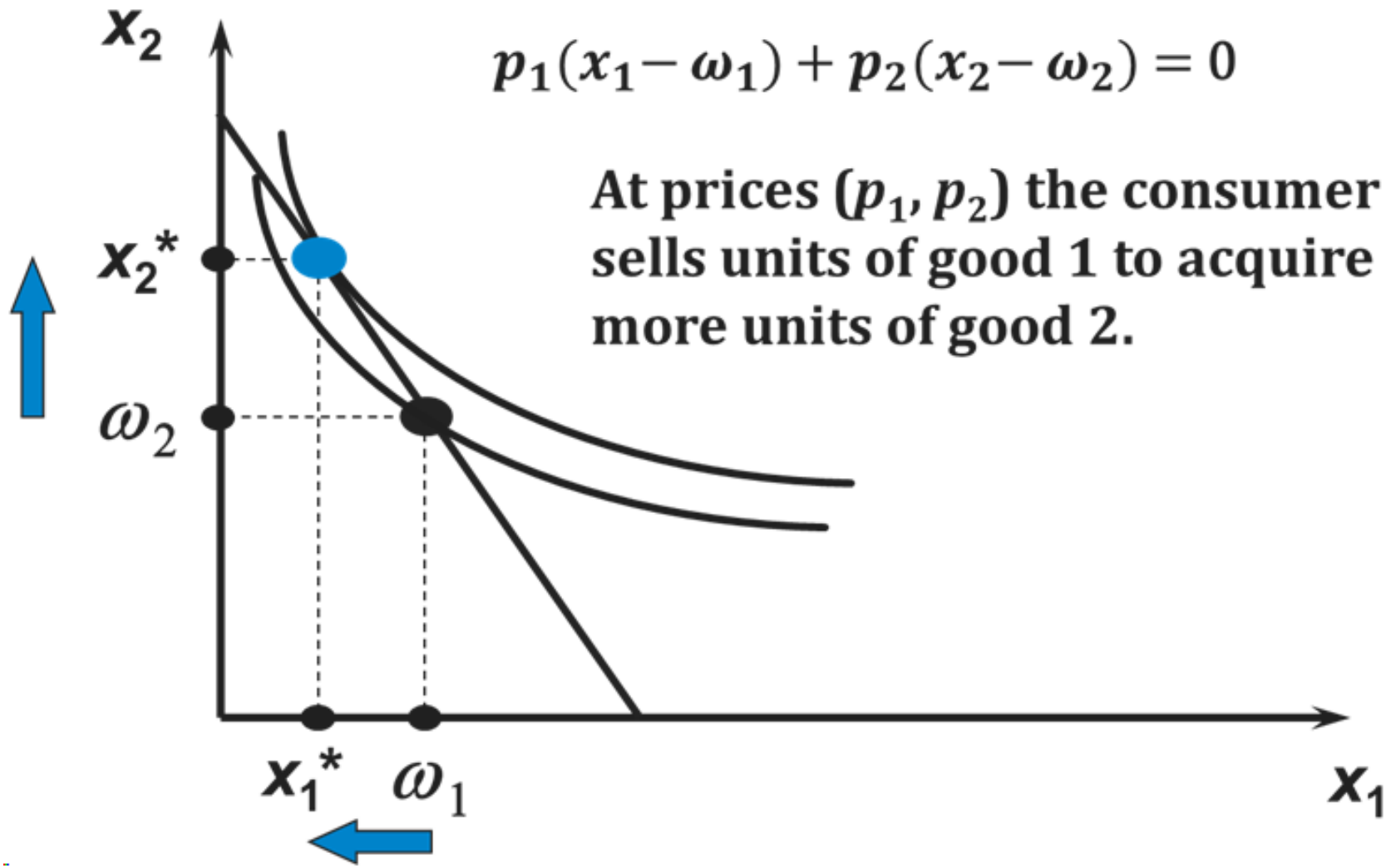


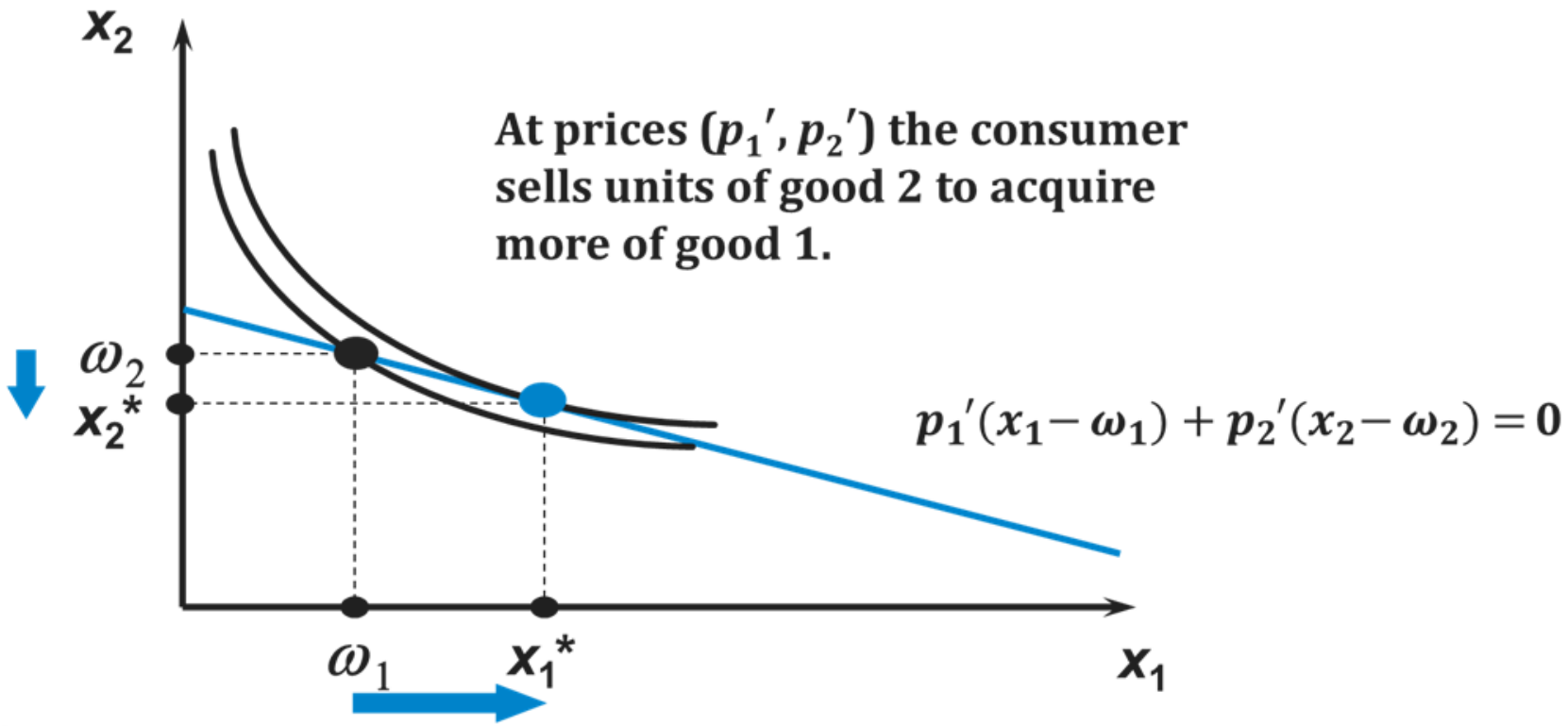
Net Demand

- The gross demand for a good is the amount of the good that the consumer actually ends up consuming
  - (x_1, x_2)
- The net demand for a good is the difference between what the consumer ends up with (the gross demand) and the initial endowment of goods
  - $(x_1 - \omega_1, x_2 - \omega_2)$
- Net demands may be positive or negative
  - positive: buying (demand)
  - negative: selling (supply)

