EC2101: Microeconomic Analysis I

Lecture 6

General Equilibrium Analysis: Exchange Economy

- Budget Constraint
- Competitive Equilibrium

Budget Constraint

Consumer Choice in the Exchange Economy

- Given an endowment allocation,
  which allocation will the consumers end up at?
  - Each consumer will choose her utility-maximizing basket given her budget constraint.
  - The budget constraint is determined by prices and endowments.

Budget Constraint in the Exchange Economy

- Suppose the market for each good is perfectly competitive.
  - I.e., consumers are price-takers.
- Let p_1 be the price of good 1 and p_2 be the price of good 2.
- Consumer *A*'s budget constraint is:

$$p_1 x_1^A + p_2 x_2^A \leq p_1 \omega_1^A + p_2 \omega_2^A$$

- Consumer *B*'s budget constraint is:

$$p_1 x_1^B + p_2 x_2^B \leq p_1 \omega_1^B + p_2 \omega_2^B$$

Budget Constraint: Example

- Suppose $p_1 = \$3$ and $p_2 = \$4$.
- Suppose Consumer *A*'s endowment is $(8,2)$.
  - Consumer *A*'s endowment is worth

    $$p_1\omega_1^A + p_2\omega_2^A = \$3 \cdot 8 + \$4 \cdot 2 = \$32,$$

    which is equivalent to having $\$32$ of income.
- Suppose Consumer *B*'s endowment is $(4,4)$.
  - Consumer *B*'s endowment is worth

    $$p_1\omega_1^B + p_2\omega_2^B = \$3 \cdot 4 + \$4 \cdot 4 = \$28,$$

    which is equivalent to having $\$28$ of income.

Budget Constraint: Example

- Consumer *A*'s budget constraint is:

$$p_1 x_1^A + p_2 x_2^A \leq p_1 \omega_1^A + p_2 \omega_2^A$$

$$3x_1^A + 4x_2^A \leq 32$$

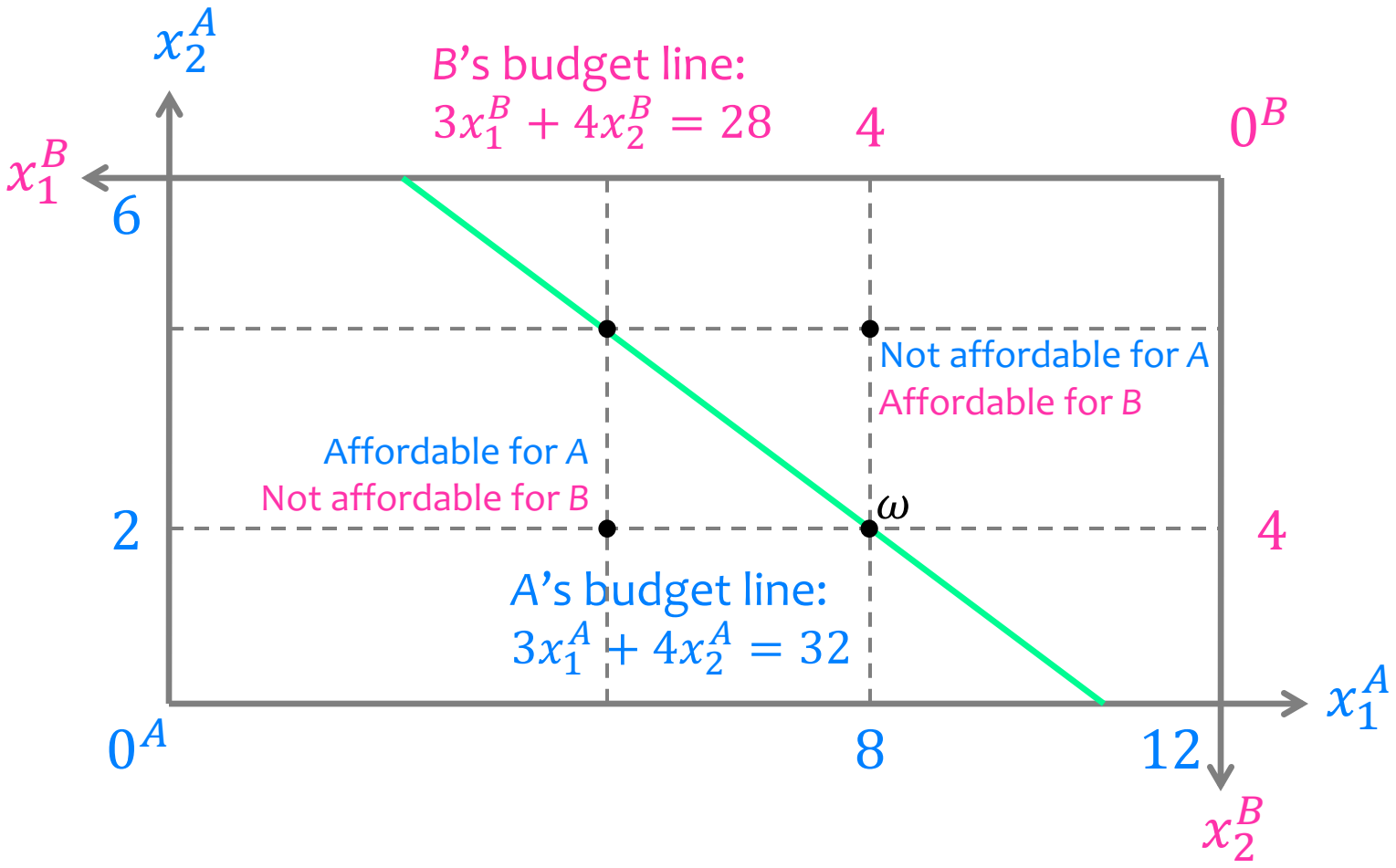
- Consumer *B*'s budget constraint is:

$$p_1 x_1^B + p_2 x_2^B \leq p_1 \omega_1^B + p_2 \omega_2^B$$

$$3x_1^B + 4x_2^B \leq 28$$

- A consumption plan $x^h = \left(x_1^h, x_2^h\right)$ is affordable if it satisfies the budget constraint.

Budget Constraint: Example

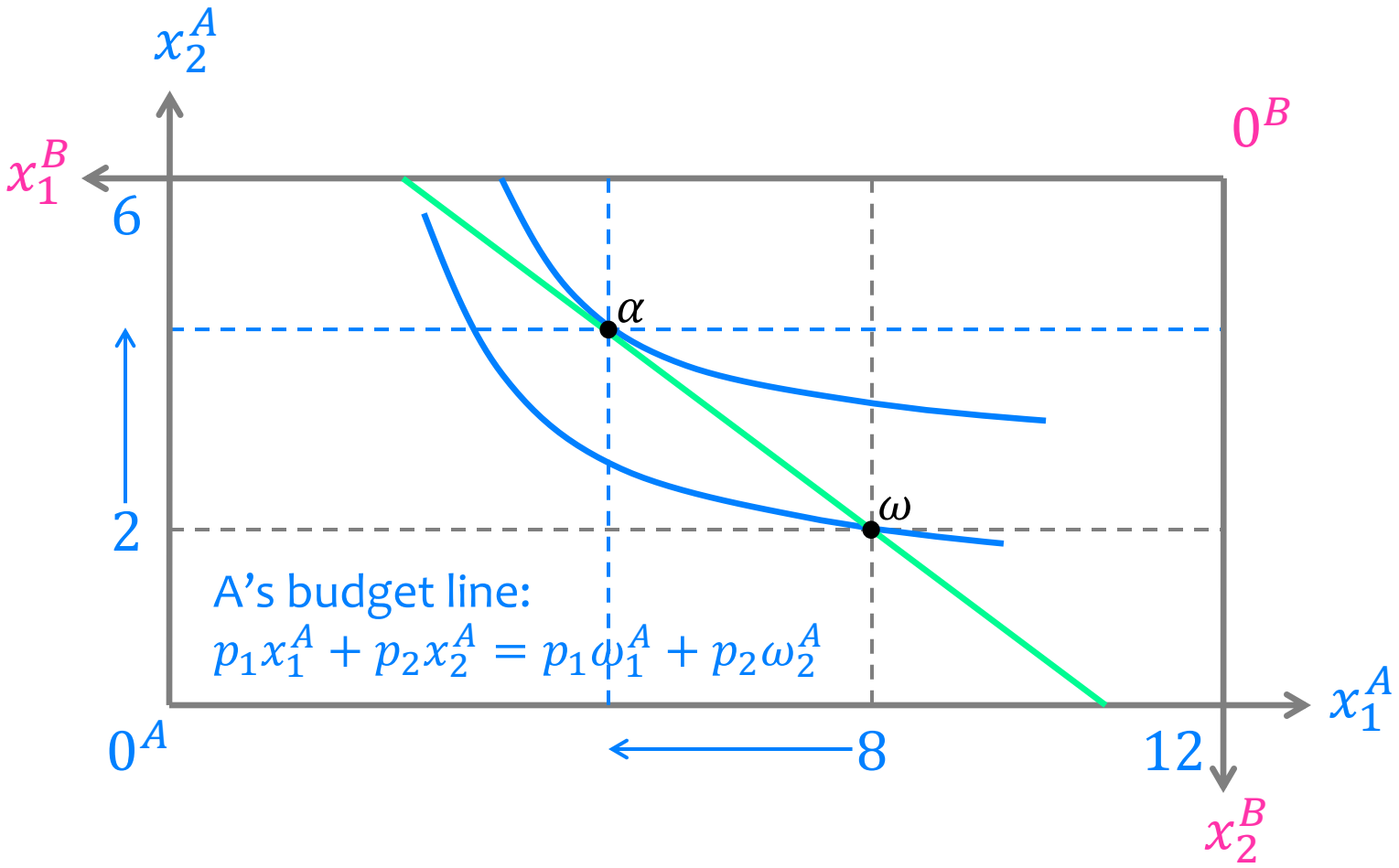


Slope of budget line = p_1/p_2.

The endowment allocation, ω, is on the budget line.

