

Unit 3

Scarcity, Work and Choice

Hui-Jun Chen

The Ohio State University

January 11, 2023

Introduction

Introduction

In this Unit I start to introduce consumer theory, i.e., **individual behavior**.

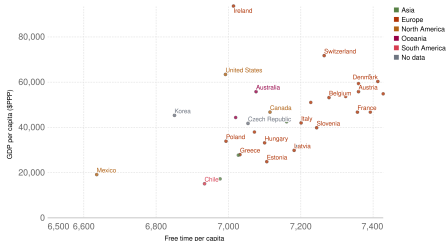
Why?! \Rightarrow **Macro needs Micro foundation**, since

- aggregate behavior is the sum of individual decisions
- **Lucas' critique**: structures of economies **change** w/ policies b/c **individual decision** changed
- Need to know effect on **individual behavior** to know the aggregate effect!
- E.g. Two forces / reactions of COVID stimulus policy:
 - ① \Rightarrow workers have **less** incentive to work \Rightarrow unemployment $\uparrow \Rightarrow$ exacerbate recession
 - ② \Rightarrow funding $\uparrow \Rightarrow$ firms have **more** incentive to hire workers \Rightarrow mitigate recession

Hours of work is different across countries and over time. Why?

Average annual hours of free time per worker and income, 2020

Unit 3 'Scarcity, work, and choice' in The CORE Team, The Economy. Available at: <https://tinyco.re/30301551>
[Figure 3.2]

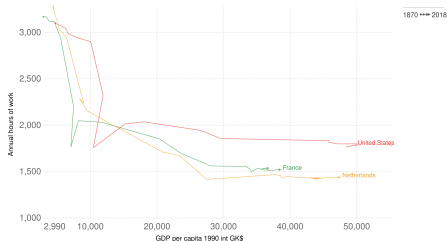


Source: OECD, Our World In Data
Note: GDP per capita is displayed on the 'MAP' tab. CC-BY-ND-NC

tinyco.re/30301551 • Powered by ourworldindata.org

Annual hours of work and income, 1870 to 2018

Unit 3 'Scarcity, work, and choice' in The CORE Team, The Economy. Available at: <https://tinyco.re/30301550>
[Figure 3.1]



Source: Maddison Project (2018); Huberman, Minns (2007); OECD (2019)
Note: Annual Hours of Work are displayed on the 'MAP' tab. CC-BY-ND-NC

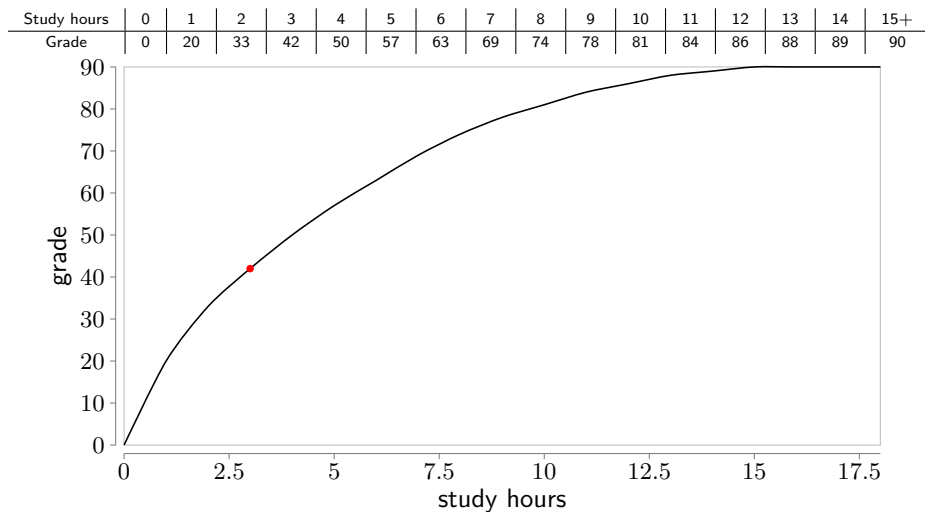
tinyco.re/30301550 • Powered by ourworldindata.org

