Gerald R. Ford School of Public Policy

Public Policy 558
Economic Analysis in the Practice of Public Policy

Insurance 2

Lecture 10

February 12th, 2025

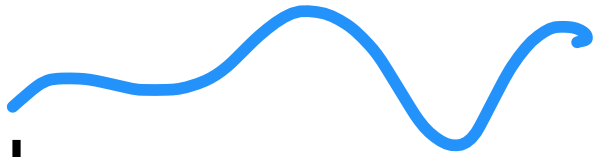
Professor Kevin Stange

Who is

?

Insurance Plan

- Today
  - Unemployment Insurance deep dive
  - Adverse selection



- Monday
  - COVID, UI, and moral hazard

Last time

- Suppose $U(Income) = 3(Income)^{0.5}$
- Choosing between two jobs mentioned earlier

  Job 1: Risky job:
  - Pays $10,000 with probability 0.50
  - Pays $20,000 with probability 0.50

  Job 2: Riskless job pays $15,000

- Questions to answer:
  1. Risk averse, loving, or neutral?
  2. Which job do you pick?
  3. What is the certainty equivalent of the risky job?
  4. What is the risk premium associated with the risky job?
  5. How much more would the risky job have to pay to make you indifferent between the two jobs?

What we found

- We found that the jobs have the same expected income

$$E[\text{Income}]_{job2} = E[\text{Income}]_{job1} = \$15{,}000$$

- But that riskless job had higher expected utility and is preferred

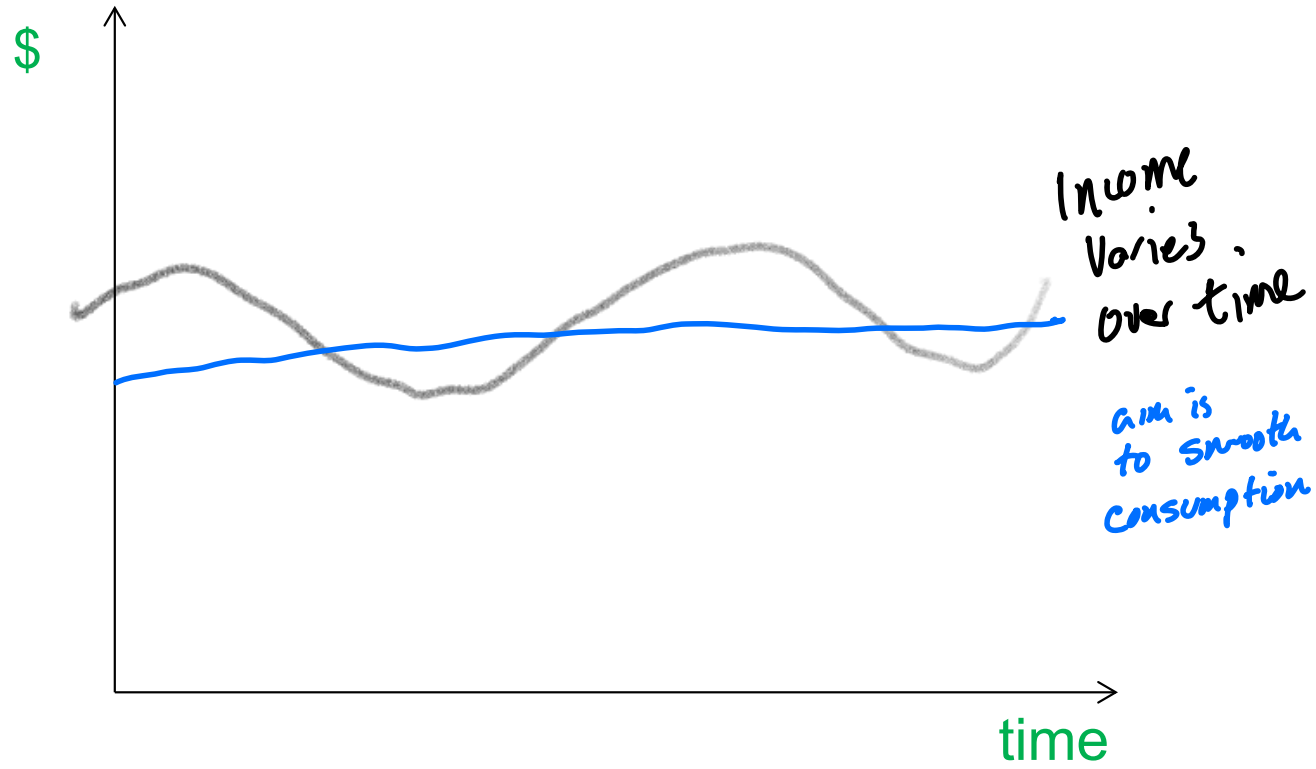
$$E[U]_{job2} = U_{job2} > E[U]_{job1}$$

- Implies that we could reduce the expected income of the riskless job so that $U_{job2} = E[U]_{job1}$

  → People will want to pay for insurance!