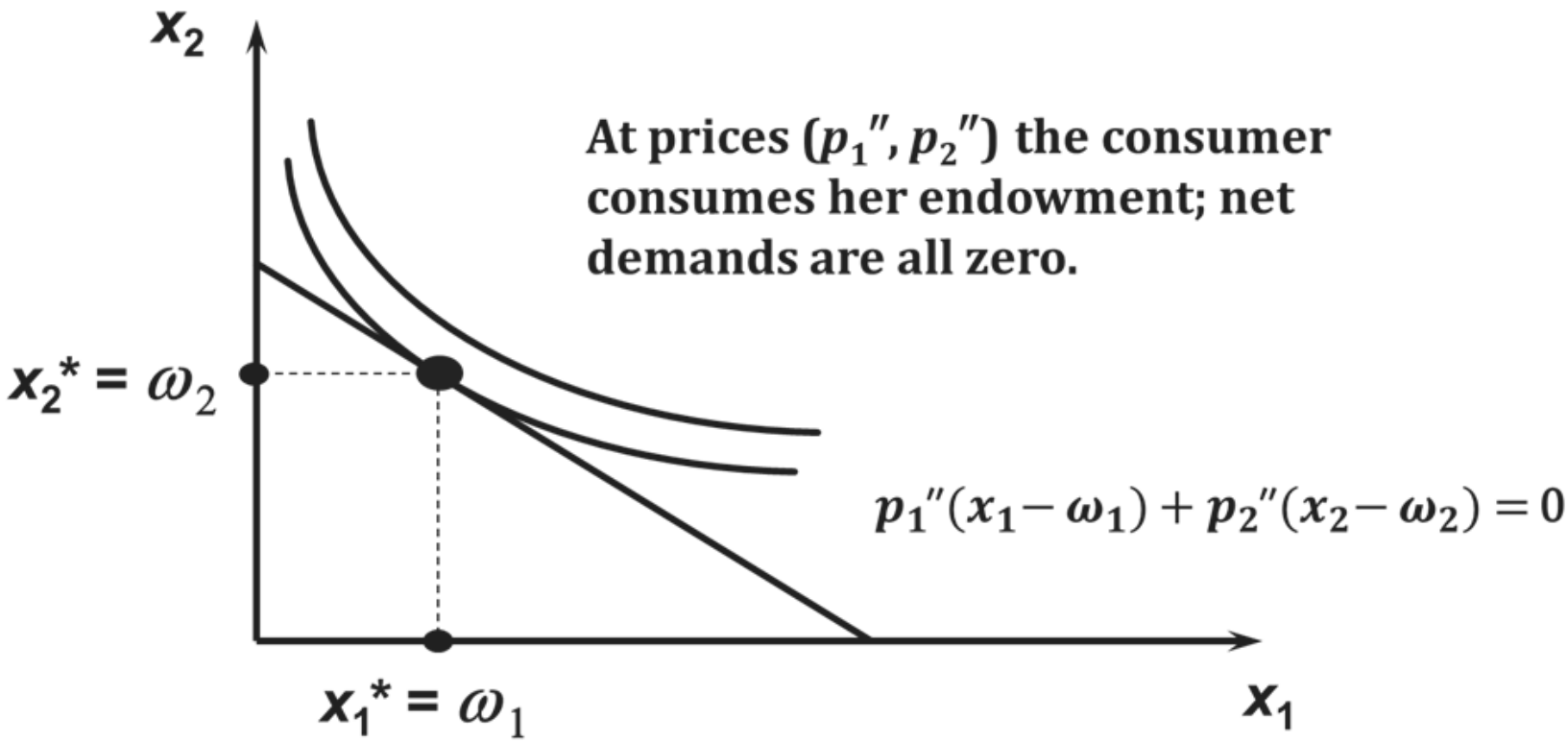
Net Demand



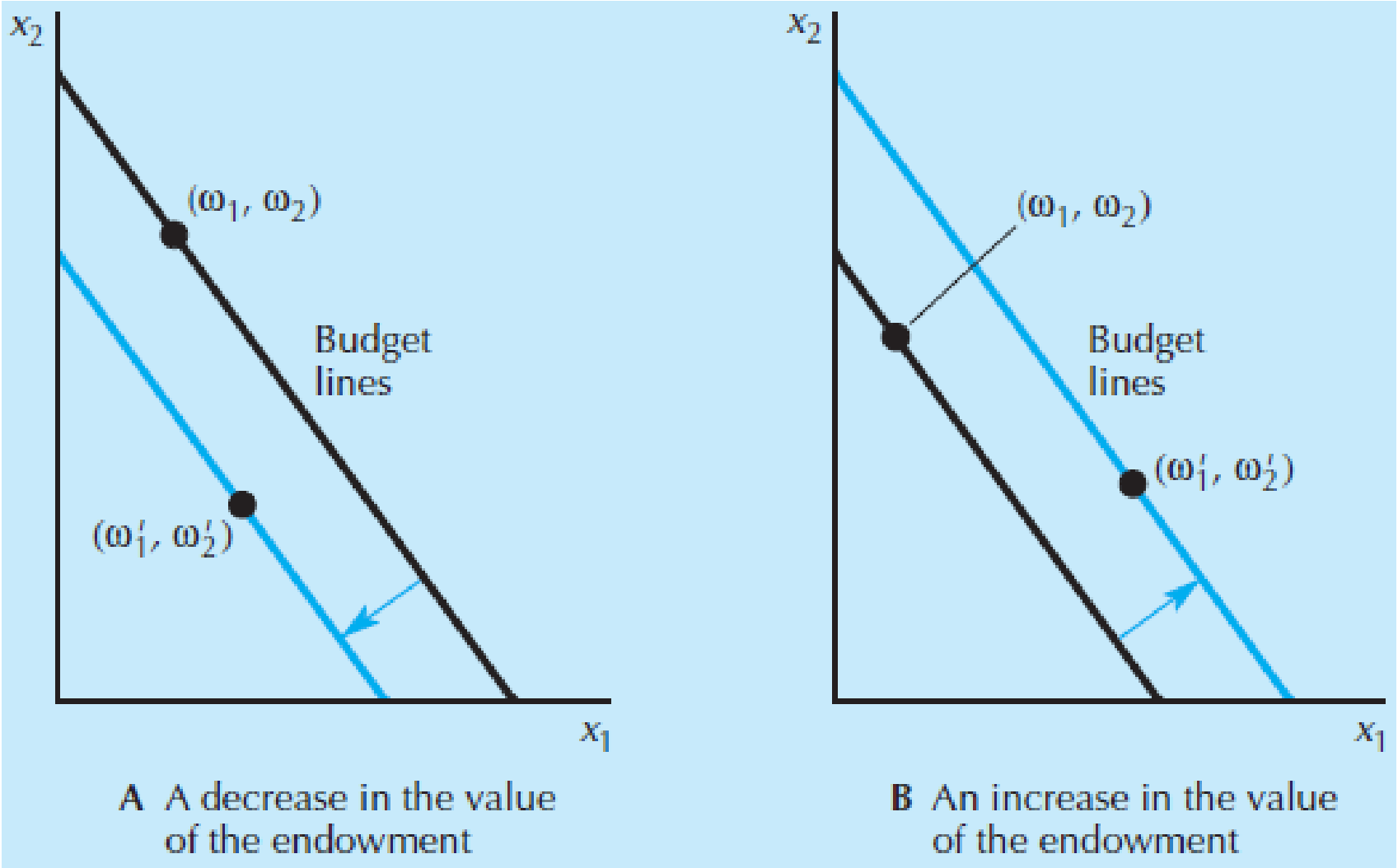
Net Demand



Net Demand



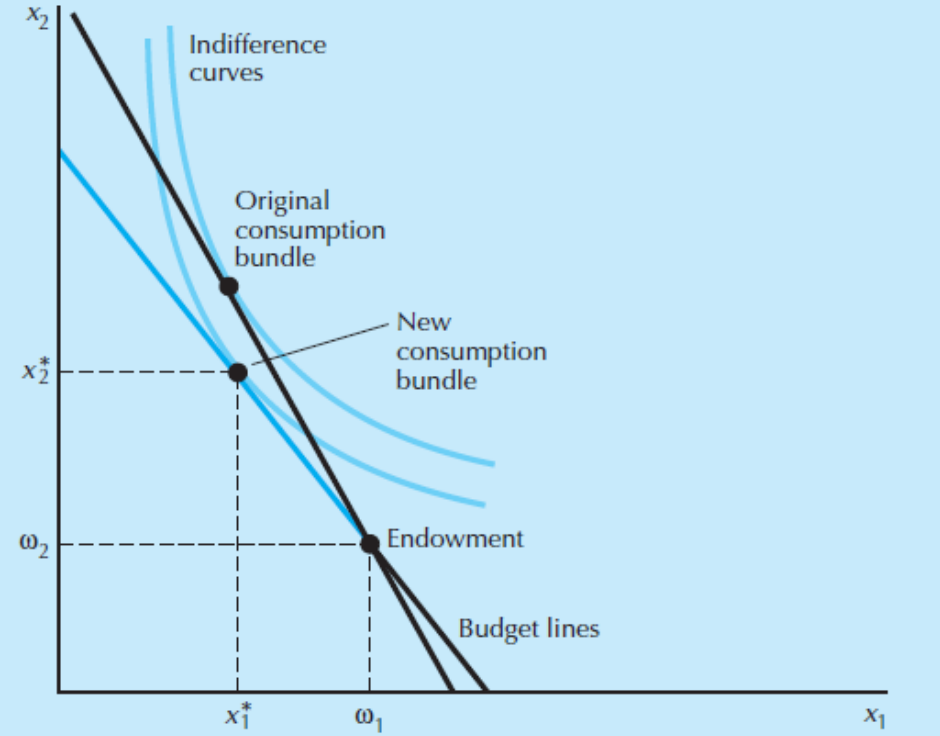
Endowment Change



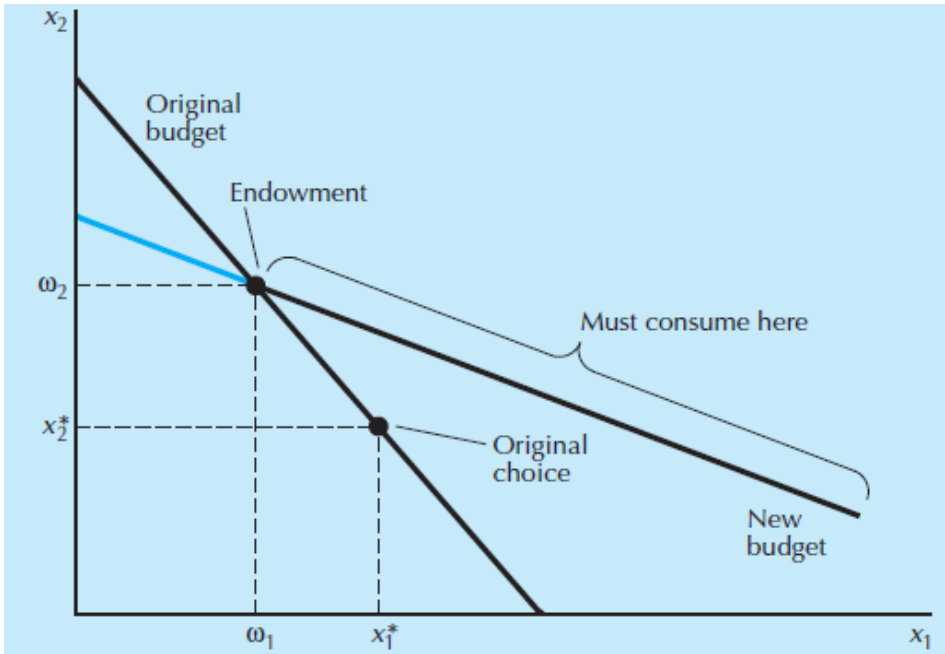
Price Change

- When money income is determined by endowment, we can not hold it constant
- When price decreases
  - seller $\rightarrow$ seller: welfare decreasing
  - seller $\rightarrow$ buyer: uncertain
  - buyer $\rightarrow$ buyer: welfare increasing
- When price increases