■ Further reading: <https://tinyurl.com/4rhaepuk>

Scarcity and Choice

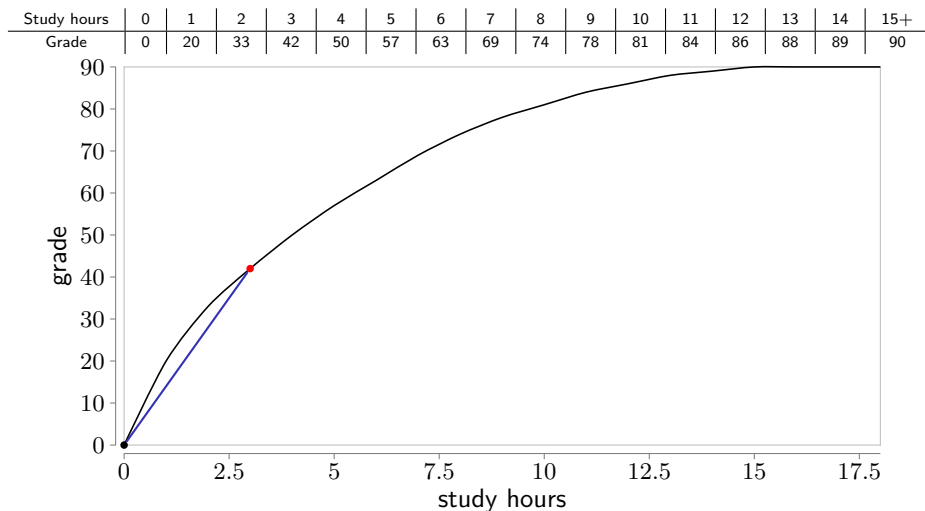
Production Function for Study

Production function: how **inputs** translate into **output**



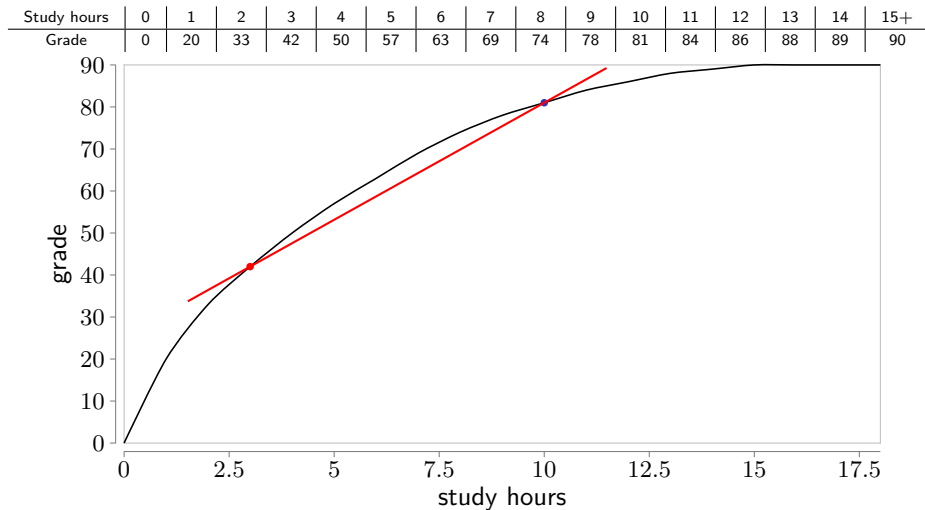
Production Function for Study

Average product: slope of the line connected with origin



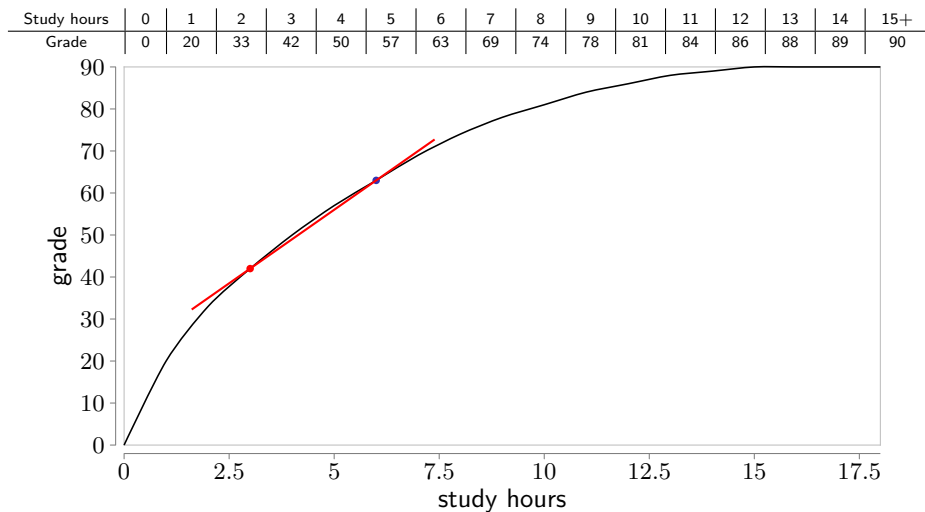
Production Function for Study

What if I want to know the average grade from 3hr to 10hr?