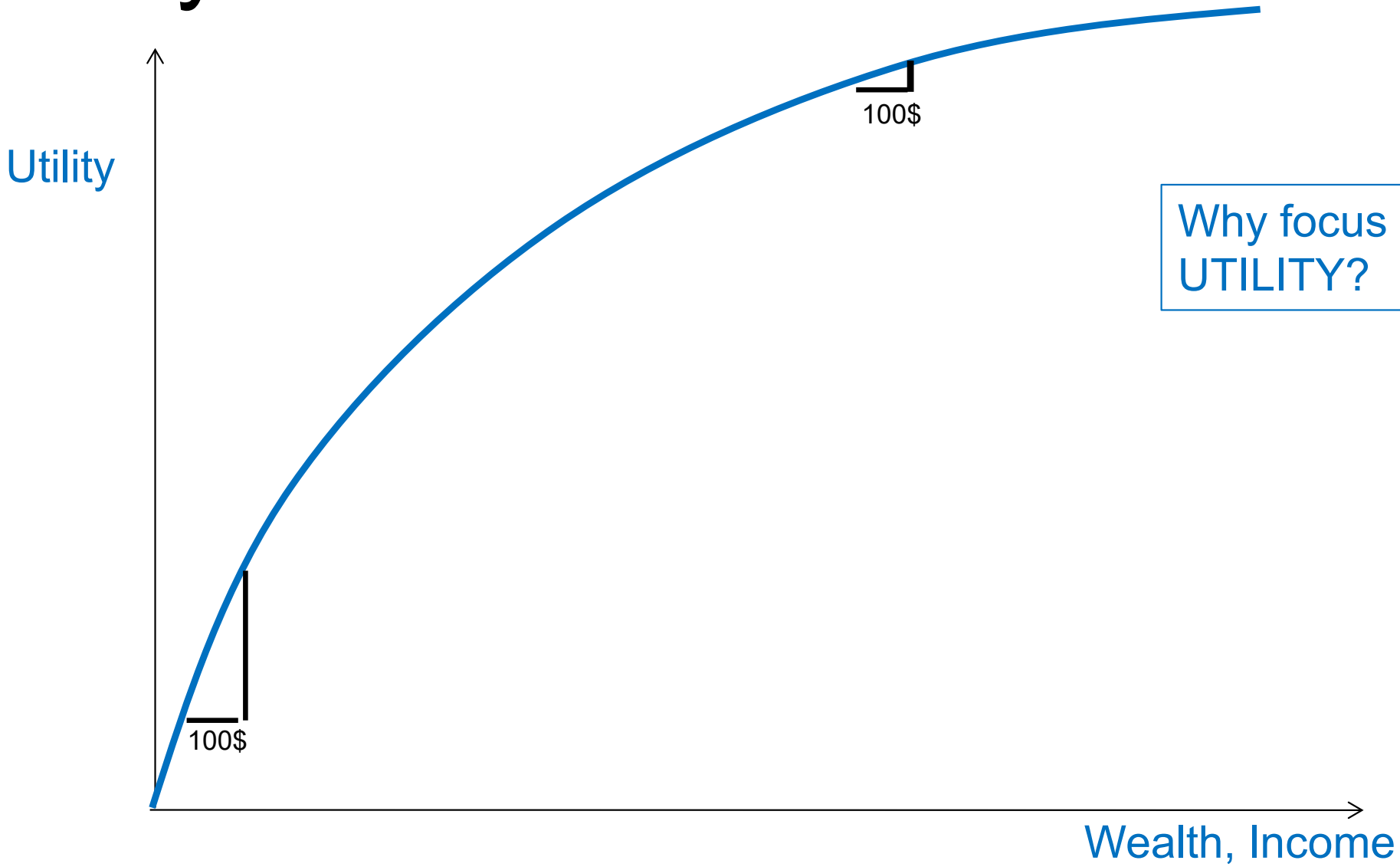
Think of the riskless job as a job with full unemployment insurance

Step Back: Why Is Insurance Valuable to People?



- Example: small farmer in developing country
- Prefer: ***steady consumption*** to variable income with same average level if **risk averse**

“Utility function” if risk averse



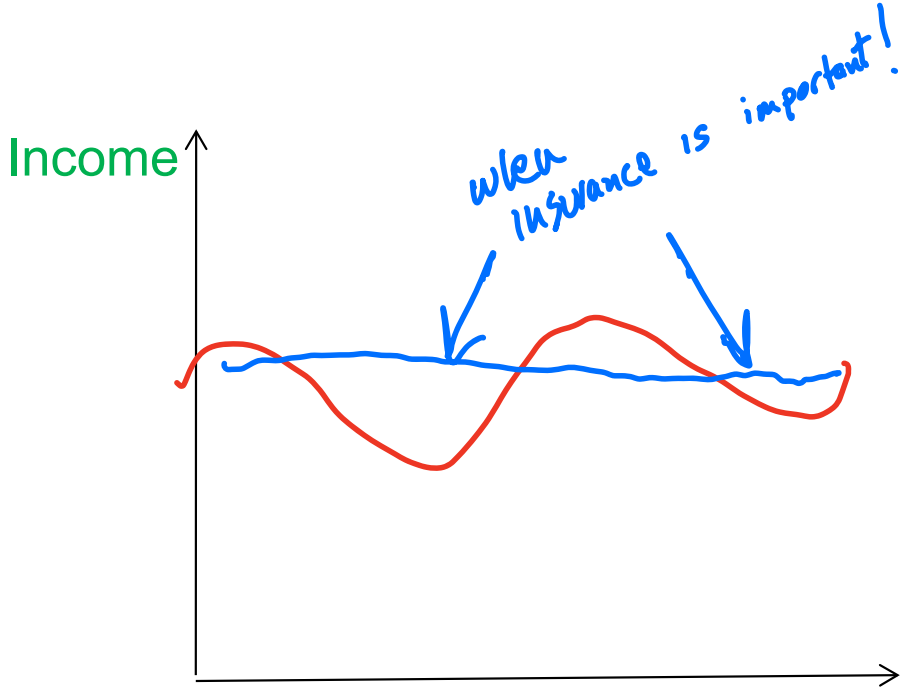
Why focus on UTILITY?

Risk averse: decreasing marginal utility (MU) of income

- concave e.g. $U=Wealth^{0.5}$

Ways for risk averse people to "smooth consumption"

1. Savings and loans (self-insure)
2. Insurance



Insurance companies: supply *risk reduction*

Example:

- Farmer pays premium every year
- Insurer pays for lost crop when drought

Unemployment Rate (UNRATE)

Observations
Jan 2025: **4.0**
Updated: Feb 7, 2025 7:47 AM CST
Next Release Date: Mar 7, 2025

Units:
Percent,
Seasonally Adjusted

Frequency:
Monthly

1Y | 5Y | 10Y | Max
1948-01-01 to 2025-01-01

Edit Graph
Download

Source: U.S. Bureau of Labor Statistics via FRED®
Shaded areas indicate U.S. recessions.

fred.stlouisfed.org
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NOTES

Source: U.S. Bureau of Labor Statistics
Release: Employment Situation
Units: Percent, Seasonally Adjusted
Frequency: Monthly

Notes:

The unemployment rate represents the number of unemployed as a percentage of the labor force. Labor force data are restricted to people 16 years of age and older, who currently reside in 1 of the 50 states or the District of Columbia, who do not reside in institutions (e.g., penal and mental facilities, homes for the aged), and

The source code is: LNS14000000

Suggested Citation:

U.S. Bureau of Labor Statistics, Unemployment Rate [UNRATE], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/UNRATE, February 10, 2025.