  - buyer $\rightarrow$ buyer: welfare decreasing
  - buyer $\rightarrow$ seller: uncertain
  - seller $\rightarrow$ seller: welfare increasing

Price Change

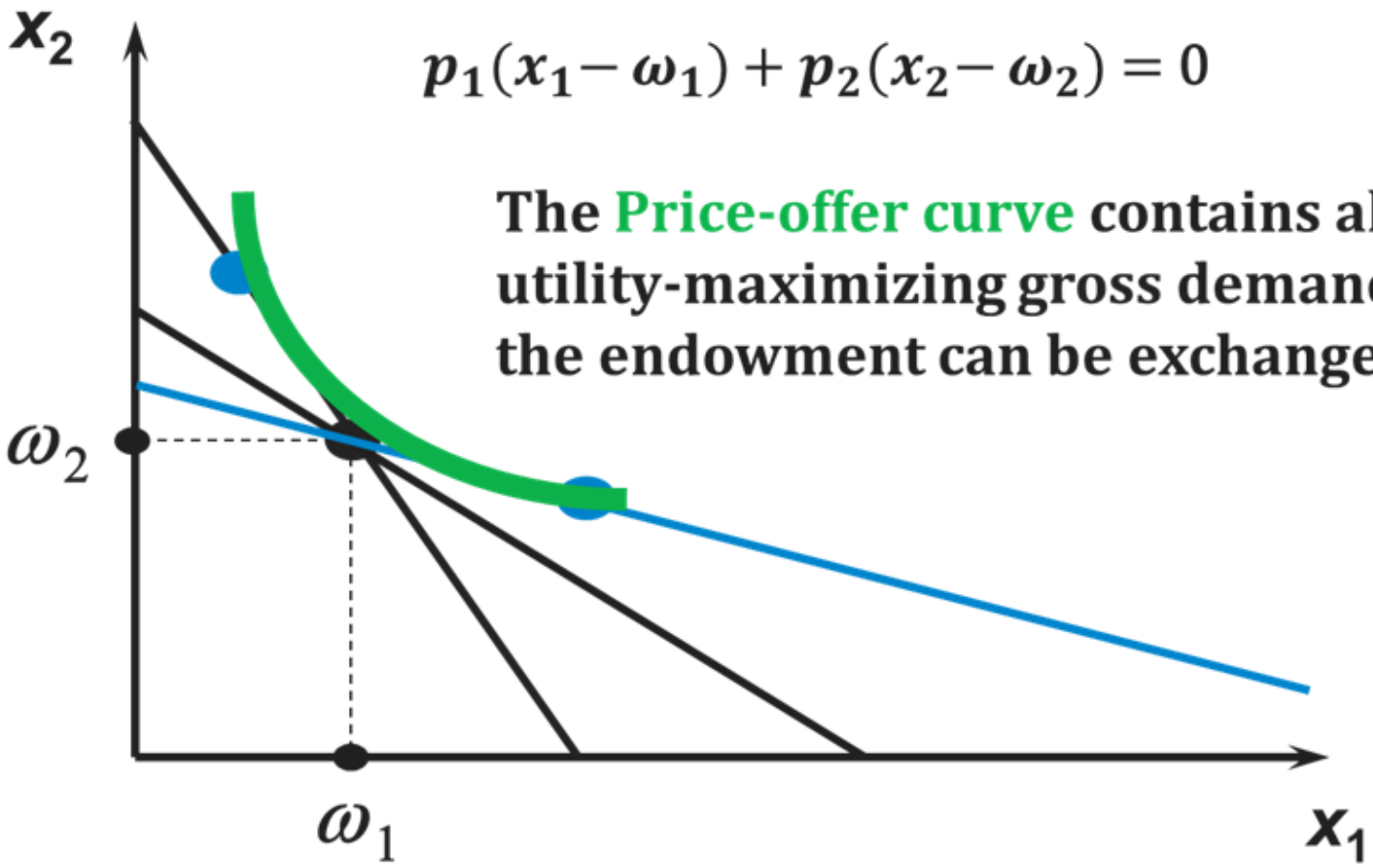


Decreasing the price of good 1. Lowering the price of good 1 makes the budget line pivot around the endowment. If the consumer remains a supplier she must be worse off.



Decreasing the price of good 1. If a person is a buyer and the price of what she is buying decreases, she remains a buyer.

