The Linear city model

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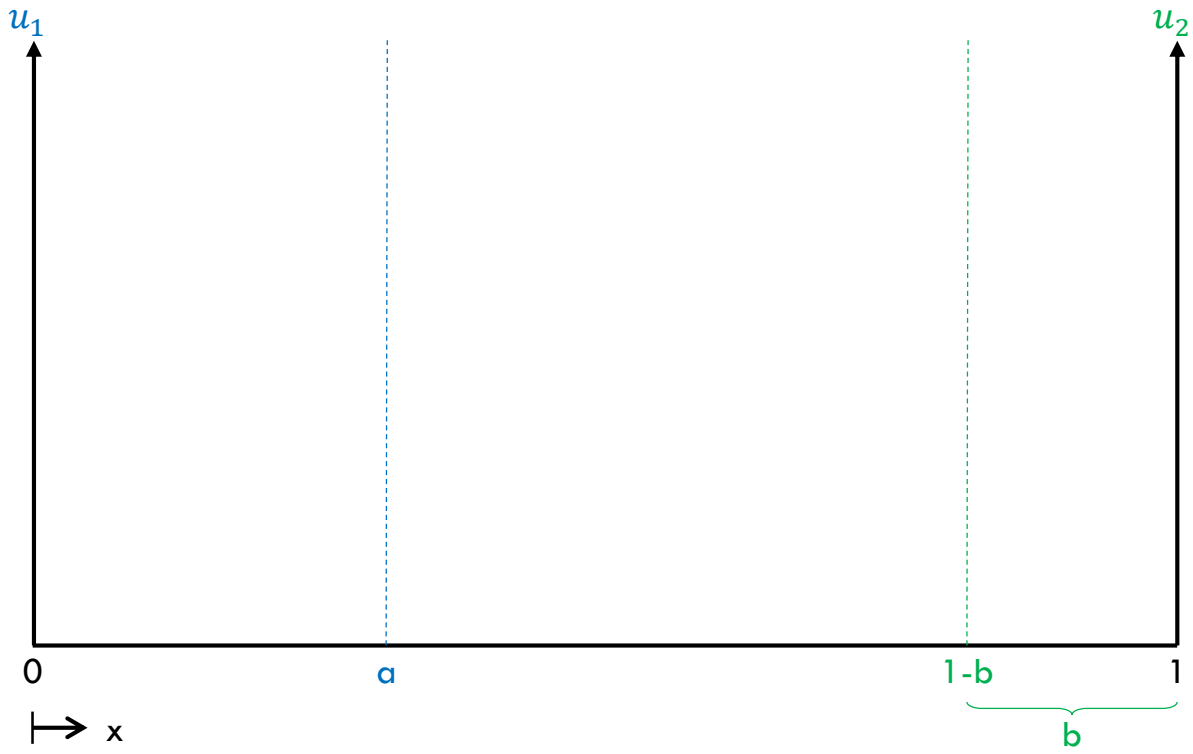

- X-axis: consumers are located uniformly from 0 to 1.
- Y-axis: consumer's utility from buying from firm 1 and firm 2 respectively
- Locations:
  - Firm 1 is located at *a*
  - Firm 2 is located at *1-b*