Unemployment Insurance (UI) in US

- Insurance against job loss (not your fault) - mandatory

- Operated and funded by states (somewhat in partnership with Fed)
- Started in 1930s as part of Social Security Act of 1935

- Employees pay into system (through their employer) when working, receive benefit when/if they lose their job
- Benefits vary by state, but typically replace 1/3 to 1/2 of earnings for a fixed period of time (usually up to 26 weeks)
- Must have been working in order to get benefits

UI During Covid

- Federal Pandemic Unemployment Compensation in April and December 2020
- Supplemental benefits $600 per week supplement on top of normal UI payments from April to July 31 2020
  - $300 from Dec 26 2020 to Sept 2021
  - Replacement rates > 100% for some workers
- Expanded eligibility to include self-employed, indpt contractors, not enough work history (PUA) (ended Sept 2021)
- Extended benefit period to 50 weeks

Is Unemployment Insurance Valuable to Worker?

1. Calculate expected utility (EU) with no unemployment insurance

2. Calculate expected utility (EU) with full insurance assuming actuarially fair premium

3. Compare $EU_{insured}$ to $EU_{uninsured}$
   → choose option with highest EU

4. Consider: will a private sector insurer offer this plan?

Terminology

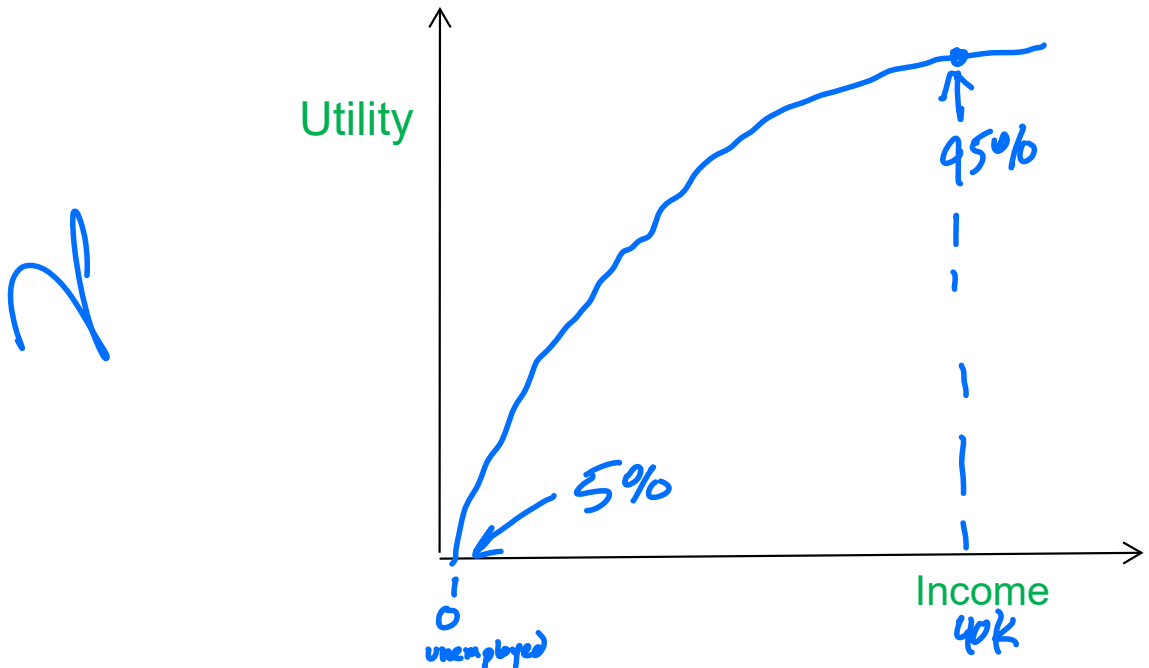
- Full insurance: pay full amount of loss if adverse event
  ("replacement rate" = 100%)

- Actuarially fair: insurance premium = expected payout
  - no administrative costs or profits

- Insurer's perspective: financial sustainability requires
  (Premiums collected across insured)
  >=
  (payouts to insured hit by adverse event)

UI Exercise

- Risk averse worker: utility function $U=W^{0.5}$
  - Utility (U) and Income (W)
    (here I am using income and wealth interchangeably)
- Earns $40,000 year
- 5% chance of being laid off and earn nothing



Step 1: Expected Utility
No Insurance

	Consumption	$U=W^{0.5}$
A) 95% keep job	$40,000	200
B) 5% laid off	0	0

Expected Utility = $(.95)(200) + (.05)(0) = 190$ utility

Probability(keep job)*Utility(keep job) + Probability(laid off)*Utility(laid off)

How to think about expectations

Expected utility (EU): average utility you *expect* from uncertain outcome

Over 100 years:

- 95 years: not laid off; job pays $40k → U ($40k) = 200
- 5 years: laid off; job pays $0 → U ($0) = 0
- Average: add up; divide by 100 = (200*95)/100 = 190

EU = Pr(keep job) U(keep job) + Pr(laid off) U(laid off)

= 0.95(200) + 0.05(0) = 190

Would worker take up full insurance?

Depends on:

- Value of insurance to worker (how risk averse they are)
- Price for insurance
- Whether worker can afford price

Actuarially Fair (AF) Premium = Pr(claim)*(cost per claim)

(from insurers perspective)

EXPECTED PAYOUT

- Each insured person pays in AFP → insurer has enough money to pay out expected claims → insurer breaks even

P(claim) × P(W) = Premium

- What is AF premium here? (.05)(40,000) = 2,000

2. EU with full insurance

Insurance worth it only if *expected utility* is higher with insurance than without insurance

if employed → 40,000 + 0 − 2000

Income= (salary) + (insurance payout) – (premium)

if unemp → 0 + 40000 − 2000

What is EU with payout = $40,000 and premium=$2000?