Offer Curve



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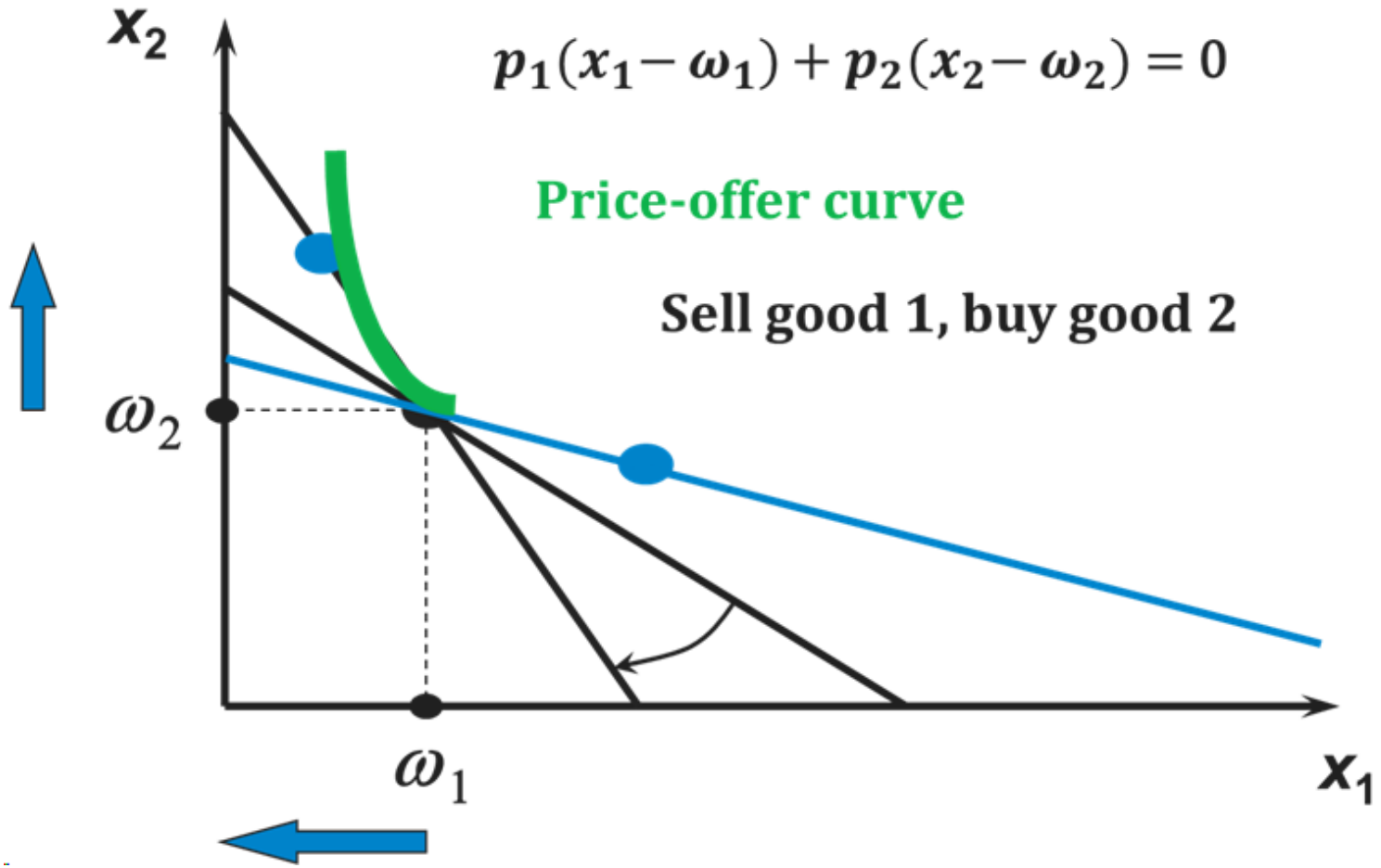

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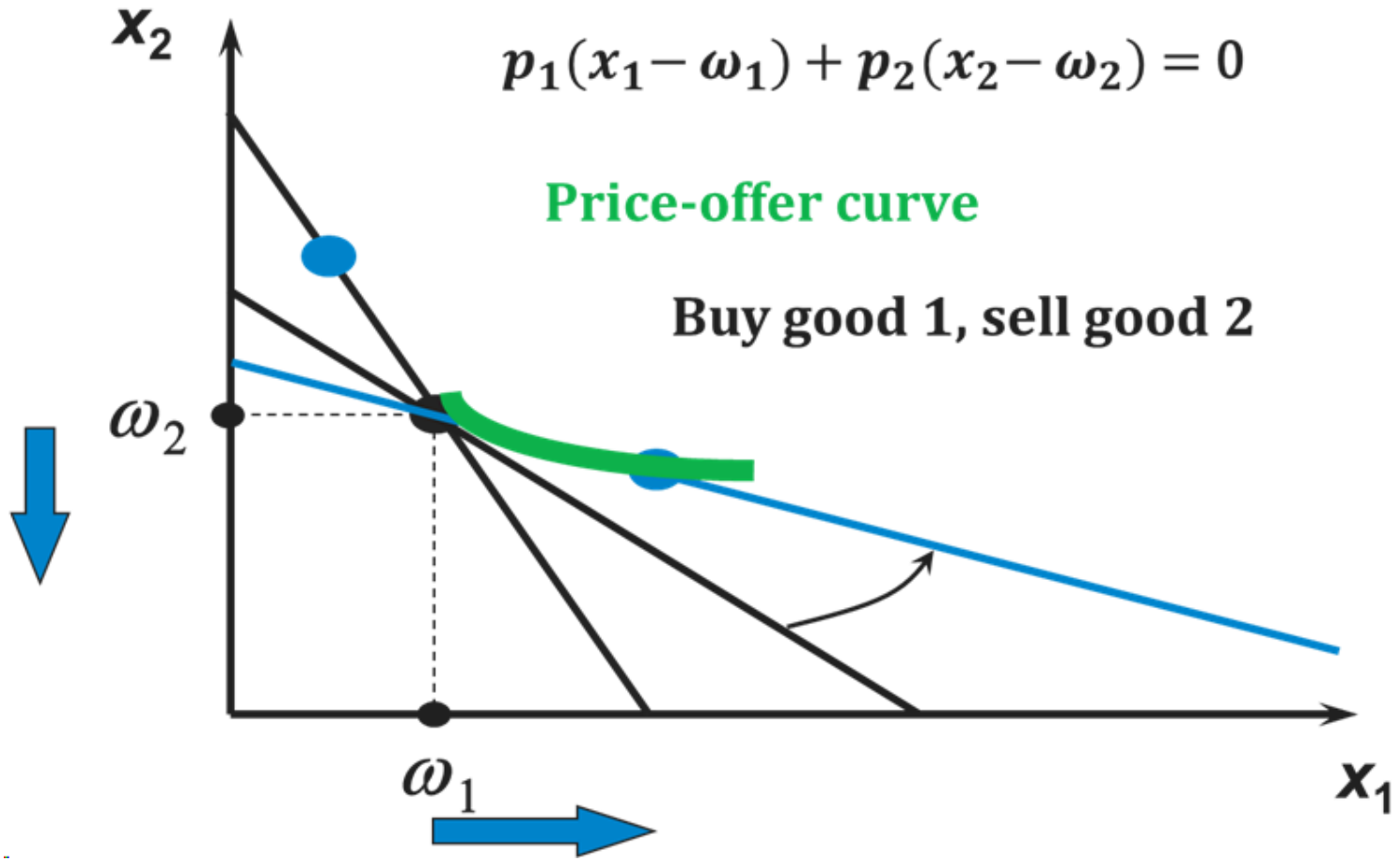
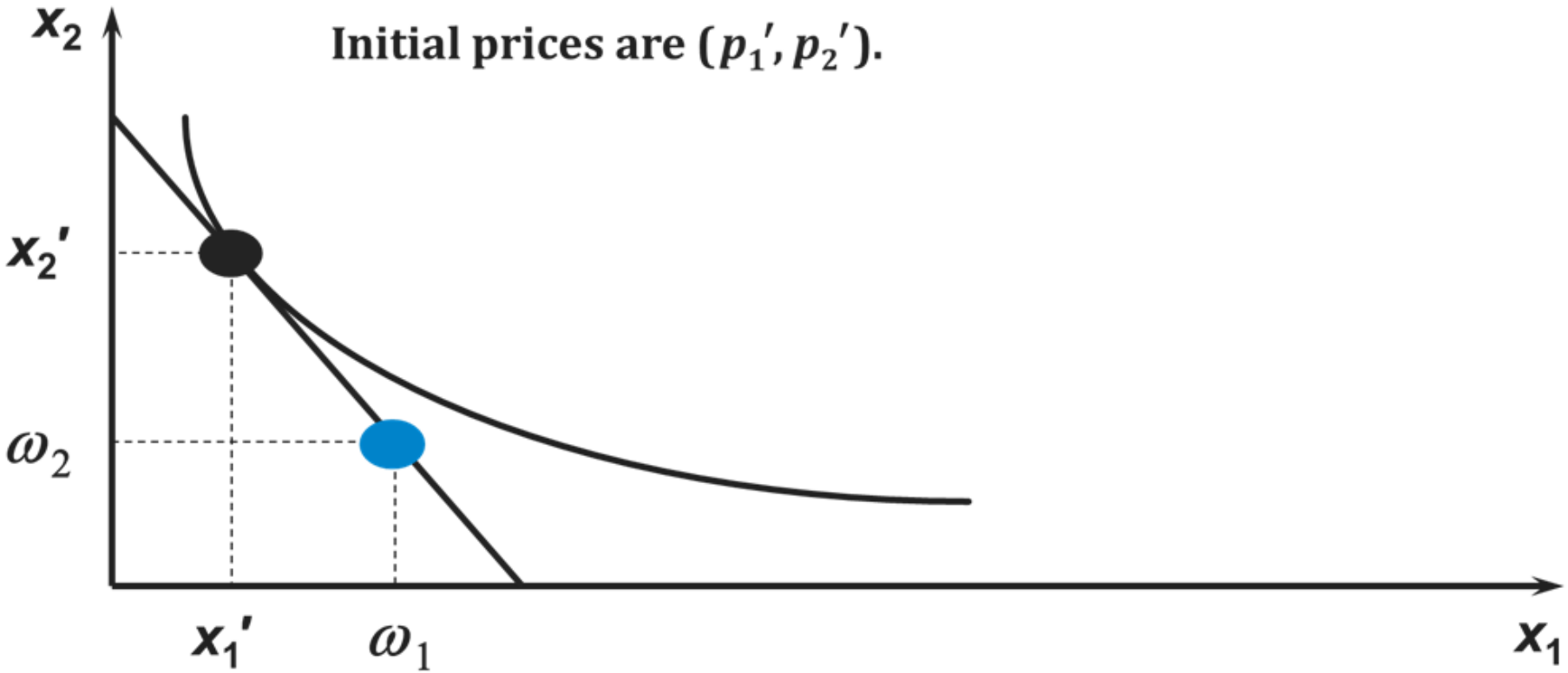


