

## Public Finance and Policy Analysis

Biwei Chen

*Public economics is the study of government intervention in the market economy, designed to move outcomes away from the market equilibrium. The two primary motivations for such interventions are improving market efficiency and redistributing resources across populations. The field is principally concerned with analyzing the effects of various tools — such as tax policies and social insurance programs — that are designed to achieve these aims.*

Raj Chetty and Amy Finkelstein (2020)  
NBER Program Report: Public Economics



Title: "Government" Mural by Elihu Vedder. Located in the Library of Congress. Source: [https://en.wikipedia.org/wiki/Public\\_finance](https://en.wikipedia.org/wiki/Public_finance)

# Public Finance and Policy Analysis

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## Learning Philosophy

Economics is the study of choice under scarcity. Public finance extends economics to the public sector and explains how governments make decisions in the economy. This course introduces the theoretical foundations, analytical tools, and empirical methods behind some of the most widely discussed policy debates and evaluations. Throughout the course, our discussions center around these basic questions:

- Should the government intervene?
- Why does the government intervene?
- How might the government intervene?
- What are the effects of the intervention?
- When should the government intervene?

In conducting empirical research and policy analysis, economists apply scientific methods to disentangling incentives and constraints facing individual, society and the government. Based on established principles, the right way to study Economics is to digest the topics intuitively, graphically, and quantitatively.

## Themes and Topics

### I. Foundations and Methods

1. Basic concepts
2. Economic principles
3. Theories and models
4. Empirical methods

### II. Public Expenditure

1. Budget analysis
2. Deficit and debt
3. Debt sustainability

### III. Public Revenue

1. Tax policy basics
2. Tax policy equity
3. Tax policy efficiency

### IV. Policy Evaluation

1. Education
2. Health care
3. Social security
4. Welfare program

## Principles in Economic Science

1. Scientific Methodology: Facts (Data) → Theory (Model) → Test (Rejection) → Application
2. Rationality Postulate: Maximum Benefit at a Minimum Cost
3. Opportunity Cost: Minimum Opportunity Cost among all Choices
4. Exchange Condition:  $UV_{Seller} < Exchange\ Value = Price < UV_{Buyer}$
5. Benefit-Cost: Maximize Net Benefit=Total Benefit–Total Cost
6. Marginal Equalization:  $MB \geq MC$  (optimize on the Margin)
7. Efficiency and Optimality: 1)  $MB=MC$ ; 2)  $\max\{NB=TB-TC\}$
8. Collective Decision and Policy Evaluation: Equity & Efficiency

# Lecture 1 Introduction & Overview

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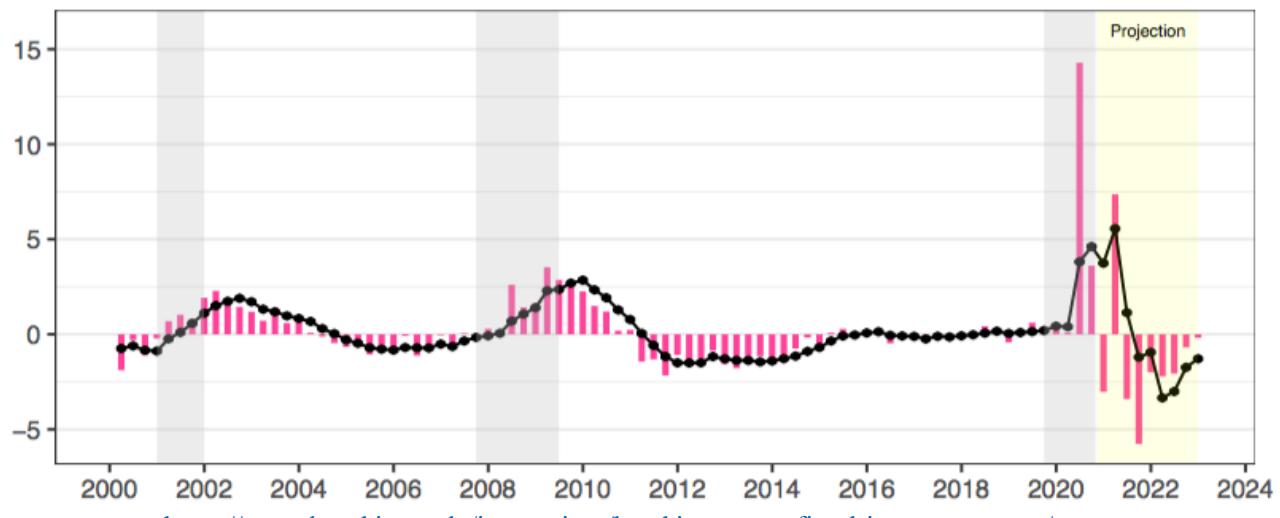
## Outline

- **Definition Nature and Scope**
- **Fiscal Response to COVID-19**
- **Federal Receipts and Outlays**
- **Government Size and Growth**
- **Public Finance Policy Debates**

### I. Definition and Scope

1. Public finance is the economics of the public sector. It focuses on the role of the government in the economy—how the government makes budget, expenditure, and taxation decisions.
2. Four fundamental questions of public finance
  - 1) *When* should the government intervene in the economy? Market failures.
  - 2) *How* might the government intervene? Tax, subsidy, provision, regulation.
  - 3) *What* is the effect of those interventions on economic outcomes? Direct and indirect.
  - 4) *Why* do governments choose to intervene in the way that they do? Equity and efficiency.
3. Scope: 1) public revenue/income; 2) public expenditure/spending; 3) public debt management
4. Domestic function: 1) resource allocation; 2) income redistribution; 3) economic stabilization
5. Foreign affairs: 1) national defense and security; 2) diplomacy and institutions; 3) foreign aid
6. Regulatory Role of the Government (regulates a wide range of economic and social activities)
  - 1) The Food and Drug Administration (FDA): food, cosmetics, drugs, and medical devices.
  - 2) The Occupational Safety and Health Administration (OSHA): workplace safety.
  - 3) The Federal Communications Commission (FCC): radio, television, wire, satellite, and cable.
  - 4) The Environmental Protection Agency (EPA): pollution of air, water, and food supplies.
7. Why study public finance? What are the benefits and costs? What are the jobs and careers?

**Fiscal Policy Contribution to Real GDP Growth, percentage points**



## II. The Fiscal Response to the COVID-19 Pandemic

### 1. What to know about all three rounds of COVID stimulus check? ([w](#))

### 2. Biden to Unveil \$1.9 Trillion COVID Response Plan (20210114)

Provision	Deficit Impact
Provide \$1,400 per person "Recovery Rebates" on top of the \$600 already issued	\$465 billion
Provide aid to state and local governments	\$350 billion
Increase Unemployment Insurance supplement to \$400/week and extend emergency UI provisions through September	~\$350 billion
Provide funding for a national vaccination program, testing, and other COVID containment efforts	\$160 billion
Fund school reopening and increase funding to schools and colleges	\$170 billion
Expand the Child Tax Credit to a refundable \$3,000 per child, \$3,600 for children under 6 (assuming one year)	~\$120 billion
Provide rental and small landlord support	\$30 billion
Provide support to childcare providers	\$25 billion
Other policy changes	~\$200 billion
<b>Total Reported Cost</b>	<b>\$1.9 trillion</b>

<http://www.crfb.org/blogs/biden-unveil-19-trillion-covid-response-plan>

### 3. Breaking Down \$3.4 Trillion in COVID Relief (20210107)

With the passage of the Response & Relief Act (20201221), the U.S. Congress has now allocated nearly \$4.5 trillion of COVID relief at a net cost of over \$3.4 trillion.

#### **Estimated Deficit Impact of Major COVID Relief Legislation (billions)**

	Families First	CARES	PPPHCE	Response & Relief	Total
Small Business Support^	-	\$375	\$255	\$325	\$960
Unemployment Benefits	\$5	\$460	-	\$120	\$585
Recovery Rebates	-	\$290	-	\$165	\$460
Health Care Spending	\$90	\$160	\$100	\$70	\$420
State and Local Aid*	\$85	\$175	-	\$80	\$340
Tax Relief	\$25	\$265	-	\$40	\$330
Other Spending	\$20	\$170	-	\$135	\$325
<b>Total COVID Relief (Net Cost)</b>	<b>\$225</b>	<b>\$1,900</b>	<b>\$355</b>	<b>\$935</b>	<b>\$3,415</b>

Rounded to nearest \$5 billion.

Source: Committee for a Responsible Federal Budget based on CBO, JCT, and other sources.

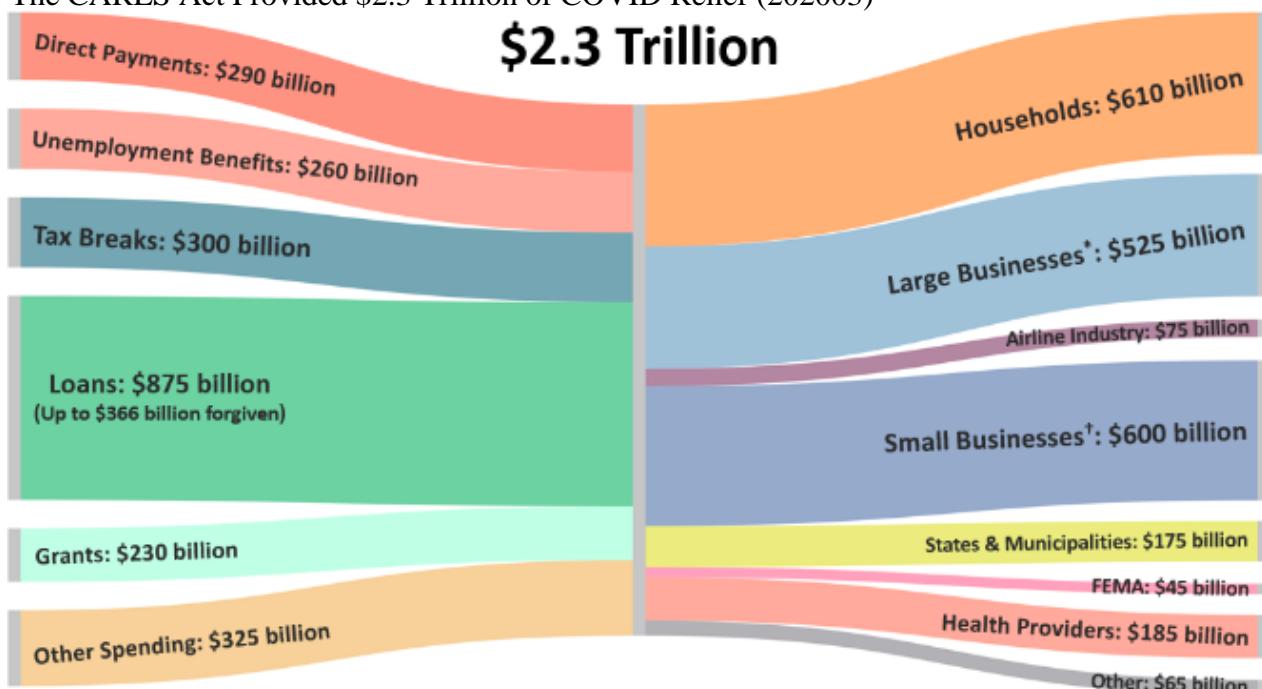
<sup>\*</sup>We assume the PPP from the CARES Act cost based on its initial score and allocate all returned or unused funds to the PPPHCE

<sup>\*</sup>Includes Coronavirus Relief Fund money and funding for public schools, transit, and existing Medicaid costs.

<http://www.crfb.org/blogs/breaking-down-3-4-trillion-covid-relief>

### 4. What's in the Final COVID Relief Deal of 2020? ([w](#))

5. The CARES Act Provided \$2.3 Trillion of COVID Relief (202003)



<http://www.crfb.org/blogs/visualization-cares-act>

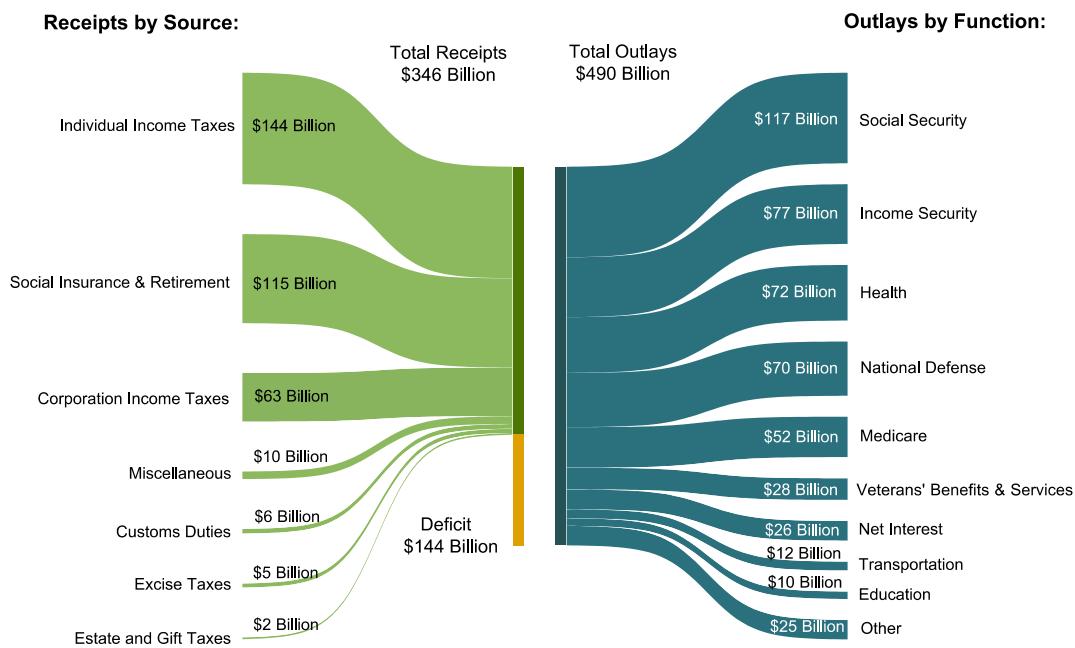
6. A Closer Look at the Record \$3.1 Trillion Deficit in FY 2020

Budget Area	FY 2019	FY 2020	% Change
Social Security	\$1.0 trillion	\$1.1 trillion	5.0%
Medicare	\$651 billion	\$776 billion	19.2%
Medicaid	\$409 billion	\$458 billion	12.0%
Economic Rebates	-	\$275 billion	N/A
Coronavirus Relief Fund	-	\$149 billion	N/A
Unemployment Benefits	\$32 billion	\$476 billion	N/A
Small Business Administration (mostly PPP)	\$0.5 billion	\$577 billion	N/A
Military	\$654 billion	\$690 billion	5.6%
Interest on the Debt	\$376 billion	\$345 billion	-8.2%
Other	\$1.3 trillion	\$1.7 trillion	33.4%
<b>Total Spending</b>	<b>\$4.4 trillion</b>	<b>\$6.6 trillion</b>	<b>47.3%</b>
Income and Payroll Taxes	\$3.0 trillion	\$2.9 trillion	-1.4%
Corporate Taxes	\$230 billion	\$212 billion	-8.0%
Fed Remittances	\$53 billion	\$82 billion	55.1%
Other	\$218 billion	\$208 billion	-4.9%
<b>Total Revenue</b>	<b>\$3.5 trillion</b>	<b>\$3.4 trillion</b>	<b>-1.2%</b>
<b>Deficit</b>	<b>-\$984 billion</b>	<b>-\$3.1 trillion</b>	<b>218%</b>

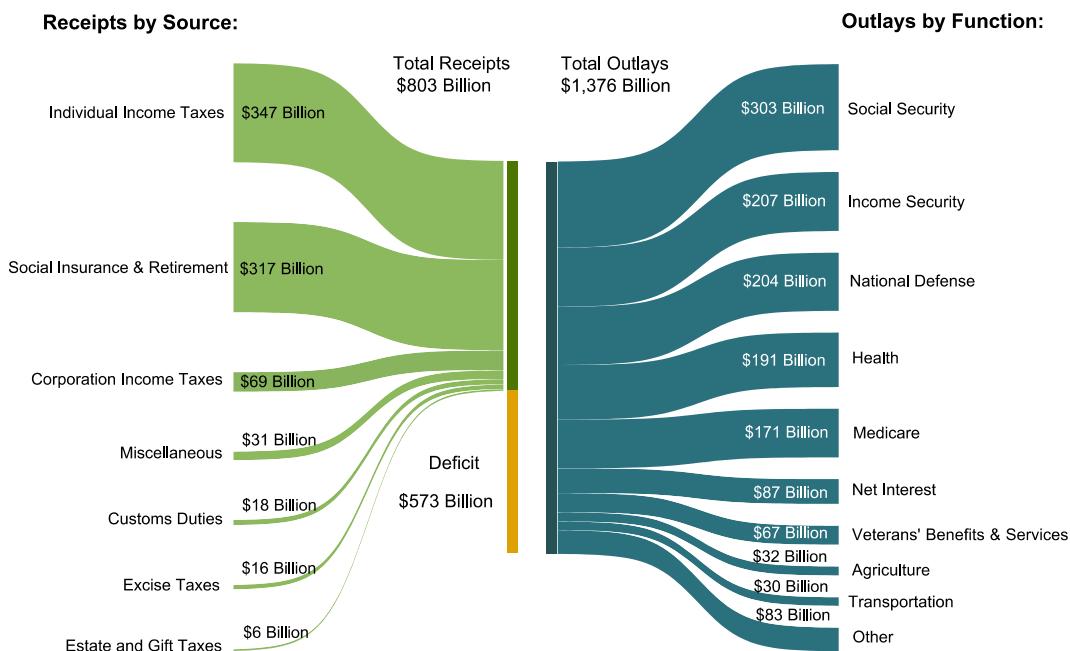
<http://www.crfb.org/blogs/closer-look-record-3-1-trillion-deficit-fy-2020>

### III. Federal Government Receipts and Outlays <https://www.fiscal.treasury.gov/reports-statements/mts/current.html>

**Figure 1. Receipts, Outlays, and Surplus/Deficit for December 2020**



**Figure 2. Cumulative Receipts, Outlays, and Surplus/Deficit through Fiscal Year 2021**

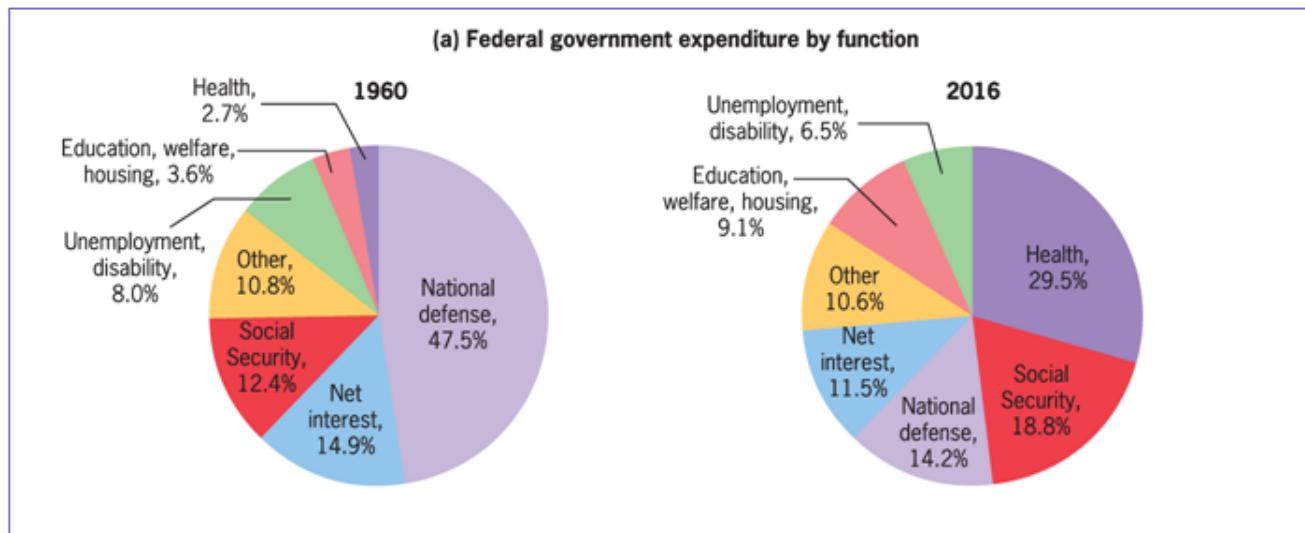


Source data: Table 9

Note: The fiscal year is the accounting period for the federal government which begins on October 1 and ends on September 30.

## 1. Federal expenditure breakdown 1960 vs 2016

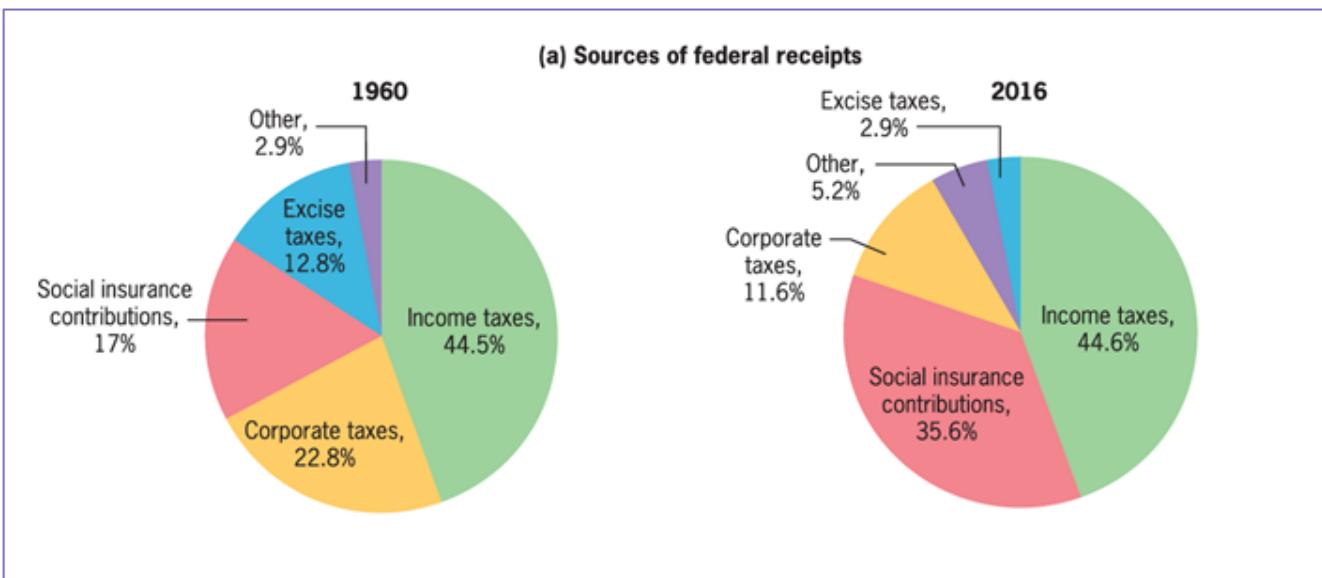
In 1960, nearly half of federal government spending was on national defense. Today, however, defense spending has fallen to less than one-fifth of the federal budget. The Social Security program is the single largest government program in the United States today.



Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

## 2. Federal revenue breakdown 1960 vs 2016

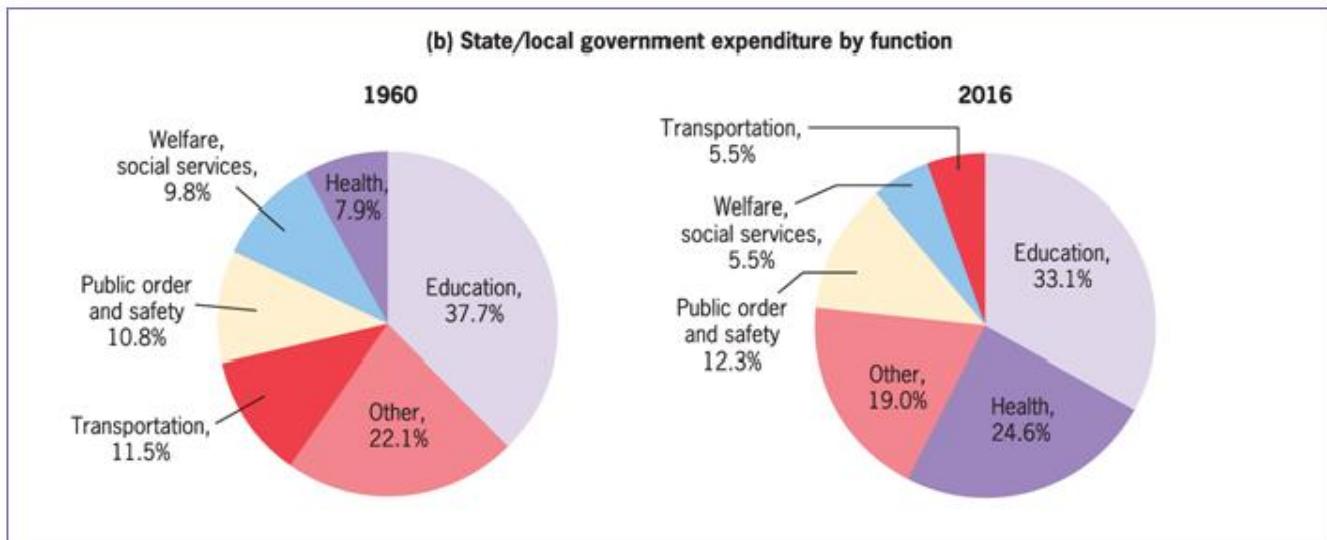
Corporate tax revenues once provided almost 25% of federal government revenue; they now provide only about 12%. Payroll taxes have grown from one-sixth of federal revenues to well over one-third.



Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

## 5. State and local expenditure breakdown 1960 vs 2016

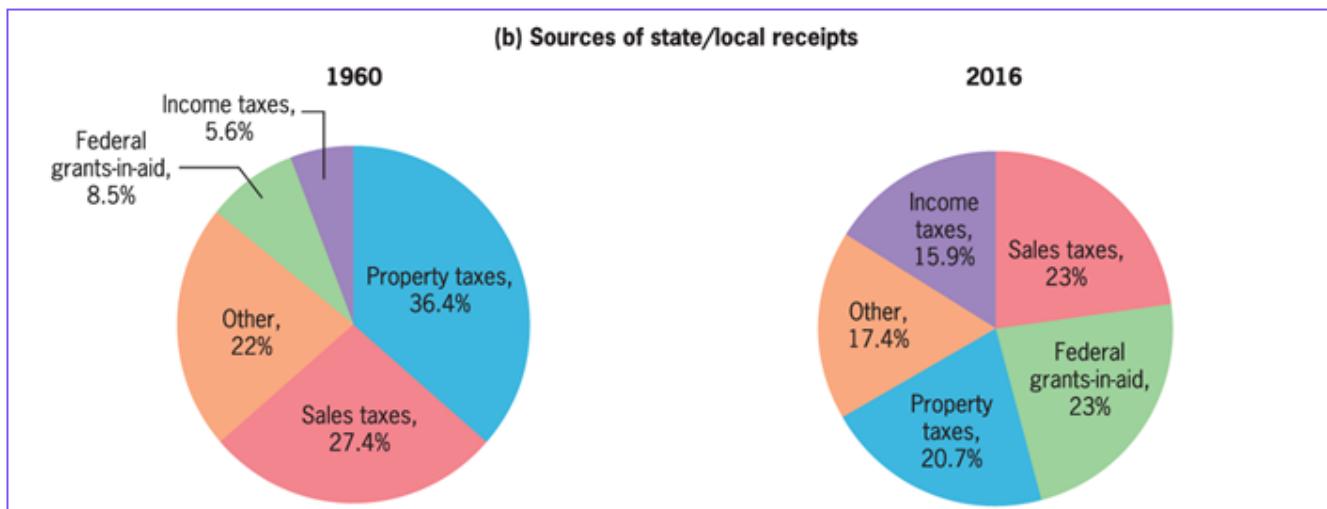
Education, welfare, and public safety account for almost 40% of state and local government spending. The major development has been the parallel growth in health care and the decline in education spending.



Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

## 6. State and local revenue breakdown 1960 vs 2016

Over the past 40 years, the substantial drop in revenue from property taxes has been made up for by rising federal grants and income taxes.

