

Economics Fundamentals

Lecture 4: Production Factors & Production Possibilities Frontier

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Recap: Lecture 3



Key Concepts from Last Class:



Rationality: Cost-benefit decision making



Marginal Analysis: Decisions at the margin (MB vs MC)



Opportunity Cost: Value of best alternative foregone



Sunk Costs: Ignore them in decisions!



Today: We build on opportunity cost to understand:

- Production factors (inputs)
- **Production Possibilities Frontier (PPF)**
- Society-level trade-offs and efficiency

Production Factors

The Three Main Inputs



PRODUCTION FACTORS

To produce goods and services, economies use three main factors: **Land** (natural resources), **Labor** (human effort), and **Capital** (produced goods used in production).

Factor Payments



Each factor receives compensation:

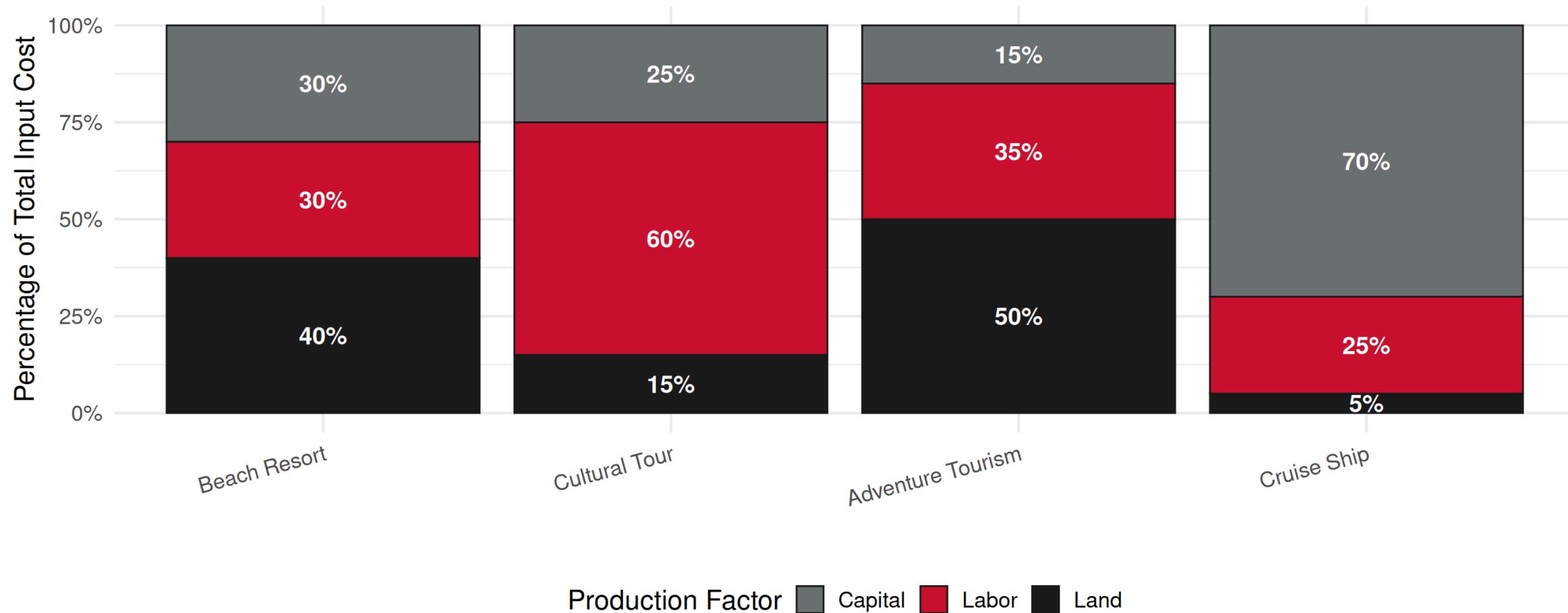
Factor	Payment Name	Example in Tourism
Land	Rent	Payment for beach concession, property lease
Labor	Wages/Salaries	Hotel staff wages, tour guide fees
Capital	Interest	Return on hotel investment, equipment loans
Entrepreneurship	Profit	Hotel owner's profit, airline earnings

Tourism Production: Example



Factor Intensity in Different Tourism Products

Different activities require different combinations of Land, Labor, and Capital



Hypothetical illustration of factor intensity

Insight: Cruise tourism is **capital-intensive**, cultural tours are **labor-intensive**, beach resorts balanced

Production Possibilities Frontier (PPF)

What is the PPF?