Substitution and Income Effects with Endowment

- In the original Slutsky equation, a price change can be decomposed into
  - a pure substitution effect
  - an income effect
- The value of endowment will change when price changes now. Slutsky's decomposition thus has three components:
  - a pure substitution effect
  - an (ordinary) income effect
  - an endowment income effect – change in the endowment value $p_1\omega_1 + p_2\omega_2$

Slutsky Equation Revisited



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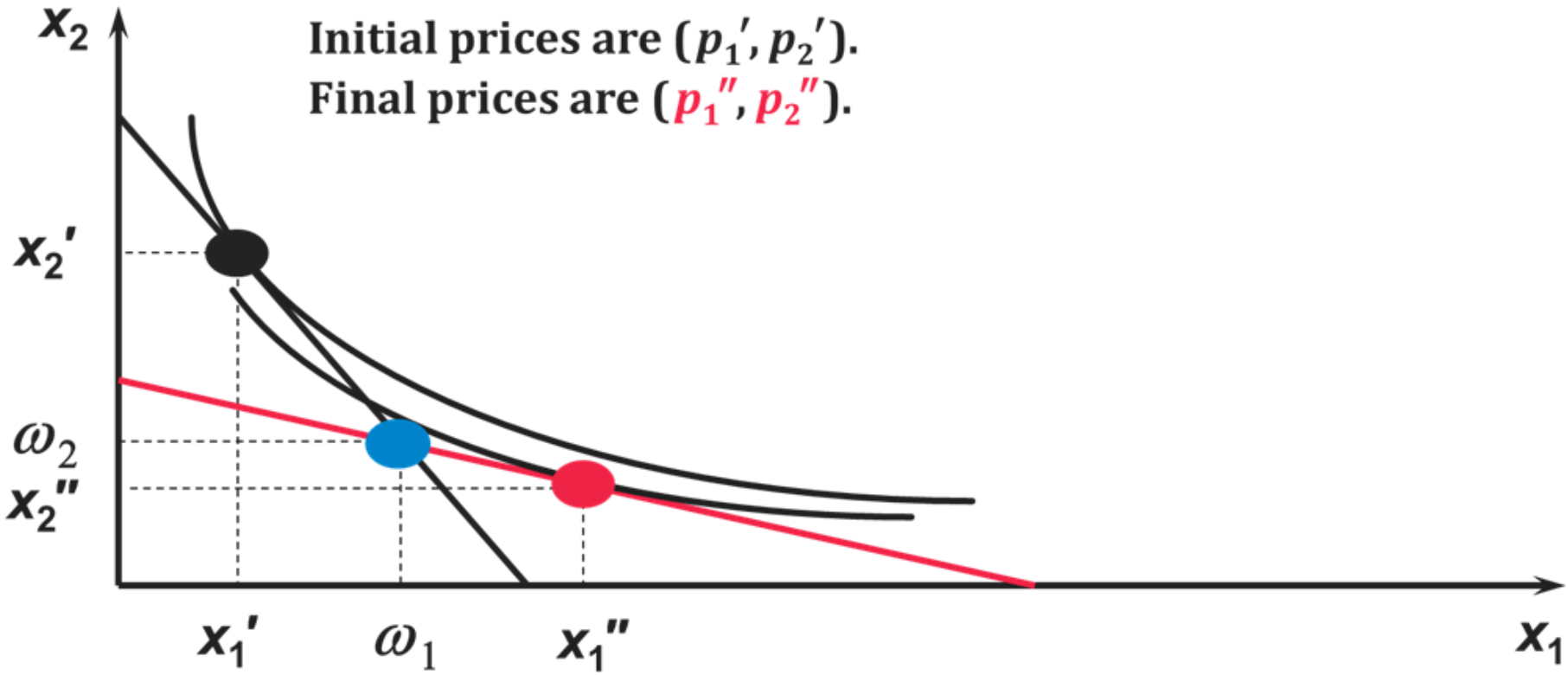

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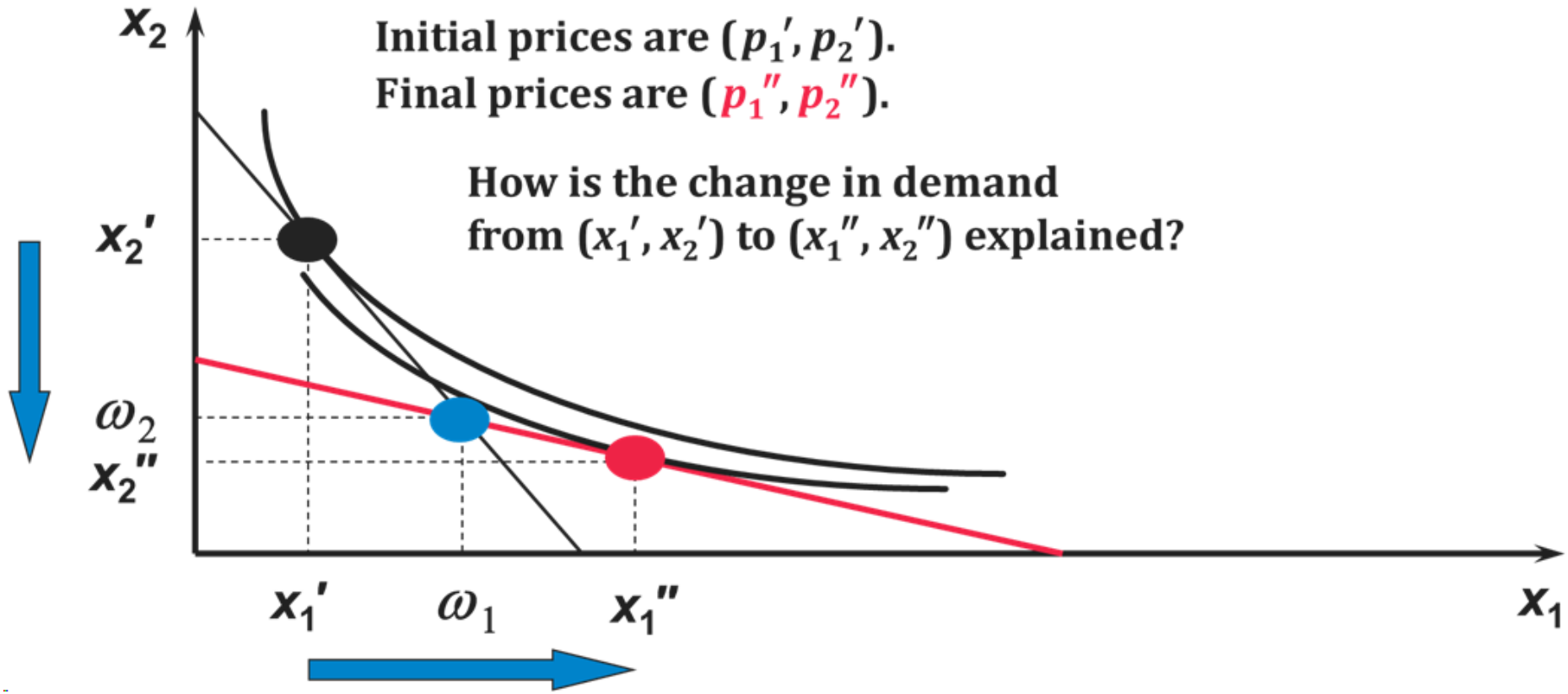