(note that you have to pay the premium even if you are unemployed)

With Insurance:

Income	$U=W^{0.5}$
38,000	$38k^{.5} = 195$
38,000	$38k^{.5} = 195$

A) 95% keep job

B) 5% laid off

190

195

Compare EU no insurance to EU insurance

A. Yes (worker buys insurance)

B. No (worker does not buy insurance)

C. Not sure

$EU_{ins} = 190$

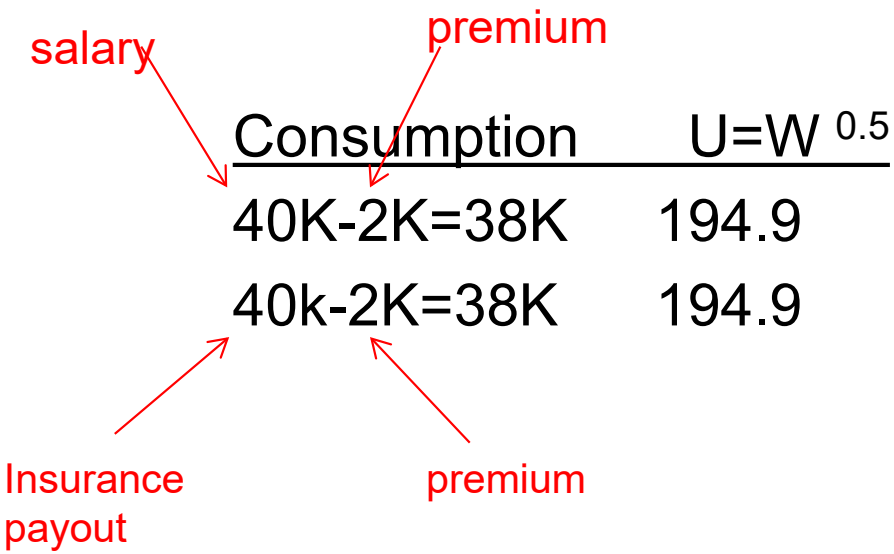
$EU_{no\ ins} = 195$

Take up insurance?

With Insurance:

A) 95% keep job

B) 5% laid off

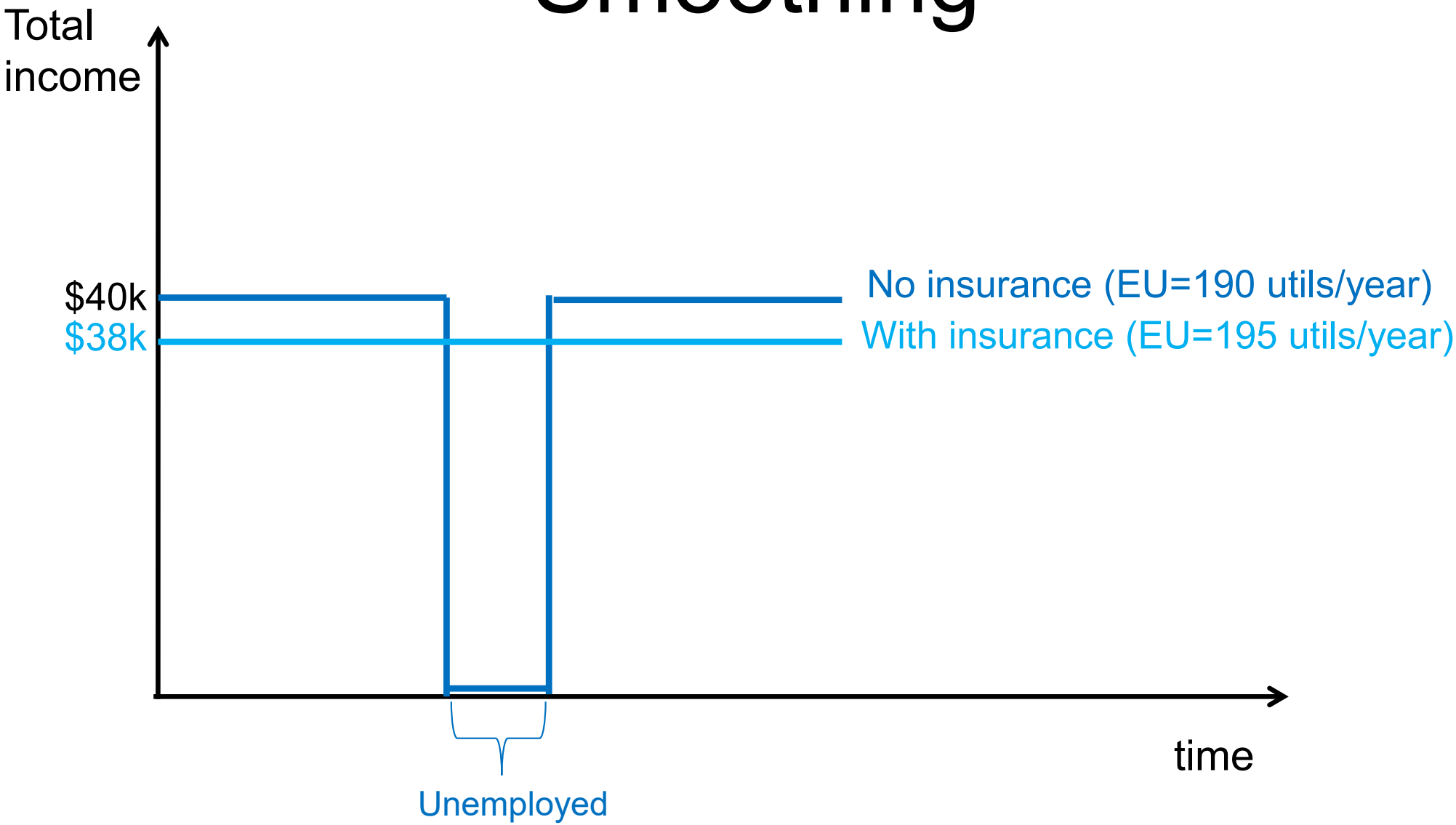


EU (insurance) = 0.95(194.9) + 0.05(194.9) = 194.9

EU (insurance) =194.9 > EU (w/o insurance)= 190

→ Insurance is better than no insurance

Back to Consumption Smoothing



4. Insurer's perspective
Does insurer break even?

- 5% probability of layoff; salary $40,000
- 100 insured workers; premium=$2000

- How many insured workers submit claim and are paid each year?