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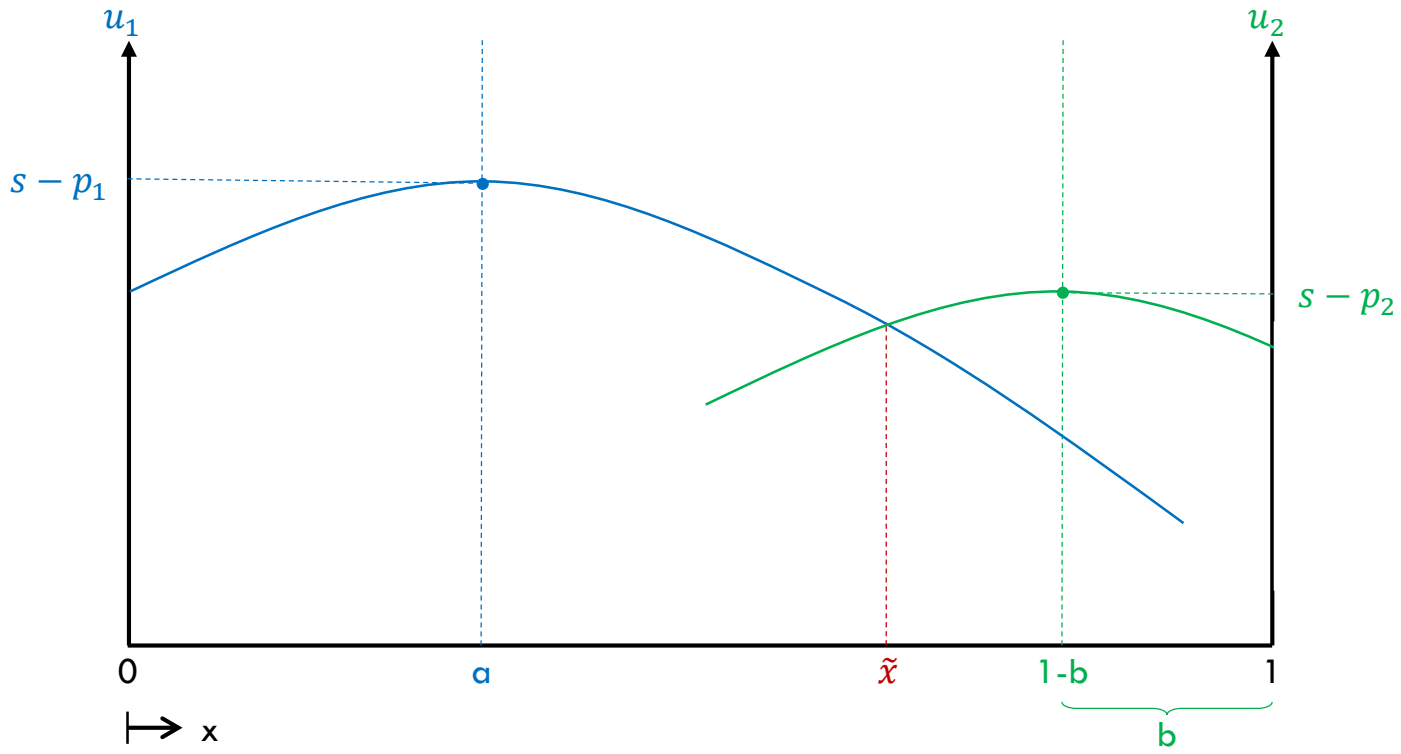

- Consumers have a reservation utility s
- Utility decreases quatratically in the distance to the firm:
  - $u_1 = s - p_1 - t(x - a)^2$
  - $u_2 = s - p_2 - t(1 - b - x)^2$
- Consumers who are located at the same place as a store, utility is *s-p*
- From there, utility decreases in distance.
- Demand is determined by the indifferent consumer $\tilde{x}$:
  - Firm 1: $D_1(p_1, p_2, a, b) = \tilde{x}$
  - Firm 2: $D_2(p_1, p_2, a, b) = 1 - \tilde{x}$