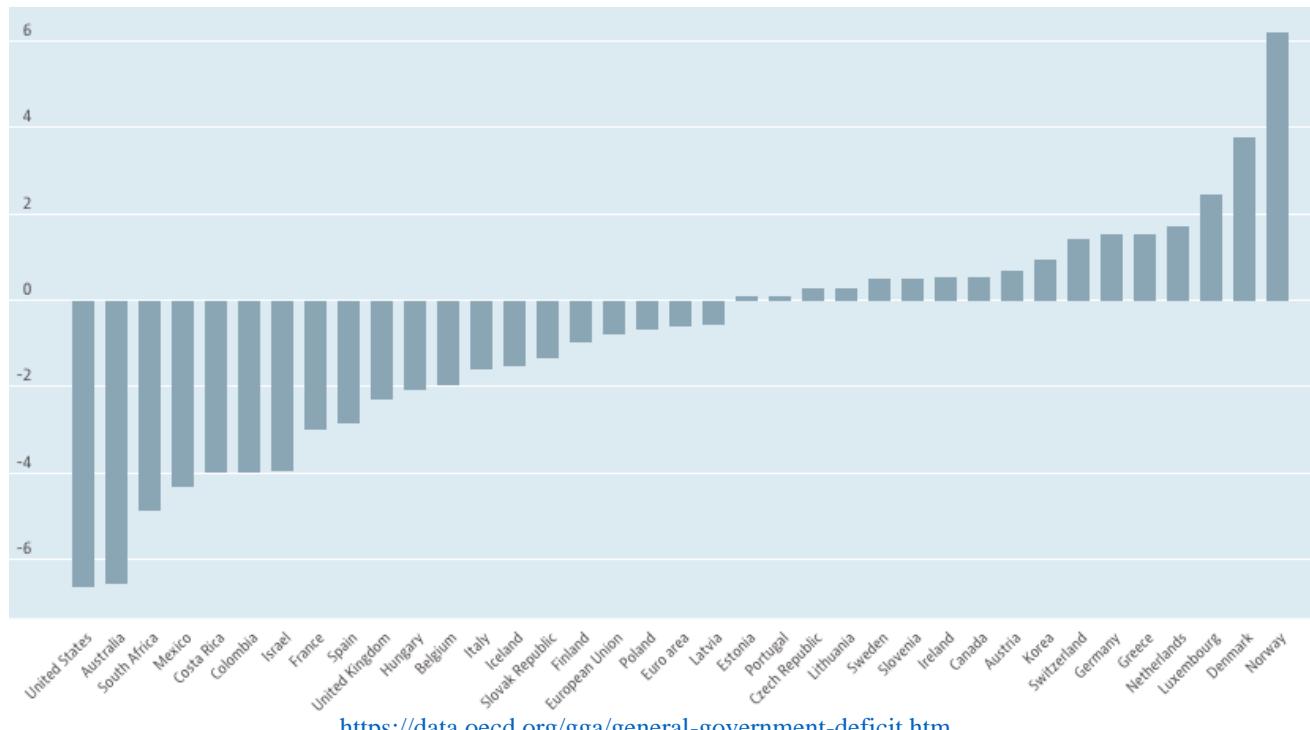


Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

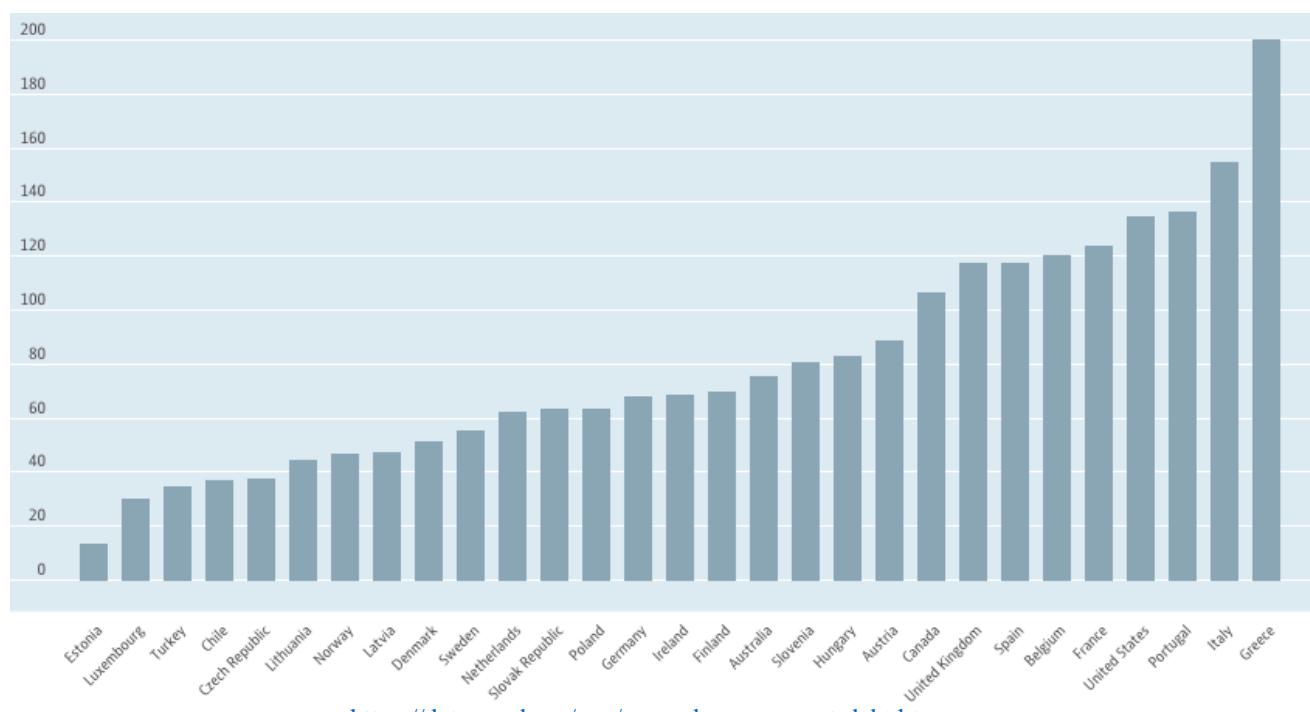
## 7. Fiscal Indicators by The Concord Coalition <https://www.concordcoalition.org/fiscal-indicators>

#### IV. The Size and Growth of the U.S. Government

##### 1. The size of the government deficit: international comparison 2019 (% GDP)

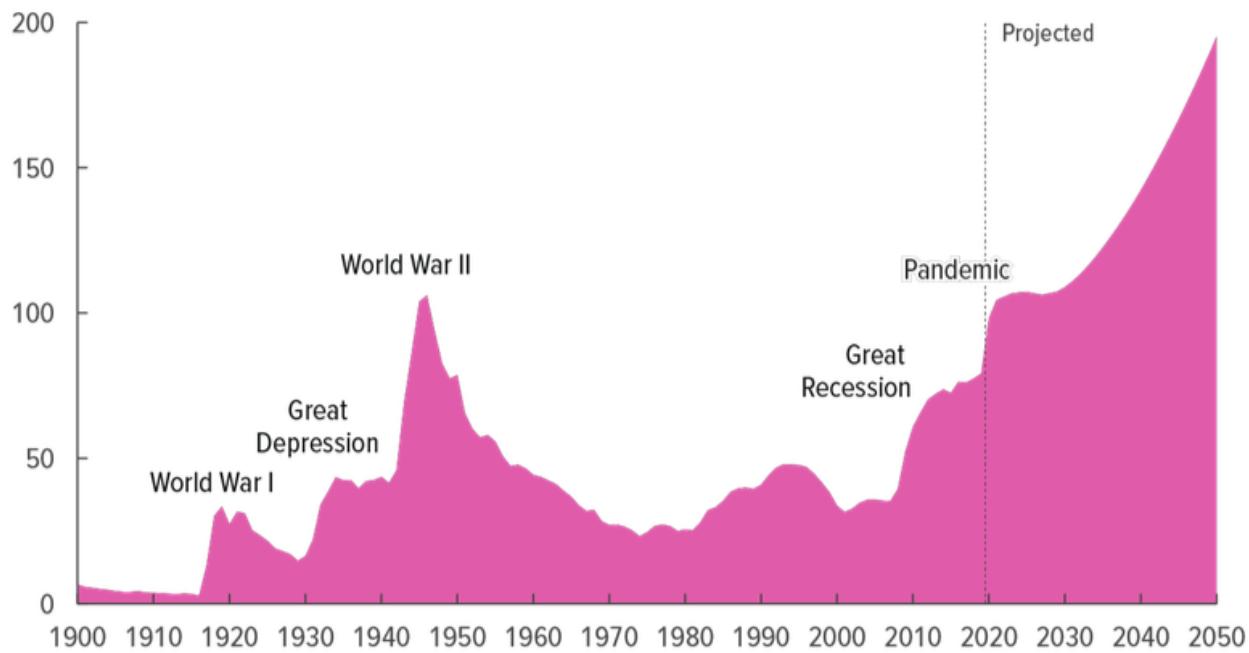


##### 2. The size of the government debt: international comparison 2019 (% GDP)



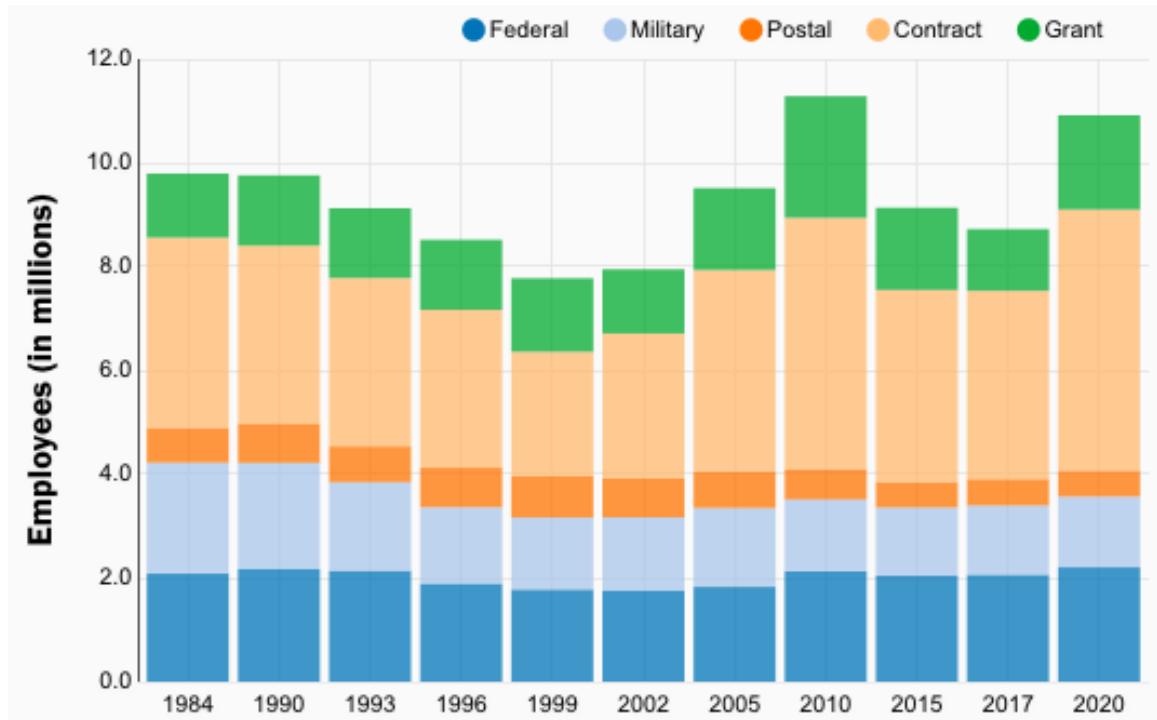
3. The size of the federal government: debt held by the public 1900-2050

Percentage of Gross Domestic Product



An Overview of the 2020 Long-Term Budget Outlook <https://www.cbo.gov/publication/56677>

4. The size of federal government: employees 1984-2020



<https://www.brookings.edu/blog/fixgov/2020/10/07/the-true-size-of-government-is-nearing-a-record-high/>

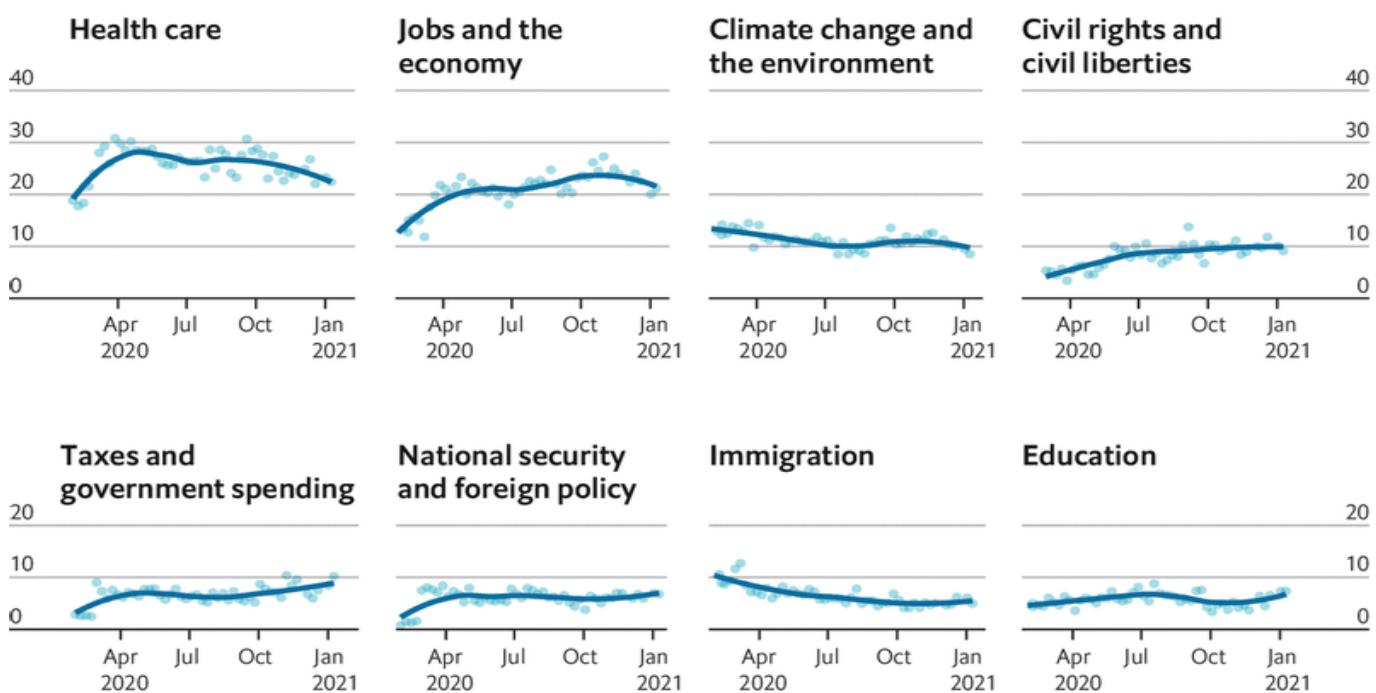
## VI. Public Policy Issues and Debates

Biden: his time 20210122

### The big issues

United States, most important issue

% responding, to January 9th 2021



Source: YouGov/The Economist

The Economist

<https://www.economist.com/graphic-detail/2021/01/22/biden-his-time>

Pandemics: *Biden's most pressing task is getting more vaccines quickly into Americans' arms. Worldwide, too, infections are still winning the race against injections. In some Asian countries, nationalism and geopolitics have hindered progress; in the European Union, institutional inertia has led to delay. Even in places that have made a fair start, such as Britain, there is a long way to go—though in Israel, which has started fastest of all, promising signs are already discernible. But with vaccine supplies limited, the spread of the virus will still depend on the effectiveness of lockdowns.* (The Economist, 2021)

202012 Gallup: What do you think is the most important problem facing the United States today?

*In December 2020, 20 percent of respondents stated that poor leadership and a general dissatisfaction with the government were the most important problems facing the U.S. Furthermore, another 33 percent of respondents said that the most important problem facing the U.S. was the coronavirus pandemic.*

<https://www.statista.com/statistics/323380/public-opinion-on-the-most-important-problem-facing-the-us/>

202102 WSJ: How Public Universities Became So Expensive ([w](#))

202102 WSJ: The Great Obamacare Expansion - Editorial Report ([w](#))

202103 WSJ: The Costs and Benefits of a \$15 Federal Minimum Wage ([w](#))

The Heritage Foundation: America's Biggest Issues <https://www.heritage.org/americanas-biggest-issues>

- Health care <https://youtu.be/BtEdYly-97g>
- Education <https://youtu.be/IcgVdUiWQ2k>
- Immigration <https://youtu.be/tZHuZUQ0atA>
- Environment <https://youtu.be/eXR2MIQf57g>
- Social welfare <https://youtu.be/ZzjXpYE2R9M>
- Public expenditure <https://youtu.be/R0LYm2fIEeo>

#### 1. The National Debt Dilemma <https://www.cfr.org/backgrounder/national-debt-dilemma>

In 2020, emergency spending in response to the coronavirus pandemic, after decades of steadily increasing debt, is projected to take U.S. debt to levels not seen since WWII.

*The way we talk about concerns associated with enormous national debt and unprecedented budget deficits must therefore evolve to match today's perception of reality. Simply ratcheting up apocalyptic and fatalistic messaging around fiscal irresponsibility, born of a concern about future catastrophic debt crises, simply does not relate to anything experienced by younger Americans. Furthermore, younger Americans frequently face tremendous financial burdens in their personal lives that often preclude a faithful reckoning with the implications of our national debt. So, although the traditional framing of the need for fiscal responsibility may remain accurate, with its emphasis on the risk of ignoring growing deficits and debts, the focus on worst-case outcomes only increases younger people's skepticism, cynicism, and detachment. (Brookings, Toolkit for engaging millennials with the national debt debate 2020)*

2. Health care: *The Affordable Care Act (ACA) has proven to be one of the most controversial and interesting policy innovations we've seen. The ACA requires Americans to buy health insurance, with a tax penalty for those who don't voluntarily buy in. The question of the proper role of government in the market for health care has many angles. One is the causal effect of health insurance on health. The United States spends more of its GDP on health care than do other developed nations, yet Americans are surprisingly unhealthy. For example, Americans are more likely to be overweight and die sooner than their Canadian cousins, who spend only about two-thirds as much on care. America is also unusual among developed countries in having no universal health insurance scheme. (M. Metrics, CH1) (CH1.3\*)*

3. Climate change: *The success of climate change activists has been both to point to apparent dangers today and to identify specific policies and individual actions young people can take that will lead to a healthier and more prosperous future—from specific policies to reduce emissions, to the financial and environmental benefits of driving a hybrid, to recycling. Although people know that their individual actions alone will not make a large difference, they feel part of an environmentally conscious movement, and their activities as members of that movement increase their support for large-scale reforms. (Brookings, Toolkit for engaging millennials with the national debt debate 2020)*

4. Education and student loans: *You'd rather pay for school with inherited riches than borrowed money if you can. However, education probably boosts earnings enough to make loan repayment bearable for most graduates. How then should we interpret the negative correlation between debt burden and college graduation rates? Does indebtedness cause debtors to drop out? Shall we claim that high debt burdens cause lower college completion rates based on comparisons of completion rates between those with more or less debt. (M. Metrics, Introduction)*

## Reference

Jonathan Gruber (2019) CH1 and Mastering `Metrics (2014) Introduction

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<https://home.treasury.gov>

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[https://en.wikipedia.org/wiki/National\\_debt\\_of\\_the\\_United\\_States](https://en.wikipedia.org/wiki/National_debt_of_the_United_States)

Brookings

<https://www.brookings.edu/topic/taxation/>

<https://www.brookings.edu/topic/the-federal-budget/>

<https://www.brookings.edu/topic/health-care-policy/>

<https://www.brookings.edu/topic/federal-fiscal-policy/>

<https://www.brookings.edu/topic/state-local-fiscal-policy/>

NBER Public Economics Programs

<https://www.nber.org/program-report-public-economics>

[www.nber.org/programs-projects/programs-working-groups/children](https://www.nber.org/programs-projects/programs-working-groups/children)

[www.nber.org/programs-projects/programs-working-groups/health-care](https://www.nber.org/programs-projects/programs-working-groups/health-care)

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[www.nber.org/programs-projects/programs-working-groups/economics-aging](https://www.nber.org/programs-projects/programs-working-groups/economics-aging)

[www.nber.org/programs-projects/programs-working-groups/public-economics](https://www.nber.org/programs-projects/programs-working-groups/public-economics)

[www.nber.org/programs-projects/programs-working-groups/economics-education](https://www.nber.org/programs-projects/programs-working-groups/economics-education)

<https://www.nber.org/reporter/2020number4/nber-retirement-and-disability-research-center>

Monthly Treasury Statement Receipts and Outlays of the United States Government for Fiscal Year 2021 Through December 31, 2020, and Other Periods [\(w\)](#)

202008 Toolkit for engaging millennials with the national debt debate [\(w\)](#)

202101 The macroeconomic implications of Biden's \$1.9 trillion fiscal package [\(w\)](#)

202102 Macroeconomic Effects of the \$1.9 Trillion Biden COVID Relief Plan [\(w\)](#)

202102 Direct Aid in the Biden COVID Relief Plan: Budgetary and Distributional Effects [\(w\)](#)

Fiscal Year vs Calendar Year <https://www.thebalance.com/fiscal-year-definition-federal-budget-examples-3305794>

202102 WSJ: How Public Universities Became So Expensive ([w](#))

202102 WSJ: The Great Obamacare Expansion - Editorial Report ([w](#))

202103 WSJ: The Costs and Benefits of a \$15 Federal Minimum Wage ([w](#))

201811 Weighing the Costs and Benefits of Facial Recognition Technology ([w](#))

Raj Chetty, John Friedman, Nathaniel Hendren, Michael Stepner, 2020. The Economic Impacts of COVID-19: Evidence from a New Public Database Built Using Private Sector Data, The Opportunity Insights Team, NBER WORKING PAPER NO. 27431, NOVEMBER 2020 ([w](#))

## Data Visualization

NPR Special Series: Coronavirus by The Numbers

<https://www.npr.org/series/885304437/coronavirus-by-the-numbers>

202012 CRFB Top 20 Charts of 2020

<http://www.crfb.org/blogs/our-top-20-charts-2020>

202003 What's Inside the \$2 Trillion Economic Stimulus

<https://howmuch.net/articles/breakdown-coronavirus-2t-economic-stimulus>

202003 How the \$150B Coronavirus Relief Fund Gets Divided

<https://howmuch.net/articles/distribution-150-coronavirus-relief-fund>

202004 Visualizing Coronavirus Stimulus Programs Around the World

<https://howmuch.net/articles/worlds-economic-programs-against-coronavirus>

2012 The U.S. Economy in Charts: The Size of Government, 1983 and 2010

<https://www.treasury.gov/resource-center/data-chart-center/us-economy/pages/default.aspx>

## Lecture 2 Theoretical Foundations

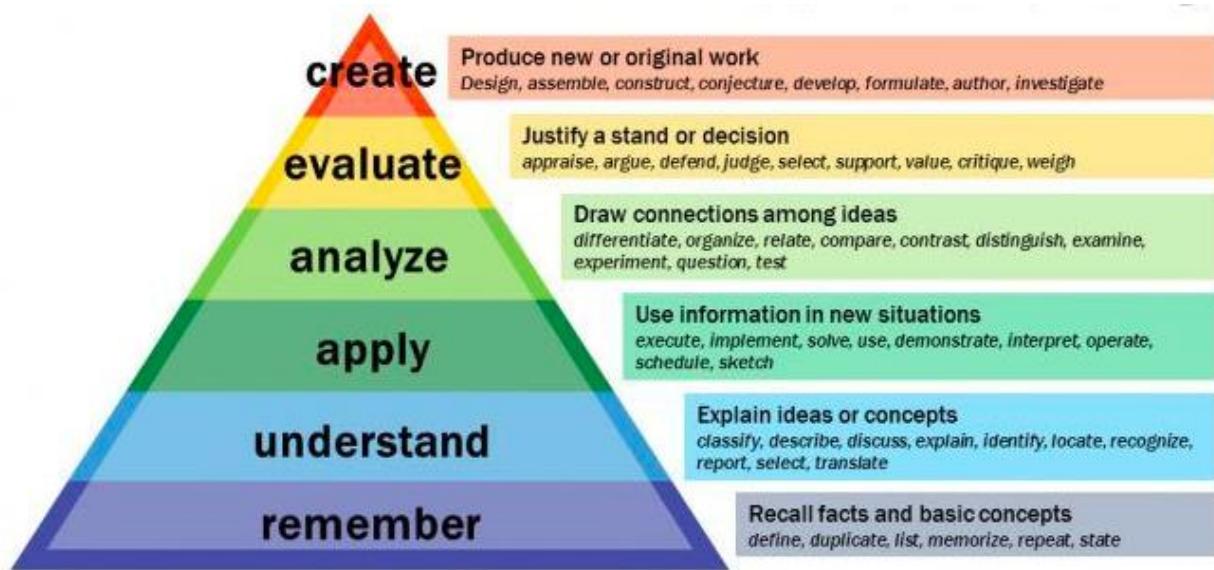
Biwei Chen

### Outline

- Scientific Methodology
- Mathematical Modeling
- Microeconomic Foundations
- Macroeconomics and Finance
- Policy Analysis and Evaluation

*Bloom's taxonomy is a framework for educational achievement in which each level depends on the one below. It's often depicted in the form of a pyramid—similar to Maslow's hierarchy of needs. Basic knowledge, the first stage of learning, leads to the development of the skills and abilities that are crucial to completing the pedagogical process: Comprehension, application, analysis, synthesis and evaluation. While there are subcategories within each, each stage lies on a continuum. The belief is that students move up through each level of the pyramid in Bloom's taxonomy, starting from very basic learning, to acquiring deeper knowledge on a subject, with each level crucial to the development of the next.*

<https://tophat.com/blog/blooms-taxonomy/>



<https://www.bloomstaxonomy.net>

**I. Scientific Methodology [Observation → Measurement → Explanation → Test → Application]****1. Procedures in scientific inquiry**

- 1) Observations and facts (What it is?): description
- 2) Theories and models (How and why?): explanation
- 3) Empirical methods (Really?): designing and testing
- 4) Empirical tests: reject or fail to reject (significance)
- 5) Gold standard: new prediction and discovery
- 6) Refinement, application and evaluation

**2. Theoretical components**

- 1) Social science: moral, social, economic, political laws
- 2) Natural science: mathematics, probability, and statistics
- 3) Components: postulates, assumptions, models, hypotheses
- 4) Testable and refutable implications and hypotheses

**3. Empirical methods**

- 1) Qualitative and quantitative research
- 2) Measurement and data collection
- 3) Experimental design (randomization)
- 4) Causal estimation and inference
- 5) Hypotheses testing
- 6) Robustness check

**4. Mathematical models: algebra and geometry**

- 1) Variables: discrete and continuous
- 2) Functions: univariate and multivariate
- 3) Linear, nonlinear, functional equations
- 4) Dynamic equations: difference and differential
- 5) Stochastic equations: white noise or autoregressive error
- 6) System of equations: equilibrium solutions and graphs
- 7) Dynamic stochastic general equilibrium models (DSGE)

**5. Structural equation models**

- 1) Endogenous variables: determined by exogenous (and stochastic) variables
- 2) Exogenous variables: pre-determined (or independent) variables (taken as given)
- 3) Structural equations: system of equations relating endogenous variables to exogenous variables
- 4) Reduced form: a functional or stochastic mapping for which the inputs are exogenous variables and unobservables (“structural errors”), and for which the outputs are endogenous variables

**6. Optimization techniques**

- 1) Unconstrained and constrained optimization
- 2) First-order condition (necessary): efficiency
- 3) Second-order condition (sufficient): maximum or minimum
- 4) Techniques: analytical; numerical; convergence criteria.

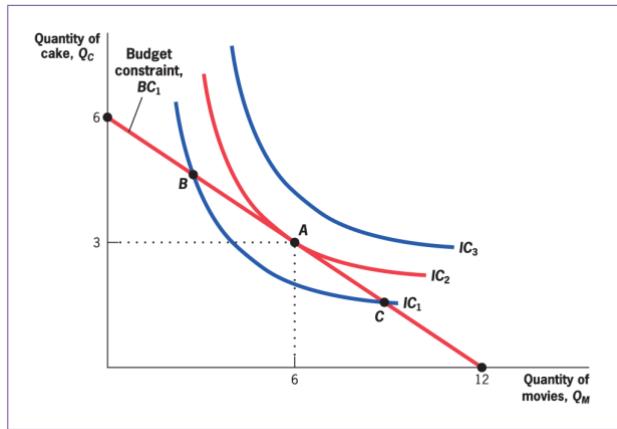
## II. Microeconomics (Price Theory)

### 1. Economics is the study of choice under scarcity.

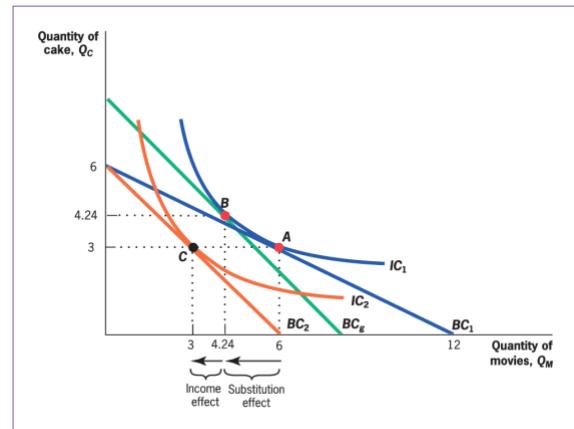
- 1) Scarcity implies competition; choice has an opportunity cost
- 2) Rationality postulate implies the choice with minimum cost.

### 2. Utility maximization model

- 1) Budget constraint (slope =  $-P_x/P_y$ )
- 2) Indifference curve (slope =  $-M_U_x/M_U_y$ )
- 3) Marginal rate of substitution  $MRS_{XY} = \Delta Y / \Delta X$
- 4) Optimal consumption rule:  $MRS = -P_x/P_y \rightarrow (X^*, Y^*)$
- 5) Income and substitution effects (due to price change)
- 6) Normal, luxury, and inferior goods (income elasticity)
- 7) The law of diminishing marginal utility

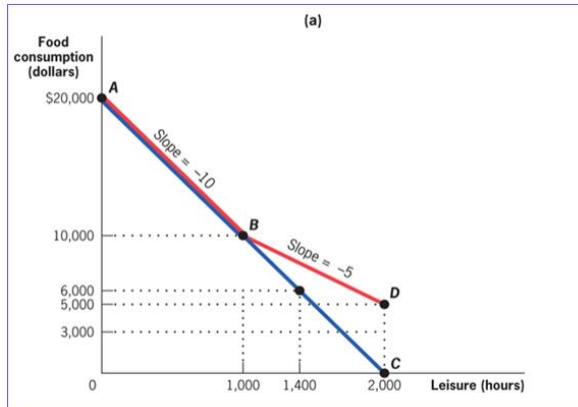


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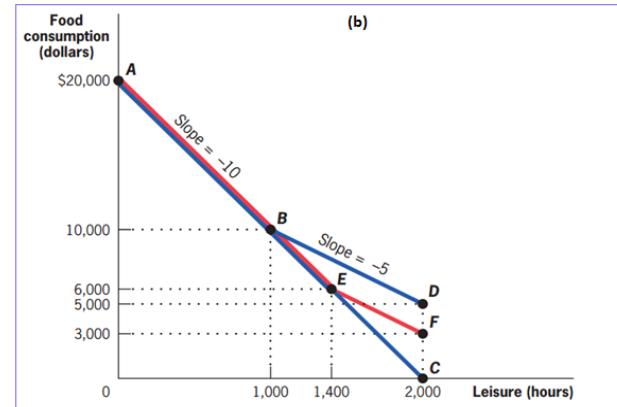


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- 8) Application: Temporary Assistance for Needy Families (TANF) and Labor Supply Among Single Mothers. The TANF program was created in 1996 and provides a monthly support check to families with incomes below a threshold level that is set by each state. Suppose that Joelle is a single mother who spends all of her earnings and TANF benefits on food for herself and her children. By working more hours, she can earn more money for food consumption, but she has less time at home with her children and for leisure. Since leisure is a normal good, she would prefer time at home to time at work. With these preferences, more work makes Joelle worse off, but it allows her to buy more food. How does Joelle decide on the optimal amount of labor to supply?