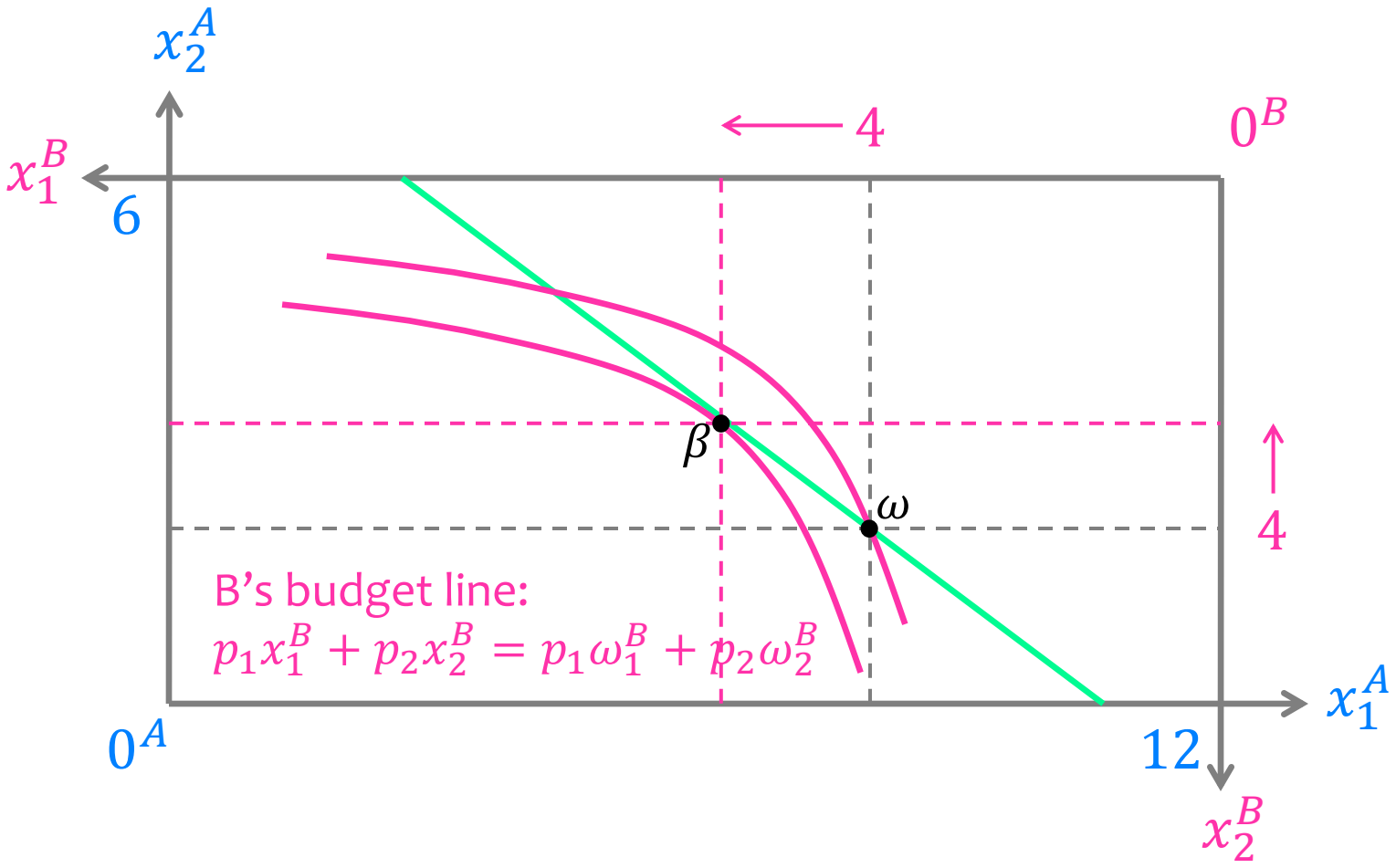
Competitive Equilibrium

Consumer *A*'s Optimal Choice



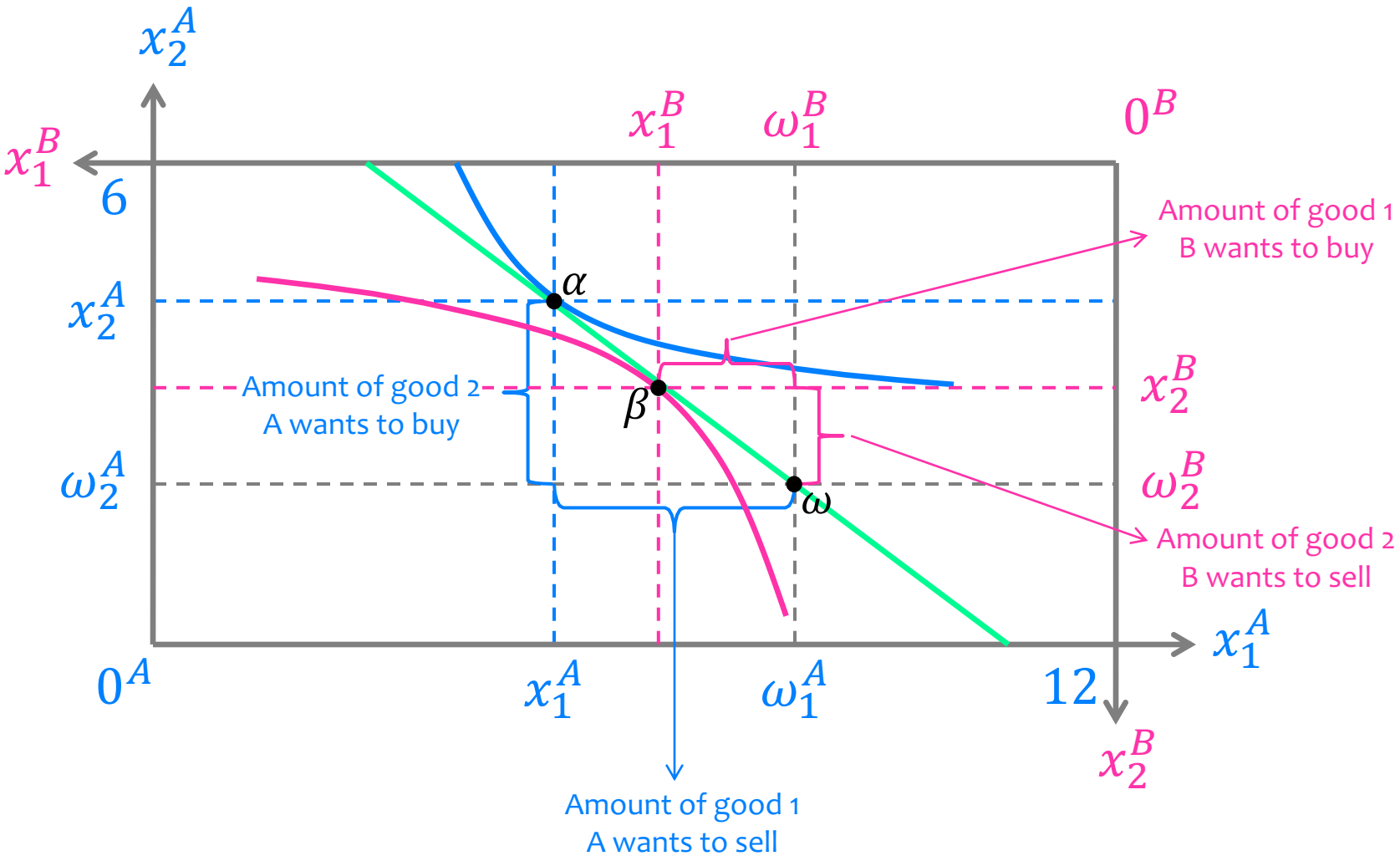
Given the endowment and the prices,
consumer *A* wants to sell some of good 1
in exchange for some of good 2.