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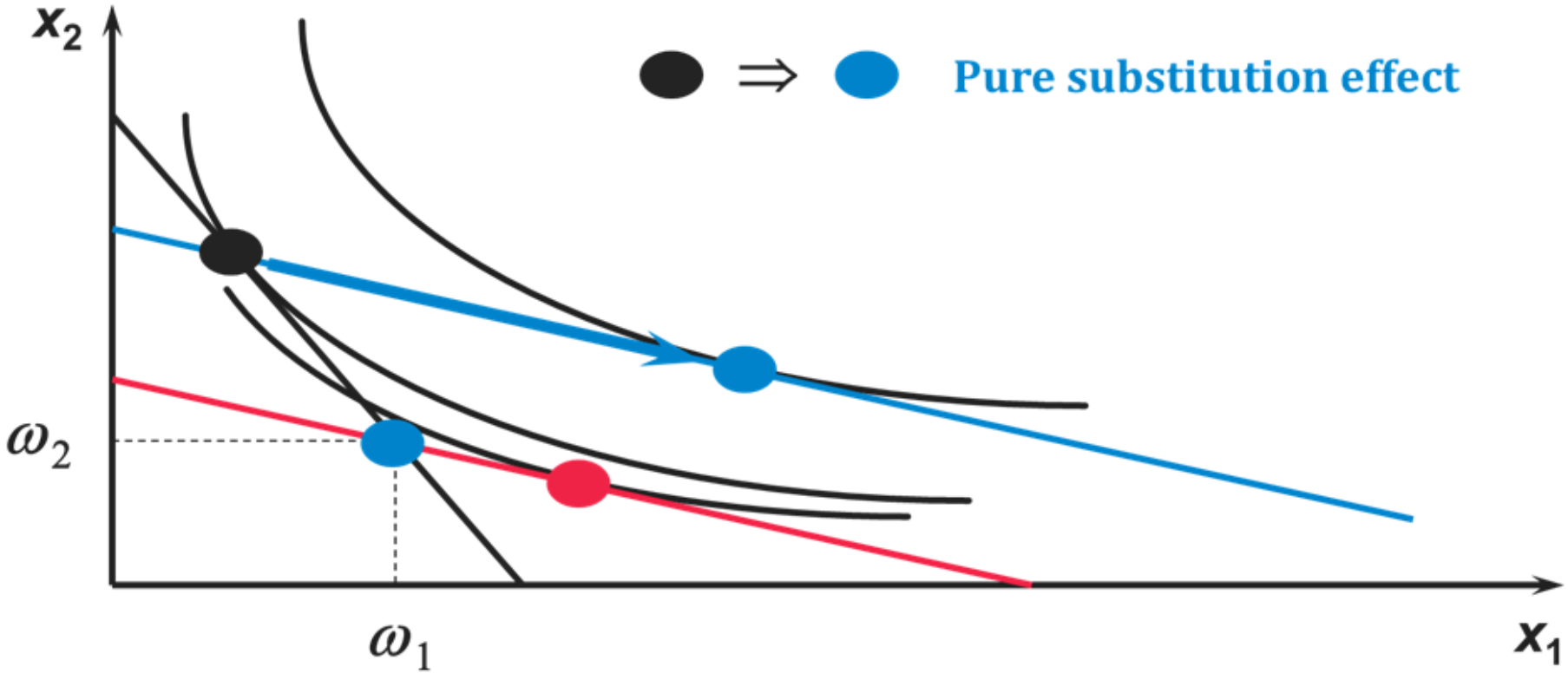

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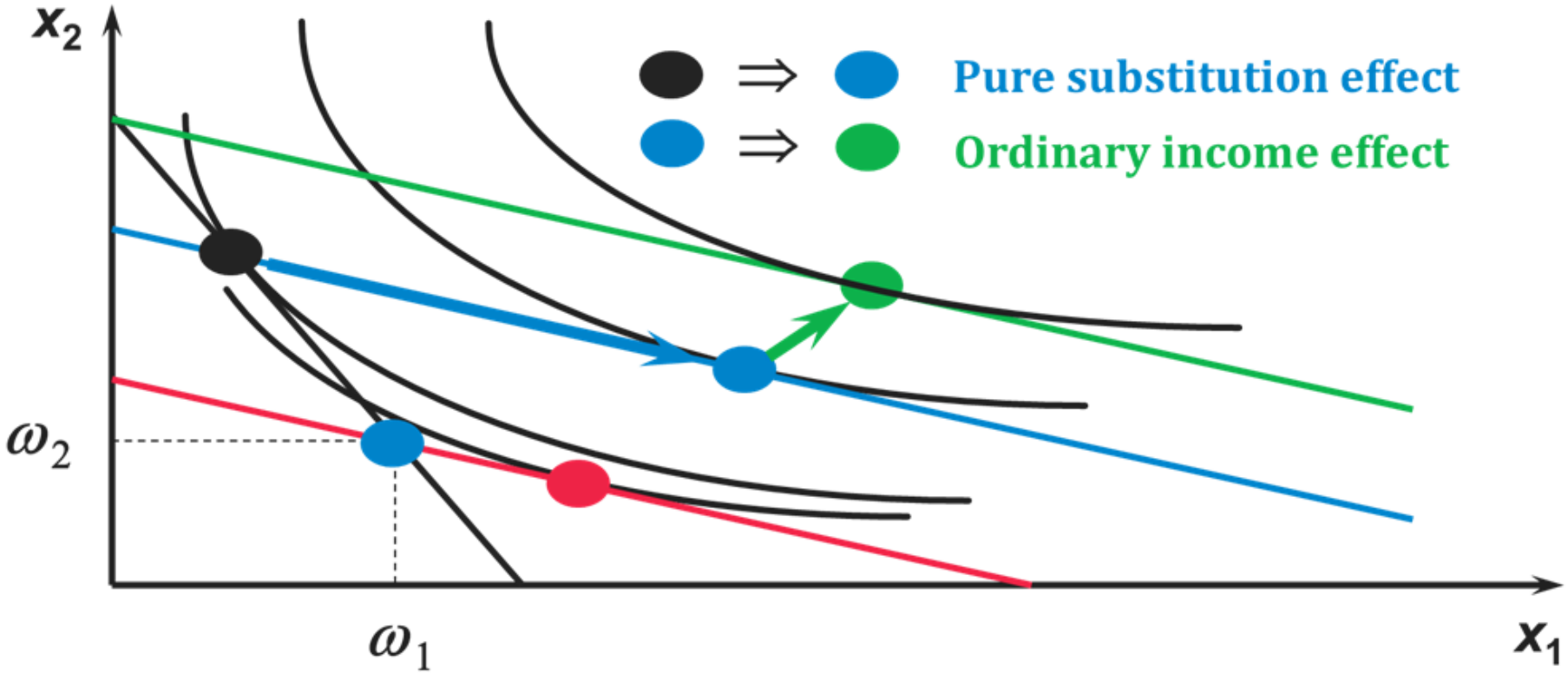

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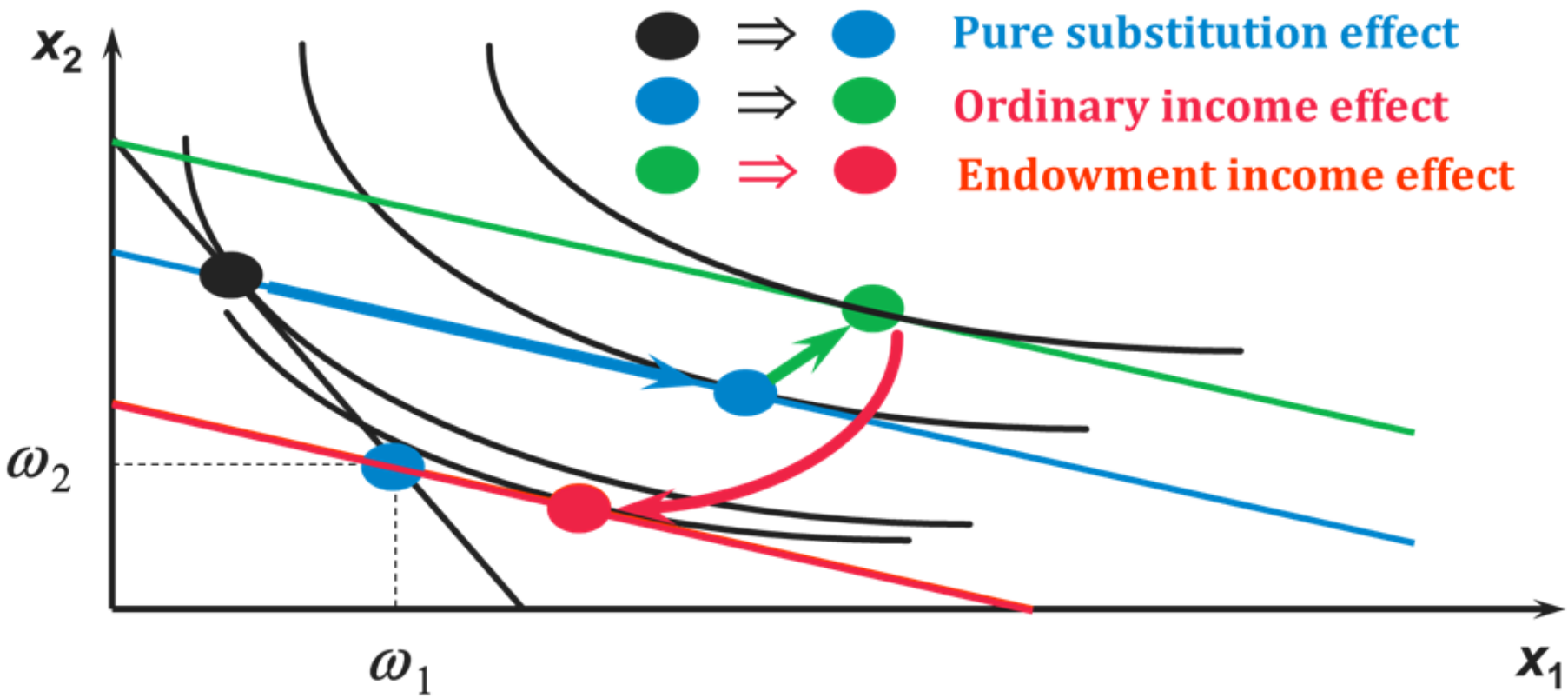