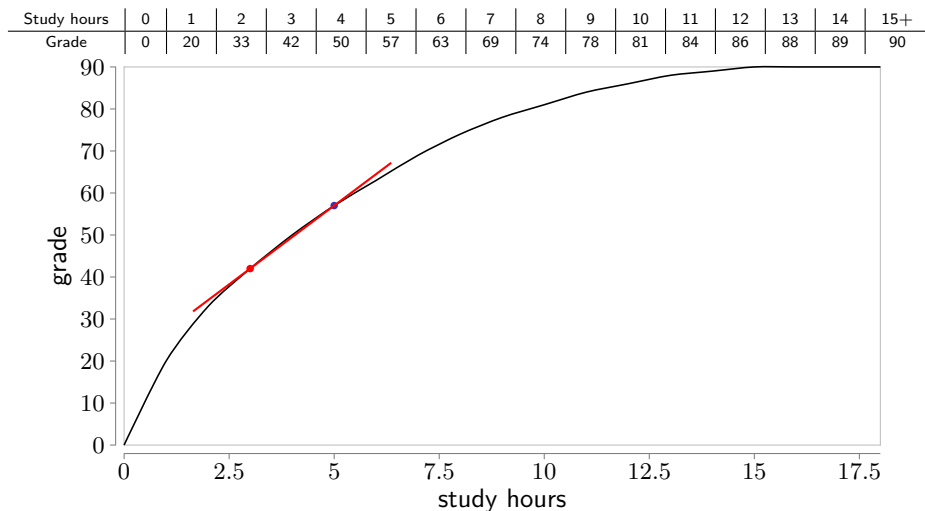
Production Function for Study

What if I want to know the average grade from 3hr to 6hr?



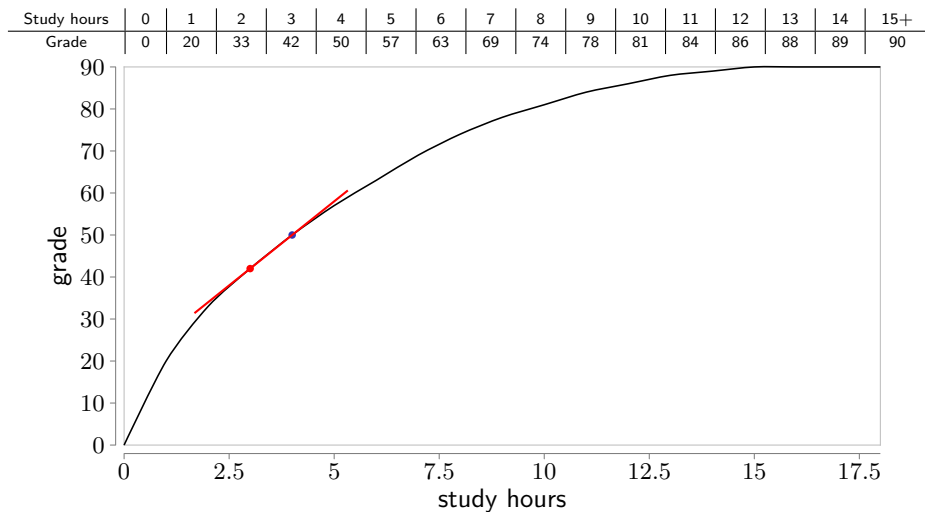
Production Function for Study

What if I want to know the average grade from 3hr to 5hr?