Consumer *B*'s Optimal Choice



Given the endowment and the prices,
consumer *B* wants to sell some of good 2
in exchange for some of good 1.

Can the consumers obtain their optimal choice?



Markets do not clear at the current prices

- At $p_1 = \$3$, there is an excess supply of good 1.
  - The amount that *B* wants to buy is less than the amount that *A* wants to sell.
- At $p_2 = \$4$, there is an excess demand for good 2.
  - The amount that *A* wants to buy is more than the amount that *B* wants to sell.
- For each good, the sum of the quantity demanded does not equal the sum of the quantity available.

$$x_1^A + x_1^B < \omega_1^A + \omega_1^B$$

$$x_2^A + x_2^B > \omega_2^A + \omega_2^B$$

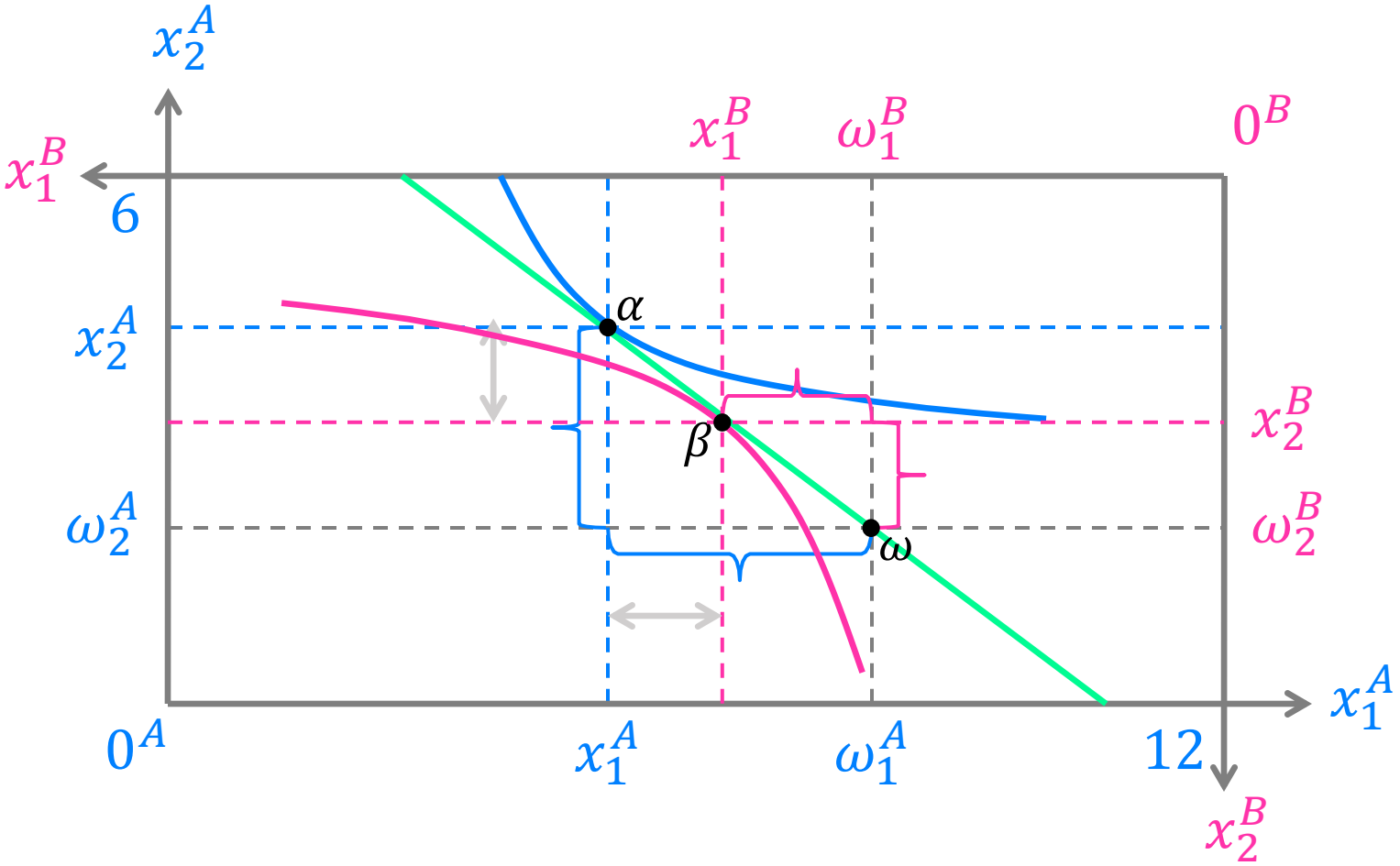
Competitive Equilibrium

- A competitive equilibrium comprises
  an allocation $\left(\left(x_1^{A^*}, x_2^{A^*}\right), \left(x_1^{B^*}, x_2^{B^*}\right)\right)$ and
  a pair of prices (p_1^*, p_2^*) such that:
  - Each consumer maximizes her utility given her budget constraint.
    - Let $\left(\left(x_1^{A^*}, x_2^{A^*}\right), \left(x_1^{B^*}, x_2^{B^*}\right)\right)$ denote each consumer's optimal choice given the equilibrium prices (p_1^*, p_2^*).
  - The markets for both goods clear:

$$x_1^{A^*} + x_1^{B^*} = \omega_1^A + \omega_1^B$$

$$x_2^{A^*} + x_2^{B^*} = \omega_2^A + \omega_2^B$$

Markets do not clear at the current prices



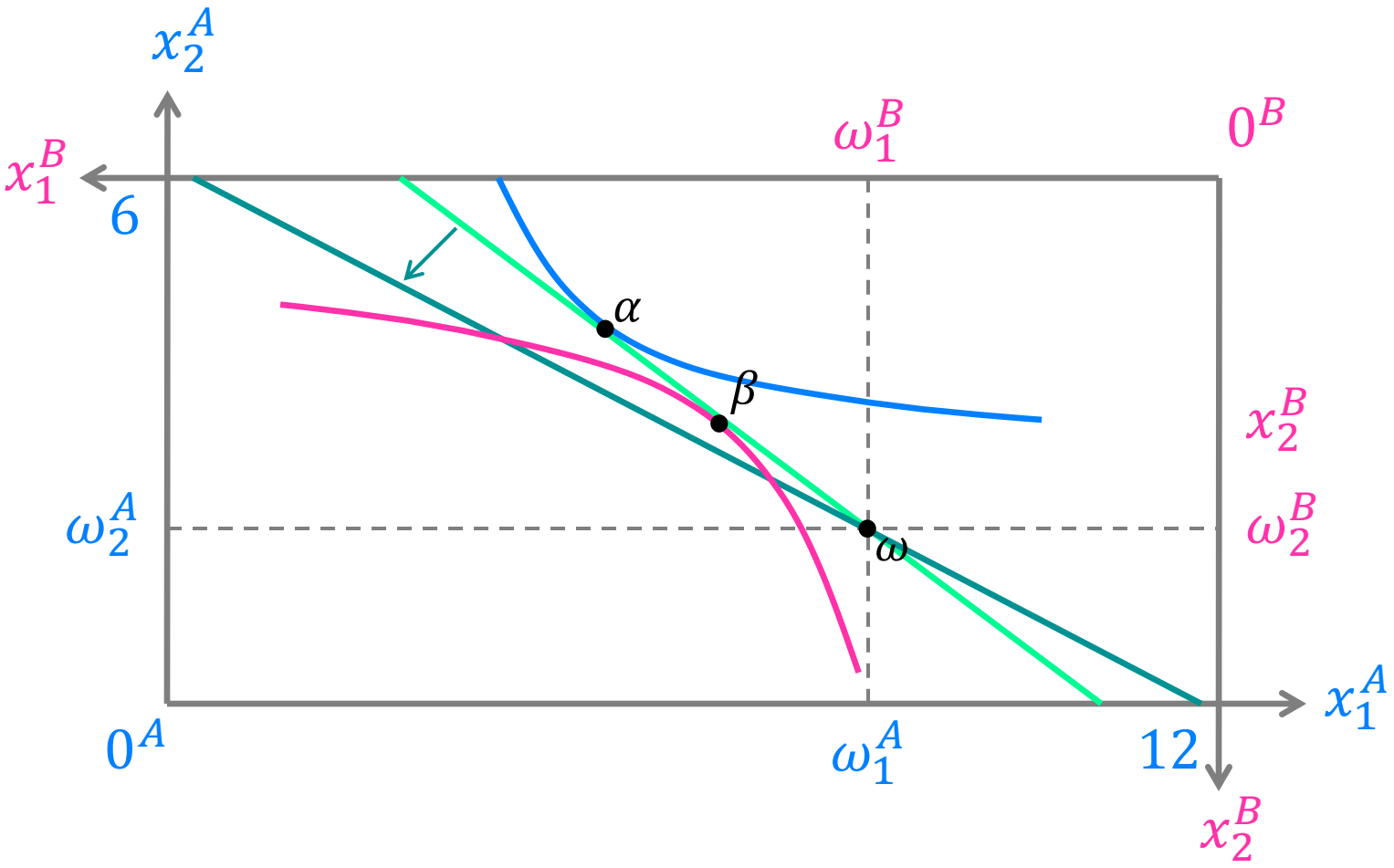