Slutsky Equation with Endowment

- Let Δx_1 be the total change in demand; Δx_1^s be the substitution effect; Δx_1^m be the ordinary income effect

$$\frac{\Delta x_1}{\Delta p_1} = \frac{\Delta x_1^s}{\Delta p_1} - x_1 \frac{\Delta x_1^m}{\Delta m} + \text{endowment income effect}$$

$$\text{endowment income effect} = \frac{\Delta x_1^m}{\Delta m}\frac{\Delta m}{\Delta p_1} = \frac{\Delta x_1^m}{\Delta m}\omega_1$$

$$\frac{\Delta x_1}{\Delta p_1} = \underbrace{\frac{\Delta x_1^s}{\Delta p_1}}_{-} + \underbrace{(\omega_1 - x_1)}_{\substack{\text{seller: } + \\ \text{buyer: } -}} \underbrace{\frac{\Delta x_1^m}{\Delta m}}_{\substack{\text{normal: } + \\ \text{inferior: } -}}$$

Budget Constraint

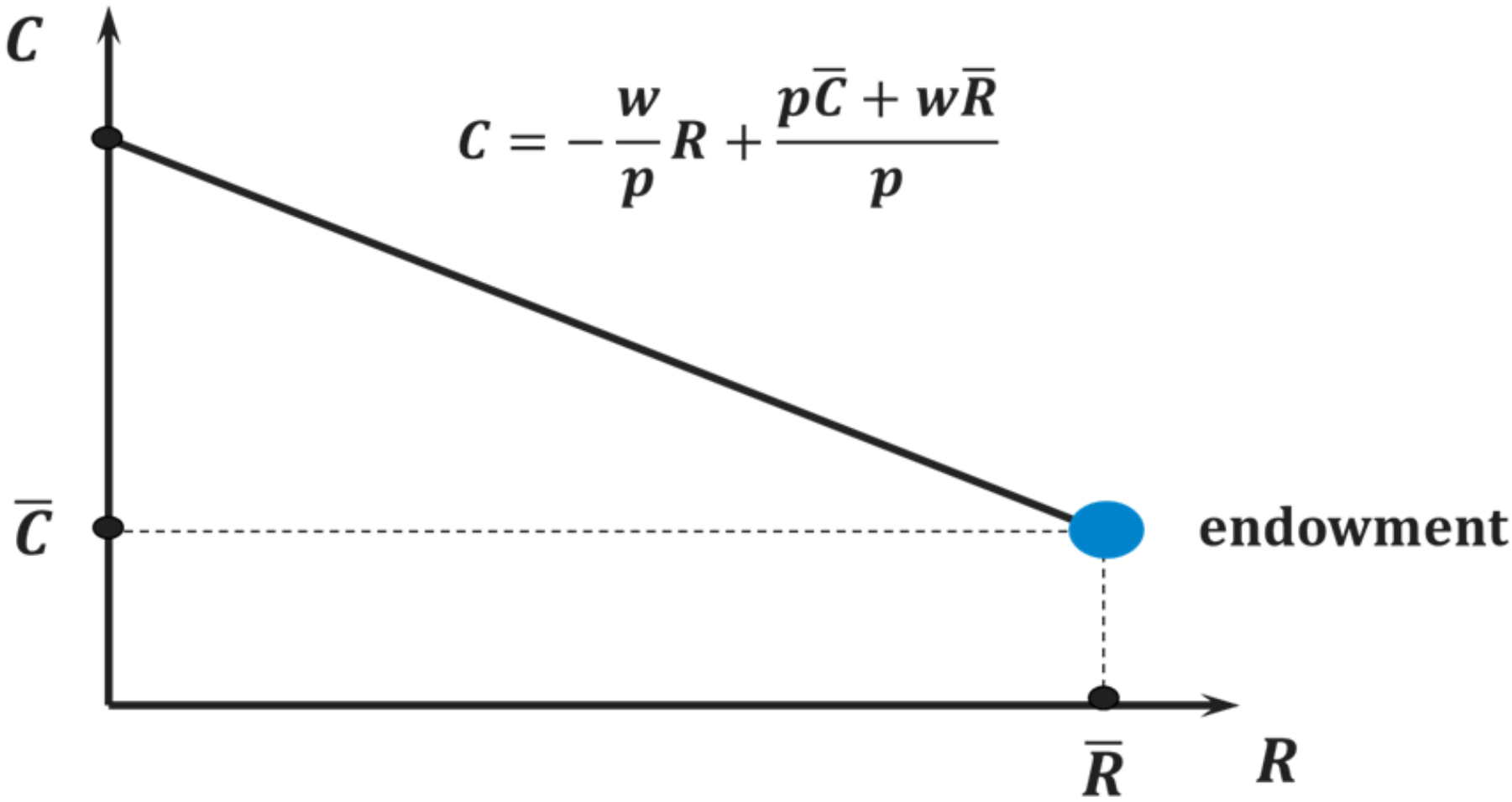
- A consumer can choose to work and consume a lot or to work and consume a little
- Let p be the price of consumption; C be the amount of consumption; M be the nonlabor income; ω be the wage rate; and L be the labor supplied

$$pC = M + \omega L$$

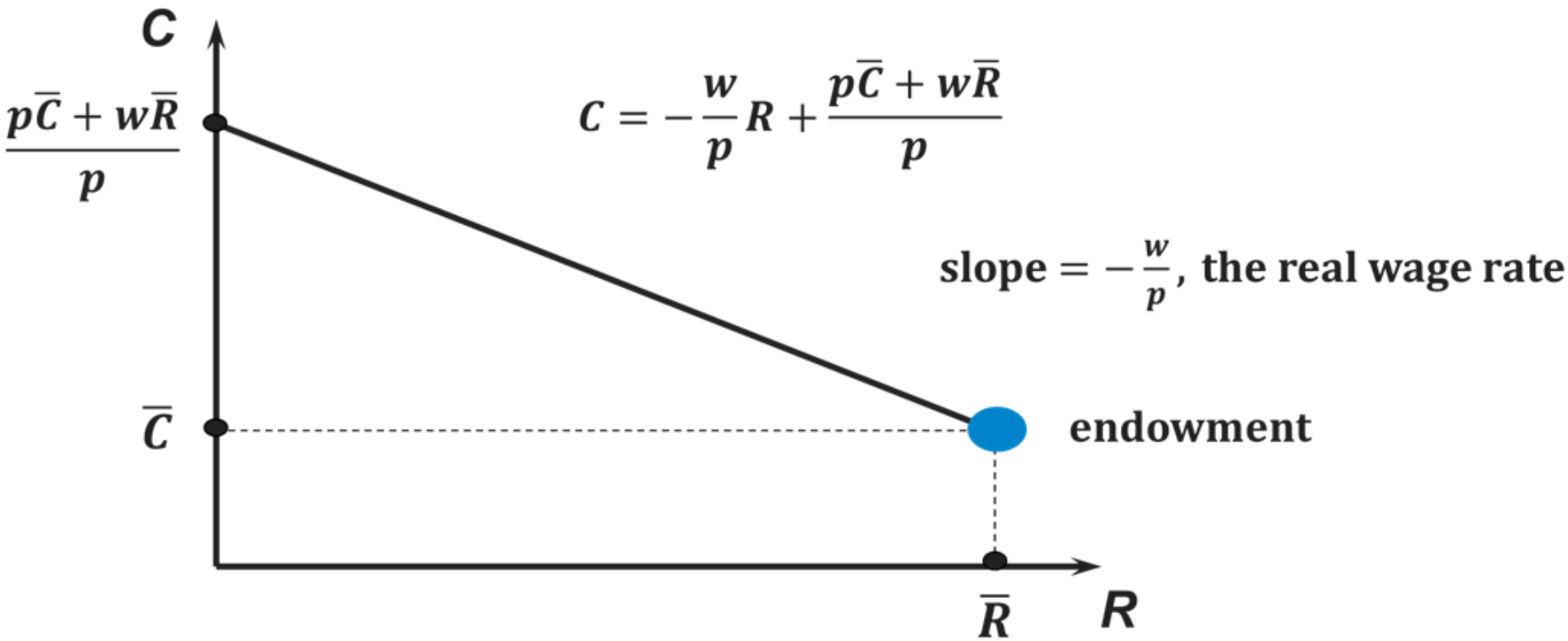
- Define $\bar{C} = \frac{M}{p}$ the amount of consumption without working; $R = \bar{L} - L$ the leisure time (where $\bar{L}$ is the total time one has)

$$pC + \omega R = p\bar{C} + \omega \bar{R} \quad \text{with } \bar{R} = \bar{L}$$