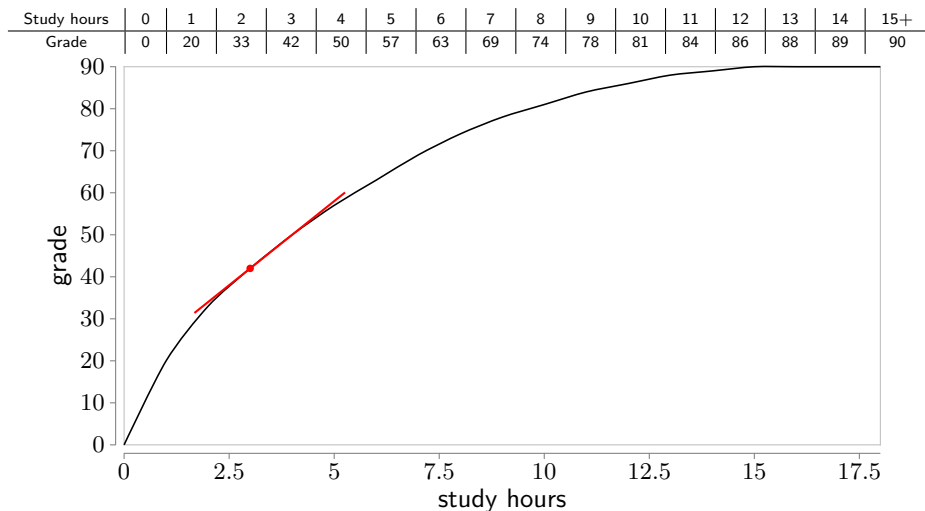
Production Function for Study

What if I want to know the average grade from 3hr to 4hr?



Production Function for Study

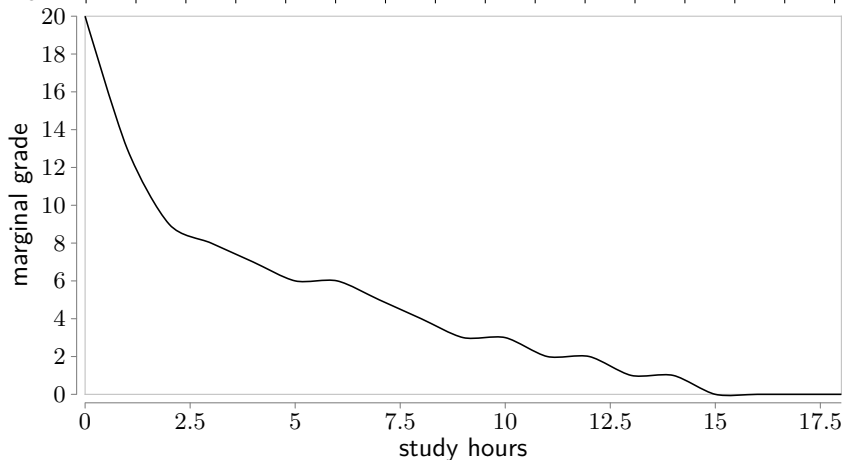
Marginal product: ceteris paribus, change in output per **arbitrary small change** in input



Diminishing Marginal Product of Study

Study become less productive the more you study! \Rightarrow Scarcity in nature

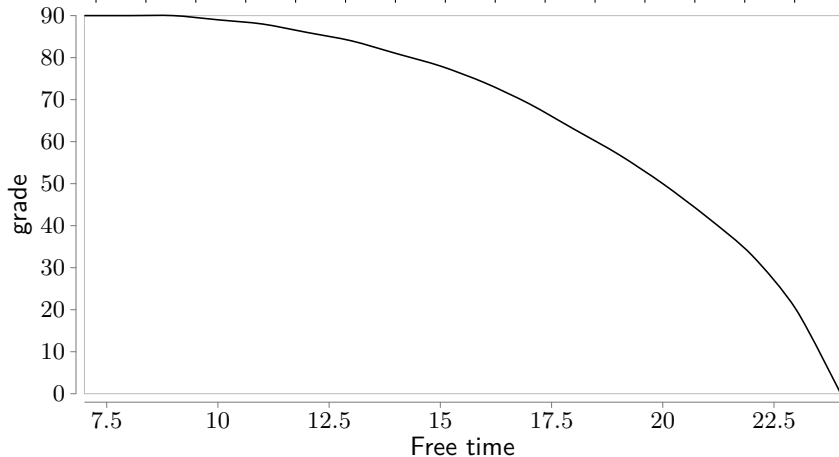
Study hours	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
Grade	0	20	33	42	50	57	63	69	74	78	81	84	86	88	89	90
mar. grade	20	13	9	8	7	6	6	5	4	3	3	2	2	1	1	0



The Production Possibility Frontier

Do you want to study all day? Probably not!