PRODUCTION POSSIBILITIES FRONTIER (PPF)

The PPF shows the **maximum combinations** of two goods an economy can produce given fixed resources, current technology, and full employment.

Key Insight



With scarcity, producing more of one good requires producing less of another

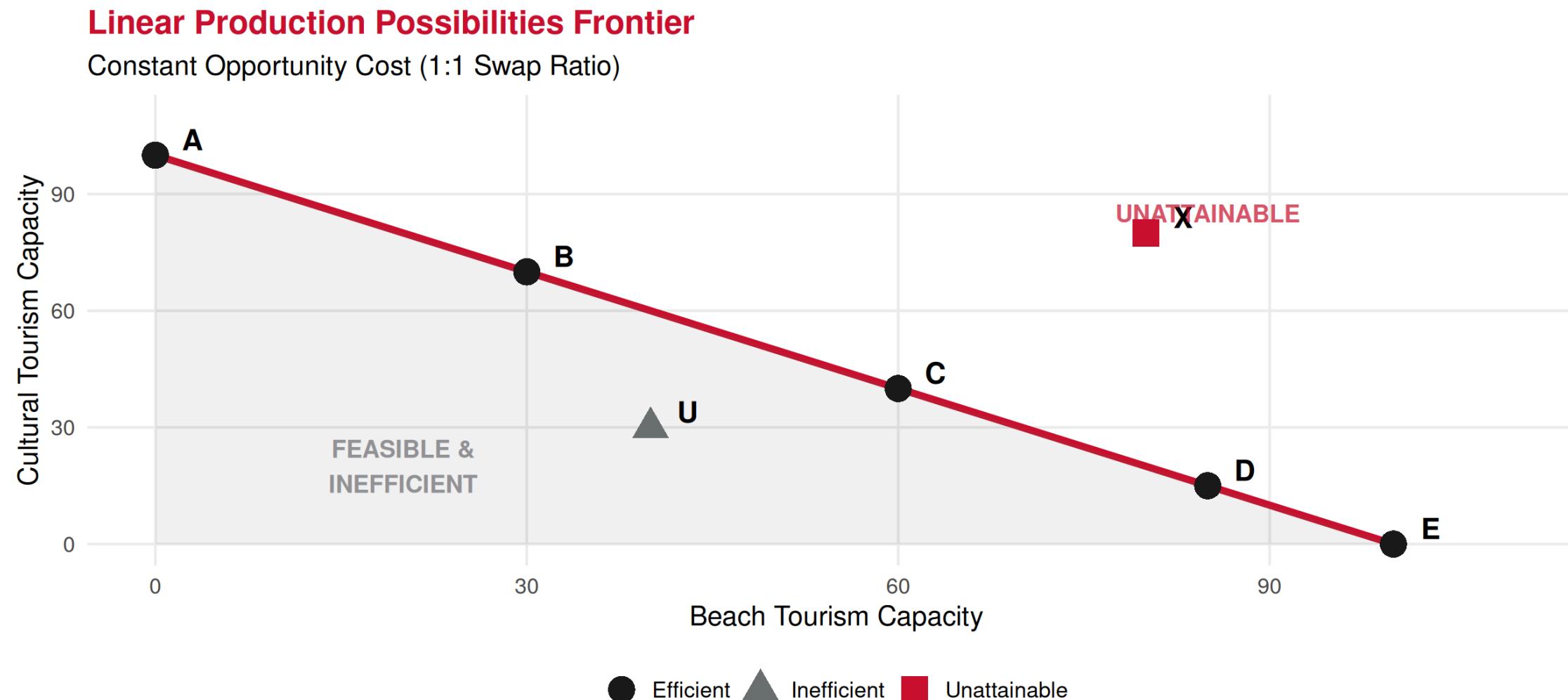
→ **This is opportunity cost visualized!**

Simple PPF Example: Tourism



Imagine an economy producing only:

- **Beach Tourism** (hotels, resorts)
- **Cultural Tourism** (museums, tours, heritage sites)



Interpreting the PPF



Point A (0, 100): All resources → cultural tourism, no beach tourism

Point E (100, 0): All resources → beach tourism, no cultural tourism

Point C (60, 40): Mixed economy, balanced allocation

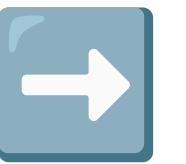
Point U (40, 30): **Inefficient** – inside PPF

- Resources unemployed or misallocated
- Could produce more of both goods!