There is an excess supply of good 1.

There is an excess demand for good 2.

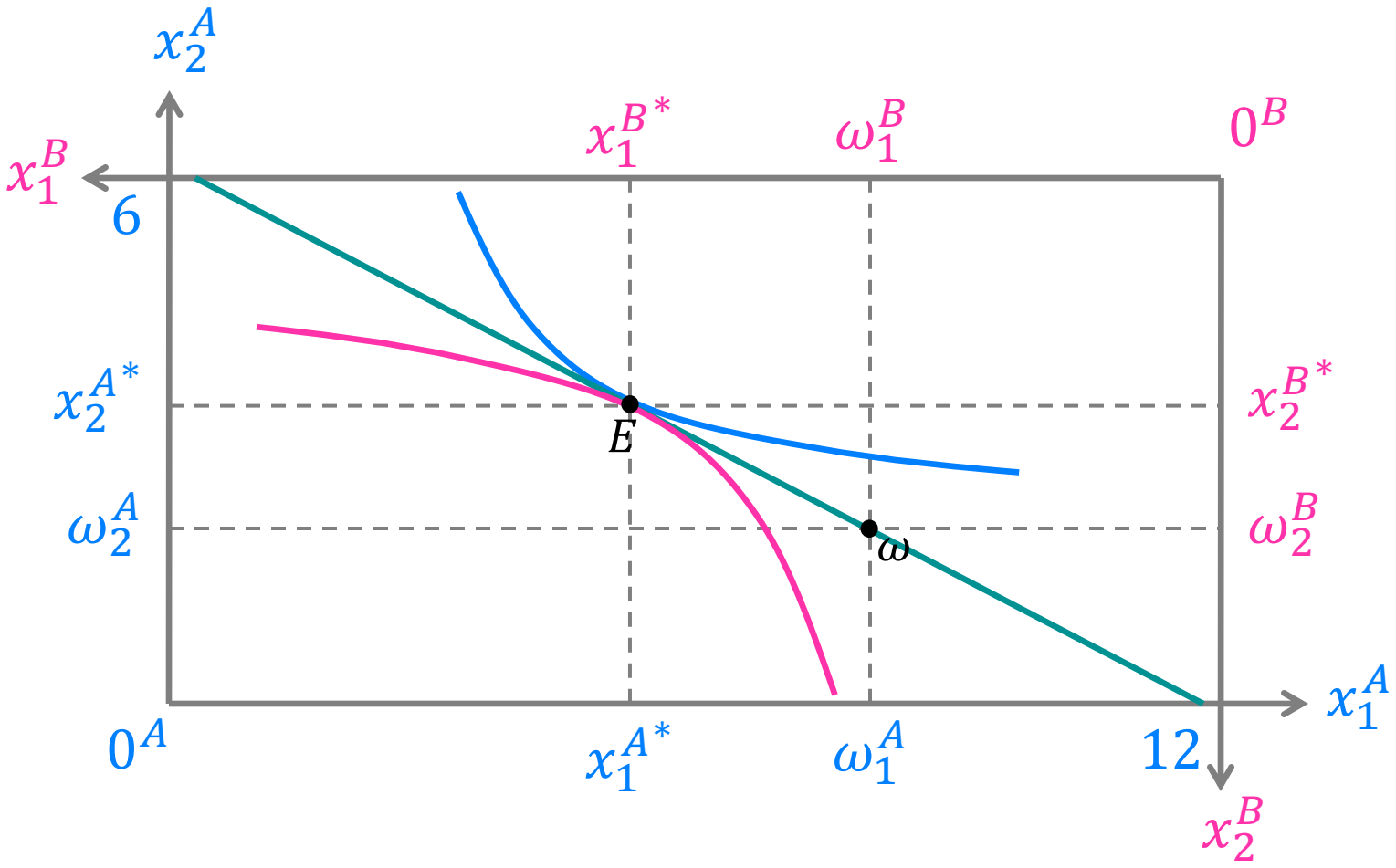
Markets do not clear at the current prices