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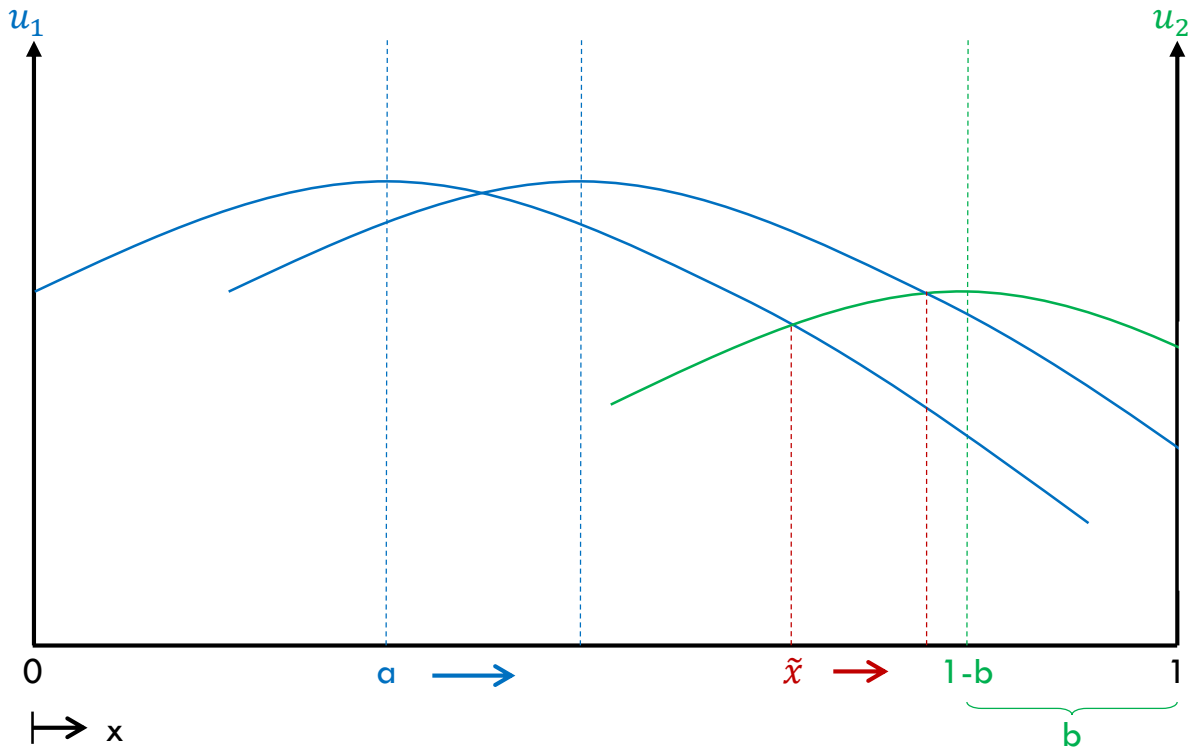

- Timing of the game:
  1. Firms choose location – this moves the «umbrellas» left/right

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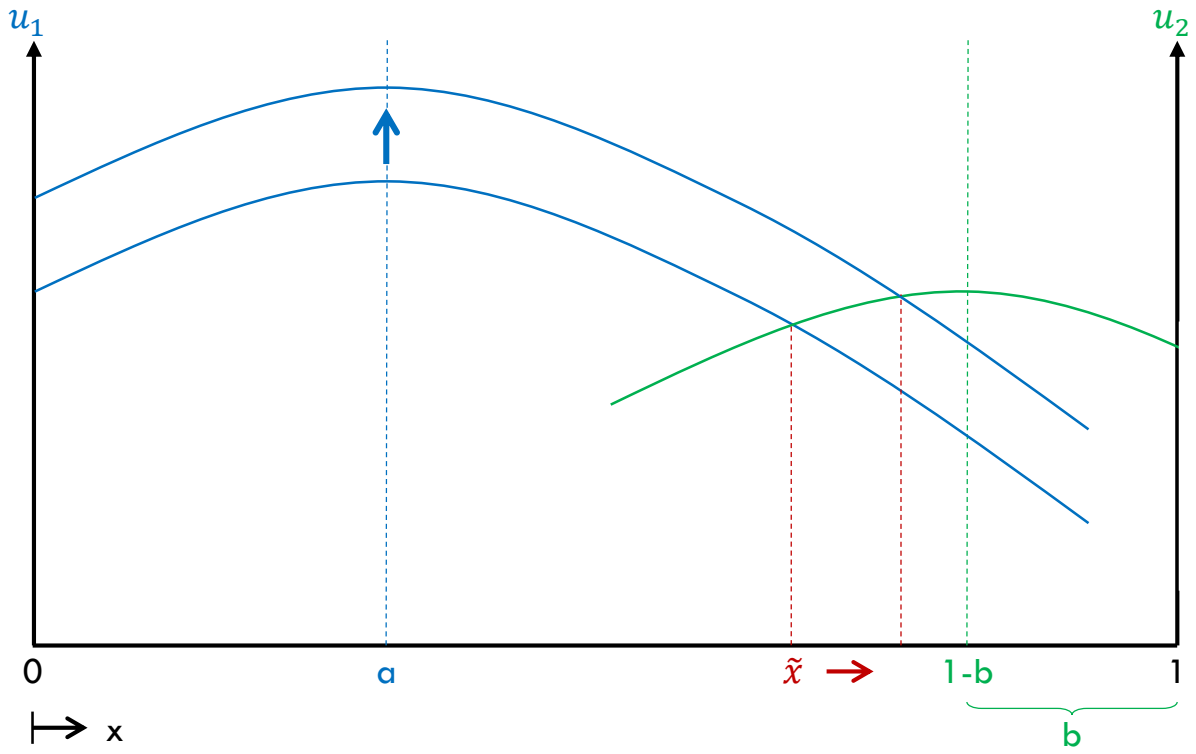