Point X (80, 80): **Unattainable** – outside PPF

- Not enough resources with current technology
- Would need economic growth

Moving Along the PPF



From B (30, 70) to C (60, 40):

✓ Gain: 30 units of beach tourism

✗ Loss: 30 units of cultural tourism

💰 Opportunity Cost: 30 cultural units

Key Point



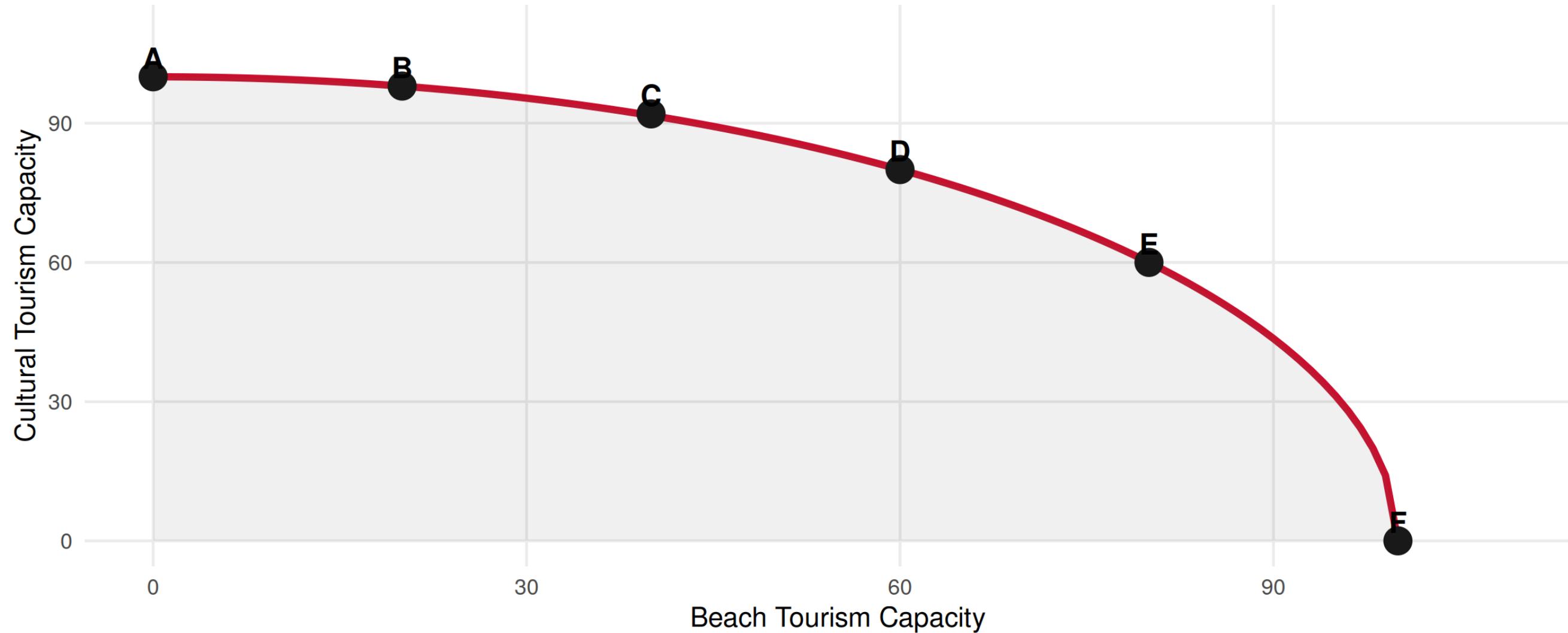
- Moving along PPF = **reallocation** of resources
- All points on PPF are **efficient** (no waste)
- But different distributions (different answers to WHAT question)
- Trade-offs are unavoidable!

Bowed-Out PPF: Increasing Opportunity Cost



Bowed-Out PPF: Increasing Opportunity Costs

As you produce more of one good, opportunity cost increases



💡 **Why bowed out?** Resources aren't perfectly adaptable — some resources are better suited for beach tourism, others for cultural tourism

Calculating Opportunity Cost on PPF :calculator:

Example: Moving from C to D

Point C: (40 beach, 92 cultural)

Point D: (60 beach, 80 cultural)

Change:

- Gain: 20 beach units
- Loss: 12 cultural units

Opportunity Cost:

$$OC = \frac{\text{Units Lost}}{\text{Units Gained}} = \frac{12}{20} = 0.6$$

👉 Each additional beach unit costs **0.6 cultural units**

Compare: D to E

- Gain: 20 beach (60→80)
- Loss: 20 cultural (80→60)
- OC = 20/20 = **1.0** (higher!)



