

# Principles of Economics – Lecture 7 (Technology) • Study Notes

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## Big Picture

- **Technology = non-material capital.**
  - Unlike physical capital, it is not scarce — ideas can be shared, copied, and reused without diminishing.
  - Technology is the plan for economic action: the recipe in the human mind before production takes place .
  - Innovation is what prevents diminishing returns to capital and drives long-term growth.
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## Core Claims

1. **Technology as a Recipe**
2. Production happens first in the mind of the acting person.
3. Technology = knowledge of how to combine inputs to achieve ends.
4. Like a recipe: not physical, but essential to the meal .
5. **Avoiding Diminishing Returns**
6. Physical capital eventually hits diminishing returns (no point in endless fishing rods).
7. New technology (nets, boats, engines) resets productivity and enables more capital formation .
8. **Technology & Labor**
9. Myth: “Machines cause unemployment.”
10. Reality: labor is always scarce; technology makes labor more productive.

11. Historical evidence: Britain has more workers and higher productivity today than in the Luddite era.
12. Technology frees labor from drudgery, raises wages, and creates new industries .
13. **Jobs vs. Services**
14. Technology eliminates outdated jobs but not the underlying *service*.
15. Example: transportation → from slaves carrying loads → carts → horses → trains → trucks → planes → ships.
16. The service (transportation) expands and improves, even if old job forms vanish .
17. **Technology & Slavery**
18. Industrialization raised productivity so much that slavery became uneconomical.
19. Machines outperform brute labor; modern work requires intelligence and consent.
20. Slavery collapses when capital is abundant because the marginal value of forced labor drops .
21. **Entrepreneurship, Not Science, Drives Innovation**
22. Common myth: science → engineering → technology.
23. Reality: entrepreneurs and tinkerers drive technology to meet market needs.
24. Example: Steam engine preceded thermodynamics; Wright brothers invented flight before scientific consensus accepted it.
25. Profit motive, trial and error, and market feedback guide real innovation .
26. **Software as Pure Technology**
27. The purest form of non-material capital.
28. Abstract, infinitely reproducible, boosts productivity across all industries.
29. Software = automation of instructions; turns general-purpose machines into tools for infinite tasks .

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## Key Concepts & Mental Models

- **Technology = non-material capital** (ideas, recipes, blueprints).
- **Diminishing returns avoided through innovation.**
- **Jobs vs. services distinction** → services persist, jobs evolve.

- **Industrialization obsoletes slavery** by making brute force uneconomical.
  - **Entrepreneurial innovation** as primary driver, not academia.
  - **Software = pinnacle of informational capital.**
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### Historical Examples

- **Luddites:** destroyed machines out of fear → proven wrong by history.
  - **Transportation:** from human carriers → wheels → horses → engines → planes → ships. Each leap raised productivity.
  - **Steam engine:** invented by workers, not scientists; later forced physics to update.
  - **Aviation:** Wright brothers succeeded despite scientific consensus declaring flight impossible.
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### Quotable Ideas

- “Technology is the plan for economic action.” — Ammous
  - “It is not thermodynamics that gave us the steam engine; it is the steam engine that gave us thermodynamics.” — Terence Kealey (via Ammous)
  - “Technological progress makes labor more productive, and that makes it more valuable.” — Ammous
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### Study Prompts

- Why is technology considered a form of capital?
- How does innovation prevent diminishing returns?
- Explain why machines do not cause unemployment.

- How did industrialization contribute to ending slavery?
  - Why is entrepreneurial innovation more important than scientific theory for technological progress?
  - Why is software considered the purest form of technology?
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### **TL;DR**

Technology is non-material capital — the recipes in our minds that guide production. Unlike physical capital, it does not run into scarcity. Innovation resets productivity, prevents diminishing returns, and drives long-term growth. Far from destroying jobs, technology makes labor more productive and more valuable, while eliminating slavery as an economic rationale. Real innovation comes from entrepreneurs solving market problems, not academic theory. Software represents the purest form of technological progress: infinitely reproducible, abstract, and transformative across every industry.

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