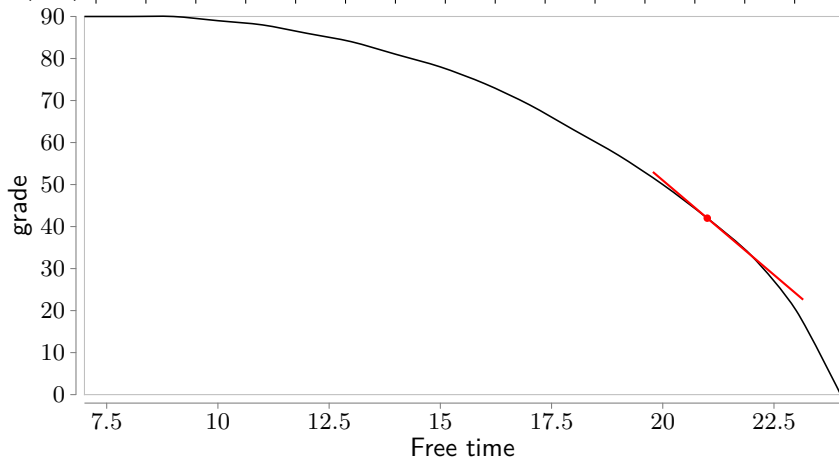
Study hours	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
Free time	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9–
Grade	0	20	33	42	50	57	63	69	74	78	81	84	86	88	89	90
MRT (=MP)	20	13	9	8	7	6	6	5	4	3	3	2	2	1	1	0



The Production Possibility Frontier

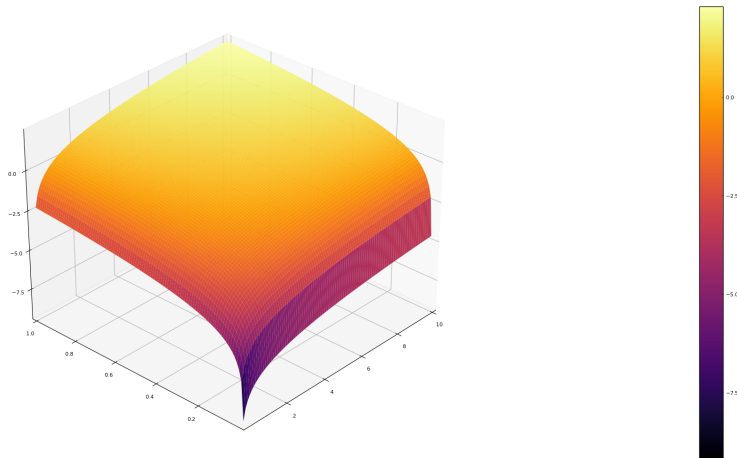
Supply side trade off between free time and grade \Rightarrow Marginal Rate of Transformation

Study hours	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
Free time	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9—
Grade	0	20	33	42	50	57	63	69	74	78	81	84	86	88	89	90
MRT (=MP)	20	13	9	8	7	6	6	5	4	3	3	2	2	1	1	0



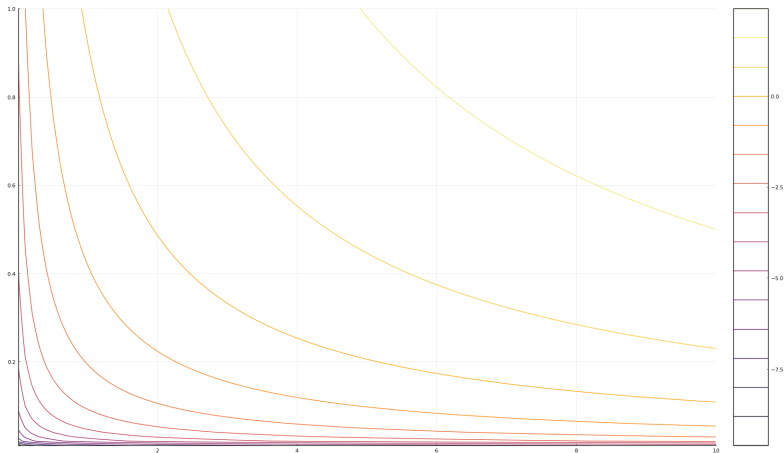
Utility Function

- As a student you **value** two things: **free time** and **grade**
- However, higher grade \Rightarrow sacrifice your free time!