Opportunity cost **increases** as we specialize more

Economic Growth & PPF Shifts

Shifting the PPF Outward



ECONOMIC GROWTH

An outward shift of the PPF represents economic growth – the ability to produce more of both goods. Caused by: more resources, better technology, or improved productivity.

Three ways to shift PPF outward:

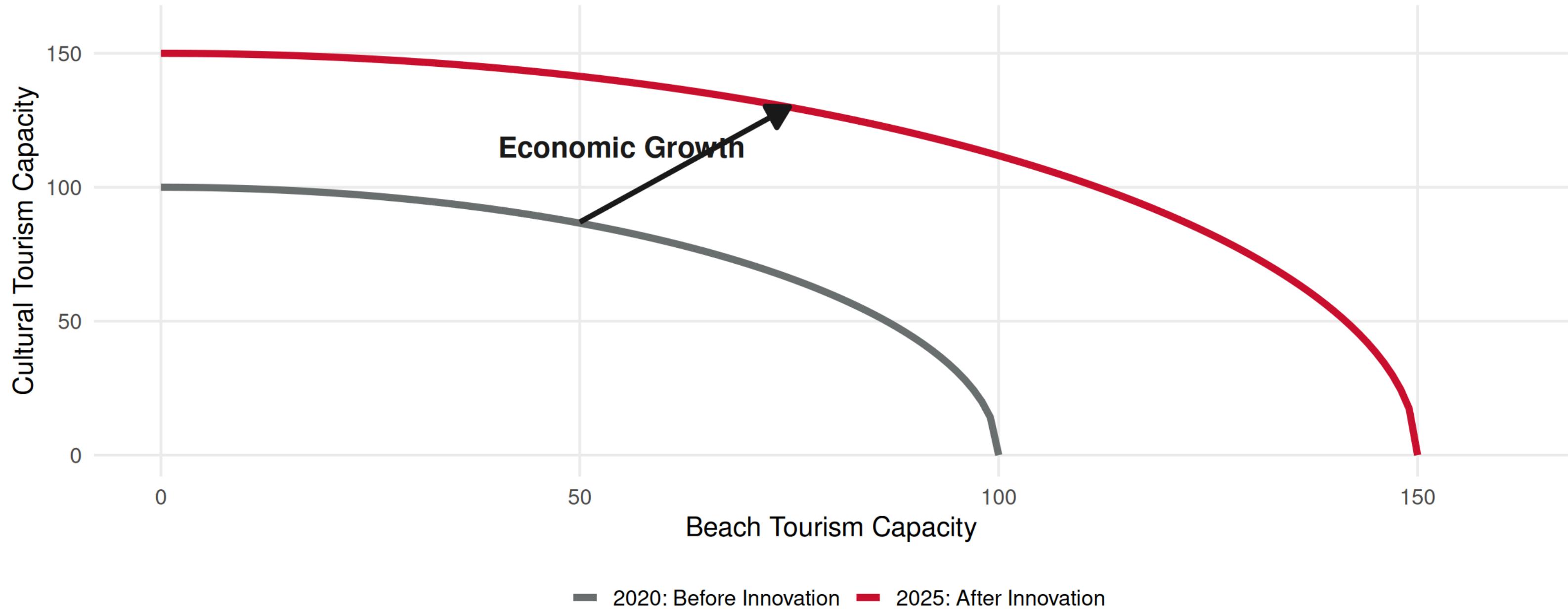
-  **More resources** (population growth, discover new land)
-  **Better technology** (innovation, improved processes)
-  **Human capital** (education, training, skills)

PPF Shift Example



PPF Shift: Technological Innovation in Tourism

New technology (AI, digital platforms) expands production possibilities



Investment Trade-off: Present vs Future



Key Economic Decision: Consumption today vs. Growth tomorrow

More Consumption Goods Today

- Higher current standard of living
- Immediate satisfaction
- Less investment in capital
- Slower future growth

More Capital Goods Today

- Faster PPF outward shift
- Higher future production
- Lower current consumption
- Sacrifice today for tomorrow