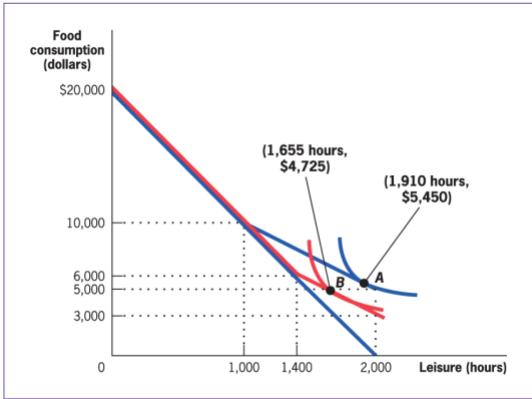


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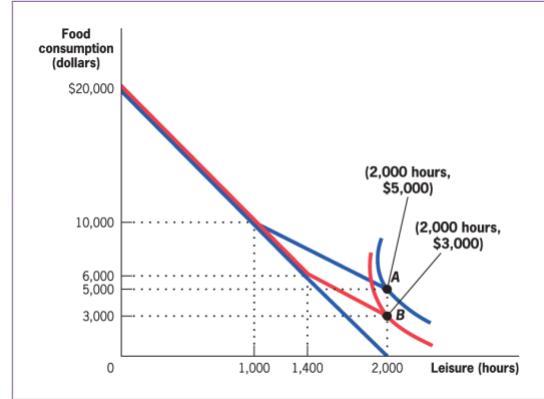


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- Consumption budget constraint (CBC): suppose that Joelle can work up to 2,000 hours per year at a wage of \$10 per hour, that she has no other source of income, and that there is not yet a TANF. If she takes no leisure, she can consume up to \$20,000 per year, but if she takes 2,000 hours of leisure, her consumption falls to 0. This is represented by the budget constraint ABC with a slope of  $-10$ , the relative price of leisure in terms of food consumption.
- TANF key features: **benefit guarantee** BG (the baseline amount of money to which recipients are entitled when they enroll in the program) and **benefit reduction** rate BRR (the rate at which the baseline amount is reduced if recipients have other income).
- What is the TANF effect on CBC if the benefit guarantee is \$5000 with no benefit reduction? Answer: The initial CBC will shift up by \$5000 in parallel (same slope).
- What is the TANF effect on CBC if the benefit guarantee is \$5000 with a BRR of 100%? [D]
- Suppose that your state provides an income guarantee of \$5,000 under TANF. The typical recipient can work up to 2,000 hours per year at a wage of \$15 per hour. Assume the recipient works 1,000 hours per year and the effective take-home wage rate is \$6.00. What is the BRR?
- TANF effect on consumption under benefit guarantee \$5,000 and benefit reduction rate 50%. Point D marks the end of the new budget constraint and provides a new option: she can have 2,000 hours of leisure and \$5,000 in food consumption because of the TANF benefit guarantee.
- If the TANF guarantee falls to \$3,000, the new budget constraint (AEF) doesn't flatten until she takes more than 1,400 hours of leisure; now, with 2,000 hours of leisure, her consumption is only \$3,000 at point F.



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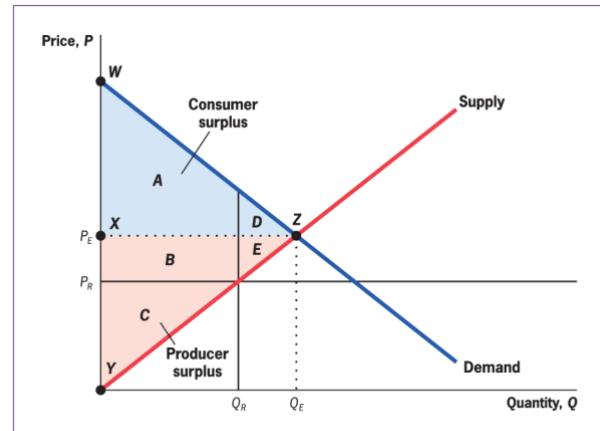
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- TANF and labor supply among single mothers. How large will the labor supply response be?
- Optimal choice: when the TANF guarantee is \$5,000, the optimal choice is to take 1,910 hours of leisure and consume \$5,450 (at point A). When the guarantee falls to \$3,000, she reduces her leisure to 1,655 hours, and her consumption falls to \$4,725 (at point B).
- What happens if Joelle values leisure more highly relative to consumption? How does this assumption impact the indifference curve of the decision-maker? What is her optimal choice?
- Because leisure is valued more highly relative to consumption for this individual, she chooses 2,000 hours of leisure regardless of the TANF guarantee. The reduction in guarantee therefore lowers her consumption from \$5,000 (at point A) to \$3,000 (at point B).
- What happens if Joelle values consumption more highly relative to leisure? How does this assumption impact the indifference curve of the decision-maker?

Challenge: What are the TANF policy implications for improving social welfare? BG, BRR, SW.

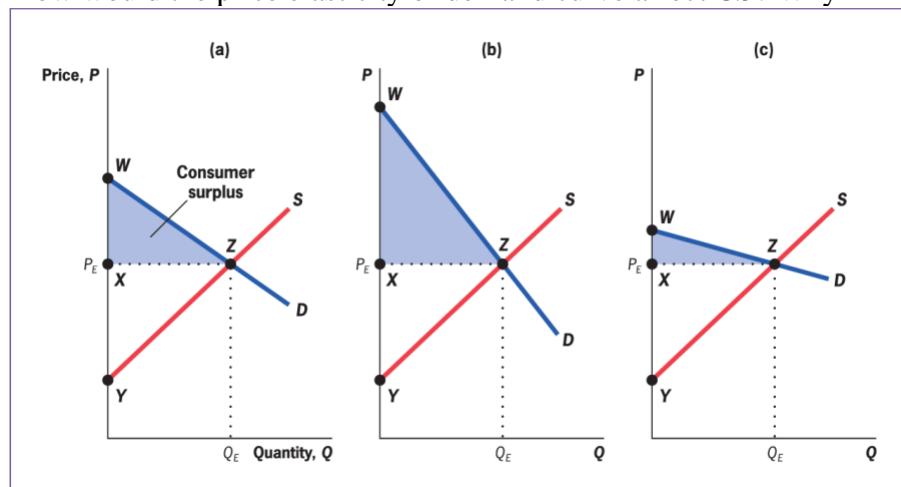
### 3. Demand and supply model

- 1) Value and exchange
- 2) The law of demand
- 3) The law of supply
- 4) Market equilibrium
- 5) Price elasticity  $E_P = (\Delta Q/Q)/(\Delta P/P)$
- 6) Consumer and producer surpluses
- 7) Market surplus and social welfare
- 8) Tax, subsidy, and P/Q regulations
- 9) Deadweight loss (inefficiency)
- 10) What is the market welfare at  $P_E$ ?
- 11) What are the MW and DWL at  $P_R$ ?
- 12) What are the MW and DWL at  $Q_R$ ?



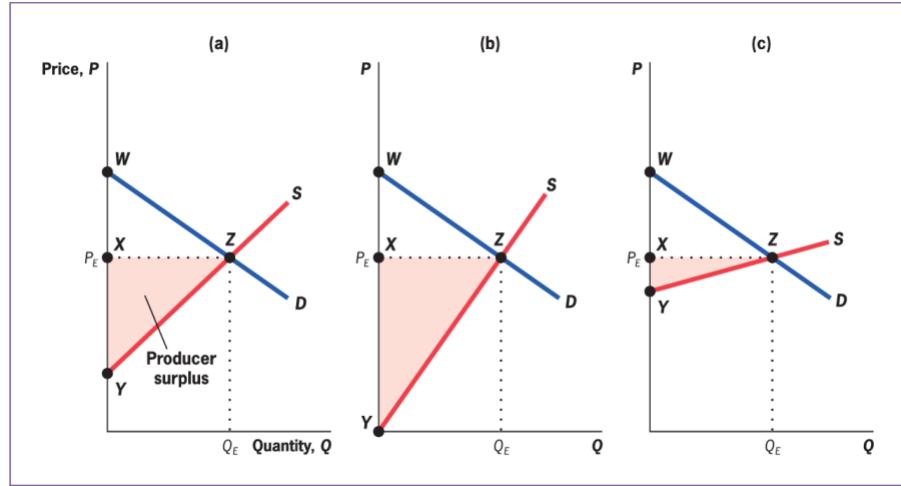
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How would the price elasticity of demand curve affect CS? Why?



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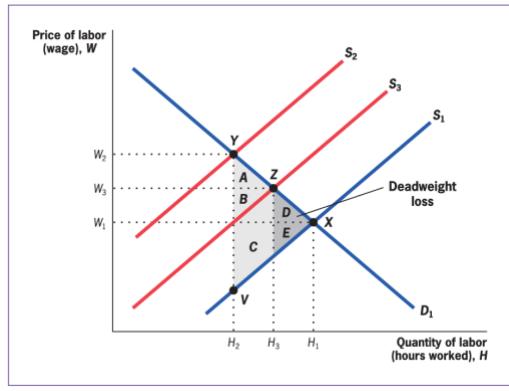
How would the price elasticity of supply curve affect PS? Why?



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#### 4. Welfare economics, Pareto efficiency and welfare theorem (first and second)

- 1) Welfare economics: The study of the determinants of well-being, or welfare, in society.
- 2) Welfare economics is used in normative analysis. Economists discuss the determination of welfare in two steps: First, the determinants of social efficiency, or the size of the economic pie. Second, how to integrate redistribution into this analysis so that the total well-being of society, or social welfare can be distributed more “fairly” (how to distribute the pie).
- 3) Pareto efficiency or optimality is when an economy has its resources and goods allocated to the maximum level of efficiency, and no change can be made without making someone worse off. Pure Pareto efficiency exists only in theory, though the economy can move toward Pareto efficiency. The concept is named after [Vilfredo Pareto](#) (1848–1923), Italian [civil engineer](#) and economist, who used the concept in his studies of [economic efficiency](#) and [income distribution](#).
- 4) First fundamental theorem: the competitive equilibrium, where supply equals demand, maximizes social efficiency. Second fundamental theorem: society can attain any efficient outcome by suitably redistributing resources among individuals and then allowing them to freely exchange.
- 5) Application: what is the welfare implications of TANF benefit introduction and reductions



Without TANF, the labor market is in competitive. When TANF is introduced, labor supply falls, which creates a deadweight loss. Increasing TANF benefits reduces efficiency.

When TANF benefits are reduced, supply increases, and social efficiency rises. When TANF benefits are reduced, supply increases to  $S_3$ , and social efficiency rises by  $A + B + C$ .

Is this a good thing to reduce TANF then?

- Governments have programs such as TANF because their citizens care not only about efficiency but also about equity.
- While reducing TANF benefits may increase social efficiency, it need not increase social welfare. Overall conclusion depends on social welfare function.

#### 6) Public policy objectives and social welfare function (SWF)

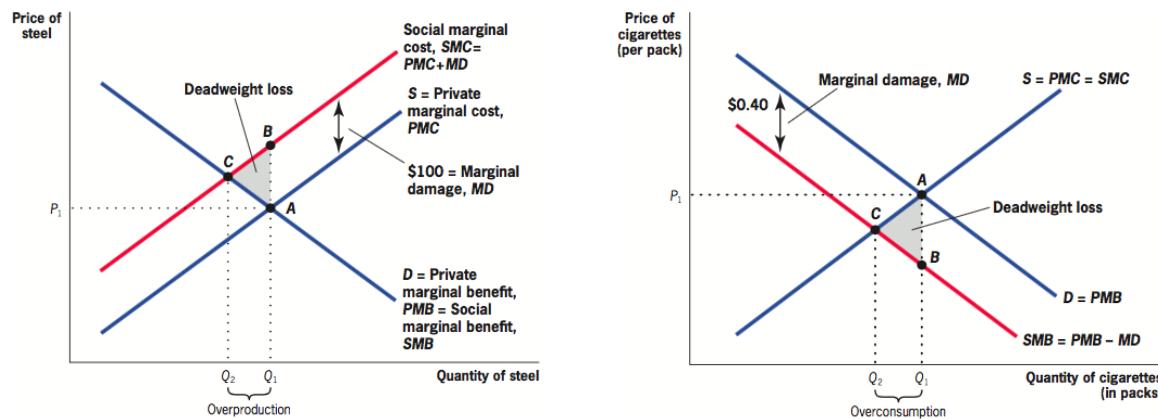
- a. Public policy objective: Equity–efficiency trade-off. The choice society must choose between the total size of the economic pie and decide its distribution among individuals.
- b. The efficiency principle requires public policy maximizing social welfare; the equity principle requires public policy weighting for individual welfare. Make a big pie and divide it fairly.
- c. SWF: A function that combines the utility functions of all individuals into an overall social utility function. Social welfare functions reflect different possible equity criteria.
- d. The utilitarian SWF maximizes the sum of individual utility.  $U_s = U_1 + U_2 + \dots + U_N$
- e. The Rawlsian SWF maximizes the utility of the worst-off member.  $U_s = \min\{U_1, U_2, \dots, U_N\}$
- f. Commodity egalitarianism: The principle that society should ensure that individuals meet a set of basic needs but that beyond that point, income distribution is irrelevant.
- g. Equality of opportunity: society should ensure that all individuals have equal opportunities for success but not focus on the outcomes of choices made. (Not equality of outcome!)
- h. Arrow impossibility theorem (Kenneth Arrow): social utility function does not exist.

5. Market efficiency and failure (market power, public goods, externality, asymmetric information)

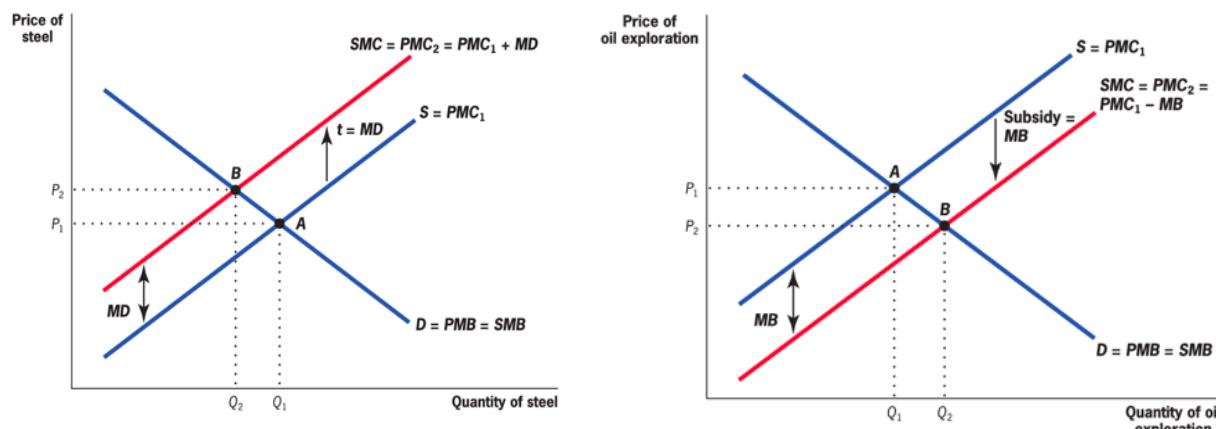
- 1) Regulating market power: antitrust laws, labor union, concentrated health care markets
- 2) Overcoming free-ride problem in public goods: national defense, free public internet, NPR
- 3) Correcting externalities: environment, pandemics, poverty, vice, education, technology hub
- 4) Asymmetric information: adverse selection (social security, annuities markets) and moral hazard (unemployment insurance, disability insurance, health insurance, workers' compensation)

6. Externalities (CH5) (external cost EC or external benefit EB)

- 1) Definition: Externalities arise whenever the actions of one party make another party worse off, yet the first party neither bears the costs nor receives the benefits of doing so.
- 2) Categories: negative externality (pandemics) and positive externality (vaccination)
- 3) Negative externality: Social cost > private cost ( $SC = PC + EC$ ) or social benefit < private benefit
- 4) Positive externality: Social benefit > private benefit ( $SB = PB + EB$ ) or social cost < private cost
- 5) How does externality affect market equilibrium and economic efficiency? ( $MC = MB?$ )
- 6) Models of negative production externality (steel) and consumption externality (cigarettes)

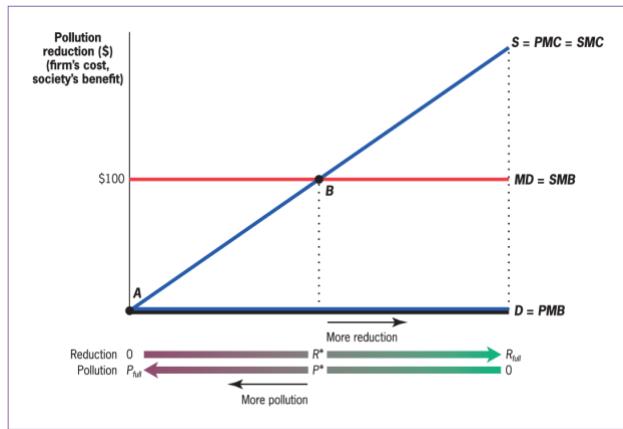


- 7) Externalities undermine efficiency because one party does not pay the costs or get all the (net) benefits of its actions. The solution: internalize externalities (when either public action or private negotiations lead the party to fully reflect the external costs or benefits of that party's actions.)



- 8) Pigouvian taxation (A.C. Pigou, 1920): Taxes that correct externalities. Pigouvian taxes and subsidies change the private marginal cost or marginal benefit without affecting the social marginal cost or benefit. Therefore, they can be used to internalize the externality.

- 9) Coase theorem (Ronald Coase, 1960): Private parties will be able to solve the problem of externalities. This is accomplished by internalizing the externality.
- Coase theorem (part I): When there are well-defined property rights and costless bargaining, then negotiations between the party creating the externality and the party affected by the externality can bring about the socially optimal market quantity.
  - Coase theorem (part II): The efficient solution to an externality does not depend on which party is assigned the property rights as long as someone is assigned those rights.
  - Problems with Coasian solutions: Assignment, Holdout, Free-rider, Transaction costs.
- 10) A comparison of public policies internalizing externalities (tax, subsidy, regulation)
- Corrective taxation to discourage use (decrease Q to socially optimal level  $Q^*$ )
  - Corrective subsidies to encourage use (increase Q to socially optimal level  $Q^*$ )
  - Regulation to directly change use (Q vs P): Full information on MC & MD is required.

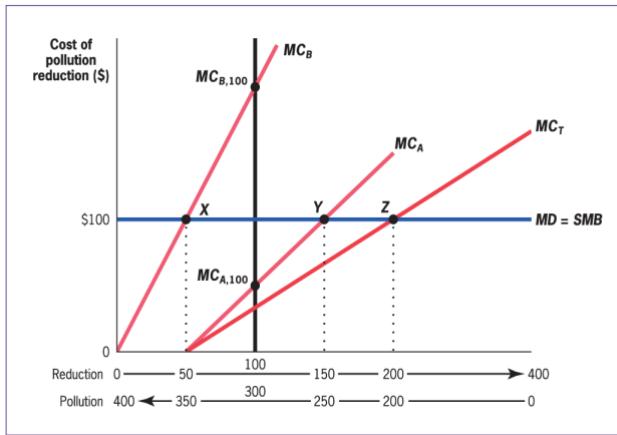


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- The socially optimal level of pollution reduction is  $R^*$ , the point at which these curves intersect. Because pollution is the complement of reduction, the optimal amount of pollution is  $P^*$ .
- The efficient solution is for  $SMB = SMC$  and  $SMC = PMC$ .
- If marginal damage (EC) is constant, setting a tax is easier than setting a regulation since there is no need to know the shape of the MC curve.

In an ideal world, Pigouvian taxation and regulation would be identical. Regulation has been the traditional choice for addressing environmental externalities in the U.S. and around the world. In practice, there are complications that may make taxes a more effective means.

- 11) Application: Multiple plants with different reduction costs (Q is pollution and R is reduction.)



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The efficient solution is one where, for each plant, the MC of reducing pollution is set equal to the social MB of that reduction, that is, where each plant's marginal cost curve intersects with the marginal benefit curve.

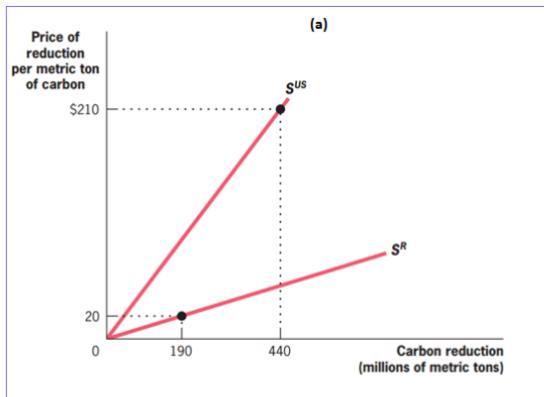
Pollution  $Q_A=Q_B=200$ ,  $Q_S=Q_A+Q_B$   
 $SMD=SMB=\$100$

Pollution reduction costs:  $MC_A < MC_B$   
For any given level of abatement,  
 $MC_A=R-50$  and  $MC_B=2R$   
What is the social cost of pollution?  
What is the social benefit of reduction?  
What is the social optimal level of pollution reduction  $R^*$ ?

Compare the efficiency level of three government policy instruments:

- Quantity regulation (QR)
- Price regulation (PR=Tax)
- Tradeable permits (TP)

- 12) Theoretical procedures for solving pollution externality and abatement plans
- Determine socially optimal level of pollution reduction:  $MSC=MSB \rightarrow R^*$
  - Determine individually optimal level of pollution reduction:  $MC_i=MB_i \rightarrow R_i^*$
  - Note  $R=R_A+R_B$  and  $\max\{NB=TB-TC\} & MB=MC$  are the efficiency conditions.
  - Socially optimal level of pollution does not guarantee socially optimal outcome (most efficient arrangement that maximize social welfare. It depends on the distribution of reduction burden.
  - Public policies can set quantity (Q), price (T), or market instruments to reach social optimum
  - Calculate costs and benefits (net benefits) for each policy and then compare their outcomes
  - The most efficient policy is the one with the highest net social benefit (lowest DWL)
- 13) Application (CH6.2): Environmental agreements and emission trading.
- Under the 1997 Kyoto treaty, the industrialized signatories are allowed to trade emissions rights among themselves as long as the total emissions goals are met.
  - Nordhaus and Boyer (2000) estimated that achieving the Kyoto targets would imply a present value cost to the U.S. of more than \$1 trillion.
  - Given the enormous costs, the reluctance of the U.S. to ratify Kyoto is understandable.

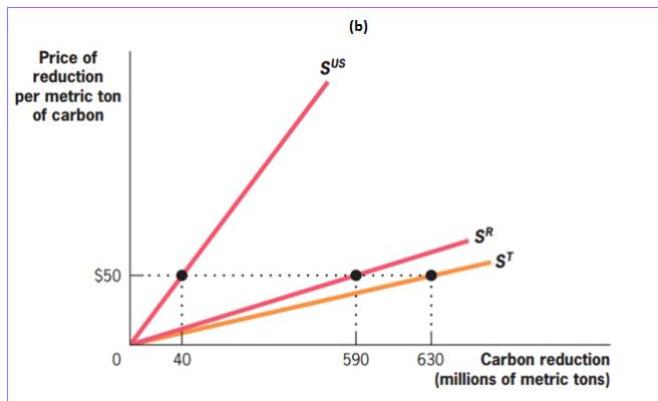


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In this no-trading world, the marginal cost of achieving the Kyoto target of a reduction of 440 million metric tons (as measured by the U.S. curve) is \$210 per metric ton of carbon.

Other nations have much lower marginal cost reduction opportunities. For those nations, reducing by 190 million metric tons would cost them only \$20 per metric ton of carbon.

- d. The total costs of emissions reduction can be reduced if we allow countries with low costs of reduction to trade with countries with high costs of reduction.



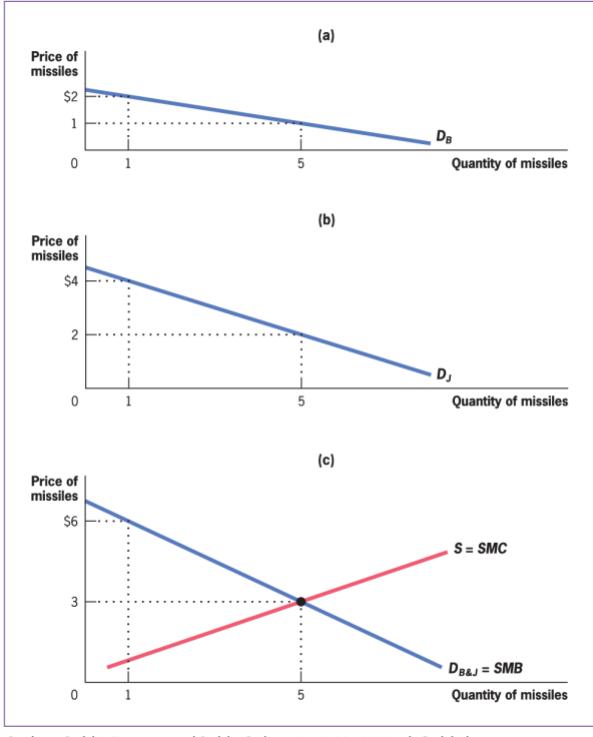
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Any reductions that cost more than \$50 per ton can be offset by purchasing permits instead. At that price, the United States would choose to reduce its own emissions by 40 million metric tons. By distributing the reduction from the high-cost United States to the low-cost other nations, we have significantly lowered the price of reductions worldwide.

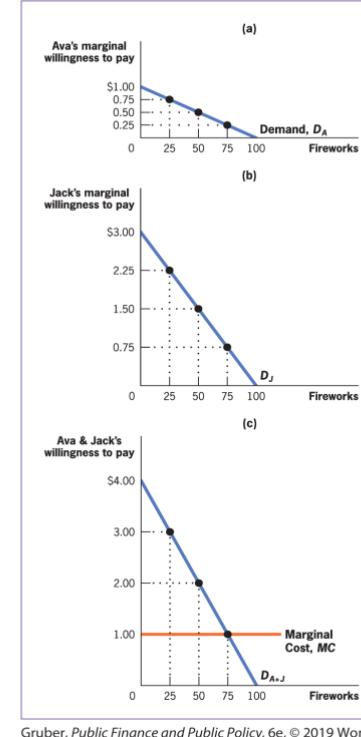
- e. International emissions trading allows efficient countries to reduce their emissions on behalf of less efficient ones (for a price). By some estimates, such trading could have lowered the global costs of reaching the Kyoto targets by 75%

7. Public goods (CH7) and Lindahl pricing (CH9.1)

- 1) Public goods that are perfectly non-rival in consumption and are non-excludable. The lack of proper waste and garbage disposal in Lebanon illustrates the serious issue of the role of gov.
- 2) Problems: non-excludability → free-riders → lack of incentive to supply a public good
  - a. Example 1: Fire service in Victoria in Australia
  - b. Example 2: Metropolitan Museum of Art in New York City
  - c. Example 3: Wikipedia, the free online encyclopedia written by volunteer contributors  
<https://mru.org/courses/economists-wild/wikipedia-how-motivate-expert-contributions>
- 3) Demand for a public good: vertical sum of individual demand curve  $D_P = D_A + D_B$ , for any given  $Q$  each individual places his/her own evaluation (MB/MU) on a common quantity of the public good.



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- 4) The public good is non-rival; because it can be consumed jointly by all consumers, society would like the producer to take into account the sum of all consumers' preferences (demand schedule).
- 5) Socially optimal level of a public good:  $MRS_A + MRS_B = SMB = SMC$  or  $MUP = MU_A + MU_B = MC_P$
- 6) Lindahl pricing: An approach to financing public goods in which individuals honestly reveal their willingness to pay and the government charges them that amount to finance the public good.
  - a. Getting individuals to reveal their true marginal willingness to pay
  - b. Aggregating these values to ensure that the social benefits exceed total cost
  - c. Charging each individual according to his or her willingness to pay
- 7) Lindahl's procedure operates as follows
  - a. Announce *tax prices* for the public good.
  - b. Everyone says how much of the public good they want at those tax prices.
  - c. Repeat to construct a *marginal willingness to pay schedule* for each individual.
  - d. Add up individual willingnesses to pay at each quantity of public good provided.
  - e. Find  $Q$  such that total marginal willingness to pay equals marginal cost of supply.
  - f. Finance the public good by charging individuals their willingnesses to pay for that quantity.

- 8) Under Lindahl pricing, the government produces the efficient amount of the public good.
- 9) Benefit taxation: Taxation in which individuals are taxed for a public good according to their valuation of the benefit they receive from that good.
- 10) Lindahl pricing faces several problems that keep it from being used in practice:
  - a. Preference revelation problem: Individuals have an incentive to lie about their willingness
  - b. Preference knowledge problem: Individuals may not know their willingness to pay.
  - c. Preference aggregation problem: Not obvious to aggregate individual preferences into a SWF
- 11) Private provision (mandatory fees, divergence, altruism, warm glow)
  - a. When private suppliers are given the ability to overcome the problem of non-excludability, they can produce the efficient quantity of the good. The private sector can in some cases combat the free rider problem to provide public goods by charging user fees that are proportional to their valuation of the public good.
  - b. Markets can (mostly) overcome the free rider problem when some individuals care more than others ( $MU_A = MC_P$ ). The efficiency loss is not too great ( $MU_A \gg MU_B \rightarrow MU_P \sim MU_A$ ).
  - c. Private markets provide public goods when people are altruistic. When individuals value the benefits and costs to others in making their consumption choices. Social capital: The value of altruistic and communal behavior in society.
  - d. Warm glow model: A model of the public goods provision in which individuals care about both the total amount of the public good and their particular contributions as well. Different from altruism because people don't care about just the amount of the public good.
- 12) Public provision (private responses as "crowd-out", measuring costs)
  - a. Crowd-out: As the government provides more of a public good, the private sector will provide less. (pp. 202-203 Empirical evidence: measuring crowd-out in experimental designs)
  - b. Contributors vs noncontributors: By forcing noncontributors to contribute to the fund for public provision, the government can increase total public goods provision.
  - c. Contracting out: The mix of private and public provision (an approach through which the government retains responsibility for providing a good or service but hires private-sector firms to actually provide the good or service). Example: 2006 Massachusetts health care reform
  - d. Measuring the costs and benefits of public goods can be complicated and challenging
  - e. Gathering individual preferences and valuation can be difficult, if not impossible

## 8. Asymmetric information (CH12)

- 1) Definition: a situation where there is imbalance of information across participants in an economic transaction. One common form of asymmetric information in markets is the lemons problem that occurs when a seller knows more about the quality of the good he is selling than does the buyer.
- 2) Adverse selection: a situation where there are stronger incentives for "bad" types of a product to be involved in a transaction than "good" types of the product.  $\rightarrow$  decline in market welfare.
- 3) Moral hazard: a situation that occurs when an entity has an incentive to increase its exposure to risk because it does not bear the full costs of that risk. [https://en.wikipedia.org/wiki/Moral\\_hazard](https://en.wikipedia.org/wiki/Moral_hazard)
- 4) Applications: social insurance markets (retirement, labor, health) and welfare programs (poverty)

## 9. Market power

- 1) Perfect competition
- 2) Monopoly and monopsony
- 3) Equity-efficiency implications
- 4) Anti-trust and anti-union laws

### III. Cost-Benefit Analysis (CH8)

- 1) Definition: The comparison of costs and benefits of public goods projects to decide if they should be undertaken. CBA is widely used to evaluate potential public programs and projects.
- 2) Example: The renovation of the turnpike in your state has three costs: asphalt, labor, and future maintenance. There are two associated benefits: reduced travel time and reduced fatalities. The goal of cost-benefit analysis is to quantify these costs and benefits.