Visualizing 3-D Function on 2-D plane

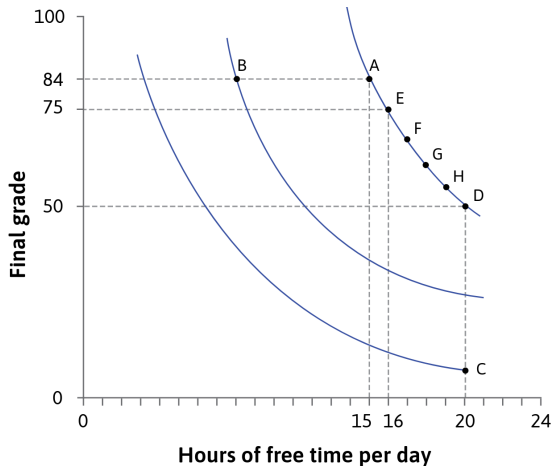
- It is hard for me to process 3D figure ☹... What should I do?
- **Contours**: “standing” at the peak and look down
 - e.g. [map on Alltrails](#)



Indifference Curve

The contour figure on utility function is indifference curve!

- **Def:** Combination of goods that gives **same level** of utility
- **Marginal Rate of Substitution:**
Demand side trade off between free time and grade
 - Graphical representation is the tangent line on indifference curve, similar to MRT

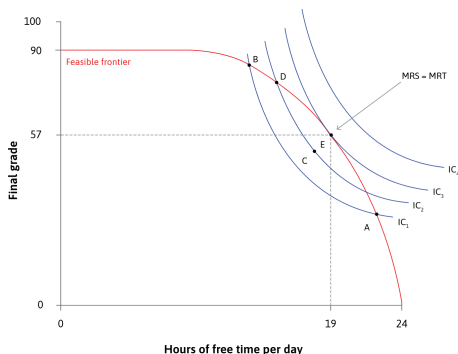


Decision-making under Scarcity

Optimal Social Resource Distribution

In the grade example, you are both the **consumer** and **producer** of grade and free time

- What you as a **social planner** want to do is to accord the **subjective** trade off in **MRS** with the **objective** trade in **MRT**
- Recall that on the figure, both MRS and MRT are **tangent lines**, and thus the **optimal social resource distribution** must allow utility function and production possibility frontier **tangent at the same point!**



Prices & Market Structure

- What real world things make $MRT = MRS$? \Rightarrow Prices!
- **Competitive** price determines the market trade off between two goods

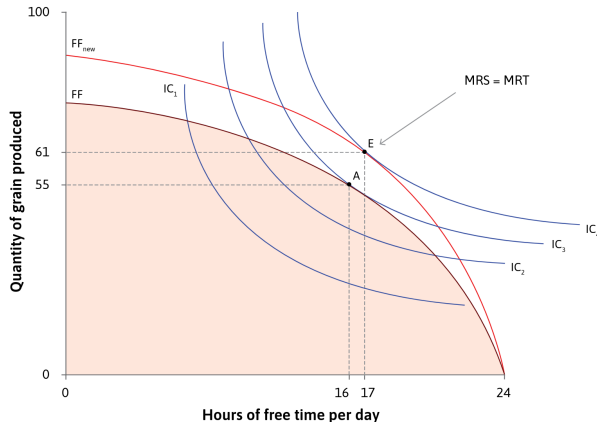
market	labor	credit	bond	capital
price	wage	interest rate	bond price	rental / purchase price

- Prices are not necessary be competitive \Rightarrow [market structure](#)
 - Perfect competition
 - Monopolistic competition
 - Monopoly
 - Oligopoly

Better Technology

What happens when the feasible frontier changes?

- PPF expands **only on grain production** \Rightarrow why?
- Better tech \Rightarrow more grain production and more free time!