100 × .05 = 5

5 × 40,000 = 200,000

- How much total does insurer pay out in UI benefits to insured who are laid off?

100 × 5 × 40,000 = 200,000

- How much does insurer collect in premiums each year from 100 insured workers?

100 × 2000 = 200,000

- Could insurer charge slightly higher premiums?

(Probably)

Private information

What are some examples of private information in the unemployment insurance market?

1. Job search intensity
2. Outside resources
3. Seasonality
4. Why you got fired.

Two big design problems

Adverse selection – only people who need the insurance buy it – they know their likelihood of a bad outcome is high. Less risky people wont buy the insurance.

Solution: group insurance and mandates.

Moral hazard – actions may affect the probability of a bad outcome. Since I have car insurance, I drive fast. Since I have unemployment insurance, I don't look as hard for a new job (or I don't try to avoid losing one).

Solutions: (1) don't make the insurance *too* generous, (2) monitoring, (3) set insurance price based on past experience, (4) incomplete coverage (co-pays, deductables)

Introduce **Asymmetric Information**

Job loss risk lies on a spectrum

Suppose only two "types" of workers—each would benefit from insurance at actuarially fair price

(1) Workers in SAFE $40,000 a year jobs: chance of layoff 5%

- Actuarially fair premium low risk= $2000

(2) Workers in RISKY $40,000 a year jobs : chance of layoff 20%

- Actuarially fair premium high risk = $8000

Insurer's perspective

- Insurer only knows ***average risk*** for population—the proportion of all workers who are at higher risk of layoff

- What if insurer offers full insurance at a weighted average premium?

- "Risk pooling": grouping people who are at higher risk together with those who are lower risk in a single insurance plan

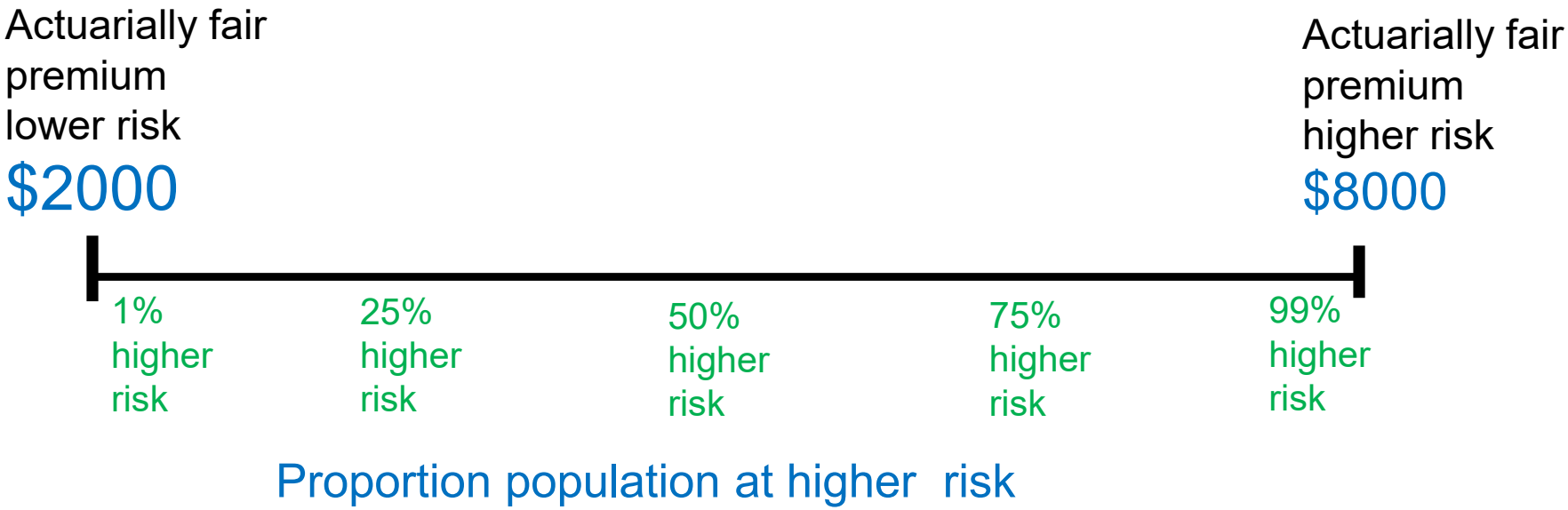
"Pooled" actuarially fair premium:

EXPECTED PAYOUT lower risk workers

(% in SAFE job) (safe payout in $)(probability safe claim) +
(% in RISKY job)(risky payout in $)(probability risky claim)

EXPECTED PAYOUT higher risk workers

Pooled premium



Share in SAFE Prop. in Risky

$(.5)(.05)(40{,}000) + (.5)(.20)(40{,}000) = \$5{,}000$

What happens in market for this plan?

Worker's perspective

- Compare expected utility of insurance to expected utility without insurance
- First for worker at lower risk of layoff
- Repeat for higher risk worker

Insurer's perspective

- Given which workers buy into this insurance plan, does the insurer break even with this plan at this pooled premium?

High risk worker – Do they purchase?