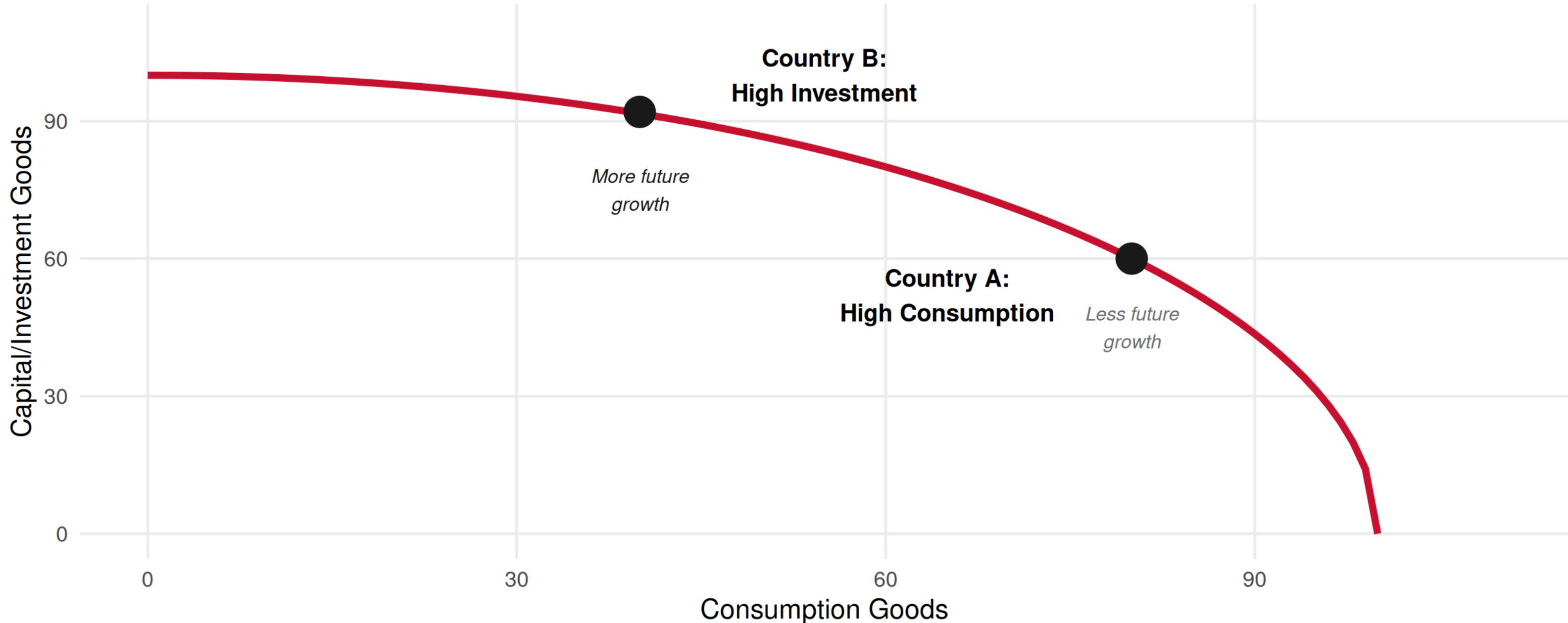
 **Tourism Example:** Build hotels now (consume less) → More capacity future → Higher tourism revenue later