Labor Supply



Labor Supply



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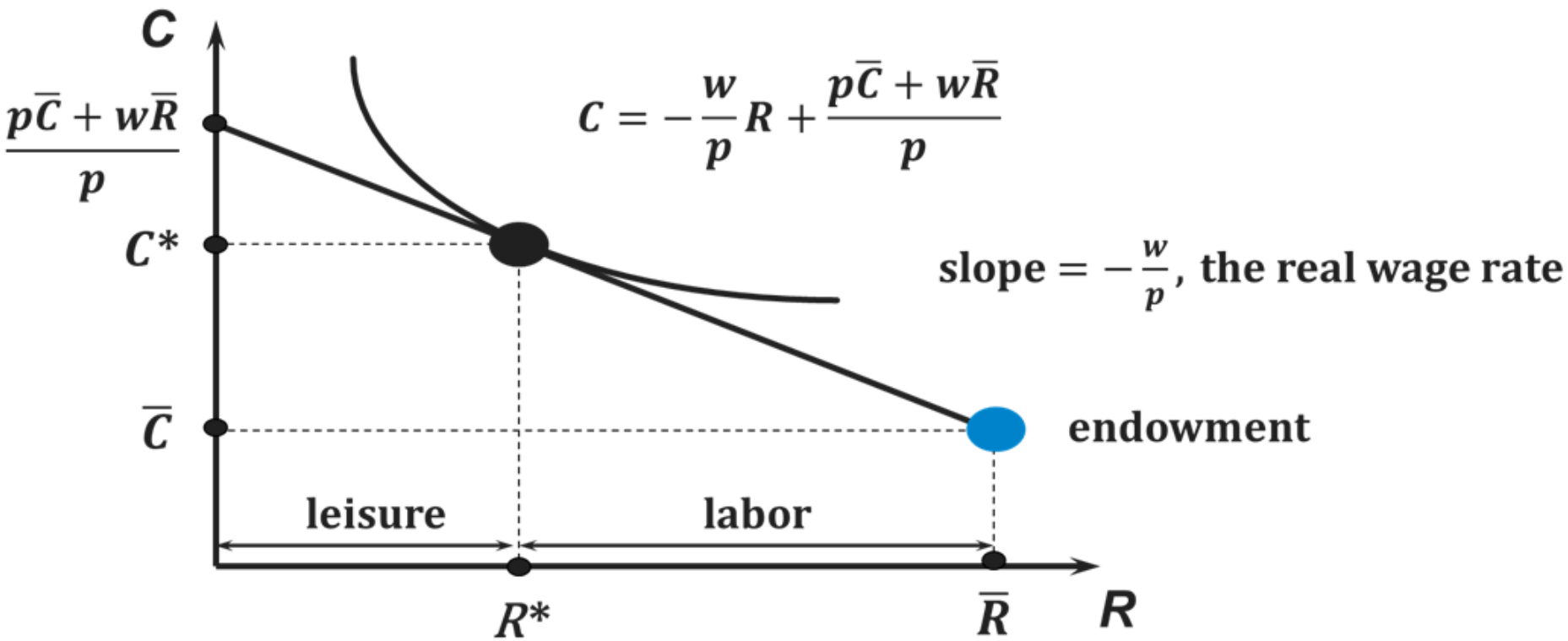


Comparative Statics of Labor Supply

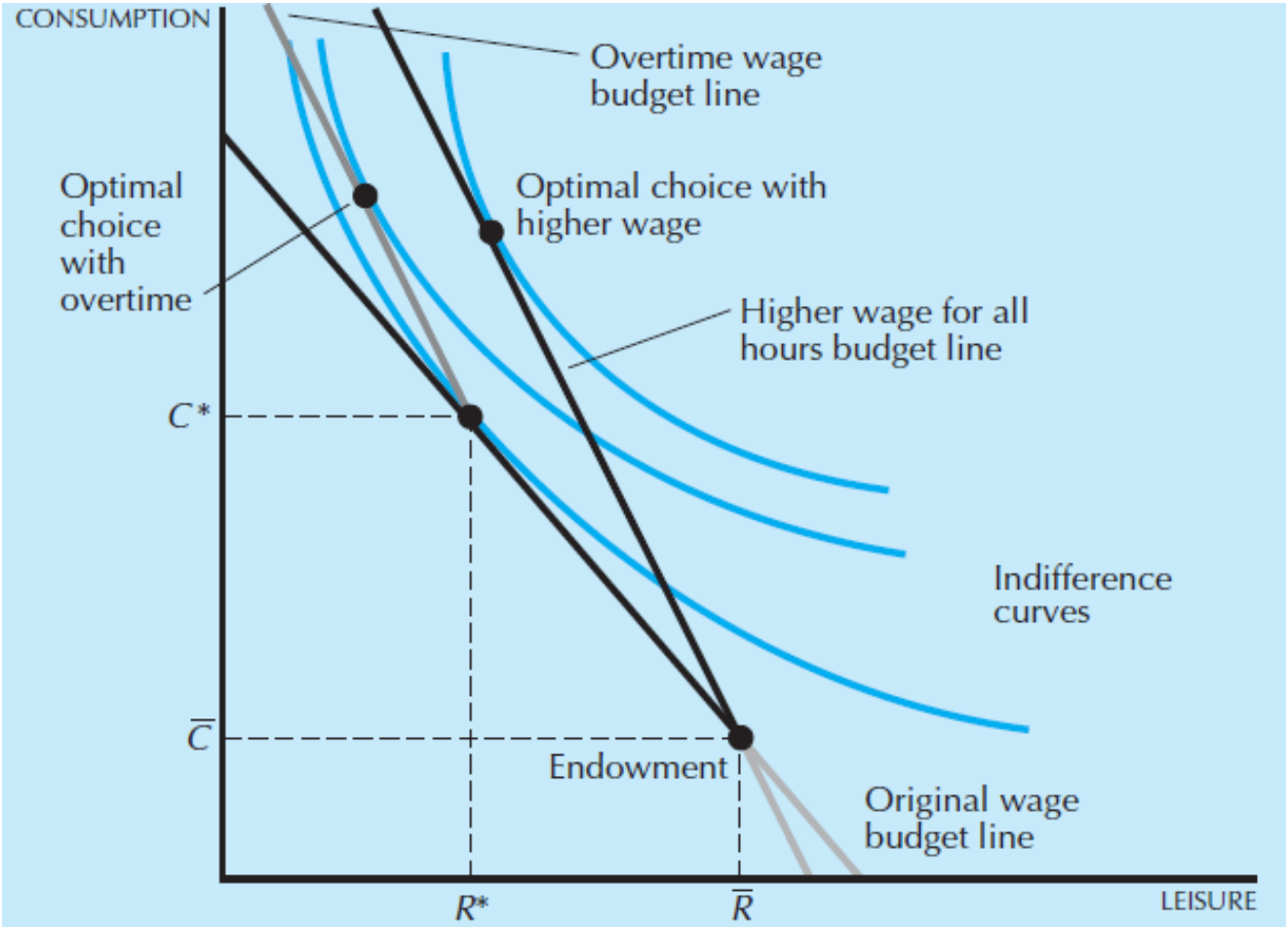
- What would happen if the wage rate (ω) changes? Apply the Slutsky equation with endowment

$$\frac{\Delta R}{\Delta \omega} = \underbrace{\frac{\Delta R^s}{\Delta \omega}}_{-} + \underbrace{(\bar{R} - R)}_{+} \underbrace{\frac{\Delta R}{\Delta m}}_{\text{normal: } +}$$

- When R is very close to $\bar{R}$, substitution effect dominates, so consumer would increase labor supply in response to wage rate increase

- When $\bar{R} - R$ is already large, the consumer might choose to enjoy more leisure when wage rate increases

Example: overtime vs. overall wage increase ▷



Overtime versus an ordinary wage increase. An increase in the overtime wage definitely increases the supply of labor, while an increase in the straight wage could decrease the supply