No Insurance

	Income	Utility=Income$^{0.5}$
A) 80% keep job	40,000	200
B) 20% laid off	0	0

Expected utility NO INSURANCE: $(.8)(40{,}000) + (.2)(0) = 160$

WITH INSURANCE

	Income	Utility=Income$^{0.5}$
A) 80% keep job	$40{,}000 - 5000 = 35{,}000$	187.1
B) 20% laid off	$40{,}000 - 5000 = 35{,}000$	187.1

Expected utility INSURANCE: $(.8)(187) + (.2)(187) = 187.1$

WILL BUY INSURANCE

Low risk worker – Do they purchase?

- Recall Expected utility without insurance = 190

Average premium when pooling with higher risk

	Income	Utility=Income$^{0.5}$
95% keep job	40K-5K=35K	187.1
5% laid off	40K-5K=35K	187.1

BAD DEAL for lower risk workers

LOW RISK workers will NOT purchase insurance at this price

→ *Self-insure:* do the best you can if laid off

Insurer perspective

- Only riskier group buys when pooling risk and averaging premium
- Will the insurer break even with pooled premium=$5000?
  - Break even only if expected payout per insured person <= premium
- Expected payout (pool *only higher risk* workers)

  = (0.2)($40,000) = $8000 >$5000 premium paid per enrollee
- Insurer loses $ if premium does not account for adverse selection

Adverse selection

"Adverse selection:" buyers who are at higher risk for insured adverse event disproportionately select into the plan (or low-risk types don't select the plan)

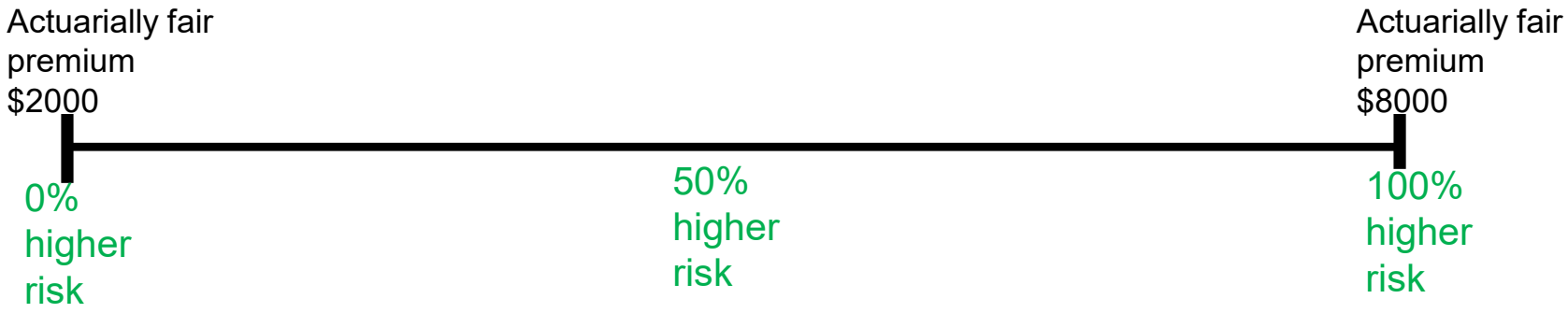
→ Buyers who are high cost to seller disproportionately buy

Insurance at average premium less likely worth it to lower risk people

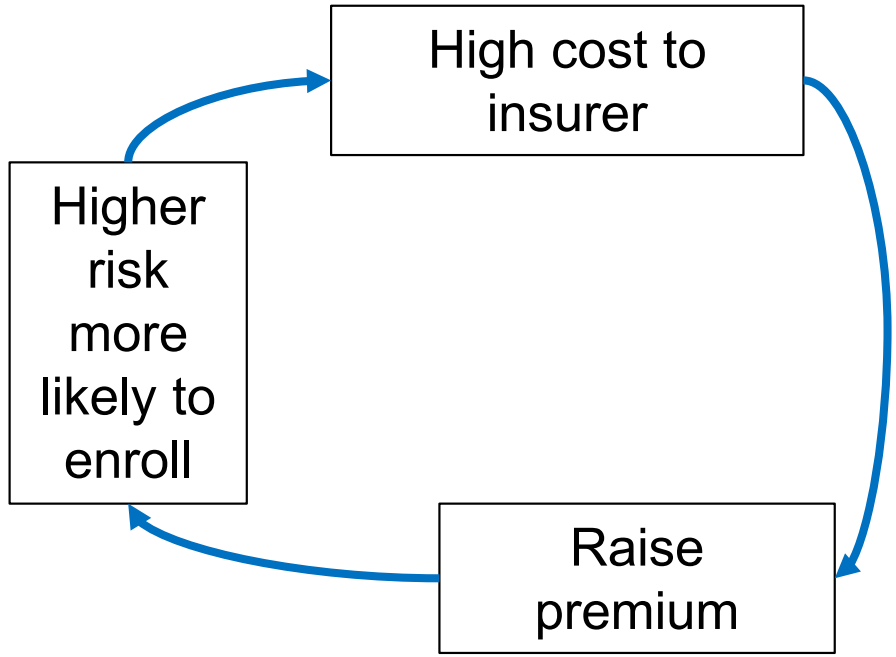
- Lower risk people subsidize higher risk people
- Insurance less valuable to these lower risk people

Implication

→ Always tendency for “selection” into plan of those at higher risk



Can end in a “DEATH SPIRAL”



Insurance plan costs rapidly increase as a result of changes in the covered population

→ no sustainable insurance plan

One private sector response to adverse selection

- Insurer offers multiple plans with different levels of coverage and prices

- Goal: buyers voluntarily "reveal their type"

Example:

- Generous coverage: full insurance ($40,000 if laid off) at high premium
- Stingy coverage: partial insurance ($20,000 if laid off) at lower premium

Possible outcome:

- High risk: worth it to pay more for more coverage
- Low risk: ok with less coverage

Why is this still problematic from social perspective?

not optimal. Want to cover everyone who is risk averse.