Investment Trade-off Visualization



Consumption vs. Investment: Different Choices

Country B sacrifices consumption today for higher growth tomorrow

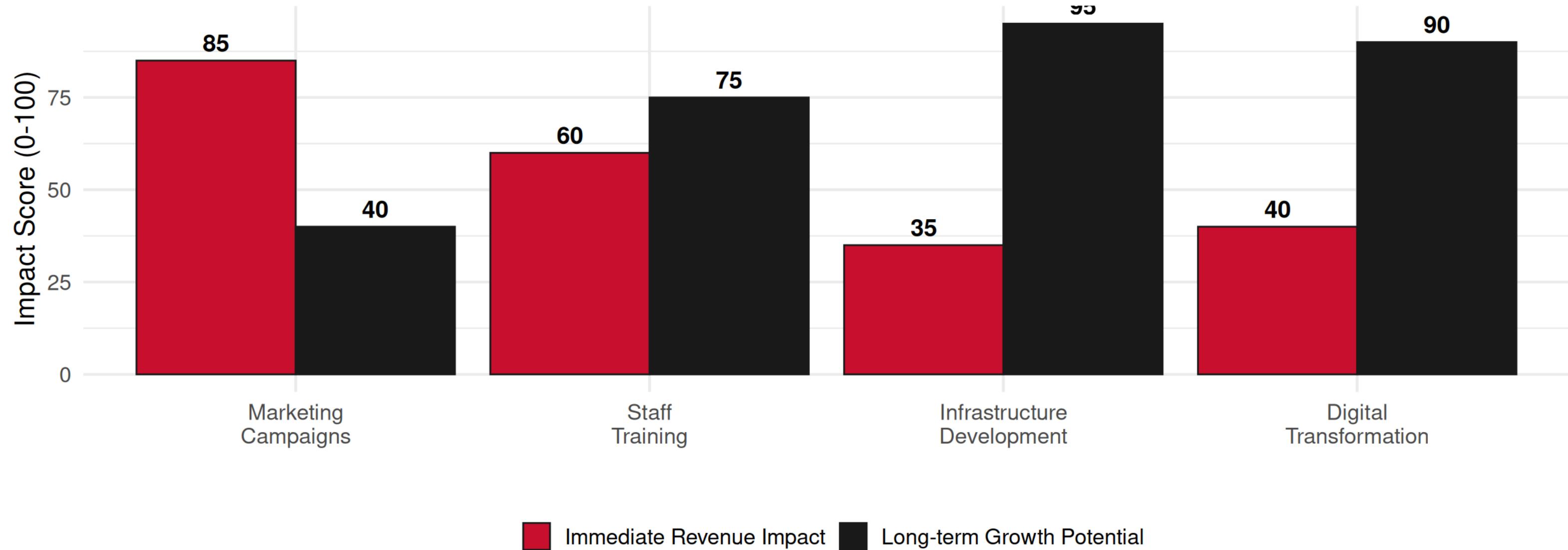


Tourism Investment Example



Tourism Investment Categories: Trade-off Analysis

Infrastructure & Digital have high long-term impact but low immediate returns



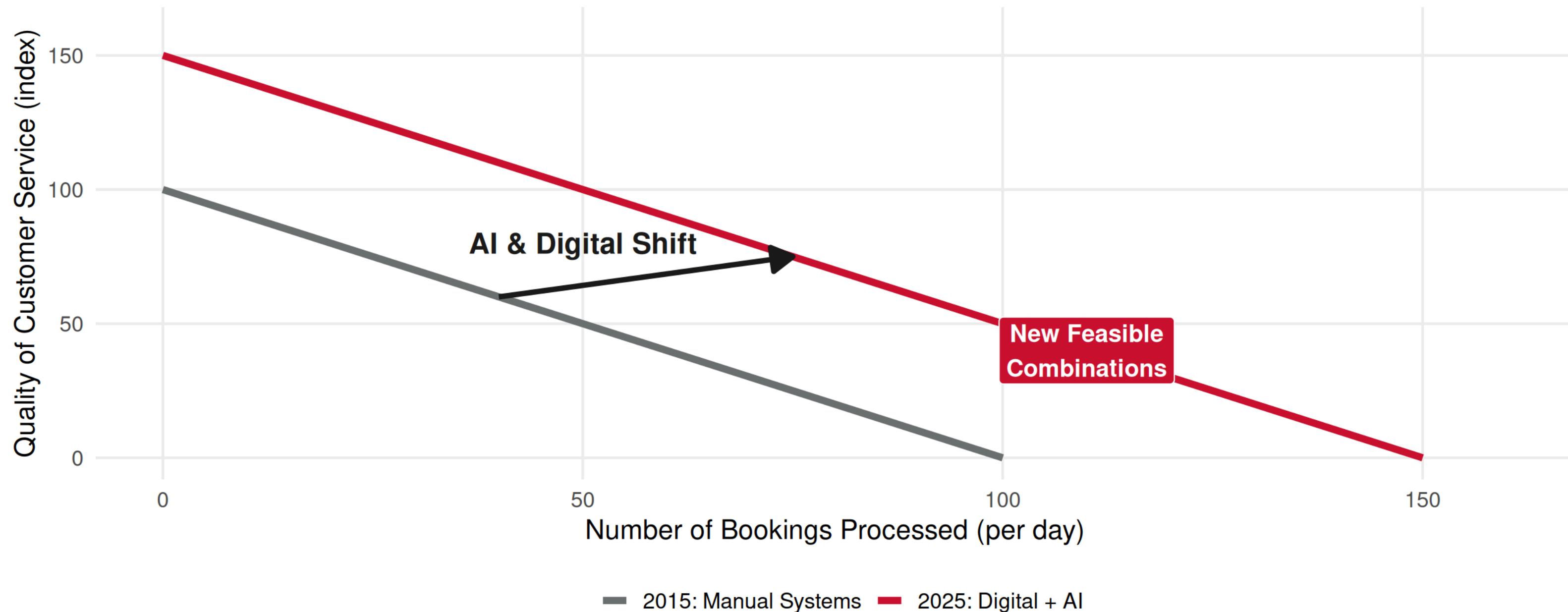
👉 **Strategic choice:** Prioritize long-term growth (infrastructure, digital) despite lower immediate returns