Cost-Benefit Analysis of Highway Construction Project			
	Quantity	Price/Value	Total
<b>Costs</b>	Asphalt	1 million bags	
	Labor	1 million hours	
	Maintenance	\$10 million/year	
<b>First-year cost:</b>			
<b>Total cost over time:</b>			
<b>Benefits</b>	Driving time saved	500,000 hours/year	
	Lives saved	5 lives/year	
<b>First-year benefit:</b>			
<b>Total benefit over time:</b>			
<b>Benefit over time minus cost over time:</b>			

- The cost of the asphalt for this project is dictated by the market price for asphalt, \$100 per bag.
- The cost of labor depends not on the wage, but on the full opportunity cost of the labor, which incorporates the current unemployment of any workers who will be used on the project.
- The cost of future maintenance is the present discounted value of these projected expenditures.

- 3) Measuring the costs of public projects
  - a. Cash flow accounting: An accounting method that calculates costs solely by adding up what the government pays for inputs to a project and calculates benefits solely by adding up income or government revenues generated by the project.
  - b. Opportunity cost: The social marginal cost of any resource is the value of that resource in its next best use. Economic rents are payments to resource deliverers that exceed those necessary to employ the resource. If labor is efficiently employed, then wages are a social cost. If some workers are unemployed, then we value their time at the value of leisure, not the wage.
  - c. Present discounted value (*PDV*): A dollar next year is worth less than a dollar now because the dollar could earn *r*% interest if invested. Formula:  $\text{PDV} = \text{FV}/(1+r)^T$
  - d. Social discount rate: The appropriate value of *r* to use in computing *PDV* for social investments. The Office of Management and Budget (1992) adopts 7% for public investments.
- 4) Measuring the benefits of public projects
  - a. Value saved time and lives: a central benefit of many government interventions
  - b. Market-based measures (wages). In practice, however, individuals can't freely trade off leisure and labor hours; jobs may come with hour restrictions. Nonmonetary aspects.
  - c. **Contingent valuation:** Asking individuals to value an option that they are not now choosing, that they do not have the opportunity to choose, or that is not yet available to them. This approach relies on answers to hypothetical questions. Straightforward, inexpensive to apply.
  - d. **Revealed preference:** Letting the actions of individuals reveal their valuation. Market prices potentially reveal preference: If people are willing to pay *P*, then it is worth at least *P* to them.
  - e. **Compensating differentials:** Additional (or reduced) wage payments to workers to compensate them for the negative (or positive) amenities of a job, such as increased risk of mortality (or a nicer office). The extra safety compensates workers for lower wages.
- 5) Cost-effectiveness analysis: For projects that have immeasurable benefits or that are viewed as desirable regardless of the level of benefits, we can compute only their costs and choose the most cost-effective project. Finding the cost of a life saved—and choosing projects with the lowest costs—avoids making judgments about the value of life saved.

### Cost-Benefit Analysis of Highway Construction Project

		Quantity	Price/Value	Total
<b>Costs</b>	Asphalt	1 million bags	\$100/bag	\$100 million
	Labor	1 million hours	\$10/hour	\$10 million
	Maintenance	\$10 million/year	7% discount rate	\$143 million
<b>Benefits</b>	<b>First-year cost:</b>			<b>\$110 million</b>
	<b>Total cost over time (7% discount rate):</b>			<b>\$253 million</b>
	Driving time saved	500,000 hours/year	\$22.70/hour	\$11.4 million
	Lives saved	5 lives/year	\$9.6 million/life	\$48 million
	<b>First-year benefit:</b>			<b>\$59.4 million</b>
	<b>Total benefit over time (7% discount rate):</b>			<b>\$848.6 million</b>
<b>Benefit over time minus cost over time:</b>				<b>\$595.6 million</b>

- 6) Other issues in cost-benefit analysis
  - a. Common Counting Mistakes
    - Counting secondary benefits
    - Counting labor as a benefit
    - Double-counting benefits
  - b. Distributional Concerns: Costs and benefits may not go to the same people.
  - c. Uncertainty: Costs and benefits are often highly uncertain.
- 7) The Benefits and Costs of the Clean Air Act from 1990 to 2020: Summary Report  
<https://www.epa.gov/sites/production/files/2015-07/documents/summaryreport.pdf>

### IV. Public Policy Analysis

1. Objective and outcome
2. Incentive and constraints
3. Cost and benefit analysis
4. Competitive criteria and rules of the game
5. Direct effects and unintended consequences
6. Two principles: equity and efficiency (tradeoff?)
7. Theoretical foundation: philosophy and morality
8. Politics: institutions, rules, and collective decision

### V. Macroeconomics (Money Theory)

1. A tale of four variables
  - 1) Flow: in a given period of time.
  - 2) Stock: at an instant of time.
  - 3) Nominal: measured in monetary units.
  - 4) Real: measured in real quantities.
2. Quantity theory of money  $PY=MV$ 
  - 1) Transaction equation: money is a medium of exchange and the most liquid asset.
  - 2) "Inflation is always and everywhere a monetary phenomenon." —Milton Friedman
  - 3) Excess money chasing too few goods → rising inflation
  - 4) Robust output growth with inadequate money supply → deflation
  - 5) Liquidity preference  $M_D=L(P, Y, i)$  and money market equilibrium  $M_D=M_S=PY/V$

3. National income determination
  - 1)  $Y=C+I+G+NX$  and  $Y=AD=AS \rightarrow E(P, Y)$
  - 2)  $(Y-C-T) + (T-G) = I+NX$  or  $S_N=S_{\text{private}} + S_{\text{public}} = I+NX$
  - 3)  $AD=AS \rightarrow IS; M_D=M_S \rightarrow LM; IS-LM \rightarrow E(i, Y)$
4. Fiscal policy, public deficit and Debt
  - 1) Government expenditure  $G$  and revenue  $T$
  - 2) Government budget or public deficit  $G-T$
  - 3) Government debt calculus:  $\text{sum}(G-T)$

## VI. Money and Finance (Interest Theory)

1. Income and wealth
  - 1) Income is a series of events, the alpha and omega of economic life.
  - 2) Income = consumption + investment (saving)
  - 3) Wealth is all possessions human beings value.
2. Capital and capital value
  - 1) Capital generates income. Income is derived from the capital.
  - 2) The value of the capital is derived from the value of income.
3. Interest is the cost of borrowing and return to lending.
  - 1) Determinants: consumption impatience and investment opportunities
  - 2) Interest rates: percentage return (cost) on initial investment (consumption)
  - 3) Interest rate is determined in the income (real) market equilibrium.
4. Fundamental equation of asset pricing
  - 1)  $P=PV=FV/(1+i)^T$  the value of capital is derived from the value of income
  - 2) FV is the projected future cash flows, T is the arrival time of the FV
  - 3) Discount rate  $i$  is the cost of capital and rate of return; the discount factor is  $1/(1+i)^T$
  - 4) Risk premia drive  $i$ : inflation, term, credit/default/counterparty, liquidity, foreign exchange, geopolitical, public policy, environmental, ecological, terrorism
5. The Fisher equation: nominal interest rate equals real interest rate plus expected inflation rate
  - 1) In a moneyless world,  $i=r$  holds; in a monetary world inflation kicks in
  - 2) Forward-looking interest rates: Ex ante vs ex post variables
  - 3) Real interest rate and expected inflation rate not observable
6. Money market equilibrium and interest rates
  - 1) Money demand is derived from liquidity preference  $M_D(Y, P, i)$
  - 2) Money supply is primarily driven by central bank policy  $M_S$
  - 3) Money market equilibrium determines interest rate
  - 4) Fisher equation links interest rate to the price level

## Reference

Gruber (2019)

CH2 Theoretical Tools; CH5 & CH6 Externalities; CH7 Public Goods & CH9.1 Public Goods Levels;  
CH8 Cost-Benefit Analysis

Goolsbee, Levitt & Syverson (2020), CH16 Asymmetric Information, Microeconomics, 3e, Worth

## Readings

202004 NPR: Lives Vs. The Economy

<https://www.npr.org/2020/04/15/835571843/episode-991-lives-vs-the-economy>

202006 Foreign Affairs: What Is a Life Worth? COVID-19 and the Economic Value of Protecting Health

<https://www.foreignaffairs.com/articles/united-states/2020-06-17/what-life-worth>

201512 Does cost-benefit analysis apply to catastrophic events? The strange economics of global disasters

<https://www.aeaweb.org/research/does-cost-benefit-apply-catastrophic-events>

Martin, Ian W. R., and Robert S. Pindyck. 2015. "Averting Catastrophes: The Strange Economics of Scylla and Charybdis." *American Economic Review*, 105 (10): 2947-85. [\(w\)](#)

201708 How much does a hurricane cost? It's more than we thought. [\(w\)](#)

Deryugina, Tatyana. 2017. "The Fiscal Cost of Hurricanes: Disaster Aid versus Social Insurance." *American Economic Journal: Economic Policy*, 9 (3): 168-98. [\(w\)](#)

201712 Why do people give? An interview with Lise Vesterlund on how economics can help us better understand altruism. [\(w\)](#)

Ottoni-Wilhelm, Mark, Lise Vesterlund, and Huan Xie. 2017. "Why Do People Give? Testing Pure and Impure Altruism." *American Economic Review*, 107 (11): 3617-33. [\(w\)](#)

201711 What should we do about climate change? Economists agree that we need to invest in solutions, but exactly how much remains up for debate. [\(w\)](#)

Heal, Geoffrey. 2017. "The Economics of the Climate." *Journal of Economic Literature*, 55 (3): 1046-63. [\(w\)](#)

201712 Saying no to energy savings. Economics is helping to explain the energy-efficiency gap. [\(w\)](#)

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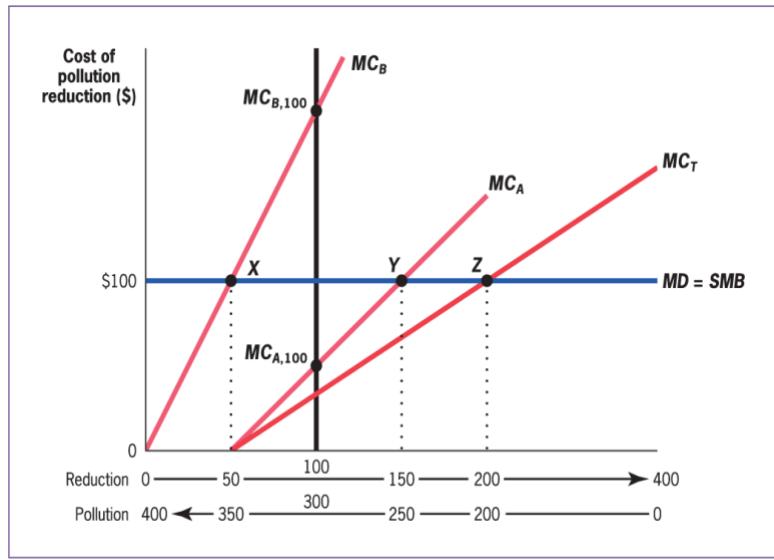
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## L2 Appendix: Addressing Pollution Externalities

Biwei Chen

Gruber (2019) CH5 Externalities: Problems and Solutions. Public Finance and Public Policy. 6E. Worth.



Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

$$\text{Pollution } Q_A = Q_B = 200, Q_S = Q_A + Q_B \\ \text{SMD} = \text{SMB} = \$100$$

Pollution reduction costs:  $MC_A < MC_B$   
For any given level of abatement,  
 $MC_A = R - 50$  and  $MC_B = 2R$

- What is the social cost of pollution?
- What is the social benefit of reduction?
- What is the social optimal level of pollution reduction  $R^*$ ?

Compare the efficiency level of three government policy instruments:

- Quantity regulation
- Price regulation (tax)
- Tradeable permits

Social cost of pollution:  $TD = MD * Q = 100 * 400 = \$40000 = TB$ , reducing pollution means benefiting society

Social optimal pollution reduction:  $SMC = SMB \rightarrow R^* = 200$  or  $SMC = MC_A + MC_B = SMB \rightarrow R^* = 200$

Social benefit of pollution reduction:  $SB = R^* * SMB = 200 * 100 = \$20000$  (SMB is assumed constant)

Social optimal net benefit of pollution reduction:  $NB^* = TB(R^*) - TC(R^*) = 20000 - 7500 = \$12500$

- $MC_A = MD \rightarrow R_A^* = 150$  ( $Q_A^* = 200 - R_A^* = 50$ )  $\rightarrow C_A^* = (100 * 100) / 2 = \$5000$
- $MC_B = MD \rightarrow R_B^* = 50$  ( $Q_B^* = 200 - R_B^* = 150$ )  $\rightarrow C_B^* = (50 * 100) / 2 = \$2500$
- $R_A^* + R_B^* = R^* \rightarrow C^* = C_A^* + C_B^* = (150 * 100) / 2 = \$7500$

1. Quantity regulation:  $R_A = R_B = 100$ . What are the total abatement cost facing firm A and B, respectively?
  - 1) According to the relationship between MC and TC, TC is the area under MC up to a given quantity.
  - 2)  $C_A = 50 * (R_A - 50) / 2 = \$1250 < C_A^* = \$5000$  (winner),  $C_B = 200 * R_B / 2 = \$10000 > C_B^* = \$2500$  (loser)
  - 3) Firm B carries a lot more burden than A under QR. Compared to the benchmark optimal solution, the loss to B (-7500) far exceeds the gain to A (+3750). Therefore, the society suffers as a whole.
  - 4) Social cost of pollution reduction  $C_s = C_A + C_B = \$11250 > C^* = \$7500$ ,  $DWL = C_s - C^* = \$3750$
  - 5) Net social benefit of pollution reduction  $NB_R = TB(R) - TC(R) = 20000 - 11250 = \$8750 < NB^* = \$12500$
  - 6) Compared to the benchmark optimality, the inefficiency loss or  $DWL = 12500 - 8750 = \$3750$
  - 7) Compared to the social optimal reduction, equal burden quantity regulation is less efficient
  - 8) Is it possible for B to pay A such that B can save some pollution reduction costs? If so, under what condition would A accept B's proposal? Answer: [3750, 7500]

2. Price regulation via Pigouvian tax  $T=MD=\$100 \rightarrow R_A=150, R_B=50$  (tax is levied on pollution)
  - 1)  $R_A=150, C_A=\$5000; Q_A=50, T_A=\$5000; TC_A=10000 < 20000 = \text{tax on all A's pollution}$
  - 2)  $R_B=50, C_B=\$2500; Q_B=150, T_B=\$15000; TC_B=17500 < 20000 = \text{tax on all B's pollution}$
  - 3) Cost of abatement:  $C_A=(150-50)*100/2=\$5000, C_B=50*100/2=\$2500, C_S=C_A+C_B=\$7500$
  - 4) Tax:  $T_A=(Q_A-R_A)T=50*100=\$5000, T_B=(Q_B-R_B)T=150*100=\$15000$ , and  $T_S=\$20000$
  - 5) Total costs:  $TC_A=(T+C)_A=5000+5000=\$10000$  and  $TC_B=(T+C)_B=15000+2500=\$17500$
  - 6) Note that tax paid from the firms to government is a transfer payment in the society
  - 7) Net social benefit of Pigouvian tax  $NB_T=TB(R)-TC(R)=20000-7500=\$12500 > \$8750 = NB_R$
  - 8) Conclusion: tax is more efficient than quantity regulation in terms of larger NB (less DWL)
  
3. Tradable permits (cap and trade): Government issues a capped quantity of pollution licenses (rights) and distribute them equally between the firms. Unlike quantity regulation, firms are permitted the freedom to trade their pollution rights based on market mechanism.
  - 1) How many permits in total shall be issued by the government? If the permits are given equally to each firm, then which firm has the incentive to buy from the firm which has the incentive to sell?
  - 2) Recall that optimal reduction (pollution):  $R_A^*=150$  (or  $Q_A^*=50$ ) and  $R_B^*=50$  (or  $Q_B^*=150$ )
  - 3) Pollution licenses:  $L=L_A+L_B=R^*=200$  and  $L_A=L_B=L/2=100$ .  $L_A > Q_A^*=50$  and  $L_B < Q_B^*=150$
  - 4) Suppose the price of a permit is \$100, what are the net benefits to firm A and B compared to the case of quantity regulation? Is cap and trade more efficient than quantity and price regulation?
  - 5) What is the possible range for the price of a permit? Hint: Benefit-cost analysis.
  - 6) Solution: B is willing to pay [3750, 7500] to A to reach a deal to increase B's pollution by 50. In this case, B reduces less: from 100 to 50 and A reduces more: from 100 to 150.
  - 7) The price of the permit should be set in the range of [75, 150] such that A and B are both better off. The equilibrium price depends on bargaining power and transaction cost in the market.

Comment:

1. Social optimal outcome must be supported by individual optimal outcomes.
2. With market mechanism (private property right + price signal), externality problem (inefficiency) can be mitigated via mutually beneficial exchange, provided relatively low transaction costs.
3. Ronald Coase: Delineation of rights is a prelude to market transactions.

Mathematical note:  $\int MC(Q)dQ=TC(Q)$

# Lecture 3 Empirical Research Methods

Biwei Chen

## Outline

- Probability and Statistics
- Econometrics: Causal Inference
- Medical Trials and Experiments
- Applications: Environment and Health

### I. Probability and Statistics

#### 1. Events, sample space, and random variables

#### 2. Moments and characteristics

- 1) Expectation and conditional expectation
- 2) Median, mode, and quantiles: central tendency
- 3) Variance: dispersion or spread around the mean
- 4) Skewness: measures the tail of a probability distribution
- 5) Kurtosis: measures the peak of a probability distribution
- 6) Moment generating function and characteristic function

#### 3. Key distributions

- 1) Normal and standard normal distributions (applied in the central limit theorem C.L.T.)
- 2) t-distribution (testing single coefficient significance; testing equality of two population means)
- 3) F-distribution (joint test of regression coefficient significance; ratio of two population variance)
- 4) Chi-square distribution (test the population variance; normality test; maximum likelihood tests)

#### 4. Correlation and dependence

- 1) Covariance and correlation: measure linear relevance
- 2) Independence: joint density = marginal density multiplication
- 3) Relation: independence  $\rightarrow$  zero correlation, but not vice versa.

#### 5. Inference on point and interval estimations

- 1) Estimate the parameter and its standard error for each sample
- 2) Find the critical value of the pivotal statistics and the degrees of freedom
- 3) Construct interval estimate for each sample, then  $100(1 - \alpha)$  % of all the intervals constructed would contain the true unknown parameter (based on **the sampling distribution**).

#### 6. Hypothesis testing (significance tests)

- 1) Choose the null and alternative hypotheses (mutually exclusive)
- 2) Specify the test statistics (t, F, chisq) and its distribution under the null
- 3) Select a significance level alpha  $\text{Prob}(\text{reject } H_0 | H_0) \rightarrow$  rejection region
- 4) Calculate the sample value of the test statistics (and corresponding p-value)
- 5) State the testing conclusion (reject or fail to reject)

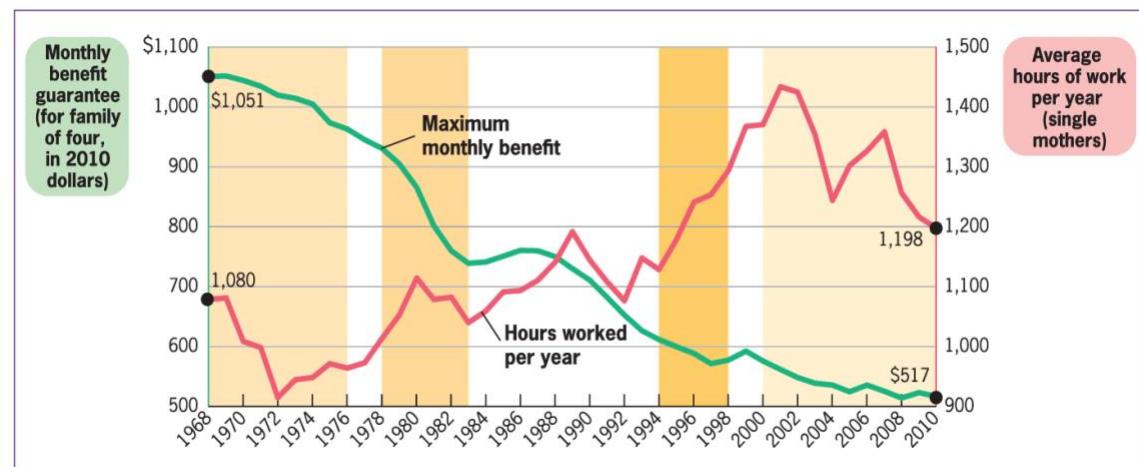
#### 7. Estimation and forecast

- 1) Goal: estimate the parameters in a model and infer underlying relationships
- 2) Requirements: establish an unbiased, consistent ( $N \rightarrow \infty$ ), efficient estimator
- 3) Methods: least squares, method of moments, maximum likelihood, Bayesian
- 4) Estimator is a random variable vs estimate is the value calculated from samples.

*Must-read: Mastering Metrics, CH1 Appendix Pages 34-46*

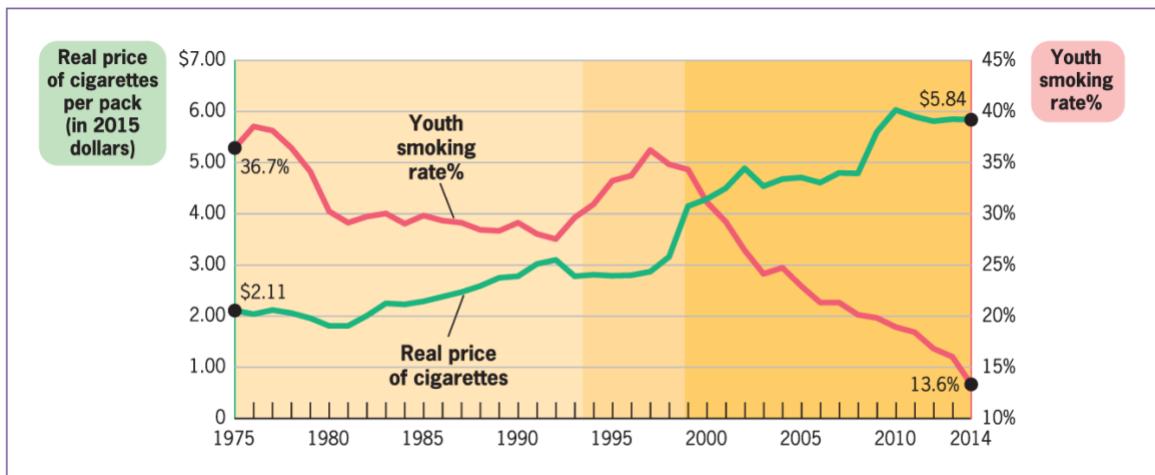
## II. Data Analysis

- 1) Types: time series, cross-sectional, panel (longitudinal), spatial
- 2) Time series frequencies: daily, weekly, monthly, quarterly, yearly
- 3) Patterns: trends, volatility, seasonality, stationarity, structural breaks
- 4) Regression: statistical procedure for estimating the function from X(s) to Y.
- 5) Classification: estimate the function from the inputs to discrete or categorical output
- 6) The central issue for any policy question is **establishing a causal relationship** between the policy in question and the outcome of interest. For economists, the challenge is how to distinguish causality from correlation or eliminate bias. Examples: time series analysis with policy variables
  - a. Cash welfare guarantee and hours worked among single mothers. Is time series analysis useful? Overall, a strong negative correlation exists between average benefit guarantee and level of labor supply. Is there necessarily a causal effect? Any other potential explanations? Note also that different sub-periods (1968–76, 1978–83, 1993–98) give different impressions.



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- b. When is time series analysis useful? Cigarette prices and youth smoking. While time series correlations are not very useful when there are long-moving trends, they are more useful when sharp breaks are detected in trends over a relatively narrow period of time. Sharp, simultaneous changes in prices and smoking rates in 1993 (price war) and from 1998 (lawsuit over) onward.

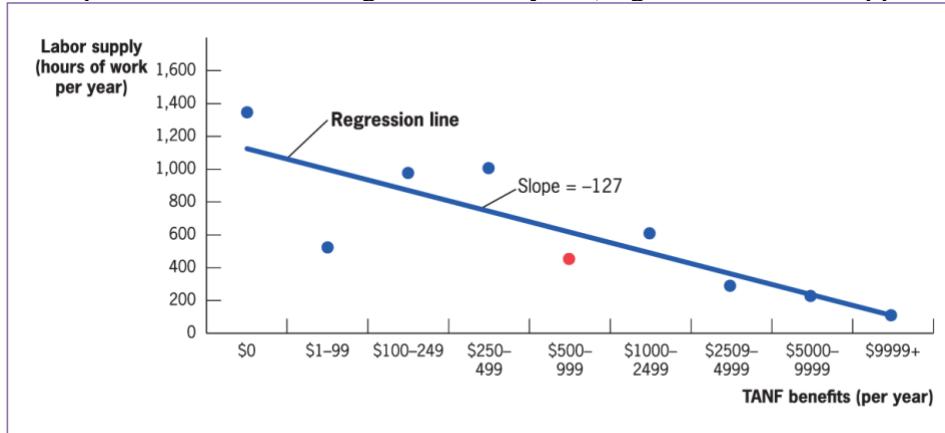


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## II. Econometrics and Causal Inference

### 1. Regression analysis

- 1) Goal: adopt unbiased and efficient estimation procedure for inference
- 2) Models: linear, nonlinear, or systems of equation (structural vs reduced)
- 3) Methods: OLS regression, method of moments, maximum likelihood, Bayesian
- 4) Robustness: residuals, specification, heteroscedasticity, autocorrelation, stability
- 5) Inference: statistical significance (t-statistics and p-value) and confidence intervals
- 6) Forecast:  $E(Y|X) \rightarrow E(Y|X')$  in-sample (interpolation) and out-of-sample (extrapolation)
- 7) Simulation: study repeated sampling properties of estimators (finite sample vs large sample)
- 8) Example: cross-sectional regression analysis (Pages 86-88, CH3 Appendix)



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### 2. Causal effect estimation and inference

- 1) Question: what is the pure effect of X on Y, controlling for other factors?
- 2) Intuition: the ceteris paribus assumption in the law of demand
- 3) Regression model:  $Y_i = \alpha + \beta X_i + e_i$  where  $e_i$  is a white noise
- 4) Problem: coefficient estimates can be biased or/and inconsistent
- 5) Source of biases:  $E[e|X] \neq 0$  (endogeneity)  $\rightarrow$  invalid causality
  - a. Omitted variables
  - b. Sample selection
  - c. Measurement error
  - d. Simultaneous equations
  - e. Lagged Y with serial correlation
- 6) Solutions and estimation techniques
  - a. Randomized control trial RCT (e.g., RAND HIE 1974-1982; Oregon HIE, 2008)
  - b. Natural experiment or quasi-experiment (e.g., North and South Korea economic growth)
  - c. Differences-in-Differences estimation (treatment and control move in parallel trend)
  - d. Regression discontinuity designs RDD (e.g., MLDA)
  - e. Instrument variables IV (MOM and TSLS)
  - f. Propensity score matching PSM
- 7) Angrist and Pischke (2015) Mastering Metrics – The Path from Cause to Effect
  - Book resources: <https://www.masteringmetrics.com/resources/>
  - Mastering Econometrics <https://mru.org/mastering-econometrics>

**Must-read: Mastering Metrics, CH1 Randomized Trials & CH2 Regression**

### III. Introduction to Randomized Experiments

#### 1. Medical Trials and Vaccine Efficacy

On the efficacy of hydroxychloroquine treatment on COVID-19 | 3:12

<https://www.youtube.com/watch?v=zFTDjQcT4tI>

20200731 Fauci Shuts Down GOP Rep Trying to Play Scientist

*"The Henry Ford Hospital study that was published, was a non-controlled, retrospective, cohort study. That was confounded by a number of issues, including the fact that many of the people who were receiving hydroxychloroquine were also receiving corticosteroids, which we know from another study, gives a clear benefit in reducing deaths with advanced disease. So, that study is a flawed study, and I think anyone who examines it carefully, is that it is not a **randomized placebo-controlled trial**. ... The point that I think is important, because we all want to keep an open mind, any and all of the randomized placebo-controlled trials, which is the gold standard of determining if something is effective, none of them had shown any efficacy by hydroxychloroquine. Having said that, I will state, when I do see a randomized placebo-controlled trial that looks at any aspect of hydroxychloroquine, either early study, middle study, or late, if that **randomized placebo-controlled trial shows efficacy, I would be the first one to admit it and to promote it**. But I have not seen yet a randomized placebo-controlled trial that's done that. And in fact, every randomized placebo-controlled trial that has looked at it, has shown no efficacy. So, I just have to go with the data. **I don't have any horse in the game one way or the other, I just look at the data.**"*

Dr. Anthony Fauci's statement on hydroxychloroquine at the House coronavirus hearing on July 31, 2020. He said: "any and all of the **randomized placebo-controlled trials**, which is the gold standard of determining if something is effective, none of them had shown any efficacy by hydroxychloroquine".