Takeaways so far

- People value insurance at premiums that are actuarially fair because it helps “smooth consumption”
- Transfers money or goods from good times to bad times

BUT:

- Cannot offer a plan priced at each person’s actuarially fair premium because of asymmetric information
  - Pooling across risk types: often unstable, always inefficient

- Some premiums may not be affordable

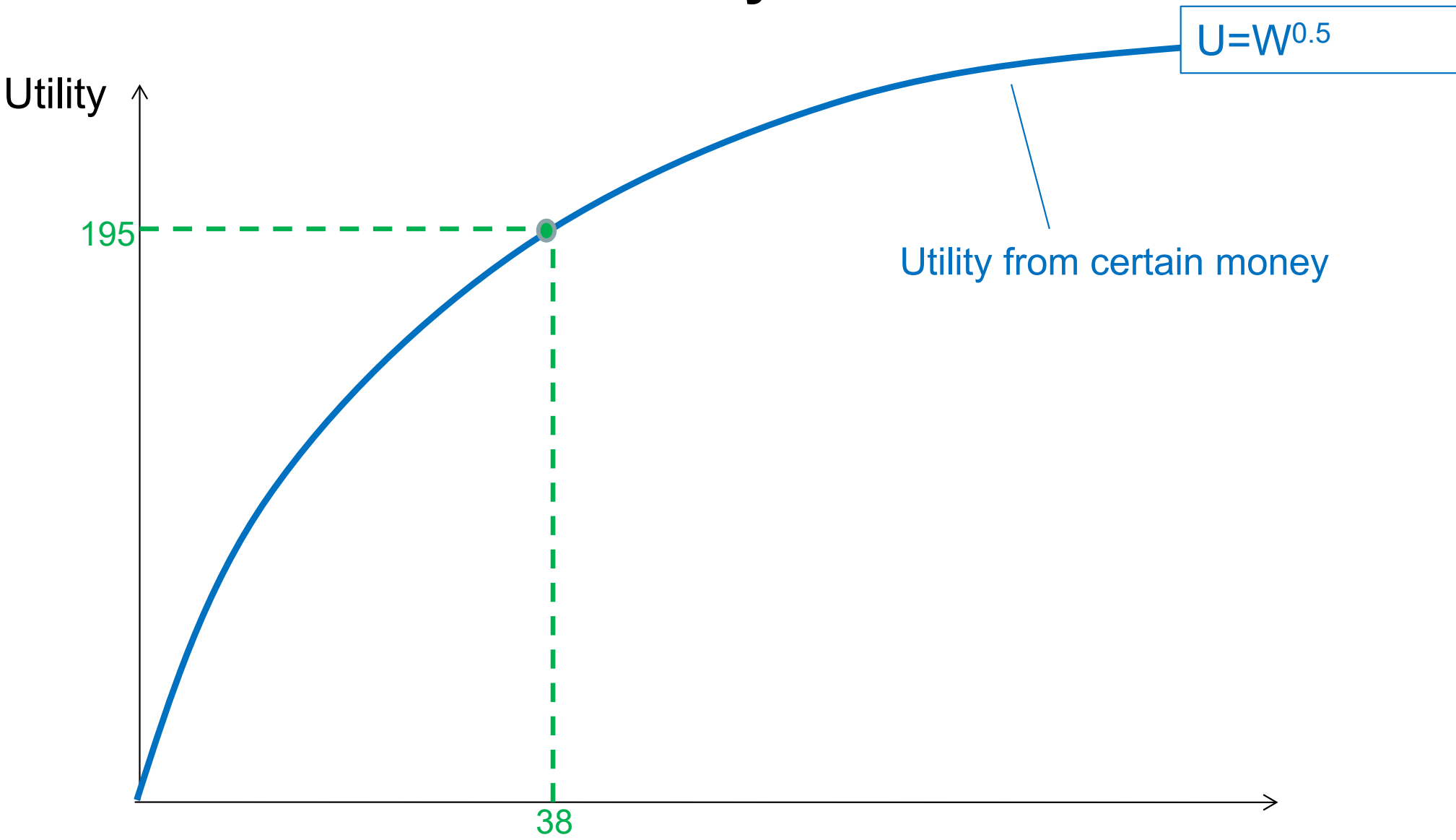
Private markets fail for efficiency and equity reasons

→ Social (public) insurance

Next class

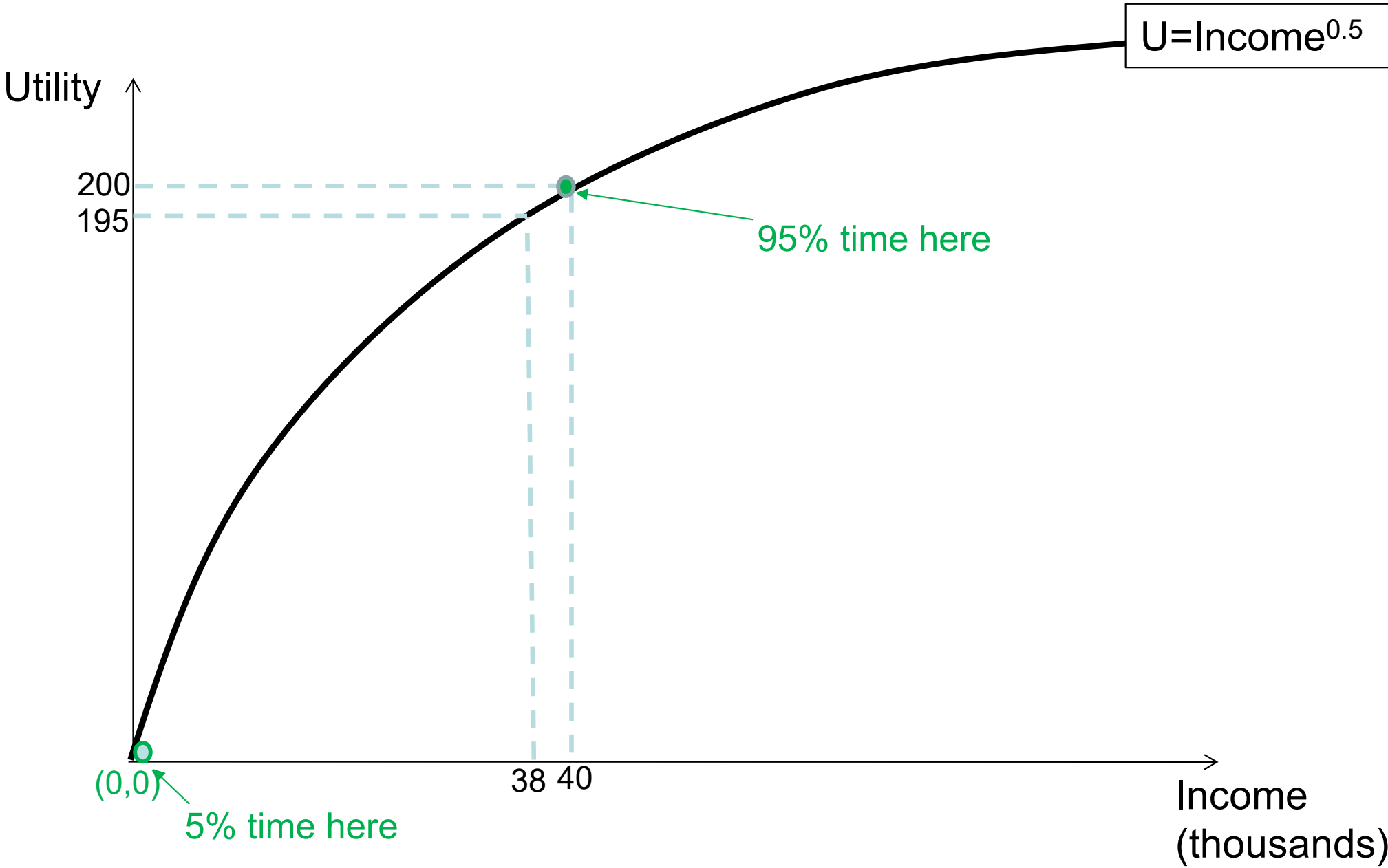
- Wrap up Unemployment Insurance
  - Moral hazard during COVID