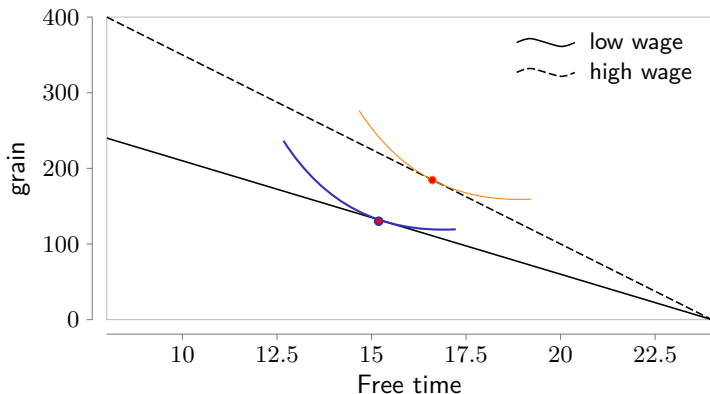


Income and Substitution Effects

Working Hours

Budget constraint is $c = w \times (24 - t)$, represented by the triangle area

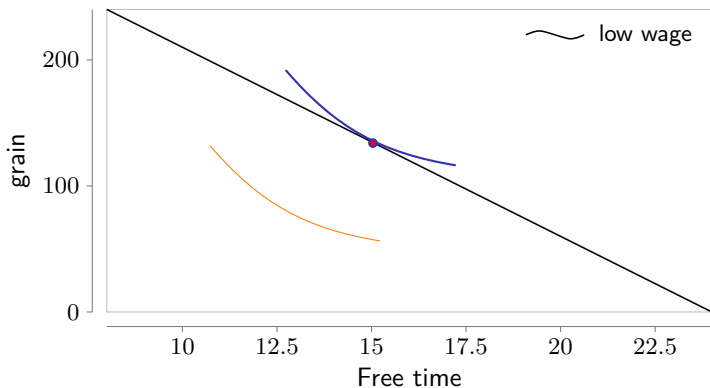
Hours of work	0	2	4	6	8	10	12	14	16
Free time, t	24	22	20	18	16	14	12	10	8
Consumption, c	0	\$30	\$60	\$90	\$120	\$150	\$180	\$210	\$240



Working Hours

Budget constraint is $c = w \times (24 - t)$, represented by the triangle area

Hours of work	0	2	4	6	8	10	12	14	16
Free time, t	24	22	20	18	16	14	12	10	8
Consumption, c	0	\$30	\$60	\$90	\$120	\$150	\$180	\$210	\$240



Two Important Effects

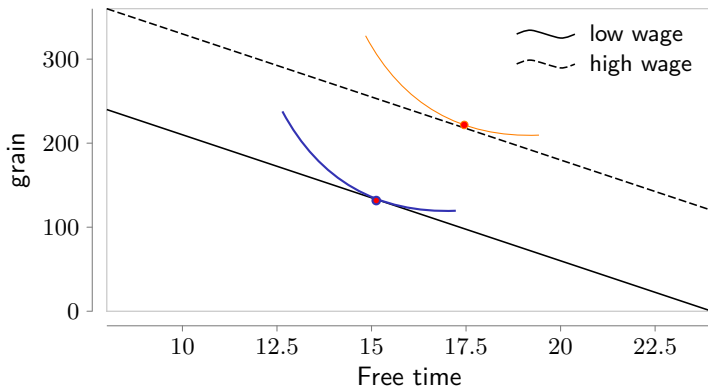
Wage change will affect the slope of budget constraint.

A wage increase will have two effects:

- ① **Income effect:** Total earnings \uparrow , if you work the same hour
 - **parallel shift** of the budget constraint
- ② **Substitution effect:** the opportunity cost of leisure is higher
 - **rotation** of the budget constraint