<https://www.rev.com/blog/transcripts/dr-fauci-hydroxychloroquine-statement-transcript-house-coronavirus-hearing-july-31>

20201222 Fauci says he's confident in the vaccine. Here's why 10:32

<https://www.youtube.com/watch?v=jZ1WVUHrae4>

20201222 Dr. Anthony Fauci on COVID-19 vaccines 7:47

<https://www.youtube.com/watch?v=2OyQLlaEM30>

20201222 Dr. Fauci receives COVID-19 vaccine 2:07

<https://www.youtube.com/watch?v=aEx2g5G57KE>

A counterexample: Thalidomide scandal [https://en.wikipedia.org/wiki/Thalidomide\\_scandal](https://en.wikipedia.org/wiki/Thalidomide_scandal)

In the late 1950s and early 1960s, the use of thalidomide in pregnant women in 46 countries resulted in the "biggest man-made medical disaster ever", resulting in more than 10,000 children born with a range of severe deformities, such as phocomelia, as well as thousands of miscarriages. It was introduced as a sedative and medication for morning sickness **without having been tested on pregnant women**.

Shadow of the Thalidomide Tragedy | The New York Times 12:07

<https://www.youtube.com/watch?v=41n3mDoVbvk>

## 2. Randomized Controlled Trial (RCT)

- 1) **Observational studies** passively collect data. Researchers observe, record, or measure, but do not impose a treatment on the subjects. In **experiments**, the researchers intentionally intervene by imposing some treatment on the subjects in order to investigate the impact on the response variable.
- 2) Experiments often try to show that changing one variable (the **explanatory variable**) causes changes in another variable (the **response variable**). In an experiment, researchers actually control the explanatory variables rather than just observe them.
- 3) Observational studies fail to verify a causal effect because **confounding** with **lurking variables** makes it impossible to say what the effect of the treatment was on the response. In a **randomized comparative experiment**, we compare two or more treatments, use chance to decide which subjects get each treatment, and use enough subjects so that the effects of chance are small.
- 4) **Randomization or randomized trial** is an experiment that produces groups of subjects that should be similar, on average, in all respects before the **treatment/intervention** is applied.
- 5) An experiment in which neither subjects nor researchers recording the symptoms know which treatment was received is called **double-blind**.

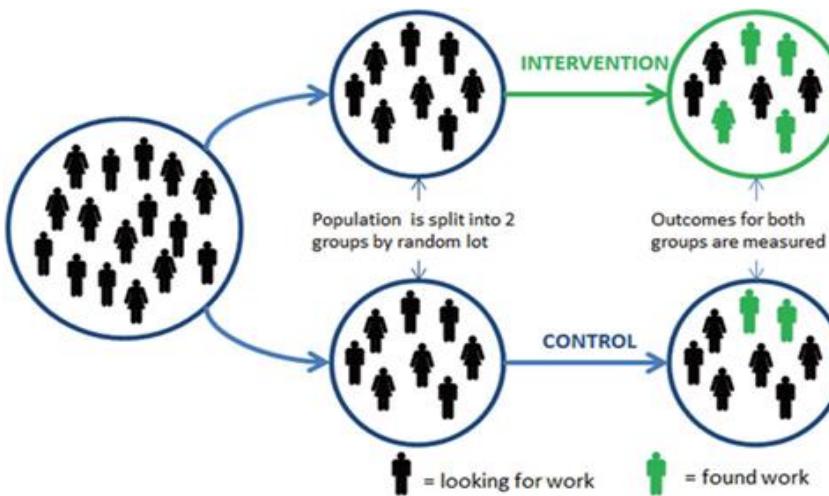


Figure 1. The basic design of a randomised controlled trial (RCT), illustrated with a test of a new 'back to work' programme.

Starting with a group of people, randomly divide them into a control group and a treatment group. Perform some intervention on the treatment group (e.g. 'back to work' program), then see how the outcomes differ. Let's say 70% of the treatment group find a job compared to 40% of the control. The randomization is the key element which allows us to causally interpret the results. If the two groups were perfectly randomized, and if nobody dropped out of the study, then we can assume the differences in the results are not due to differences between the groups because they should be more or less identical in terms of age, gender, income, education and so on. Since the 'back to work' program is the only important difference between the groups, we conclude that it caused the 30% improvement in employment outcomes.

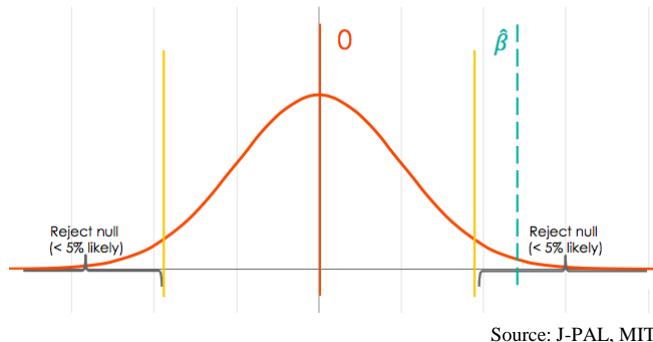
- 6) Real world experiment example: researchers at Johns Hopkins University School of Medicine studied whether some people develop a serious addiction called caffeine dependence syndrome.
  - a. Research question: Is caffeine dependence real?
  - b. Eleven caffeine dependent volunteers took either their daily amount of caffeine or a fake (nonactive substance) for two days. Randomization was used to determine whether a subject took their daily caffeine or the fake substance.
  - c. Assigning treatment: at least a week later, subjects received the opposite treatment for a two-day period. (If a subject took caffeine during the first two-day period, they took the fake substance during the second two-day period and vice versa.)
  - d. Controlling for confounding effects: subjects' diets were restricted during the study periods. They were not allowed caffeine and also were not allowed products with artificial sweeteners (this hopefully diverted their attention from caffeine).
  - e. Several assessments (questionnaires, subject tasks, researcher interviews) were administered at the end of each two-day period.

### 3. Randomized Evaluations on Social Programs: The J-PAL

- 1) Abdul Latif Jameel Poverty Action Lab (J-PAL): Abhijit Banerjee, Esther Duflo, and Sendhil Mullainathan co-founded J-PAL at the MIT in 2003, with a mission of reducing poverty by ensuring that policy is informed by scientific evidence. <https://www.povertyactionlab.org>
- 2) Banerjee and Duflo, with longtime J-PAL affiliate Michael Kremer, were jointly awarded the 2019 Nobel Prize in Economics “for their experimental approach to alleviating global poverty.”
- 3) J-PAL conducts randomized evaluations of innovative policy ideas and programs to identify what works, what doesn’t, and why in the fight against poverty; and works with partners to bring the most effective programs to scale.
- 4) Esther Duflo (2010): Social experiments to fight poverty 17:18 TED <https://youtu.be/0zvrGiPkVcs>

### 4. The Power of Randomized Assignment

- 1) The Law of Large Numbers (LLN): a sample average can be brought as close as the average in the population from which it is drawn simply by enlarging the (i.i.d.) sample. ([w](#))
- 2) If the samples are large enough, randomly assigned groups should be similar in every way, including in ways that are easily measured or observed. Magic!
- 3) Selection bias is the source of difference between treatment and control groups that is correlated with the treatment but is not due to the treatment. Example: private school earnings premium.
- 4) Difference in group means=average causal effect (ATE) + selection bias (SB). RCT → SB=0
- 5) Treatment effect estimation
  - a. The best estimator of the treatment effect is the difference in the average outcomes in **a randomly selected** treatment and comparison group.
  - b. Mean difference method:  $E[Y_T] - E[Y_C] = \text{sum}(Y_{Ti})/N_T - \text{sum}(Y_{Ci})/N_C$
  - c. Regression method (a treatment effect estimate is often denoted  $b$ , where  $\beta$  is the true effect)
    - Model:  $Y_i = \alpha + \beta D_i + e_i$  where  $D_i$  is a binary indicator and  $e_i$  is a white noise
    - Indicator:  $D_i=1$  if individual in treatment group and  $D_i=0$  if individual in control group
    - Estimator:  $b = \text{Cov}(D_i, Y_i)/\text{Var}(Y) = E[Y_1] - E[Y_0] = Y_1/N_1 - Y_0/N_0$
- 6) Treatment effect hypothesis testing
  - a. The null hypothesis ( $H_0$ ) is that there was no (zero) impact of the program on the outcome variable. Start by assuming that the program did not cause any change.  $H_0: \beta = 0$  vs  $H_1$
  - b. Ask: how likely is it that we would see an estimate as large as  $b$  in an experiment, if the true effect was actually zero? If it is “very unlikely”, we can reject the null hypothesis.

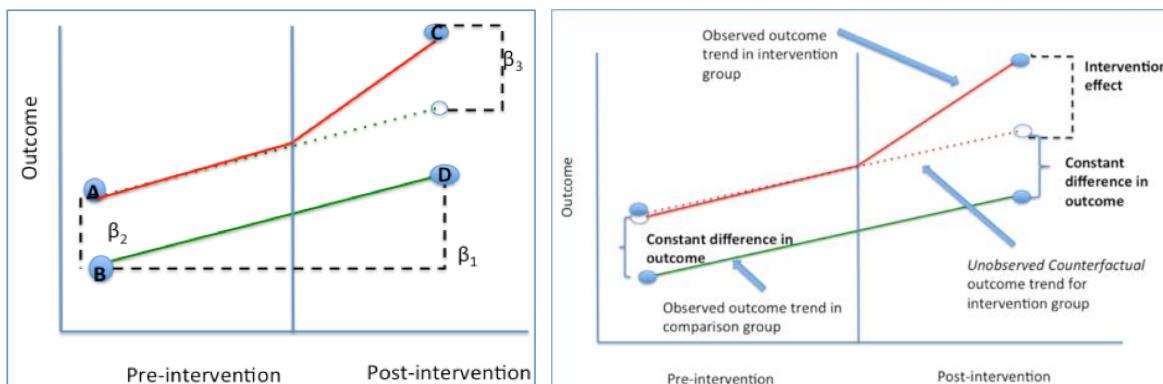


- Large treatment estimates are less likely when the true treatment effect is zero. Randomization allows us to know how likely.
- If it is very unlikely (less than 5% probability) that the T-C difference is solely due to chance: *“We can reject the null hypothesis.”* or *“The program has a statistically significant impact.”*

- a. This is a conservative approach in which emphasis is on avoiding false positives (Type I error).
- b. “The treatment effect estimate is statistically significantly different from zero at the 5% level” if an estimate this high (or low) has less than 5% probability under the null hypothesis.

#### IV. Quasi-Experiments: D-in-D and RDD Estimation

1. Natural experiments: Changes in the economic environment that create nearly identical treatment and control groups for studying the effect of that environmental change, allowing public finance economists to take advantage of randomization created by external forces.
2. Natural experiments arise when comparable individuals or groups of people are sorted by “nature” into something like a control and treatment group. They differ from RCTs because they are not consciously designed by a researcher. Example: Economic growth in NK vs SK. ([w](#))
3. Policy differences across similar areas over time (*ceteris paribus*) often create quasi-experiments.
4. **Difference-in-difference estimator:** The difference between the changes in outcomes for the treatment group, which experiences an intervention, and the control group, which does not.
  - 1) Assumption: the common factors (e.g., economic and social trends) in the treatment group that is unrelated to the policy change is the same as the ones in the control group
  - 2) Graphical representation
    - a. Time trend in the control group:  $\text{Trend} = D - B = \beta_1$
    - b. Total change in the treatment group:  $C - A = \text{Trend} + \beta_3 = \beta_1 + \beta_3$
    - c. Difference in changes between two groups over time:  $(C - A) - (D - B)$
    - d. Causal effect of the intervention =  $\beta_3 = (C - A) - (D - B) = (\beta_1 + \beta_3) - \beta_1$



<https://www.publichealth.columbia.edu/research/population-health-methods/difference-difference-estimation>

- 3) Estimator:  $(Y_{\text{Treat, After}} - Y_{\text{Treat, Before}}) - (Y_{\text{Control, After}} - Y_{\text{Control, Before}})$ , for the means of outcome  $Y$
- 4) Hypothetical example: In Arkansas, there is a cut in the TANF guarantee between 1996 and 1998 and there is no policy change in Louisiana. What is the causal effect on labor supply? For a corresponding rise in labor supply, if everything is the same for single mothers in both years, this is a causal effect. If not the same, we can perhaps use the experience of a neighboring state that did not decrease its benefits, Louisiana, to capture any bias to the estimates.

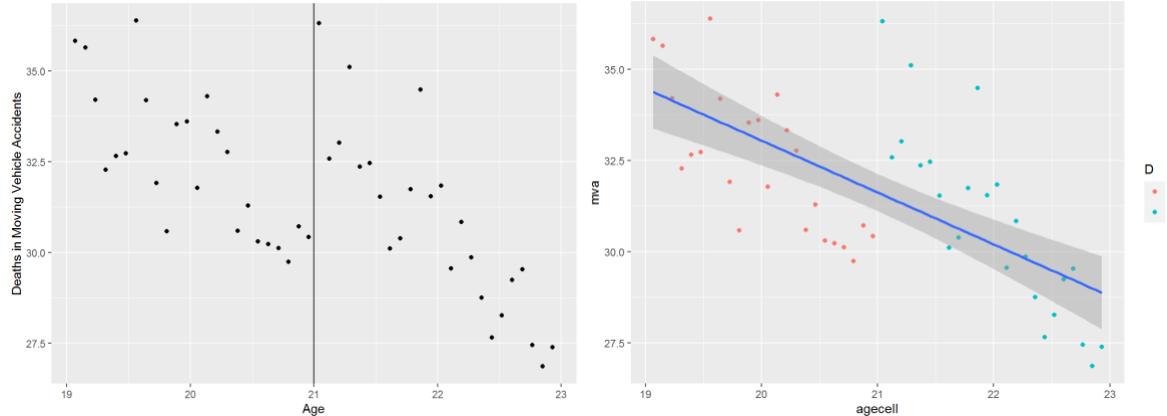
Arkansas				
		1996	1998	Difference
Benefit guarantee		\$5,000	\$4,000	-\$1,000
Hours of work per year		1,000	1,200	200
Louisiana				
		1996	1998	Difference
Benefit guarantee		\$5,000	\$5,000	\$0
Hours of work per year		1,050	1,100	50

Arkansas:  
 Labor supply in 1998 –  
 Labor supply in 1996 =  
 Policy factor + other factors  
 (other effects → bias)

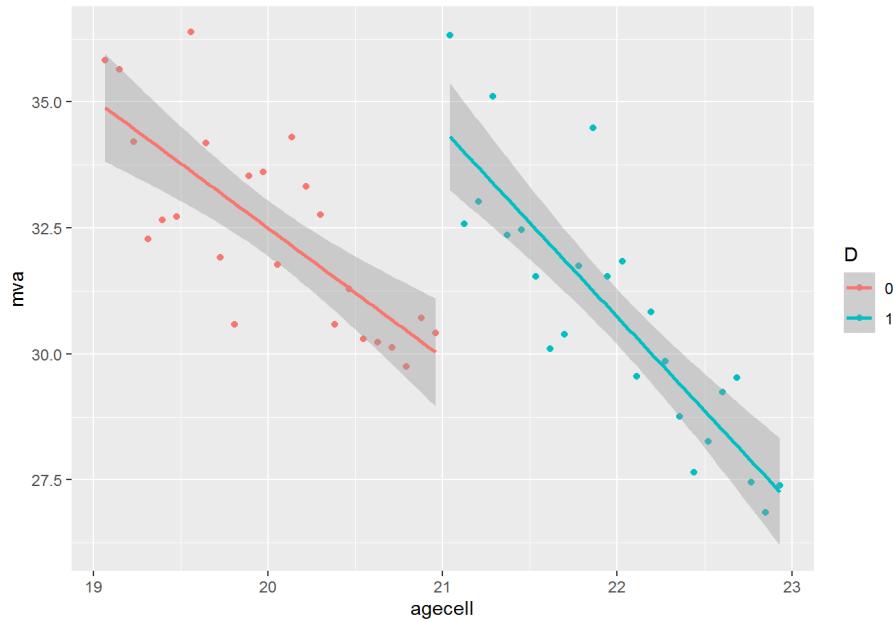
Louisiana:  
 Labor supply in 1998 –  
 Labor supply in 1996 =  
 Other factors

## 5. Regression Discontinuity Designs (RDDs)

- 1) Definition: RDDs arise when the separation into treatment and control groups follows a deterministic rule set by an exogenous or policy variable.
- 2) Graphical representation: look for the jump in the data at the cutoff



- 3) Model:  $Y_R = \alpha + \beta D_R + \gamma R + e_R$  where  $D_R$  is a binary indicator and  $e_R$  is a white noise
- 4) The parameter  $\beta$  (treatment effect) captures the jump in the  $R$  variable at the cutoff
- 5) The treatment variable  $D_R=1$  indicates the presence of treatment and  $D_R=0$  otherwise.
- 6) The running variable  $R$  determines treatment status and plays a central role in the RDD.
- 7) Treatment status is a deterministic function of  $R$ , so that once we know  $R$ , we know  $D_R$
- 8) Treatment status is a discontinuous function of  $R$ , because no matter how close  $R$  gets to the cutoff,  $D_R$  remains unchanged until the cutoff is reached.
- 9) In sharp RDD, treatment switches cleanly off or on as the running variables passes a cutoff.



<https://bookdown.org/carillitony/bailey/chp11.html>

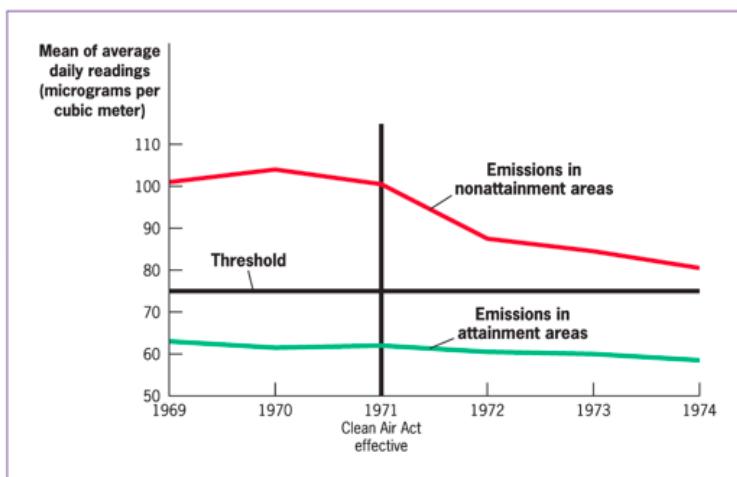
*Must-read: Mastering Metrics, CH5 Differences-in-Differences*

*Must-read: Mastering Metrics, CH4 Regression Discontinuity Designs*

## V. Quasi-Experimental Evaluation Applications

### 1. Environmental externalities (CH6.1)

- 1) Research question: What are the health effects and costs of emission particulates?
- 2) Traditional approach: Relate adult mortality to the level of particulates in the air and compare dirty areas to cleaner ones based on a mortality measure.
- 3) Potential problem: The areas with more particulates may differ from areas with fewer particulates in many other ways, not just in amount of particulates in the air (e.g., workplace safety).



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Chay and Greenstone (2003)

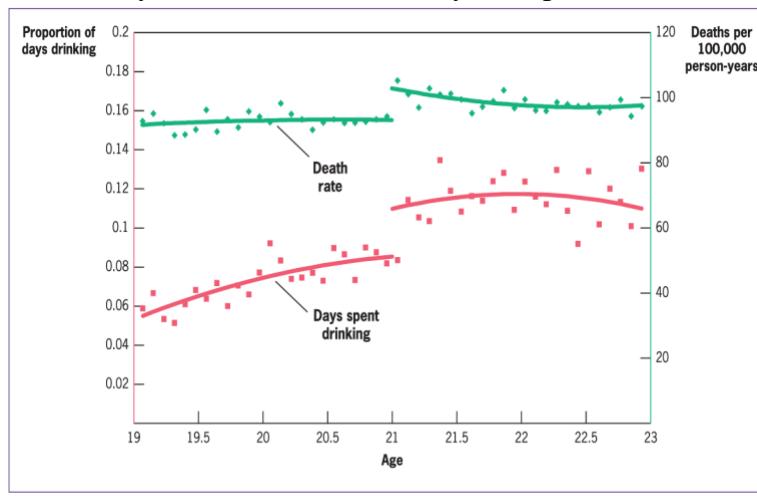
- SO<sub>2</sub> Levels in Attainment and Nonattainment Areas.
- For areas with totally suspended particulates (TSPs) below the mandated threshold, there was only a slight reduction in TSPs over time.
- For areas above the mandated threshold, there was a very large reduction in emissions after the legislation became effective in 1971.

- 4) Quasi-experimental design: regulatory changes induced by the Clean Air Act, effective 1971
- 5) Treatment/intervention: state regulation with a mandated emission threshold (60m)
- 6) Treatment group: counties with emissions above a mandated threshold (nonattainment)
- 7) Control group: counties with similar emissions but below that threshold (attainment)
- 8) Two groups were similar before the treatment and should experience similar changes over time. In the set of counties that had low levels of TSPs before the CAA, there was little change in emission over this time period. In the set of higher-emitting counties that were subject to the restrictions of the regulations, TSPs fell dramatically after 1971.
- 9) Empirical findings: infant mortality rate (the share of newborns who die before their first birthday) declined substantially in the treatment areas relative to the controls
- 10) Treatment effect estimation: 10% decline in particulates led to a 5% decline in IMR
- 11) Implication: 1300 fewer infants died in 1972 as a result of the CAA, confirming in a much more convincing manner the high health costs of emissions and the benefits of regulation.
- 12) Limitation: what were the costs of regulation? Were the treatment and control truly comparable?
- 13) Similar research: Deryugina et al. (2016) and Barreca et al. (2017)

The Plain English Guide to the Clean Air Act provides a brief introduction to the 1990 Clean Air Act. The 1990 Clean Air Act is the most recent version of a law first passed in 1970 to clean up air pollution. This summary covers some of the important provisions of the 1990 Clean Air Act and may help you understand what is in the law and how it may affect you. <https://www.epa.gov/clean-air-act-overview>

## 2. MLDA minimum legal drinking age and health externalities (CH6.4 and MM4.1)

- 1) Research question: Should the government increase minimum legal drinking age?
- 2) Pros: Youths are particularly susceptible to the internalities and externalities of drinking, particularly with respect to drunk driving. Imposing MLDA reduces youth drinking behavior.
- 3) Cons: A higher drinking age doesn't stop youth drinking and may even make it even worse.
- 4) Naïve approach: Compare drinking rates above and below the minimum legal drinking age
- 5) Potential problem: Age itself may be a confounding factor affecting drinking behavior. For example, the taste for alcohol rises with age. If that is the case, we might find drinking rises after MLDA but that this increase has nothing to do with legality. Bias of a naïve comparison.
- 6) Quasi-experimental design: in the 1980s states changed their drinking ages at different times as they moved from lower drinking age toward a nationally uniform standard of age 21.
  - a. Treatment vs control: states that raised their drinking ages versus states that did not
  - b. If the drinking age matters for drinking, then drinking should have fallen among those people between lower drinking age and age 21 when the law changed, relative to the "control" states
  - c. Treatment effects: a lower drinking age led to 6 to 17% more drinking among 18- to 20-year-olds and they tend to drink more as they aged (Cook and Moore, 2001); 17% increase in the rate of motor vehicle deaths for the 18- to 20-year-olds (Carpenter and Dobkin, 2011); worse outcomes for birth to teen mothers (Fertig and Watson, 2009)
- 7) RDD design: Contrast outcomes in recent data right around the 21<sup>st</sup> birthday.
- 8) Key assumption: While those who are over 21 may be different in general than those under age 21, those who are observed in the few days before their 21<sup>st</sup> birthday should be similar to those in the few days after their 21<sup>st</sup> birthday—except for the fact that the latter group can drink legally.



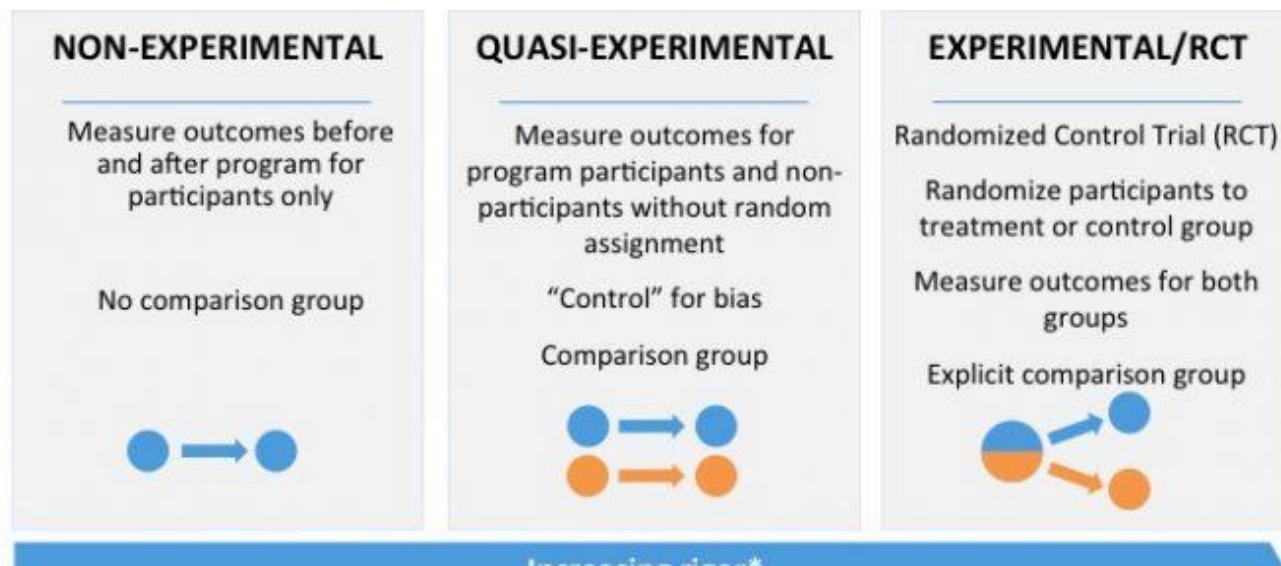
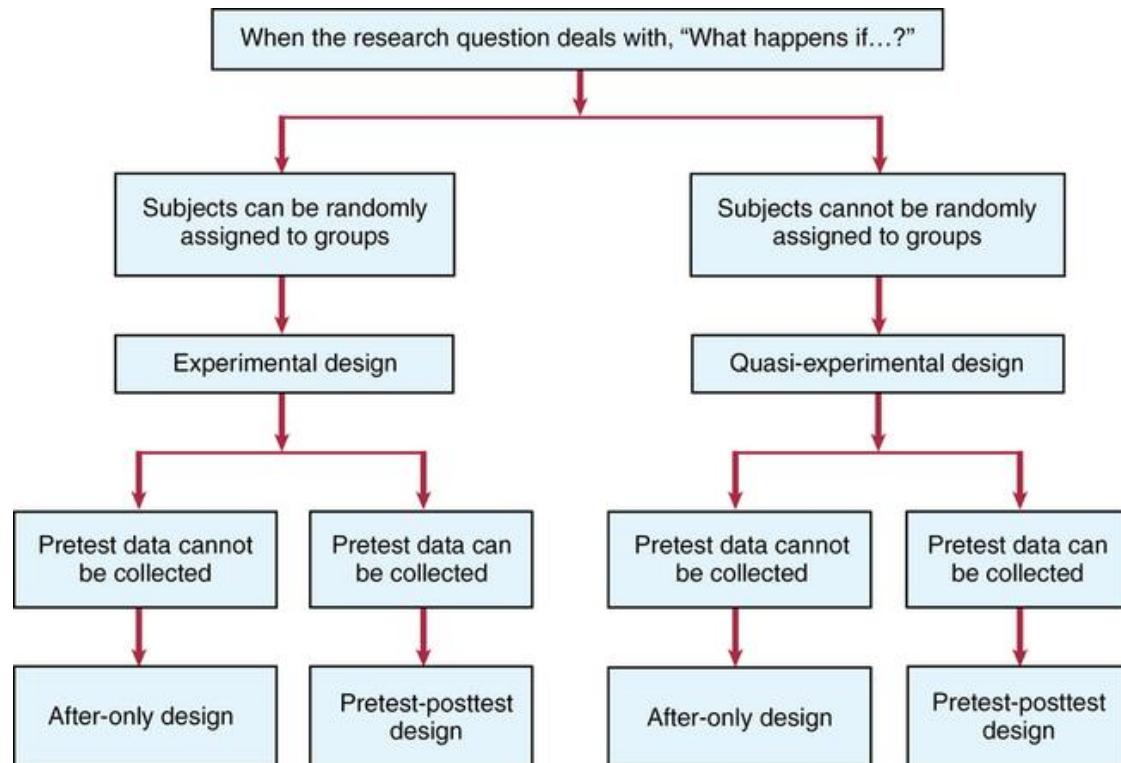
Carpenter and Dobkin (2009)

There is a discontinuous shift at age 21—a clear jump in the data on the proportion of days drinking and the death rate at the twenty-first birthday.

The lines/curves are fitted via regressions minimizing the total sum of square errors.

- 9) Model:  $Y_R = \alpha + \beta D_R + \gamma Age + e_R$  where  $D_R$  is a binary indicator and  $e_R$  is a white noise
- 10) The parameter  $\beta$  (treatment effect) captures the jump in the Age running variable at the cutoff
- 11) The treatment variable  $D_R > 21$  indicates the presence of treatment and  $D_R = 0$  otherwise.
- 12) The points in the figure are the actual monthly averages by month of age. The solid line/curve is a regression line/curve estimated separately for ages up to 21 and ages over 21.
- 13) Treatment effect: regression using the actual birthday, rather than just month of birth, shows that those individuals just over age 21 spend about 30% more days drinking than those just below 21.
- 14) Implication: the sizeable discontinuity suggests that there is an effect of legalization at age 21.

## VI. Summary and Comparison on Experiments



*While a well designed RCT is the most rigorous method, RCTs are not always well designed and they are not always feasible. In fact, a strong quasi-experimental design may produce the most rigorous evidence available for a given program and the greatest value for practitioners and policy makers. It is important to choose the right method of evaluation for the program and population of interest.*

<https://www.publichealthnotes.com/20-differences-between-randomized-controlled-trial-rct-and-quasi-experimental-study-design/>

## VI. Limitations of Both Randomized Trials and Quasi-Experimental Approaches

- 1) They can tell us how outcomes change when there is an intervention but often can't tell us why.
- 2) Internal validity may not imply external validity:
- 3) RCT experiments can be very expensive, time-consuming, and often raise difficult ethical issues
- 4) The **Attrition** problem: Reduction in the size of samples over time, which, if not random, can lead to biased estimates.
- 5) With quasi-experimental studies, we can never be completely certain that we have purged all bias from the treatment-control comparison. Quasi-experimental studies use two approaches to try to make the argument that they have obtained a causal estimate. **Intuitive approach:** Argues that, given the experiment, most of the bias has been removed. **Statistical approach:** Uses alternative or additional control groups to confirm that bias has been removed.
- 6) They provide only an estimate of the causal impact of a particular treatment such that we can't necessarily extrapolate from a particular change in the environment to model all possible changes in the environment

## Appendix: The Science and Art of Natural Experiment

The foundation of causal inference is the law of demand: P causes Q<sub>D</sub>, all else equal. This is a single equation approach in understanding causal inference. The question is what causes P in the first place?