Back to Utility Function

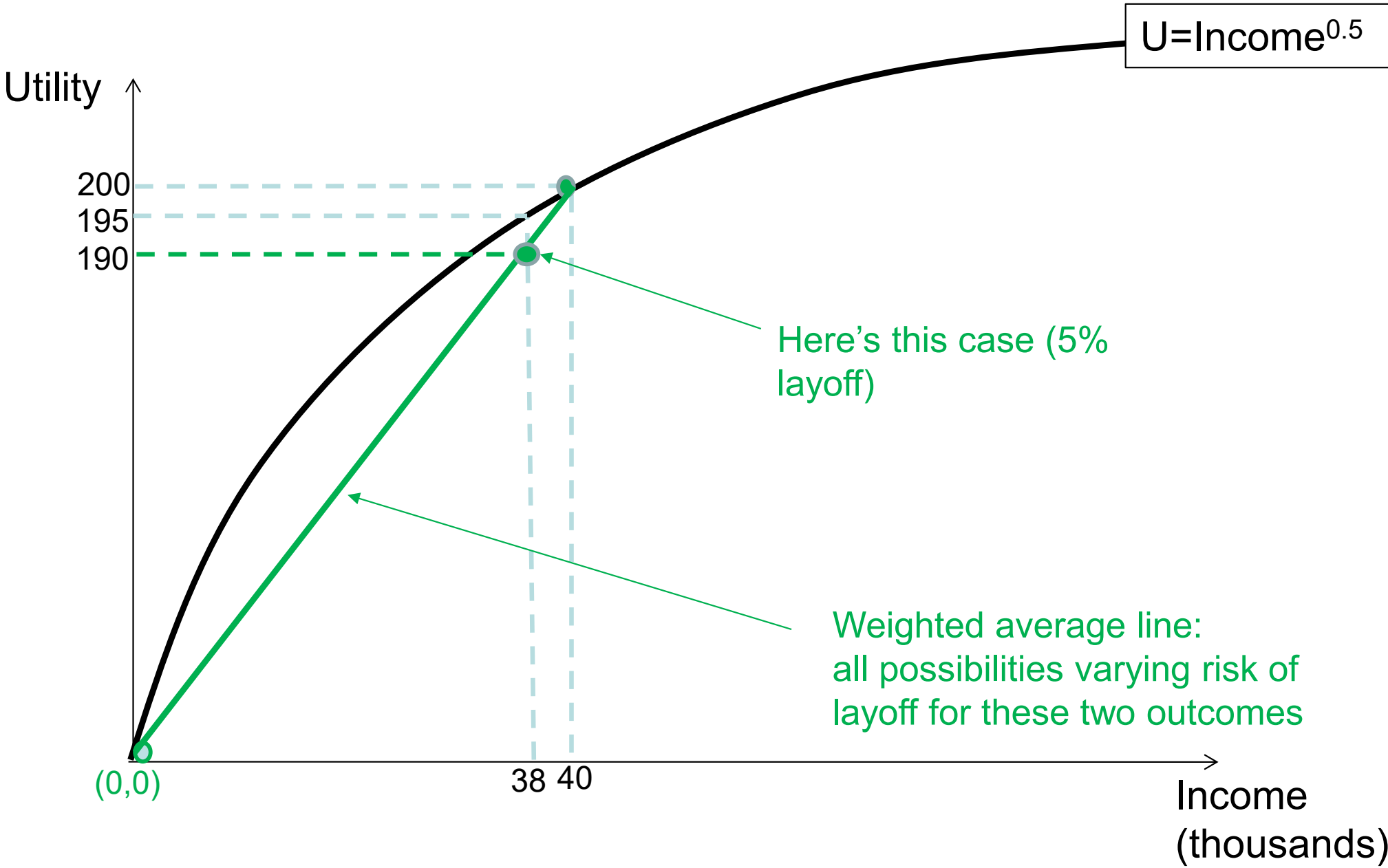


Example: $40k earnings; 5% risk layoff
Insurance: always $38k

NO INSURANCE: GAMBLE



NO INSURANCE: GAMBLE



NO INSURANCE: GAMBLE