- Timing of the game:
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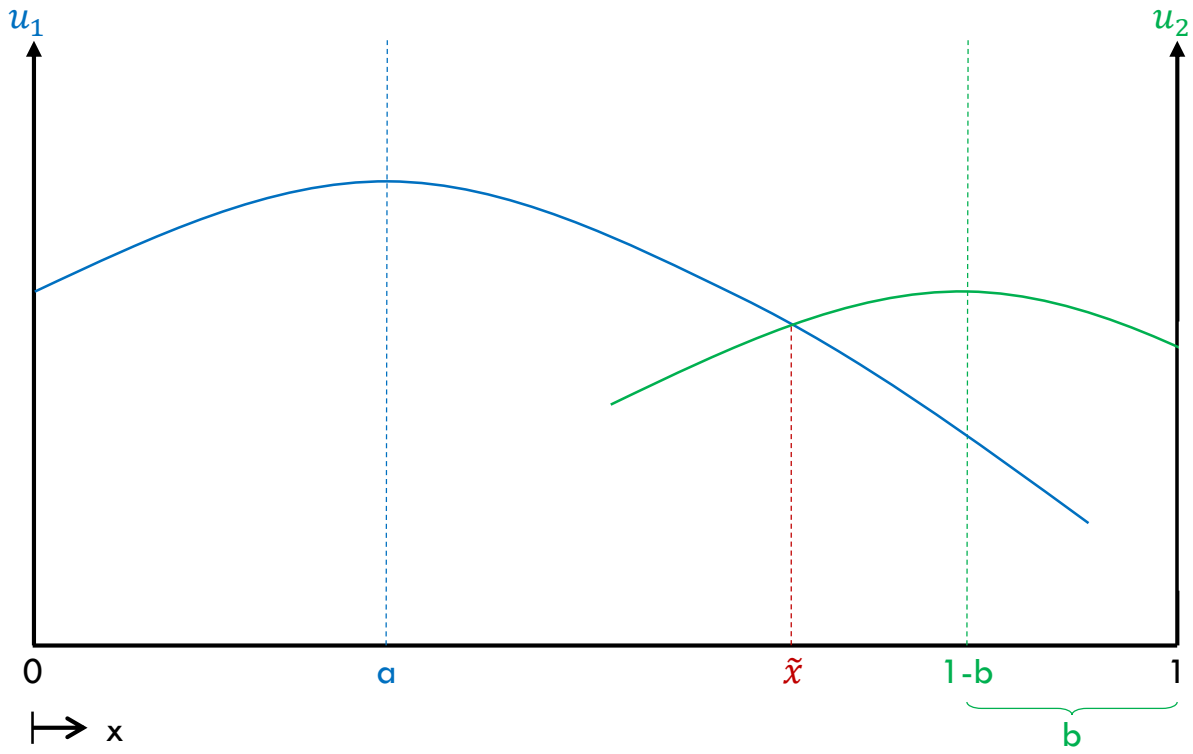

- Timing of the game:
  1. Firms choose location – this moves the «umbrellas» left/right
  2. Firms choose prices

- What location is the optimal choice?
  - ➢ *Solution: Backward induction*

    1.Step: Solve the price game:
    - What are the optimal prices *given* a and b?
    - Prices become functions of a and b:

$$p_1 = p_1(a, b)$$
$$p_2 = p_2(a, b)$$

    2.Step: Solve the location game.
    - What are the optimal locations a and b?