Example: What is the cause of different economic performance between NK and SK?

Effect: Income or wealth disparity between the two countries.

Cause: Communist vs capitalist regimes (political and economic system)

How much should we trust in this causal argument?

Are the two countries truly all else equal except for the social economic system?

Causal inference works as follows: P price of economic system → Q<sub>D</sub> national income or output

The communist regime has a much higher price in guiding and coordinating social economic activities ("the visible hand replaces the invisible hand"), causing much smaller Q<sub>D</sub> and equilibrium output.

If P is the cause and Q is the effect, then what drives P? From the general equilibrium perspective, supply of the market institutions reduces transaction costs (price of economic activities) in the economy and stimulates productivity, as in the case of SK.

## References

Gruber (2019)

CH3 Empirical Tools of Public Finance

CH3 Appendix: Cross-Sectional Regression Analysis

CH6 Externalities in Action: Environmental and Health Externalities

Mastering Metrics

CH1 Randomized Trials & Appendix

CH2 Regression & Appendix

CH4 Regression Discontinuity Designs

CH5 Differences-in-Differences

CH2.1 A Tale of Two Colleges

CH4.1 Birthdays and Funerals (MLDA)

CH5.2 Drink, drunk... (MLDA)

Introduction to Probability [7 Videos]

[www.youtube.com/playlist?list=PLA94274C337F094CD](https://www.youtube.com/playlist?list=PLA94274C337F094CD)

Introduction to Statistics [11 Videos]

[www.youtube.com/playlist?list=PL5FDF9394AF35A986](https://www.youtube.com/playlist?list=PL5FDF9394AF35A986)

Review Statistics with Khan Academy [Online Video]

<https://www.khanacademy.org/math/statistics-probability>

Probability and Statistics Cheat Sheet by Shervine Amidi ([w](#)) ([w](#))

<https://stanford.edu/~shervine/teaching/cme-106/cheatsheet-statistics>

World Bank DIME Research Group [https://dimewiki.worldbank.org/Main\\_Page](https://dimewiki.worldbank.org/Main_Page)

List of 19 Natural Experiments ([w](#))

North Korea vs. South Korea, a natural economic experiment ([w](#))

Natural Experiments: An Overview of Methods, Approaches, and Contributions ([w](#))

Test, Learn, Adapt: Developing Public Policy with Randomised Controlled Trials ([w](#))

Medical Research Council: Using natural experiments to evaluate population health interventions ([w](#))

Columbia Public Health – Population Health Methods - Difference-in-Difference Estimation ([w](#))

Regression Discontinuity: Looking for Jumps in Data ([w](#))

Presenting results of a Regression Discontinuity Design ([w](#))

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Bruce D. Meyer, 1995, Natural and Quasi-Experiments in Economics, Journal of Business & Economic Statistics, Vol. 13, No. 2, JBES Symposium on Program and Policy Evaluation, pp. 151-161 [\(w\)](#)

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Levy, Ro'ee. 2021. "Social Media, News Consumption, and Polarization: Evidence from a Field Experiment." American Economic Review, 111 (3): 831-70. [\(w\)](#)

Cohen, Lauren, Umit G. Gurun, and Danielle Li. 2021. "Internal Deadlines, Drug Approvals, and Safety Problems." American Economic Review: Insights, 3 (1): 67-82. [\(w\)](#)

## Lecture 4 Government Budget Analysis

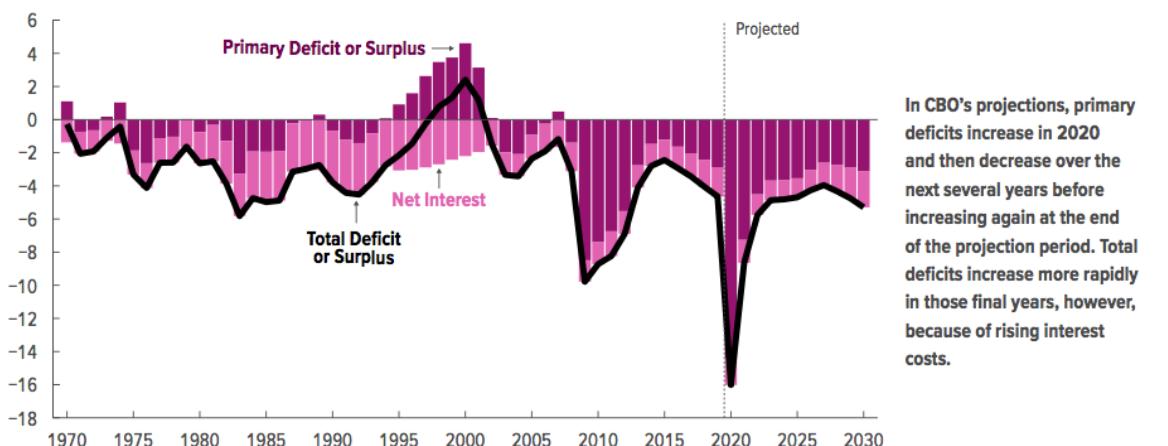
Biwei Chen

### Outline

- Federal Deficit and Debt
- Government Budget Analysis
- Empirical Study and Evidence

*At 14.9 percent of gross domestic product (GDP), the deficit in 2020 was the largest it has been since the end of World War II. Much of that deficit stemmed from the 2020 coronavirus pandemic and the government's actions in response—but the projected deficit was large by historical standards (\$1.1 trillion, or 4.9 percent of GDP) even before the disruption caused by the pandemic. In the Congressional Budget Office's projections, deficits as a percent of GDP fall between 2021 and 2027 (from 8.6 percent of GDP to 4.0 percent), and then increase to 5.3 percent of GDP by 2030—more than one-and-a-half times the average over the past 50 years. ...*

Percentage of Gross Domestic Product



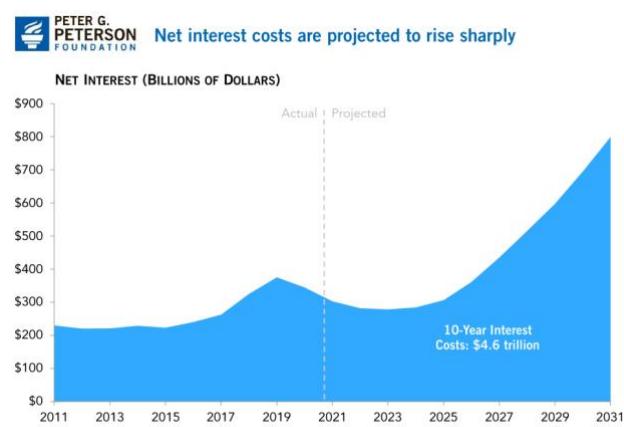
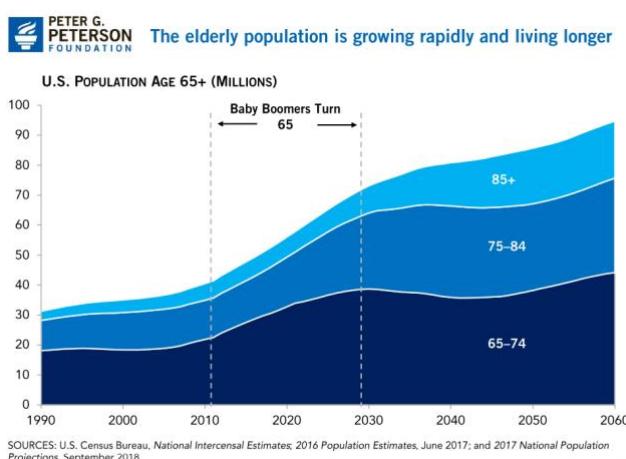
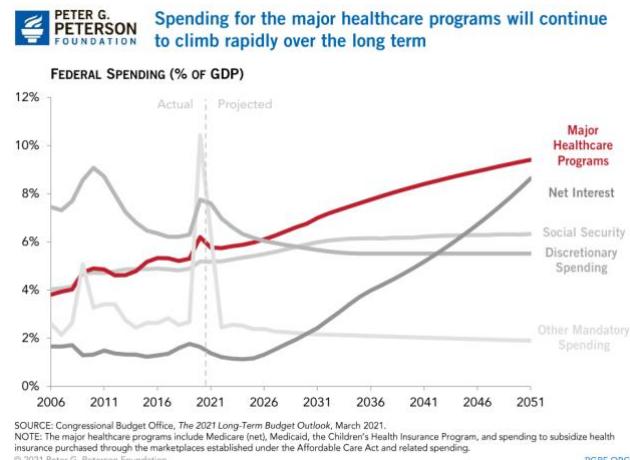
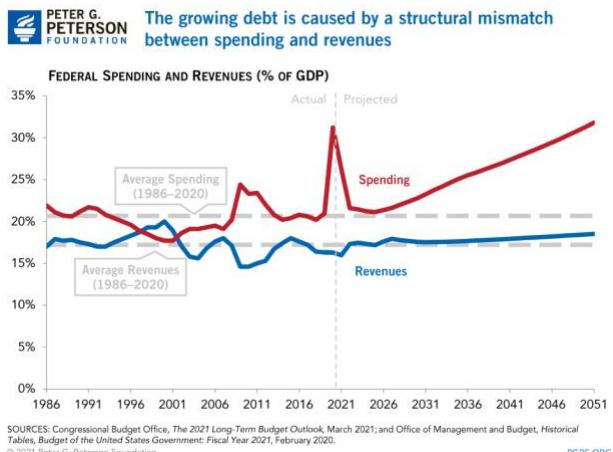
CBO projects that if current laws governing taxes and spending generally remained unchanged, **federal debt held by the public** would first exceed 100 percent of gross domestic product (GDP) in 2021 and would reach 107 percent of GDP, its highest level in the nation's history, by 2023. Debt would continue to increase in most years thereafter, reaching 195 percent of GDP by 2050. High and rising federal debt makes the economy more vulnerable to rising interest rates and, depending on how that debt is financed, rising inflation. The growing debt burden also raises borrowing costs, slowing the growth of the economy and national income, and it increases the risk of a fiscal crisis or a gradual decline in the value of Treasury securities. <https://www.cbo.gov/publication/56783>

Percentage of Gross Domestic Product



## I. The Current U.S. Fiscal Position ([w](#)) ([w](#))

1. Federal debt is on an unsustainable path
  - 1) The growing debt is caused by a structural mismatch between spending and revenue
  - 2) The national debt is already equal in size to the entire economy and could rise to twice its size by 2051 if current laws remain the same, according to the Congressional Budget Office
  - 3) That level of debt would far exceed the 50-year historical average of 44 percent of GDP
2. Drivers of the long-term debt
  - 1) Rising healthcare costs: U.S. per capita healthcare spending is nearly three times the average of other developed countries (although the U.S. spends more on healthcare than other developed countries, its health outcomes are generally not any better.)
  - 2) Changing demographics: the elderly population is growing rapidly and living longer
  - 3) Rapidly rising interest costs: Interest costs will soon be the fastest-growing “program” in the federal budget — exceeding the growth of Social Security or Medicare — and will total \$4.6 trillion over the next decade according to CBO.



### Footnote:

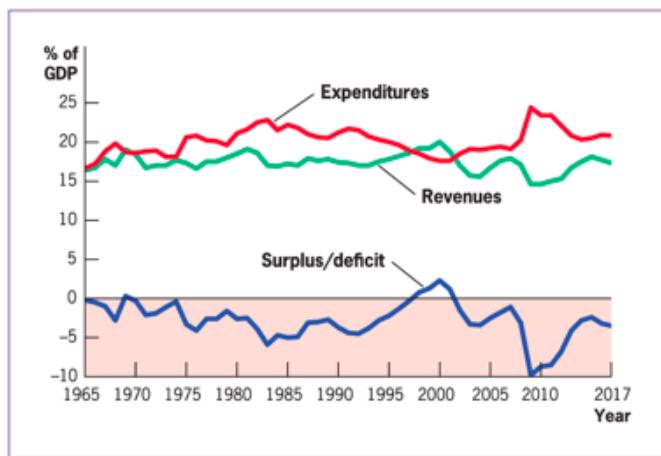
Primary deficit: the difference between government revenues and spending, excluding interest payments.

Mandatory spending: social security, health care, income security/welfare programs, interest payments

Discretionary spending (determined by Congress): national defense, non-defense (education, research grants, space exploration, training, employment, transportation, etc.), and other public infrastructure

## II. Government Budgeting: A Primer

1. Deficit: The amount by which a government's spending exceeds its revenues in a given year.
2. Debt: The amount that a government owes to those who have loaned it money.
3. What is American national debt today, total and per capita? ([w](#))
4. The budget process distinguishes between two types of federal spending:
  - 1) Entitlement (mandatory) spending: Mandatory funds for programs for which funding levels are automatically set by the number of eligible recipients, not the discretion of Congress.
  - 2) Discretionary spending: Optional spending set by appropriation levels each year, at Congress's discretion.

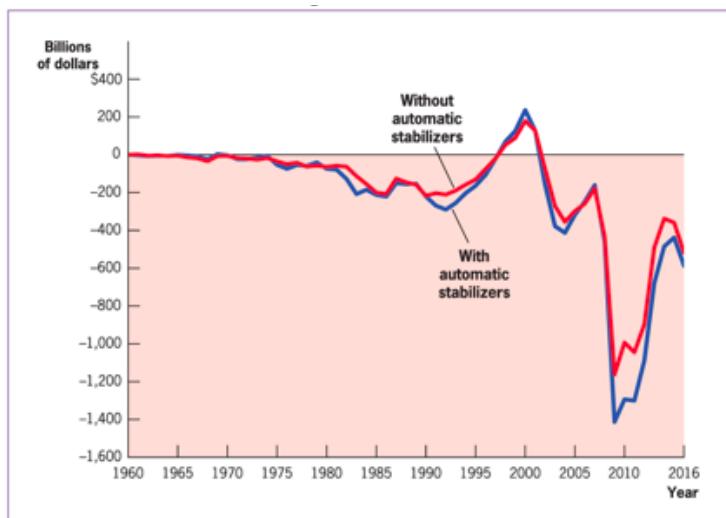


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Federal government spending rose fairly steadily from 1965 through the mid-1980s, but tax revenues did not keep pace, leading to a large deficit. This deficit was eroded and turned to a surplus in the 1990s, but by 2001, the United States was back in deficit again. Controlling the budget is a difficult process.

1985 GRH Deficit Reduction Act  
1990 BEA Budget Enforcement Act

5. Congressional Budget Office: Established under the Congressional Budget Act of 1974, CBO provides objective, nonpartisan information to support the budget process and to help the Congress make effective budget and economic policy. <https://www.cbo.gov/about/overview>
6. Budget policies and deficits at the State Level: One tool for balancing budgets is a balanced budget requirement, used by many states.
  - 1) Balanced budget requirement (BBR): A law forcing a given government to balance its budget each year (spending = revenue).
  - 2) Ex post BBR: A law forcing a given government to balance its budget by the end of each fiscal year. Forces revenues and expenditures at the end of each year to actually balance.
  - 3) Ex ante BBR: A law forcing either the governor to submit a balanced budget or the legislature to pass a balanced budget at the start of each fiscal year or both.
  - 4) Ex ante BBR is less effective than ex post BBR because rosy projections of revenues can make a budget appear to be balanced when at the end of the year it is revealed to actually be unbalanced due to unrealistic expectations.
7. Measuring the budgetary position of the government
  - 1) Nominal vs real measurements: current prices vs constant prices
  - 2) Economic condition: Because revenue (taxes) and spending (insurance) depend on the economy, the deficit changes even when policy does not.
    - a. Automatic stabilizers: Automatic reductions in revenues and increases in outlays when the economy shrinks relative to its potential.
    - b. Cyclically adjusted budget deficit: A measure of the government's fiscal position if the economy were operating at full potential GDP.
    - c. Economic adjustment to measuring the deficit: the CBO computes the cyclically adjusted



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The cyclically adjusted budget deficit controls for the impacts of economic activity on the budget. In periods of economic expansion (e.g., the late 1990s), the cyclically adjusted deficit is actually higher than the reported deficit.

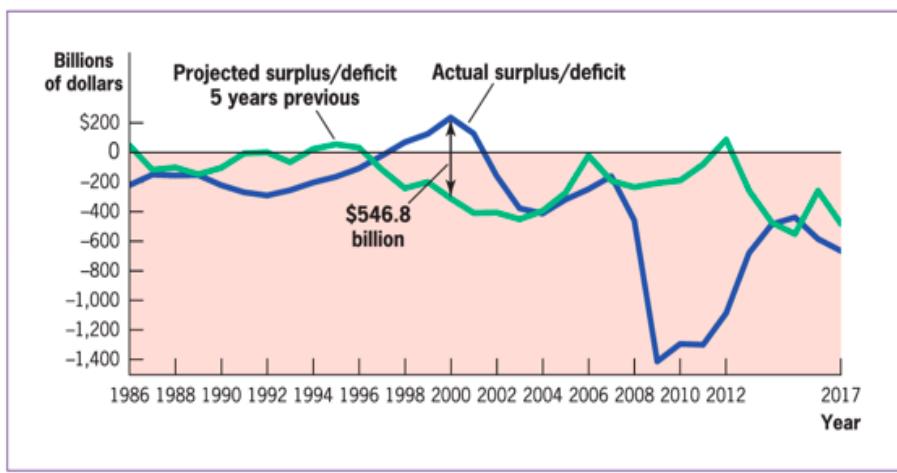
On the other hand, when the economy is underperforming—such as in the early 1990s, the early 2000s, and especially in recent years—the cyclically adjusted deficit is significantly lower than the reported deficit.

Data: CBO (2019)

- 3) Cash vs capital accounting: Government investments in assets can worsen the budget deficit.
  - a. Cash accounting: A method of measuring the government's fiscal position as the difference between current spending and current revenues.
  - b. Capital accounting: A method of measuring the government's fiscal position that accounts for changes in the value of the government's net asset holdings.
  - c. Cash accounting treats a birthday party and an office building as identical, but capital accounting does not.
- 4) Problems with capital budgeting: Capital budgeting seems conceptually appealing, but some U.S. states and foreign countries use capital budgets with mixed results.
  - a. It is very hard to say when spending has increased the government's assets. Does buying a missile count as an investment?
  - b. The difficulties might make it easier for politicians to misstate the government's budgetary position with a capital budget than without one.
- 5) Static vs dynamic scoring: When policy changes, household behavior also changes, potentially affecting the budget deficit. How to account for this?
  - a. Static scoring: A method used by budget modelers that assumes that government policy changes only the distribution of total resources, not the amount of total resources.
  - b. Dynamic scoring: A method used by budget modelers that attempts to model the effect of public policy on both the distribution of total resources and the amount of total resources.
  - c. How does "stimulus spending" affect the budget deficit? This government spending can be very large and is explicitly intended to grow the economy; static scoring would suggest that it is very expensive. Dynamic scoring by the CBO suggested that the stimulus increased GDP by 0.1–1.9% in 2012–2013. But in the long run, the stimulus may slightly decrease growth. Overall, it is difficult to assess the impact of policy on the economy.

### III. Long-Run Perspective on Deficits and Debts

1. Do current debts and deficits mean anything? Many government programs create future expenses even if they are not explicitly in law.
  - 1) Implicit obligation: Financial obligations that the government has in the future that are not recognized in the annual budgetary process. Example: Social Security payments are promised into the far future.
  - 2) Deciding whether to spend \$1 this year or next affects the current deficit by \$1 but has very little impact on the government's financial position. How much do future obligations or payments cost today? Present discounted value is applicable in long-run budgeting.
2. Why current labels may be meaningless? Looking at only the current revenues and expenditures can lead to biased government policy making that favors policies that look good in terms of current budgets, even if they have bad long-term consequences for the fiscal position of the government.
3. Measuring long-run government budgets: One way to account for current and future expenditures and revenue is the intertemporal budget constraint. (Gokhale and Smetters, 2003)
  - 1) Intertemporal budget constraint: An equation relating the present discounted value of the government's obligations to the present discounted value of its revenues.
  - 2) Using this approach, the Trustees of the Medicare and Social Security Funds released data in 2012 on the long-run fiscal imbalance of the Social Security and Medicare programs. The results are stunning: from the perspective of 2012, the fiscal imbalance is \$64.8 trillion.
  - 3) Limitations to this approach. These calculations require potentially heroic assumptions about interest rates (assume an interest rate of 3.2%), costs, and incomes in the very distant future. They assume that government policy remains unchanged. They consider the pattern over time only of transfer programs, not of other investments and government policies.
4. What does the government do? The current budgeting approach scores policies on a 10-yr window.



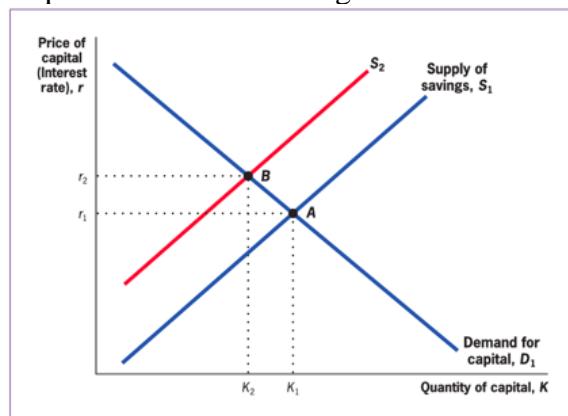
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CBO projections of the budget surplus/deficit five years ahead have deviated significantly from the actual surplus or deficit, particularly during the high-deficit years of the early 1990s and the high-surplus years of the late 1990s and early 21st century.

- 1) Replaces 1- and 5-year windows used before 1996, incorporating some long-run concerns.
- 2) Avoids imposing assumptions about revenue and expenditure in the very distance future.
- 3) Nonetheless, difficult to forecast over even a 5-year period: Actual and projected deficits can differ by more than \$500 billion.

#### IV. The Fiscal and Economic Impact ([w](#))

1. A strong fiscal outlook is an essential foundation for a growing, thriving economy. Putting our nation on a sustainable fiscal path creates a positive environment for growth, opportunity, and prosperity. With a strong fiscal foundation, the nation will have increased access to capital, more resources for future public and private investments, improved consumer and business confidence, and a stronger safety net.
2. Rising debt threatens America's future in a number of critical ways
  - 1) Reduced public and private investments
  - 2) Fewer economic opportunities for Americans.
  - 3) Greater risk of a fiscal and social crisis
  - 4) Challenges to national security
  - 5) Imperiling the social safety net
3. What does the national debt mean for American's future? ([w](#))
  - 1) High and rising federal debt reduces our flexibility to plan for and respond to urgent crises.
  - 2) Growing interest costs make it harder to invest in our future—to build and sustain infrastructure, enhance education and support an economy that creates job growth and rising wages.
  - 3) It threatens the safety net—critical programs like Social Security, Medicaid, Medicare, SNAP and unemployment compensation are essential lifelines for our most vulnerable populations.
  - 4) America faces emerging and ongoing challenges that will require resources to keep our country safe and strong—challenges like climate change, affordable health care, international conflicts and an increasingly complex and competitive global economy.
  - 5) Our children and grandchildren. Borrowing more and more today reduces the opportunities and prosperity of the next generation.
4. Fiscal responsibility: Implications for efficiency and (intergenerational) equality.
  - 1) Budget deficits can affect the amount of savings and growth in the economy. More capital, more growth: Capital accumulation is a key part of economic growth ( $MPL \rightarrow TPL$ ).
  - 2) The key concern about federal deficits is that the federal government's borrowing might compete with the borrowing of households and firms. Crowd-out: Deficit  $\rightarrow S \rightarrow i \rightarrow C & I$



- Adding government borrowing into the capital market reduces the supply of saved funds available to the private capital market.
- Suppose a fixed supply of savings is used to finance both the capital of private firms and the borrowing of the government.
- Government's borrowing reduces the supply of savings. This increases interest rates and crowd outs the borrowing of the private sector, leading to a lower level of capital accumulation.

- 3) Intergenerational equity: The treatment of future generations relative to current generations. Budget deficits mean more benefits for the current generation relative to future generations. Today's deficits are tomorrow's taxes, so high deficits imply redistribution from future to current generations. But, because of economic growth, future generations have better standards of living than previous ones.
- 4) The existing empirical literature on this question is somewhat inconclusive (short vs long rates)

## V. Government Budget Constraint and Taxation

### 1. Inter-temporal budget constraint (government expenditure=government revenue)

$$G_t + V_t + i_{t-1} \cdot (B_{t-1}^g / P_t) = T_t + (B_t^g - B_{t-1}^g) / P_t + (M_t - M_{t-1}) / P_t$$

- 1) All variables are real except government bond B and money M. Thus, B/P is real quantity of government securities and M/P is real money balances in circulation.
- 2) The governments sources of funds are taxes, borrowing, and printing money. The governments uses of funds are government purchases, real transfers, and paying interest on its past debt. Government deficits can be financed via higher taxes, more borrowing, or printing money.
2. What are public, private and national saving and what is the implication of real national saving?
  - 1) Real government saving is the negative of the government deficit:  $(B_t - B_{t-1}) / P_t$
  - 2) Real private or total household saving is:  $K_t - K_{t-1} + (B_t - B_{t-1}) / P_t$
  - 3) Real national saving is the total of real government saving and real private savings:  $K_t - K_{t-1}$
  - 4) The implication of this is that real national saving equals real net investment  $S_t = I_t = K_t - K_{t-1}$
3. What are the effects of the government lowering taxes by \$1 for one period in the market clearing model with no transfer payments, the money stock fixed, no inflation and with a given time path of government purchases?
  - 1) Households now hold the \$1 government bond that must be issued to finance the resulting government deficit. Households also earn the interest while holding that debt.
  - 2) In the following period, however, households tax liabilities must rise by that exact \$1 to retire the bond and interest to be paid on the bond. Thus, the net effect of the deficit on households is zero.
4. Ricardian equivalence theorem: The theoretical finding that, for given government purchases, an increase in the current taxes has the same effect on an economy as an equal increase in the government budget deficit or that government budget deficits do not affect real national saving and leads to no income effects for households.
5. Federal debt policy in an era of low interest rates (real interest rate “r” vs economic growth rate “g”)

Impact of r and g on debt sustainability			
Case 1. r>g . Interest rate is 5% and growth rate of the economy is 3%			
Year	Debt	GDP	Debt to GDP Ratio
1	\$100	\$1,000	10.0%
2	\$105	\$1,030.00	10.2%
3	\$110	\$1,060.90	10.4%
Case 2. r=g. Interest rate is 3% and growth rate of the economy is 3%			
Year	Debt	GDP	Debt to GDP Ratio
1	\$100	\$1,000	10%
2	\$103	\$1,030.00	10%
3	\$106	\$1,060.90	10%
Case 3. r<g. Interest rate is 2% and growth rate of the economy is 3%			
Year	Debt	GDP	Debt to GDP Ratio
1	\$100	\$1,000	10%
2	\$102	\$1,030.00	9.9%
3	\$104	\$1,060.90	9.8%

From the position of the federal budget, the condition for debt to be “free” is for the interest rate to be less than the growth rate of the economy. The federal government isn’t like a household. **The government goes on forever, and so it doesn’t ever have to pay down debt.** Typically, we think that debt is sustainable so long as it isn’t growing as a share of GDP. If the total amount of debt grows by the growth rate of the economy, then debt as a share of the economy will remain stable. What that means is that the government doesn’t have to pay all the interest on the debt, it just has to pay the interest on it (“r”) less the rate of economic growth (“g”).

Source: Sheiner and Yilla (2020) Federal Debt Policy in an Era of Low Interest Rates: A Guide to the Issues. Brookings.

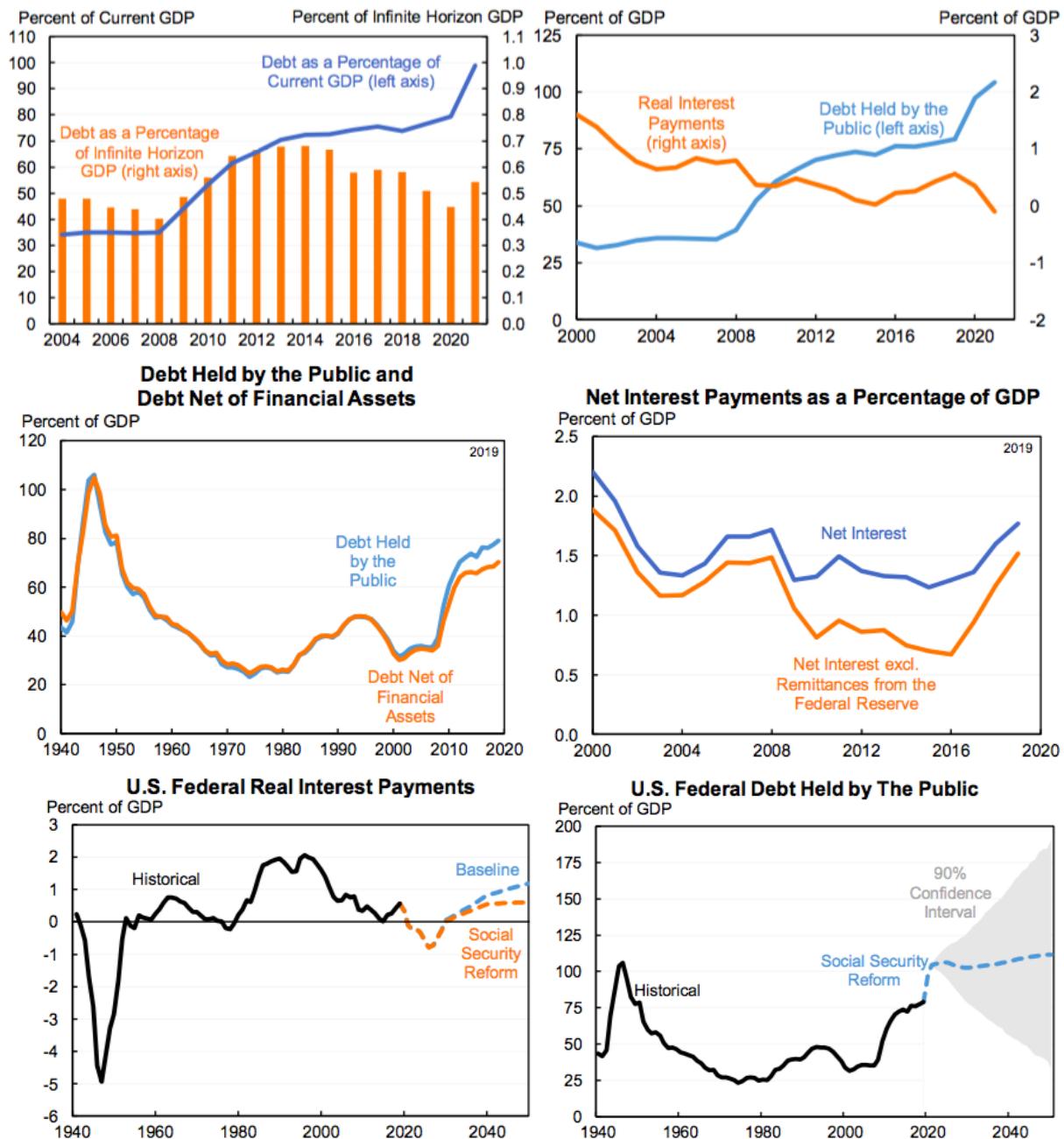
$r \approx i - pi$ , what are the determinants of i and pi? Can the central bank keep r low or negative for good?