Technological Change Example



Technology Impact: Travel Agency PPF Shift

Digital transformation enables higher efficiency across all services



PPF Summary: Key Insights



- 1 Shows maximum production given resources & technology
- 2 Points on PPF = efficient (can't produce more without trade-off)
- 3 Points inside PPF = inefficient (unemployment, waste)
- 4 Points outside PPF = impossible (currently unattainable)
- 5 Moving along PPF = reallocating resources (opportunity cost)
- 6 Shifting PPF outward = economic growth (more resources, better technology)
- 7 Investment trade-off = consumption today vs. growth tomorrow

Real-World Applications



PPF thinking helps answer:

- ? Should Portugal build more hotels or preserve more heritage sites?
- ? How much should airlines invest in fuel efficiency vs. passenger comfort?
- ? Trade-off between mass tourism revenue and sustainable tourism?
- ? How much GDP to allocate to tourism vs. other sectors?



All involve opportunity costs and efficiency considerations!

Complete Picture: Integration

Today's Lecture Integration:

- 1 **Production Factors** (Land, Labor, Capital) are scarce inputs
 - 2 **Scarcity** forces choices between alternatives
 - 3 **PPF** visualizes society's production possibilities
 - 4 **Opportunity Cost** = moving along PPF (what's foregone)
 - 5 **Efficiency** = operating on (not inside) PPF
 - 6 **Economic Growth** = PPF shifts outward
 - 7 **Investment** today enables faster growth tomorrow
-  **This connects to:** Lecture 3 (opportunity cost), Lecture 2 (WHAT/HOW/FOR WHOM), Lecture 1 (scarcity & efficiency)

Exercises



Application Time!

PPF and opportunity cost calculations.

Exercise 1: Multiple Choice

An economy is producing at a point INSIDE its PPF. This indicates:

- A. The economy is efficiently using all resources
- B. The economy has economic growth
- C. There is unemployment or resource misallocation
- D. It's impossible to produce more of any good

Answer: C - Inside PPF means inefficiency — resources are unemployed or misallocated.

Could produce more of at least one good without sacrificing the other (move toward frontier).

Exercise 2: Multiple Choice

A country's PPF shifts outward. This could be caused by:

- A. Higher unemployment
- B. Decrease in the labor force
- C. Technological innovation
- D. Producing less capital goods

Answer: C - Outward PPF shift = economic growth. Caused by: more resources, better technology, improved productivity. Options A, B, D would shift PPF inward or cause movement inside PPF.

Exercise 3: Open Question - Setup

Scenario: The Portuguese Algarve region has limited land and labor. It can allocate resources between golf tourism and beach tourism. Current production possibilities:

Combination	Golf Resorts	Beach Hotels
A	0	50
B	5	48
C	10	44
D	15	38
E	20	30
F	25	0