- Since there is an excess supply of good 1,
  - the price of good 1 will decrease.
- Since there is an excess demand for good 2,
  - the price of good 2 will increase.
- Thus p_1/p_2 will fall.
  - The budget line will become flatter.
  - The budget line will still go through the endowment allocation.

Reaching an Equilibrium



Reaching an Equilibrium



At the new prices,
markets for both goods clear,
and each consumer maximizes her utility given her budget constraint.

Finding the Competitive Equilibrium

- Each consumer maximizes her utility given her budget constraint.
  - Consumer *A*: Tangency condition
    Budget line
  - Consumer *B*: Tangency condition
    Budget line
- The markets for both goods clear.
  - The market for good 1 clears.
  - The market for good 2 clears.

Application

Competitive Equilibrium

- In your own words, explain what a competitive equilibrium is.
- Think of an example of a competitive equilibrium in your life.

Exercise 6.1

Finding the Competitive Equilibrium

- Suppose the consumers' utility functions are:

$$U^A\left(x_1^A, x_2^A\right) = x_1^A x_2^A$$

$$U^B\left(x_1^B, x_2^B\right) = x_1^B x_2^B$$

- The consumers' endowments are:

$$\left(\omega_1^A, \omega_2^A\right) = (10,6)$$

$$\left(\omega_1^B, \omega_2^B\right) = (10,4)$$

- Find the equilibrium prices $\left(p_1^*, p_2^*\right)$ and the equilibrium allocation $\left(\left(x_1^{A^*}, x_2^{A^*}\right), \left(x_1^{B^*}, x_2^{B^*}\right)\right)$.

Exercise 6.1

Finding the Competitive Equilibrium

Exercise 6.2

Meaning of Prices

- In the exchange economy,
  there is no income and there is no money.
- But the competitive equilibrium refers to:
  - A pair of equilibrium prices.
  - An equilibrium allocation.
- If there is no money, what do prices mean?

Exercise 6.2

Meaning of Prices

Exercise 6.3

PE, CE, Prices, Endowments

- Indicate whether the following statements are True or False. Explain briefly.
  - Pareto efficiency depends on prices.
  - Pareto efficiency depends on the endowment allocation.
  - A competitive equilibrium depends on prices.
  - A competitive equilibrium depends on the endowment allocation.

Exercise 6.3

PE, CE, Prices, Endowments