6. A reconsideration of fiscal policy in the era of low interest rates

- 1) Interest rates are dangerously low, debt is projected to be stable, real debt service is projected to be low. More fiscal expansion needed.
- 2) Real interest payments should not be rising sharply or projected to exceed around 2 percent of GDP over the next decade.
- 3) Growth and financial stability including the avoidance of recessions and stronger long-run growth

$$\text{(Real Interest/GDP)}_t = (\text{Nominal Interest}_t - \text{Inflation}_t \cdot \text{Debt}_{t-1})/\text{GDP}_t$$

$$(\text{Debt}/\text{GDP})_t - (\text{Debt}/\text{GDP})_{t-1} \approx (r_t - g_t) (\text{Debt}/\text{GDP})_{t-1} + (\text{Deficit}/\text{GDP})_t$$



Source: Furman and Summers (2020) A Reconsideration of Fiscal Policy in the Era of Low Interest Rates. Brookings.

**Don't forget the stagflation:  $g < 0, r > 0$  will make the debt even more unsustainable. Why?  
If the government treats the investors too harsh for too long ( $r < 0$ ), it will end up with rising interest rates (Treasury securities getting dumped).**

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Options for Reducing the Deficit: 2021 to 2030 <https://www.cbo.gov/publication/56783>  
The Budget and Economic Outlook: 2021 to 2031 <https://www.cbo.gov/publication/56970>  
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An Evaluation of CBO's Past Deficit and Debt Projections <https://www.cbo.gov/publication/55234>

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Fiscal Therapy: 12 framing facts [\(w\)](#)  
Reimagining the Federal Budget Process [\(w\)](#)  
The Hutchins Center Explains: The debt limit [\(w\)](#)  
The Hutchins Center Explains: Federal budget basics [\(w\)](#)  
The Hutchins Center Explains: What are automatic stabilizers? [\(w\)](#)  
The Hutchins Center Explains: How worried should you be about the federal debt? [\(w\)](#)  
2019 Fiscal policy with high debt and low interest rates [\(w\)](#)  
2020 Fiscal policy for COVID-19 and beyond [\(w\)](#)  
2020 Federal debt policy in an era of low interest rates: A guide [\(w\)](#)  
2020 How worried should you be about the federal deficit and debt? [\(w\)](#)  
2021 The macroeconomic implications of Biden's \$1.9 trillion fiscal package [\(w\)](#)  
2021 What's the Fed doing in response to the COVID-19 crisis? What more could it do? [\(w\)](#)

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Policy Basics: Deficits, Debt, and Interest [\(w\)](#)  
Policy Basics: The “Pay-As-You-Go” Budget Rule [\(w\)](#)  
Policy Basics: Non-Defense Discretionary Programs [\(w\)](#)  
Policy Basics: Introduction to the Federal Budget Process [\(w\)](#)  
Policy Basics: Where Do Our Federal Tax Dollars Go? [\(w\)](#) [\(w\)](#)

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## Data Visualization

Real Time U.S. Debt Clock

<https://www.usdebtclock.org>

<https://www.usdebtclock.org/world-debt-clock>

2020 America's \$28T Debt Explained in one Chart

<https://howmuch.net/articles/timeline-us-debt-history>

2021 Visualizing America's \$28T Debt Explosion

<https://howmuch.net/articles/national-debt-of-the-united-states>

2020 Charting America's Debt: \$27 Trillion and Counting

<https://www.visualcapitalist.com/americas-debt-27-trillion-and-counting/>

2019 American's debt explained in 10 visualizations

<https://howmuch.net/articles/americas-debt-explained-in-10-visualizations>

2021 Visualizing Biden's \$1.52 Trillion 2022 Budget Proposal

<https://www.visualcapitalist.com/bidens-budget-proposal-2022/>

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<https://www.pgpf.org/the-fiscal-and-economic-challenge/fiscal-and-economic-impact>

## Lecture 5 Taxation Policy

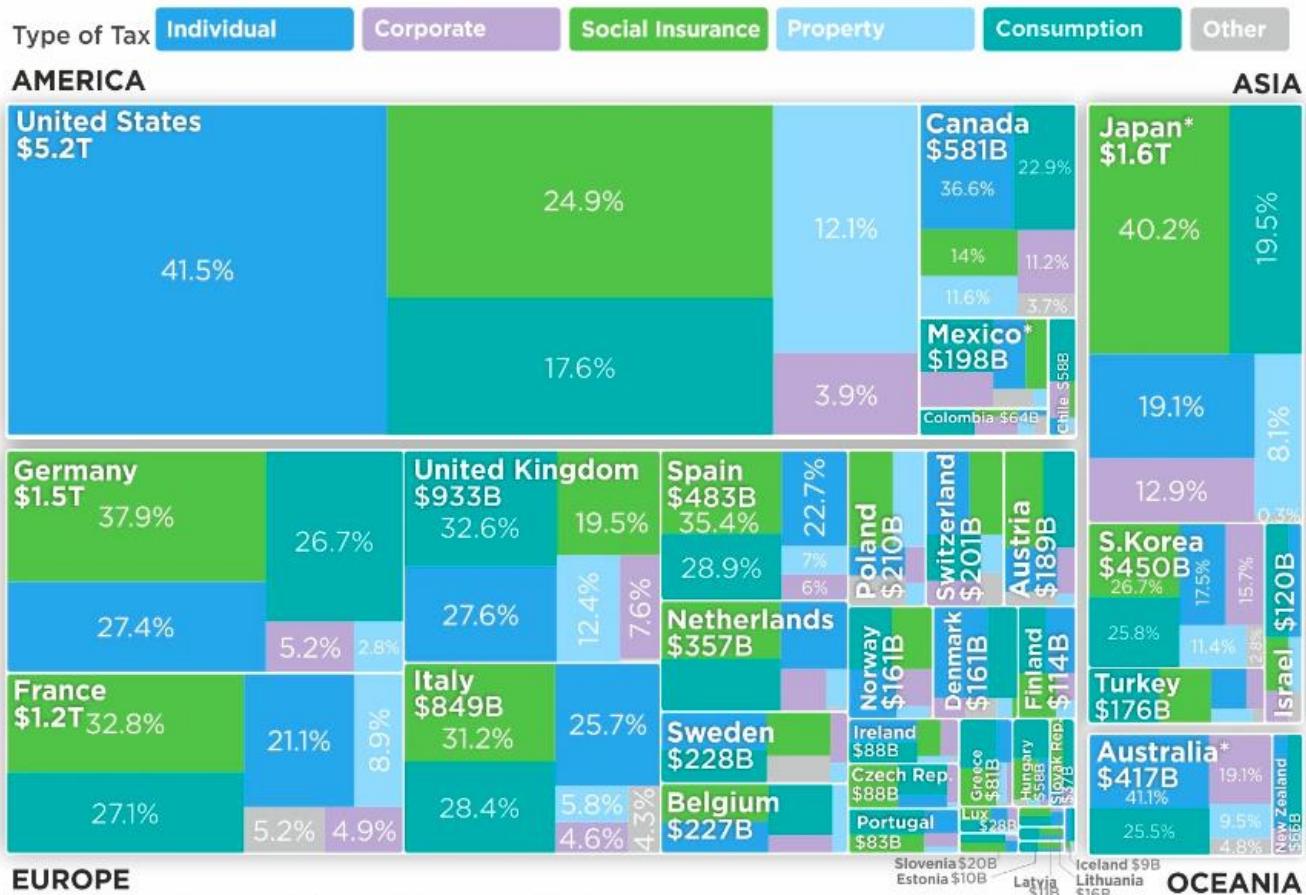
Biwei Chen

### Outline

- Data and Facts
- Taxation Basics
- Taxation Equity
- Taxation Efficiency

## OECD Total Tax Revenue by Member Countries

Taxes as the Percentages of Total Tax Revenue



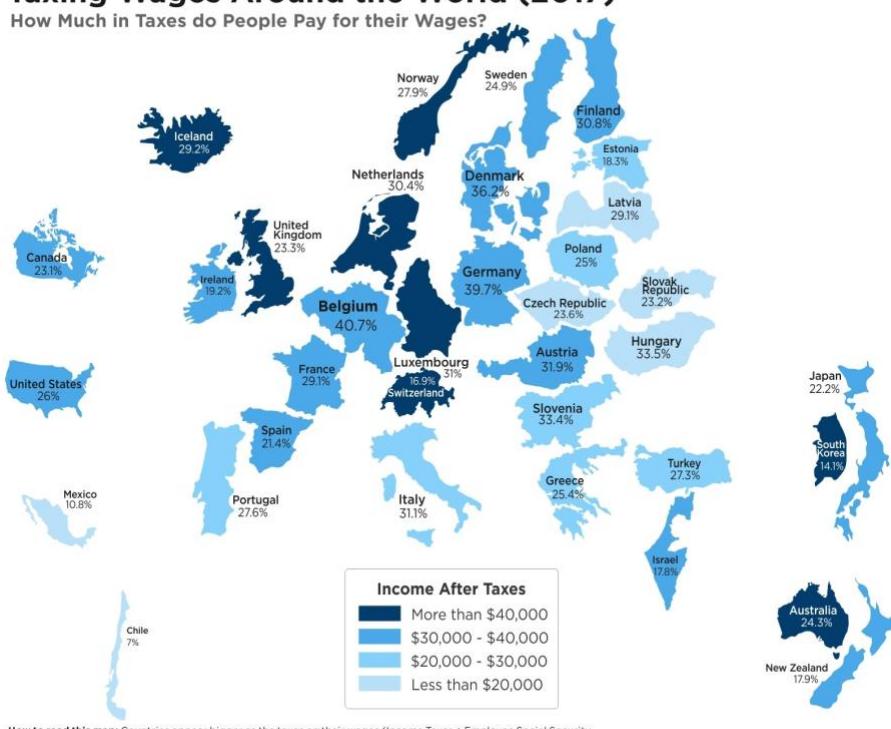
\*Data for Australia, Japan, and Mexico is from 2018 because 2019 data was not available yet.

In 2019, the U.S. tax system generates the most money in the world (\$5.2T), and individuals shoulder a disproportionate burden of that total (41.5%) compared to other OECD countries. Social insurance and consumption taxes contribute a higher share of tax revenue for other OECD countries than the U.S. (24.9% OECD average vs. 17.6% in the U.S.). Companies pay far less in taxes in the U.S. (3.9%) compared to other countries, like Japan (12.9%) or Australia (19.1%). Consumption taxes, like the Value-added Tax (VAT), make up a third of total tax revenue for OECD countries, but this is usually passed to consumers through higher prices.

<https://howmuch.net/articles/oecd-total-tax-revenue-by-member-countries>

## Taxing Wages Around the World (2017)

How Much in Taxes do People Pay for their Wages?



In 2016, the average personal tax rate across all OECD countries was 25.5% - but those rates varied greatly among the member states. To some workers, paying a quarter of your gross income in taxes may seem like burdensome imposition; others would have signed up immediately for such a light-touch tax collection. The size of the countries on this map relates to their personal tax rate. That is why the U.S. is slightly bigger than Canada (23.1%).

### Top 10 OECD Countries by Highest Personal Tax Rate

1. Belgium - 40.7%
2. Germany - 39.7%
3. Denmark - 36.2%
4. Hungary - 33.5%
5. Slovenia - 33.4%
6. Austria - 31.9%
7. Italy - 31.1%
8. Luxembourg - 31%
9. Finland - 30.8%
10. Netherlands - 30.4%

### Top 10 OECD Countries by Highest Income Tax Rate

1. Denmark - 36.2%
2. Iceland - 28.9%
3. Belgium - 26.8%
4. Australia - 24.3%
5. Finland - 22%
6. Italy - 21.6%
7. Norway - 19.7%
8. Germany - 19%
9. Latvia - 18.6%
10. United States - 18.3%

### Top 10 OECD Countries by Lowest Personal Tax Rate

1. Chile - 7%
2. Mexico - 10.8%
3. South Korea - 14.1%
4. Switzerland - 16.9%
5. Israel - 17.8%
6. New Zealand - 17.9%
7. Estonia - 18.3%
8. Ireland - 19.2%
9. Spain - 21.4%
10. Japan - 22.2%

### Top 10 OECD Countries by Lowest Income Tax Rate

1. Chile - 0%
2. South Korea - 5.7%
3. Poland - 7.2%
4. Japan - 7.8%
5. Mexico - 9.5%
6. Greece - 9.6%
7. Slovakia - 9.8%
8. Israel - 9.9%
9. Switzerland - 10.7%
10. Slovenia - 11.3%

The OECD is an association of 35 high-income countries committed to democracy and market economy. Since 2000, it has published annual reports on taxes paid for wages in all of its member states.

The net personal average tax rate is composed of two main categories: personal income taxes and social security contributions. Added up, they constitute the difference between your gross earnings and your income after taxes. All figures cited here relate to taxes levied on a single individual without children at the income level of the average worker, and are expressed in U.S. dollars with equal purchasing power.

<https://howmuch.net/articles/taxing-wages-2017>

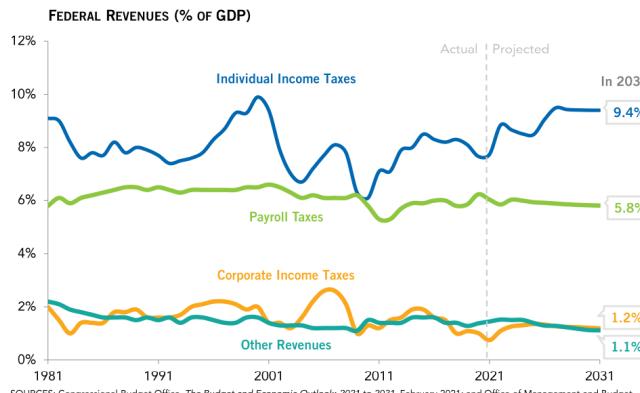
howmuch.net

## I. U.S. Federal Government Revenue and Tax System

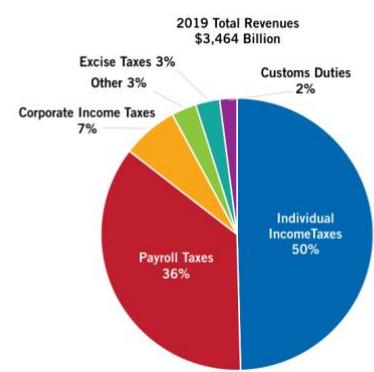
1. Composition of federal revenues: 1981 to 2031
2. The federal government collects revenues from many types of taxes
3. Overall, the U.S. tax system is progressive: higher-income → greater burden



**Most federal revenues come from individual income and payroll taxes**



**The federal government collects revenues from a variety of sources**



SOURCE: Office of Management and Budget, *Budget of the United States Government: Fiscal Year 2021*, February 2020.

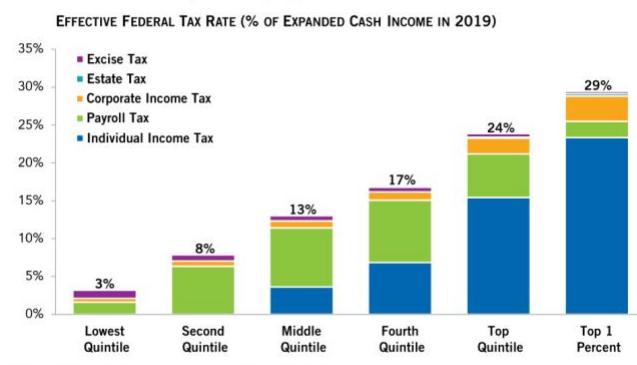
NOTE: Other includes estate and gift taxes, income from the Federal Reserve, and miscellaneous fees and fines.

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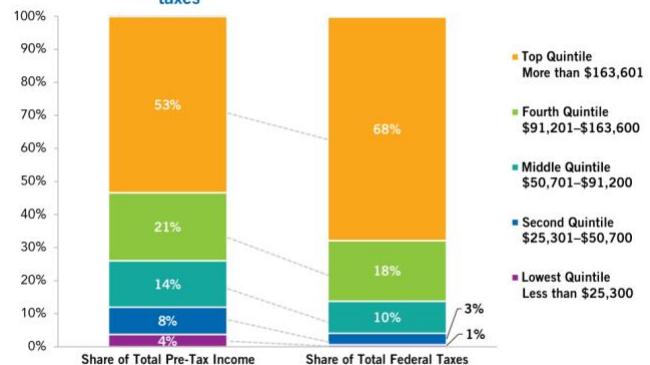
PGPF.ORG



**All income groups pay taxes, but overall the U.S. federal tax system is progressive**



**High-income households earn a disproportionate share of pre-tax income and pay an even larger share of total federal taxes**



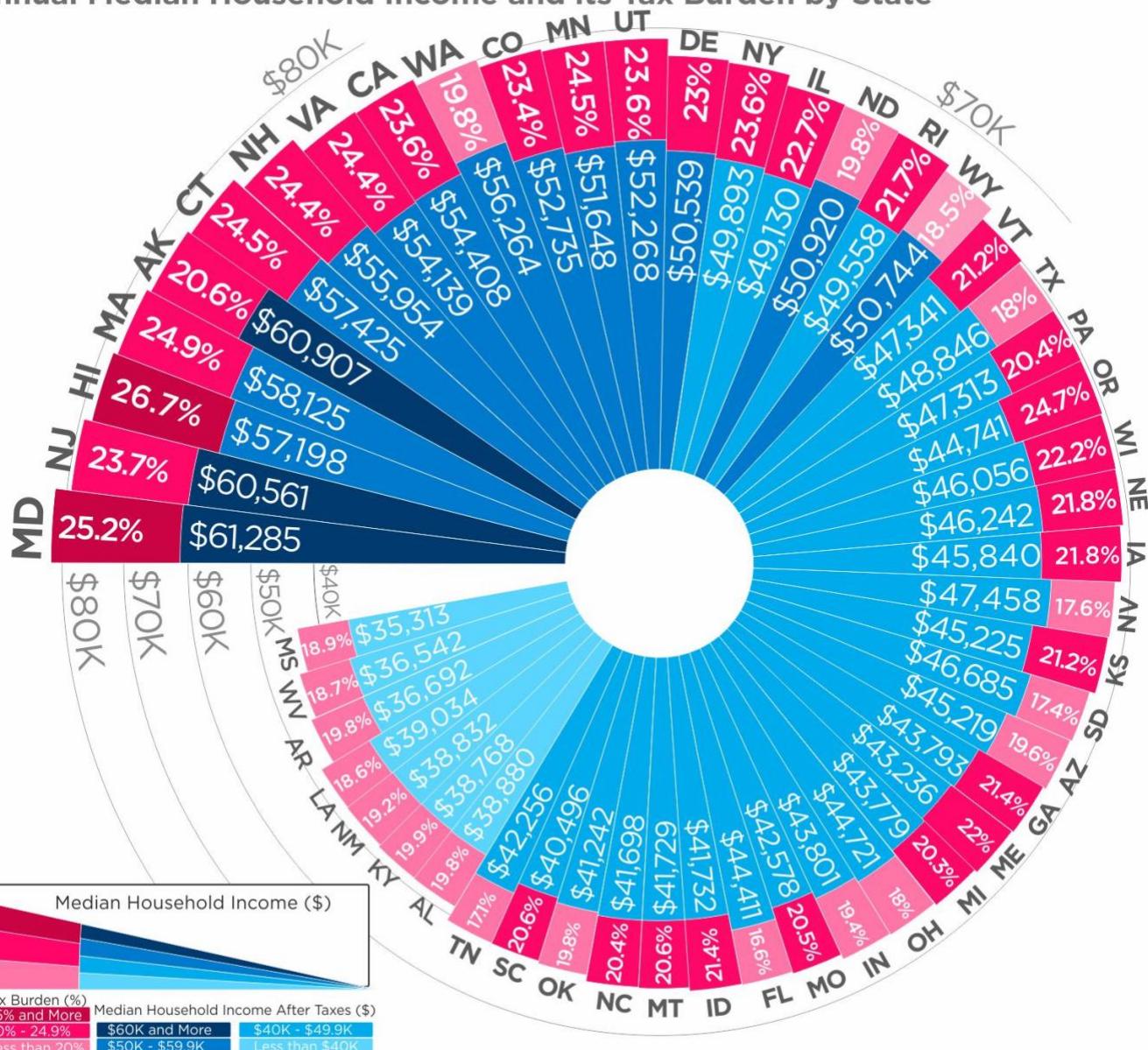
<https://www.pgpf.org/budget-basics/who-pays-taxes>

## II. Taxation Basics (CH18)

1. Types of taxation: 1) Earnings; 2) Corporate; 3) Wealth; 3) Consumption (sales and excise)
2. Individual income tax in the US: 1) Tax base; 2) Marginal tax rate and effective average tax rate
3. Tax fairness: Fairness is an important concern and elusive goal.
  - 1) Vertical equity: The principle that groups with more resources should pay higher taxes than groups with fewer resources. (Progressive, proportional, and regressive)
  - 2) Horizontal equity: The principle that similar individuals who make different economic choices should be treated similarly by the tax system.
4. Tax subsidies: Tax deductions (reduce taxable income) versus tax credits. Which is more equitable?

# How Much Money Gets Taken Out of Paychecks

Annual Median Household Income and its Tax Burden by State



## Article &amp; Sources:

<https://howmuch.net/articles/how-much-money-gets-taken-out-paychecks>  
 U.S. Census - <https://census.gov>  
 Tax Foundation - <https://taxfoundation.org>  
 ADP - <http://adp.com>

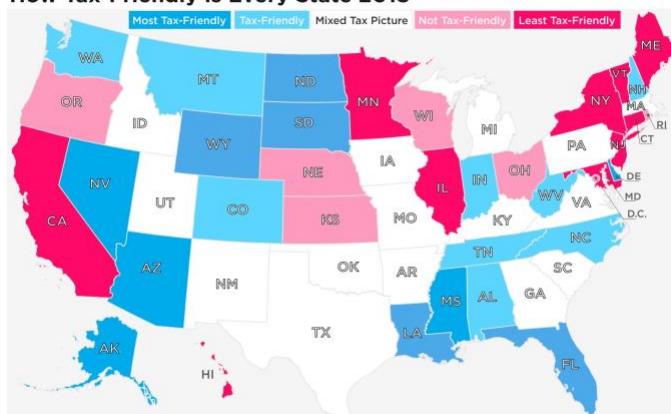
**howmuch**.net

The coronavirus has forced the U.S. economy to ground to a halt. The IRA extended the deadline to file taxes, and with the vast majority of the country under a stay-at-home order, more than 16 million people filed for unemployment over the last 3 weeks. Like other social programs, unemployment benefits are funded by taking a percentage out of workers' paychecks. One insight from our visualization is how low-income states generally see lower tax burdens. Mississippi, West Virginia and Arkansas are among the poorest states in the country, and consequently residents in each state pay less than 20% in total taxes. On the other hand, high-income states typically pay a greater percentage of their income in taxes. Maryland and Hawaii are among the top 3 highest income states, and they both pay over 25% in taxes. That's because progressive tax systems require high-income earners to pay more, expressed as a percentage of income, than low-income earners. Of course, how much individual states are getting back from the federal government is also unequal. <https://howmuch.net/articles/how-much-money-gets-taken-out-paychecks>

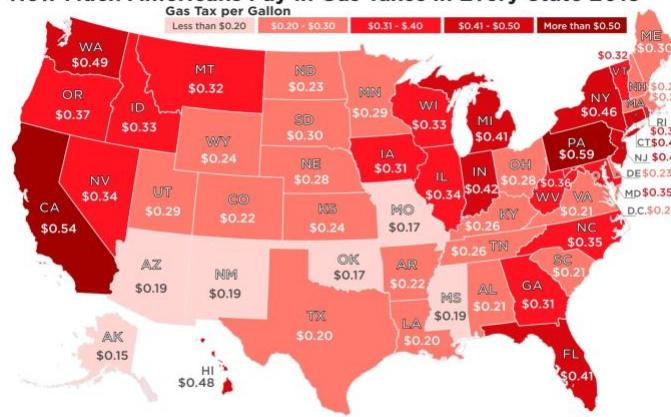
## How Much Americans Pay in Income Taxes in Every State 2018



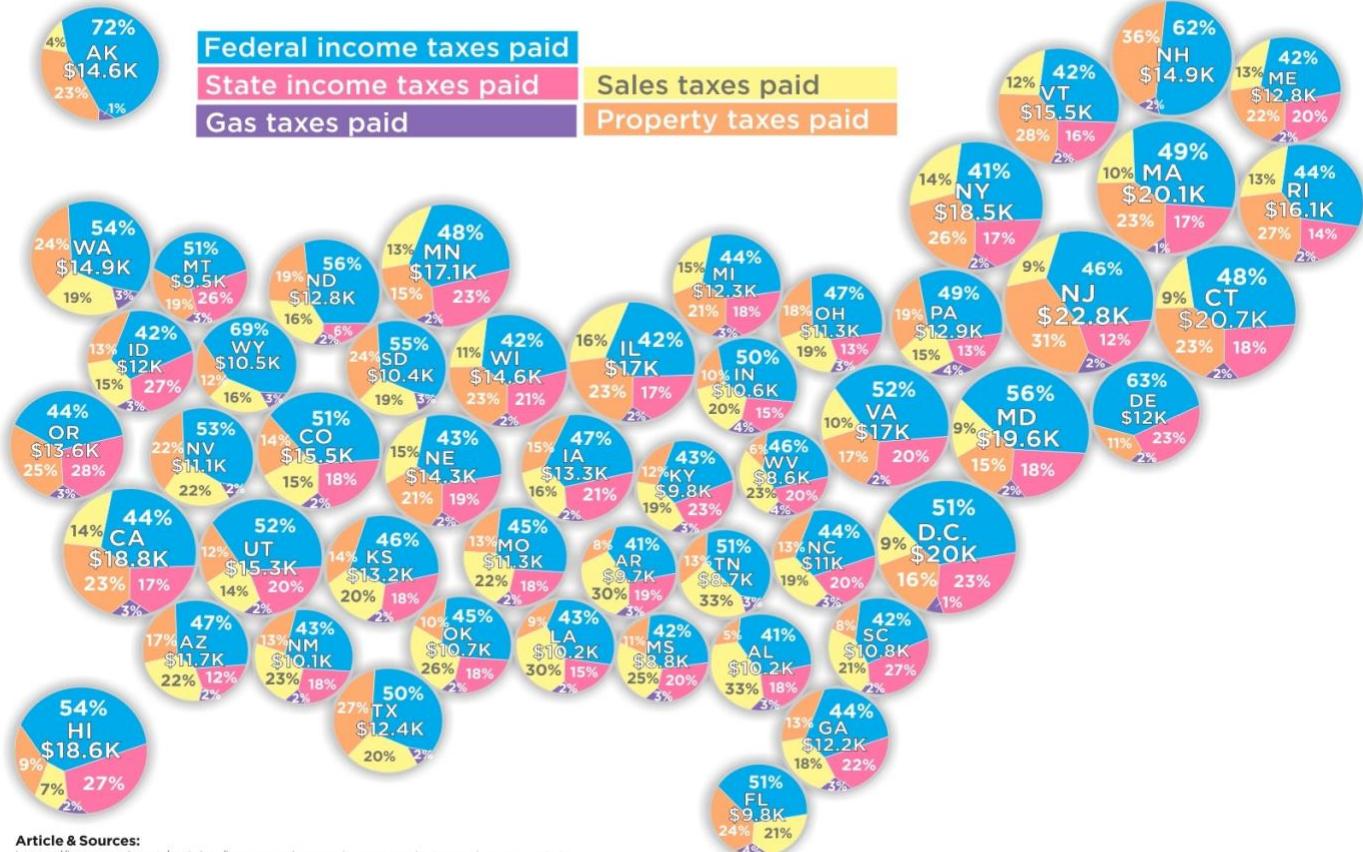
## How Tax-Friendly is Every State 2018



## How Much Americans Pay in Sales Taxes in Every State 2018



# How Much Americans Pay in Taxes in Every State


**Article & Sources:**

<https://howmuch.net/articles/how-much-americans-pay-in-taxes-in-every-state>  
<https://www.census.gov/>  
<https://taxfoundation.org/>  
<http://www.api.org/>  
<http://www.gallup.com/home.aspx>  
<https://www.zillow.com/research/data/>

**howmuch** net

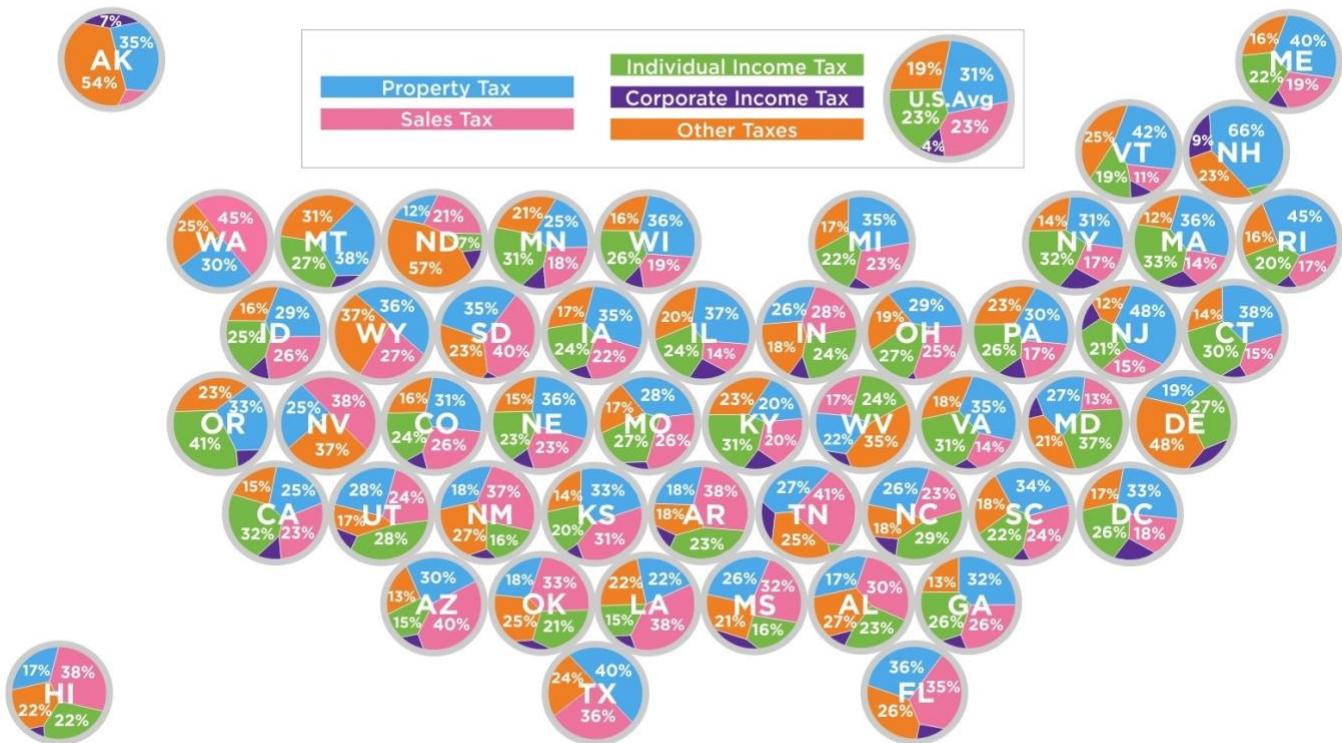
2016-2017 Datasets <https://howmuch.net/articles/americans-pay-in-taxes-in-every-state>

First off, the Northeast has several states with tax burdens far higher than those in the rest of the country. People in New Jersey pay more than 3 times as much in total taxes as their counterparts in West Virginia. There are a few different explanations for these enormous differences in tax levels, the most obvious being that some states don't collect any income tax (like Tennessee and Florida) and a few don't collect any sales tax (like Montana).