Exercise 3: Questions

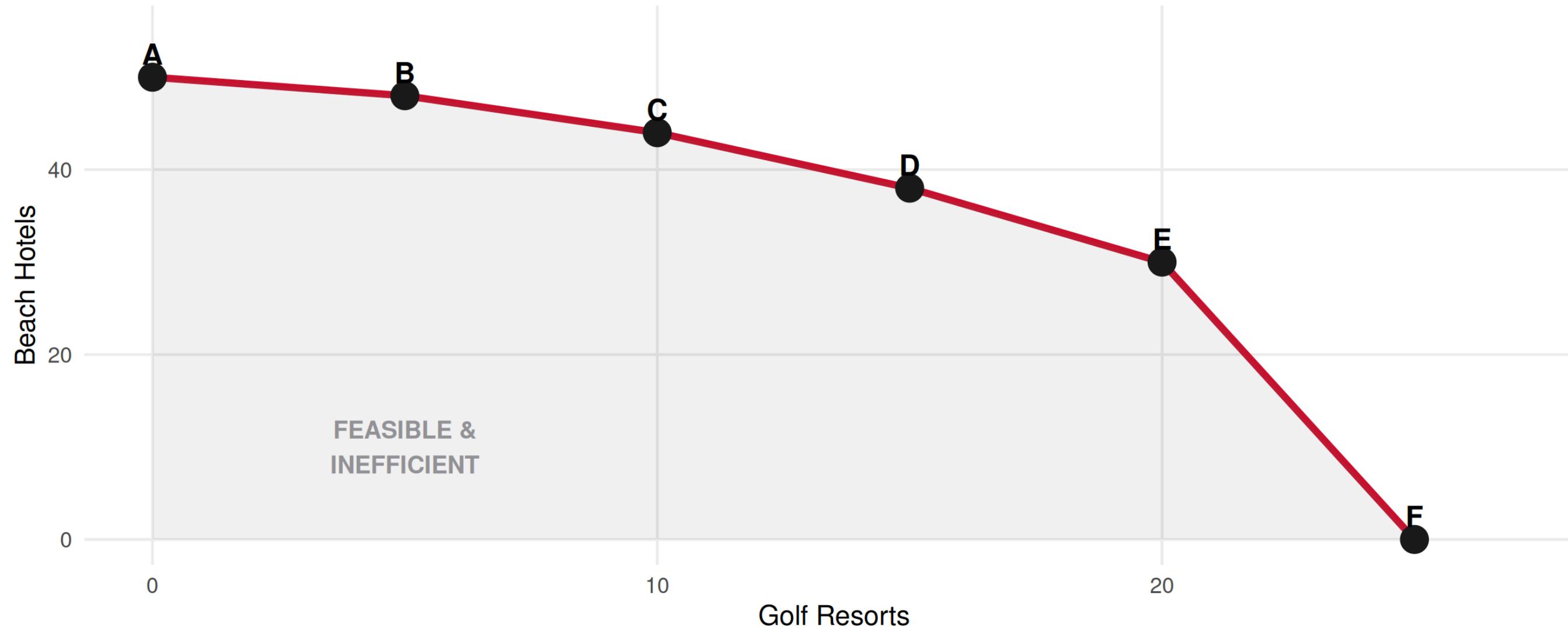
Questions:

- a. Draw the PPF with Golf Resorts on x-axis, Beach Hotels on y-axis
- b. Calculate the opportunity cost of moving from:
 - Point B to Point C
 - Point D to Point E
- c. Does the PPF exhibit increasing opportunity costs? Explain.
- d. If region currently operates at point U (12 golf, 30 beach), what does this indicate?
- e. A new tourism development technology is invented. How would this affect the PPF? Draw the new curve.

Exercise 3: Solution - Part a (PPF Graph)

Algarve Tourism PPF: Golf Resorts vs. Beach Hotels

Bowed-out curve indicates increasing opportunity costs



- a) The PPF shows all efficient combinations (points A-F) and the bowed-out shape indicating increasing opportunity costs.

Exercise 3: Solution - Part b

b) Opportunity Cost Calculations:

B → C (5 golf → 10 golf):

Gain in Golf = $10 - 5 = 5$ resorts

Loss in Beach = $48 - 44 = 4$ hotels

Opportunity Cost = $\frac{4 \text{ hotels}}{5 \text{ resorts}} = 0.8 \text{ beach hotels per golf resort}$

Exercise 3: Solution - Part b continued

D → E (15 golf → 20 golf):

$$\text{Gain in Golf} = 20 - 15 = 5 \text{ resorts}$$

$$\text{Loss in Beach} = 38 - 30 = 8 \text{ hotels}$$

$$\text{Opportunity Cost} = \frac{8 \text{ hotels}}{5 \text{ resorts}} = 1.6 \text{ beach hotels per golf resort}$$

Exercise 3: Solution - Part c & d

c) Increasing Opportunity Costs?

YES! Opportunity cost increases from 0.8 ($B \rightarrow C$) to 1.6 ($D \rightarrow E$).

Explanation: As more resources shift to golf, we use resources less suited for golf (originally better for beaches). Each additional golf resort requires sacrificing more beach hotels.

d) Point U (12 golf, 30 beach):

This is **INSIDE** the PPF (compare to point D: 15 golf, 38 beach).

Indicates:

- **Inefficiency** (unemployment or resource misallocation)
- Could produce more golf without reducing beach (move to D: 15 golf, 38 beach)
- Could produce more beach without reducing golf

Exercise 3: Solution - Part e

e) New Technology Effect:

Technology shifts PPF OUTWARD (economic growth).

New PPF might be:

Combination	Golf Resorts	Beach Hotels
A'	0	60 (+10)
C'	12	55 (+11)
E'	24	38 (+8)
F'	30	0 (+5)

Effect: Can now produce MORE of both types of tourism with same resources!

Graph: Draw original PPF, then new PPF further from origin (parallel or biased depending on where technology applies).

Next Lecture



February 19, 2026: Budget Set and Budget Constraint



Preparation: Think about how you allocate your own limited budget across different goods!

Thank You! 🙌

Questions?

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Next class: Thursday, February 19, 2026