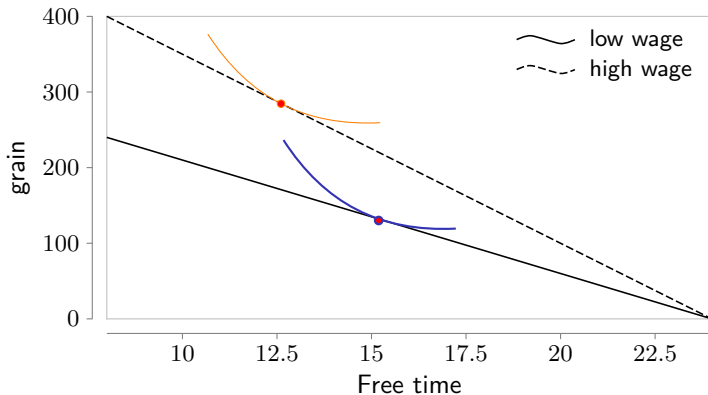
Income Effect

Both free time and grain $\uparrow \Rightarrow$ Both goods are **normal goods**



Substitution Effect

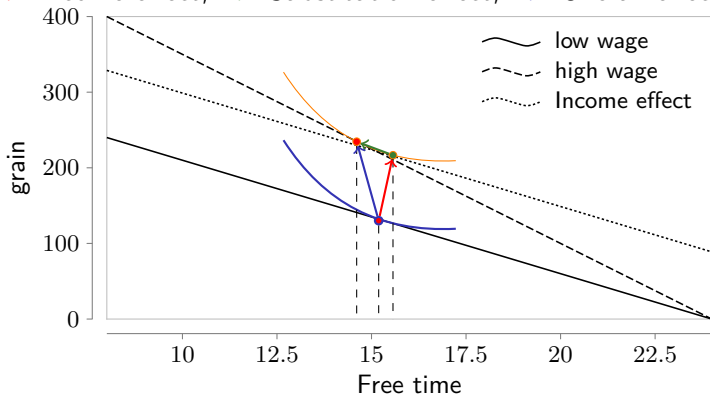
Cost of free time $\uparrow \Rightarrow$ Leisure \downarrow and grain \uparrow



Overall Effect on Labor Choice

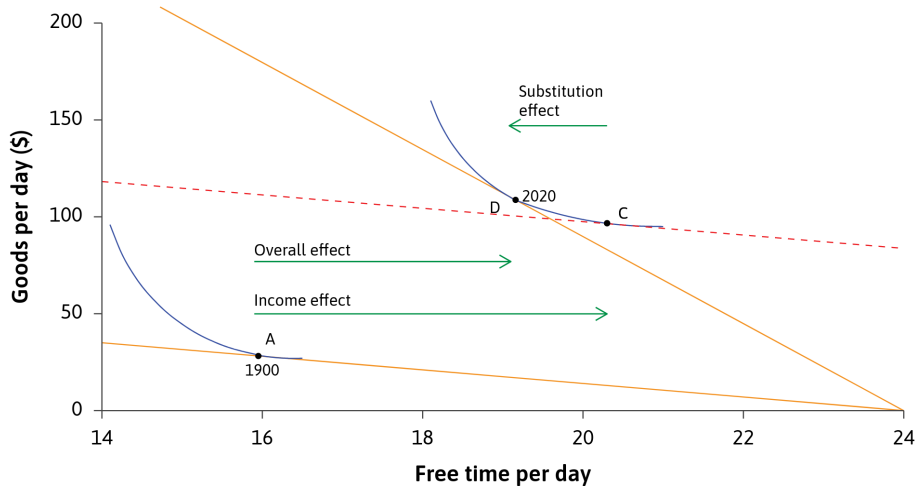
Overall effect = Income effect + Substitution effect

→: Income effect; →: Substitution effect; →: Overall effect

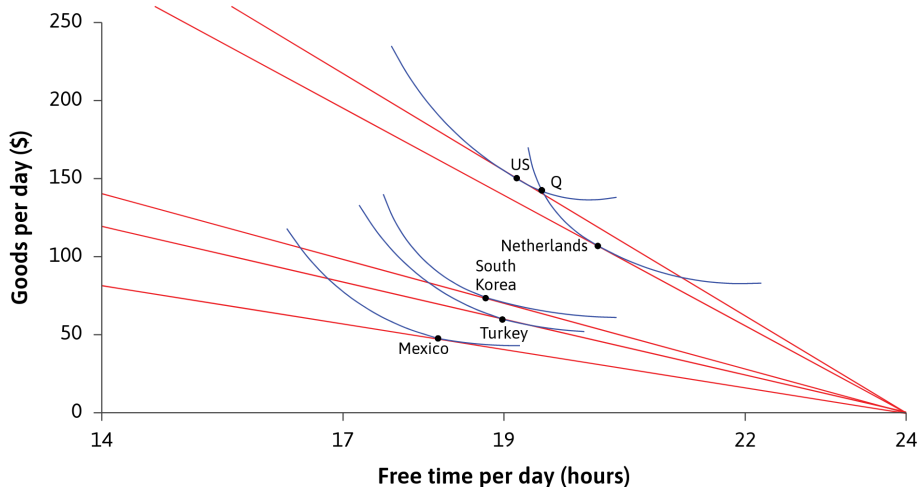


Application to Technological Change

Difference over time



Difference in Countries



Good Model?

Disadvantage:

- ① Most people cannot change their working hour in the short term
- ② blame the victim: poor countries are poor because their indifference curve

Advantage:

- ① Good approximation: Over time, people learn what combination of working hours and free time suits them best.