Despite these differences, every state taxes property and this is where the true disparities are found. New Jerseyans fork over an average \$7,163 in property taxes each year, representing an incredible 31% of their total tax burden. Compare that to West Virginians, who pay only \$544, or 6%, of their total tax burden in property taxes. That means property taxes are 5 times more expensive in relative terms—or 13 times more expensive in absolute terms—in New Jersey than West Virginia! Another interesting trend in our visualization is how clearly it reflects the partisan nature of different states' decisions about taxes. President Trump won none of the 15 states with the highest tax burdens, and Hillary Clinton won only one of the 15 with the lowest (New Mexico). Many of the states typically considered political "swing states" come election time are in the middle of the pack; for example, Wisconsin (21st), Iowa (24th), Pennsylvania (26th), Michigan (30th), and Ohio (35th). How Trump's tax cut bill (or even a second one) will affect the political landscape is anyone's guess, but our graph makes us wonder if political divisions determine tax rates or if tax rates determine political divisions.

So why doesn't everyone move to low-tax states? To a certain extent, rich people are actually leaving states with high tax burdens for places with friendlier policies. Most people can't afford to relocate their entire families even if it would mean hundreds of dollars in tax savings, but at the very high end the numbers can really add up and may make a big move worth the cost.

## Sources of State and Local Tax Collection by State


**Sources:**

<https://howmuch.net/articles/sources-government-tax-collections>  
<https://taxfoundation.org>

**howmuch** net

2016-2017 Datasets <https://howmuch.net/articles/americas-tax-collection>

States and local authorities basically have five different tax categories to generate the bulk of their income: property and sales taxes, personal and corporate income taxes, and a vast array of 'other' taxes (including, apparently, a blueberry tax in Maine, and a mosquito tax in Alabama).

The national average for these state and local taxes is shown next to the legend near the top of this data visualization: the largest part (31%) is raised by property taxes (in blue), equal parts (23%) by taxes on sales (in pink) and on individual income (in green), just under a fifth (19%) by 'other' taxes (in orange), and the smallest part (4%) by taxes on corporate income (in purple). But research published by the Tax Foundation shows great deviations between the federal average and the average at a State level.

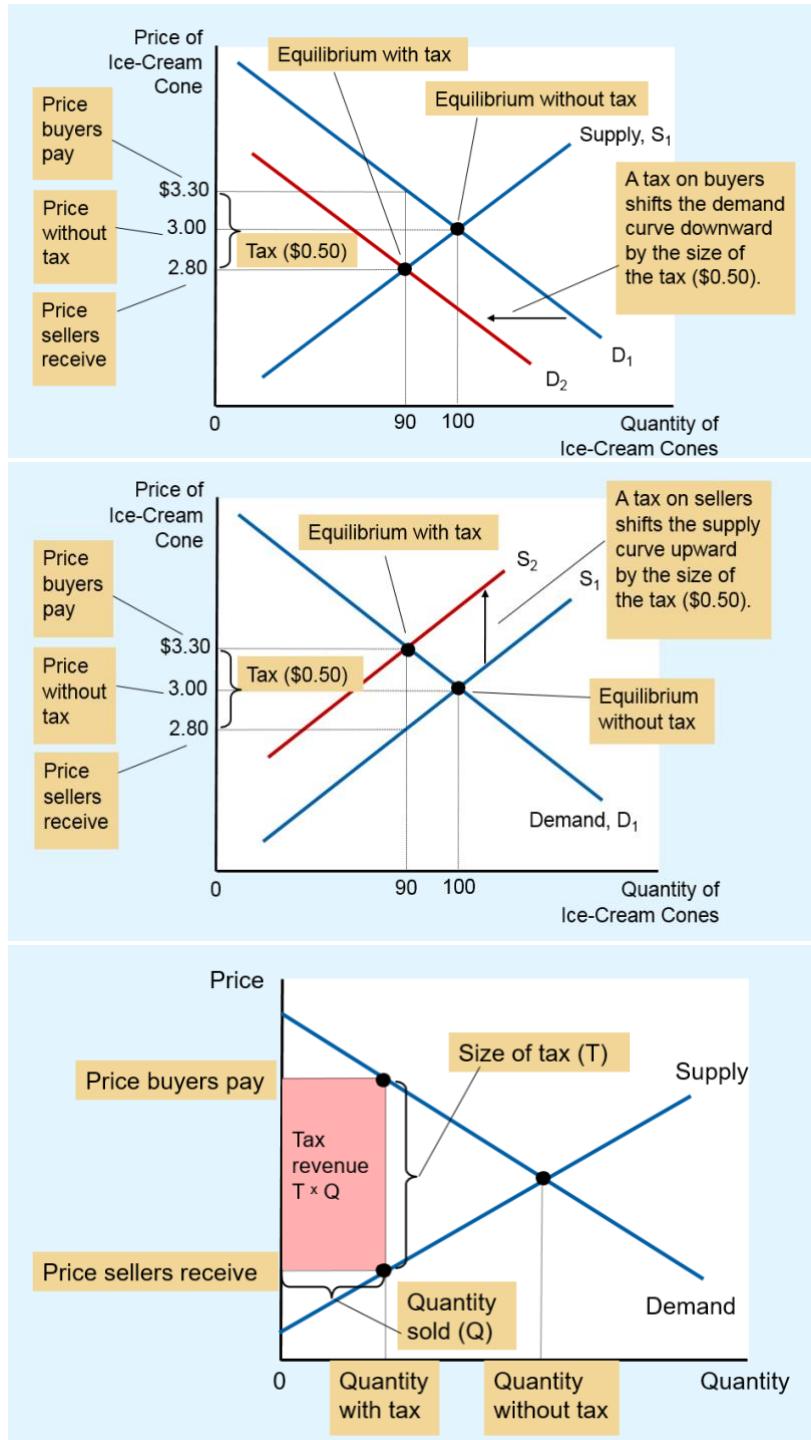
As this map shows, there is great variation in the way state and local governments choose to fill their coffers. As the Tax Foundation points out, higher-income states (e.g. New England) tend to rely more heavily on property taxes, while lower-income states (often in the South) go or sales and gross receipt taxes. However, over the years, property tax reliance has declined, while income taxes have risen. These variations and evolutions are not merely academic: they reflect different economic choices and create different economic realities.

Some states choose not to tax certain categories – personal income, corporate income, or sales – with the aim of stimulating growth. The flipside is that they must rely more heavily on other tax categories, which may render tax revenue more volatile, and has a negative effect on its own. Other states divide their collections more evenly over the various categories, but then lack a particular tax incentive to distinguish them from their neighbors. The result is a patchwork of tax burdens that varies greatly throughout the land – and that makes it worthwhile for both individuals and corporations to wonder: Would I be better off next door?

### III. Taxation Equity: Incidence Analysis (CH19)

#### 1. Three rules of taxation incidence and equity

- 1) The statutory burden of a tax does not describe who really bears the tax. (de jure vs de facto)
- 2) The side on which the tax is imposed is irrelevant to the distribution of the tax burdens.
- 3) Parties with inelastic supply or demand bear taxes; parties with elastic S or D avoid them.



#### Consumption tax: Demand

When a tax of \$0.50 is levied on buyers, the demand curve shifts down by \$0.50 from  $D_1$  to  $D_2$ . The equilibrium quantity falls from 100 to 90 cones. The price that sellers receive falls from \$3.00 to \$2.80. The price that buyers pay (including the tax) rises from \$3.00 to \$3.30. Even though the tax is levied on buyers, buyers and sellers share the burden of the tax.

#### Production tax: Supply

When a tax of \$0.50 is levied on sellers, the supply curve shifts up by \$0.50 from  $S_1$  to  $S_2$ . The equilibrium quantity falls from 100 to 90 cones. The price that buyers pay rises from \$3.00 to \$3.30. The price that sellers receive (after paying the tax) falls from \$3.00 to \$2.80. Even though the tax is levied on sellers, buyers and sellers share the burden of the tax.

#### Government tax revenue:

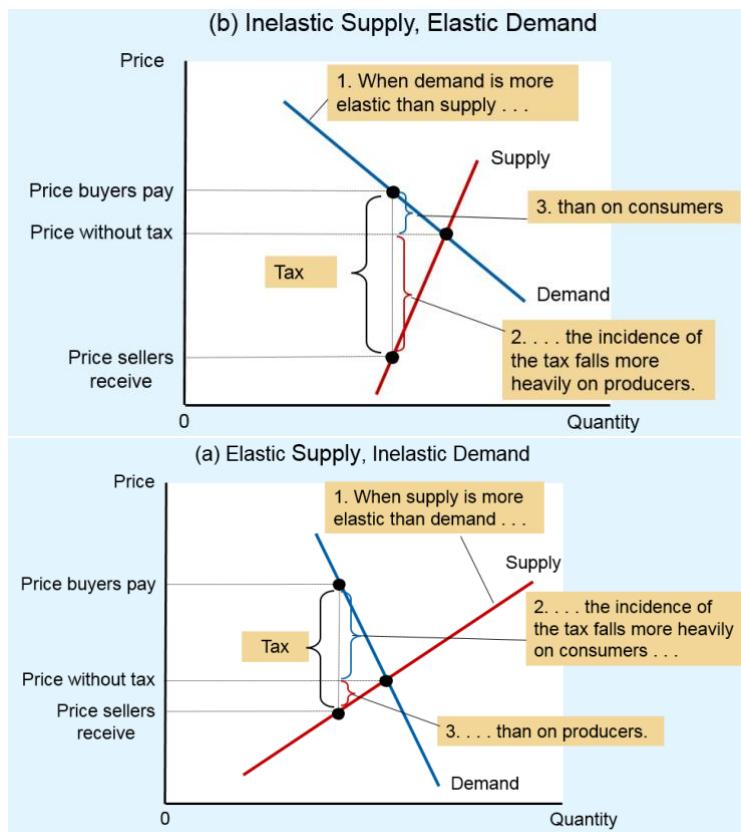
The tax revenue that the government collects equals  $GTR = T \times Q$ , the size of the tax  $T$  times the quantity being taxed. Thus, tax revenue equals the area of the rectangle between the supply and demand curves.

Tax wedge is the difference between what consumers pay and what producers receive (net of tax) from a transaction.

Source: Mankiw (2020) Principles of Microeconomics. Cengage.

## 2. Market elasticity and tax burden (CH19)

- 1) In general, tax burden falls more heavily on the side of the market that is less elastic:
  - a. Small elasticity of demand: Buyers do not have good alternatives to consuming this good
  - b. Small elasticity of supply: Sellers do not have good alternatives to producing this good
- 2) The tax burdens are identical regardless of who bears the statutory burden. In general, tax burden falls more heavily on the side of the market that is less elastic or flexible.
- 3) In general, the less elastic is demand relative to supply, the larger share of the incidence falls on demand. Demand for goods is more elastic when there are many substitutes. For products with an inelastic demand, the burden of the tax is borne almost entirely by the consumer.
- 4) A golden rule of thumb: more “flexible” market participants carry less tax burden.



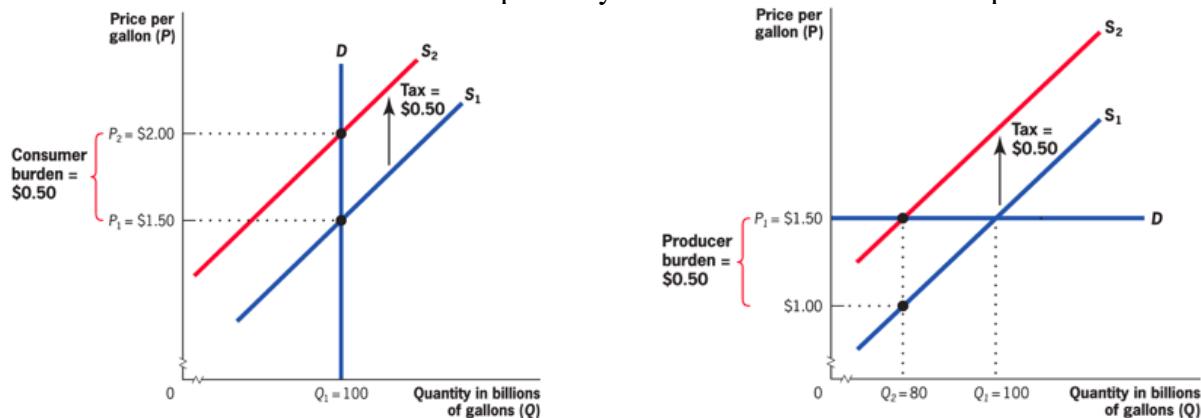
### Tax burden: Case I

The supply curve is inelastic, and the demand curve is elastic. In this case, the price received by sellers falls substantially, while the price paid by buyers rises only slightly. Thus, sellers bear most of the burden of the tax and **producers' surplus** declines by more than those of consumers'.

### Tax burden: Case II

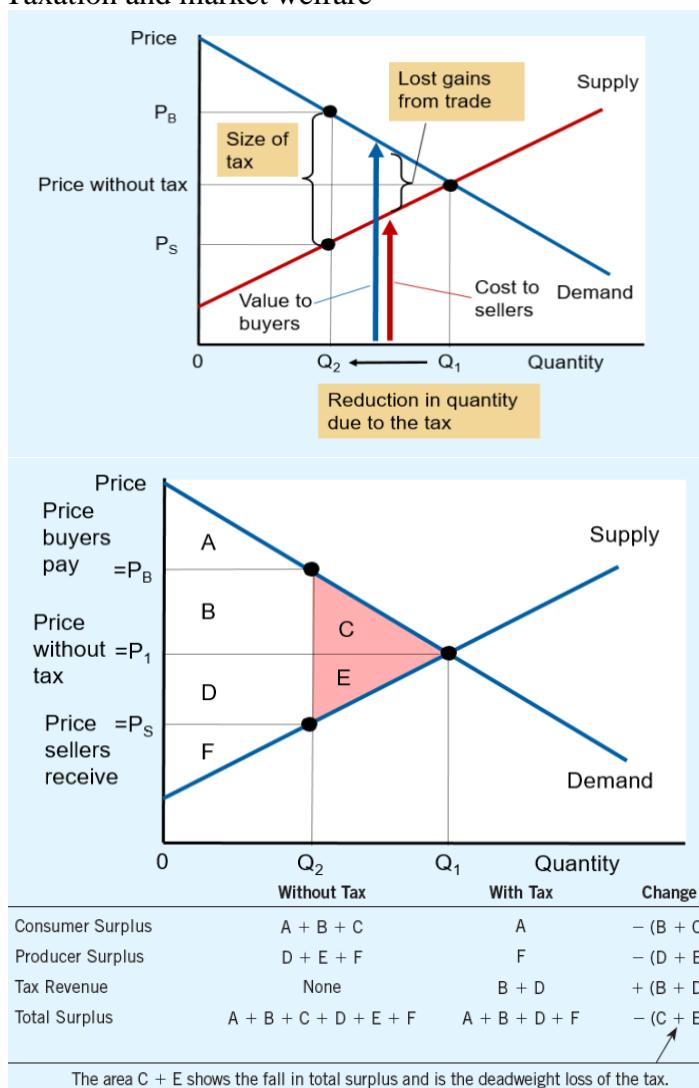
The supply curve is elastic, and the demand curve is inelastic. In this case, the price received by sellers falls only slightly, while the price paid by buyers rises substantially. Thus, buyers bear most of the burden of the tax and **consumers' surplus** declines by more than those of producers'.

### Tax burden: Case III demand curve is perfectly inelastic vs demand curve is perfect elastic



## IV. Taxation Efficiency and Optimal Tax (CH20)

## 1. Taxation and market welfare



When the government imposes a tax on a good, the quantity sold falls from  $Q_1$  to  $Q_2$  ("smaller pie").

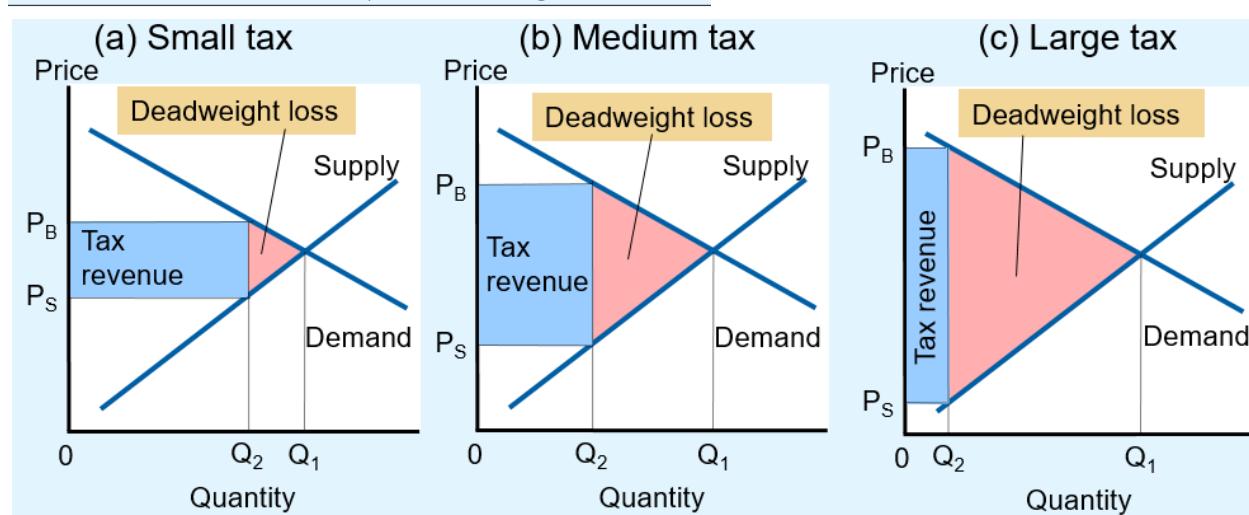
At every quantity between  $Q_1$  and  $Q_2$ , the potential gains from trade among buyers and sellers are not realized. These lost gains from trade create the deadweight loss.

With taxation, the market welfare consists of consumer surplus, producer surplus, and government tax revenue.

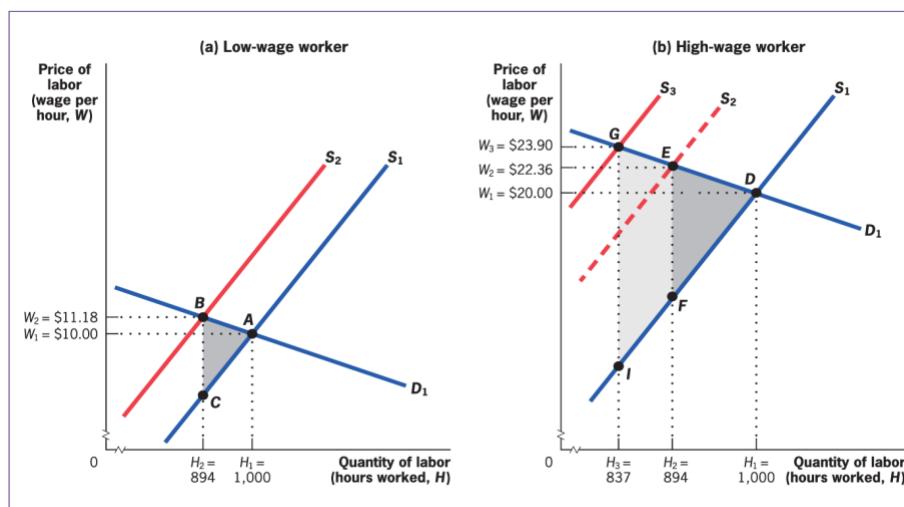
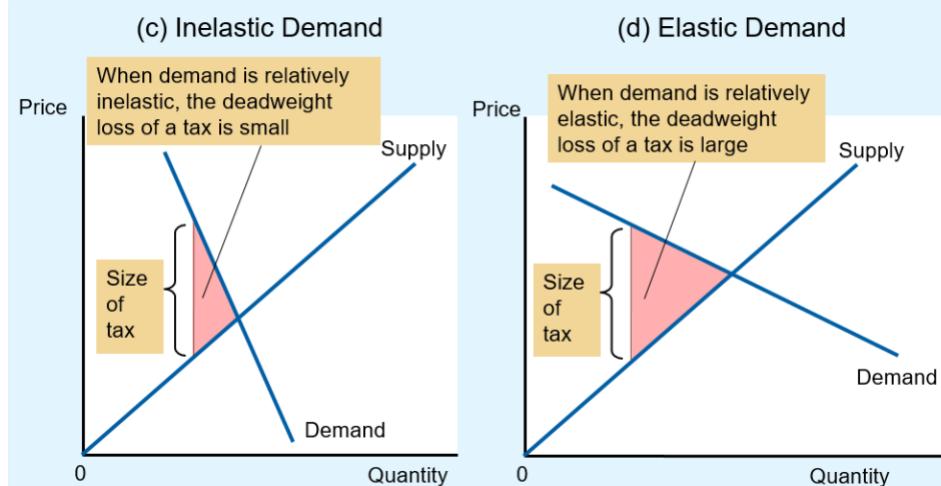
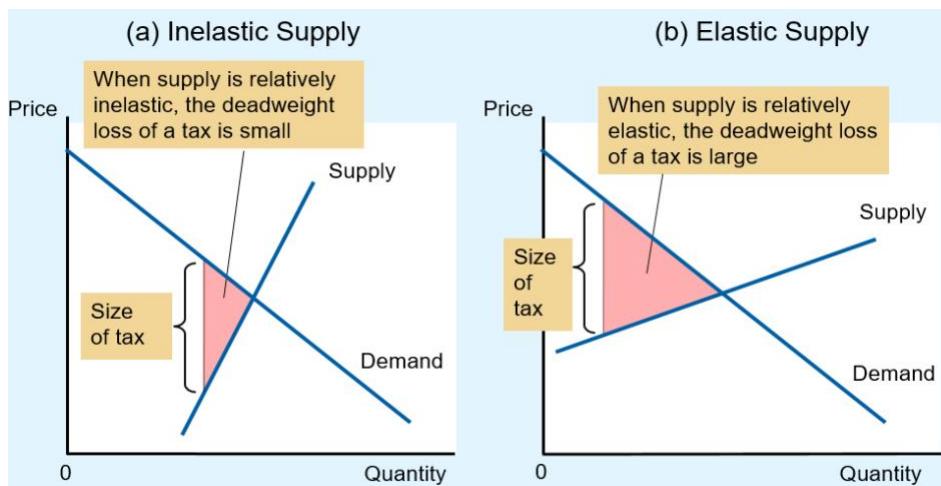
- Buyers: consumer surplus (use value minus exchange value)
- Sellers: producer surplus (exchange value minus use value)
- Government: total tax revenue: tax times quantity sold

$$DWL = -[\eta_S \cdot \eta_D / 2(\eta_S - \eta_D)] \tau^2 Q/P$$

Where  $\eta$  is the elasticity and  $\tau$  is the tax rate. Marginal DWL, the increase in DWL per unit increase in the tax, rises with  $\tau$ .



## 2. Elasticity and taxation deadweight loss



Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

In panels (a) and (b), the demand curve and the size of the tax are the same, but the price elasticity of supply is different. Notice that the more elastic the supply curve, the larger the deadweight loss of the tax.

In panels (c) and (d), the supply curve and the size of the tax are the same, but the price elasticity of demand is different. Notice that the more elastic the demand curve, the larger the deadweight loss of the tax.

Progressive tax system is less efficient than proportional tax system

Initially, tax rate is  $\tau$  for both groups.

When  $\tau$  rises for the rich and falls for the poor, then total social deadweight loss is increasing. Why?

### 3. Progressive tax system: Inefficiency

- 1) Why is the DWL larger for the higher-wage worker despite the same reduction in hours worked?

	Low-Wage Worker (panel a)		High-Wage Worker (panel b)				
	Tax Rate Below \$10,000	Tax Rate Above \$10,000	Hours of Labor Supply	Deadweight Loss from Taxation	Hours of Labor Supply	Deadweight Loss from Taxation	Total Deadweight Loss
No tax	0	0	1,000 ( $H_1$ )	0	1,000 ( $H_1$ )	0	0
Proportional tax	20%	20%	894 ( $H_2$ )	\$115.71 (area BAC)	894 ( $H_2$ )	\$231.42 (area EDF)	\$347.13 (BAC + EDF)
Progressive tax	0%	60%	1,000 ( $H_1$ )	0	837 ( $H_3$ )	\$566.75 (area GDI)	\$566.75 (EDF + GEF)

- 2) When system is replaced with no tax on low-wage workers, there is no DWL for this worker, but the DWL for the high-wage worker increases by the trapezoid GEFI. This results in an increase in deadweight loss because additional taxes must be collected from high-wage workers in order to collect the same revenues as before. The deadweight loss is larger for the higher-wage worker despite the same reduction in hours worked.
- 3) In a competitive labor market, wage equals the marginal product of labor, so the high-wage worker has a higher marginal product of labor. Society loses twice as much when the high-wage workers reduces their hours than when the low-wage workers do.
- 4) Implications: Government efficiency in taxation over time is maximized by tax smoothing, by having a relatively constant tax rate over time rather than high taxes in some periods and low taxes in others. High and then low tax rates produce a larger DWL than steady medium tax rates.

## V. Taxation Principles (CH20)

### 1. Two principles of tax fairness:

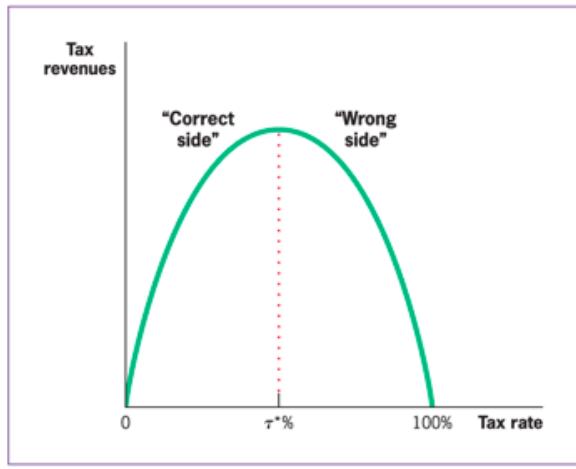
- 1) **The benefits principle:** Those who benefit from public spending should bear the burden of the tax that pays for that spending.
- 2) **The ability-to-pay principle:** Those with greater ability to pay a tax should pay more tax. Progressive effective average tax rate is fair.
- 3) A trade-off between equity and efficiency: The system can be made more efficient only by making it less "fair," and vice versa.

### 2. The fundamental issue in designing tax policy is the equity-efficiency trade-off.

- 1) Tax is inefficient in that it causes deadweight loss. Tax is necessary because government services and market resources are costly. If the goal for tax policy is to raise more tax revenue while improving market efficiency (reducing DWL), then policymakers should apply marginal equality principle by setting the tax rate to maximize **net tax revenue** (revenue minus administration cost and the deadweight loss resulting from taxation).
- 2) Tax efficiency comes down to two key principles:
  - a. The more elastically supplied or demanded the good, the larger the DWL from the tax.
  - b. The higher the tax rate, the larger the incremental deadweight loss of taxation.
- 3) Taxation is inefficient in most markets. But it can be efficient in certain markets when government tries to discourage consumption. Economic efficiency requires decisions made align benefits with costs. In an equation,  $MB=MC$ . This is the marginal equality principle.

### 3. Optimal taxation design

- 1) Government tax revenue and tax rate: In economics, the Laffer curve, popularized by supply-side economist Arthur Laffer, illustrates a theoretical relationship between rates of taxation and the resulting levels of the government's tax revenue. [https://en.wikipedia.org/wiki/Laffer\\_curve](https://en.wikipedia.org/wiki/Laffer_curve)

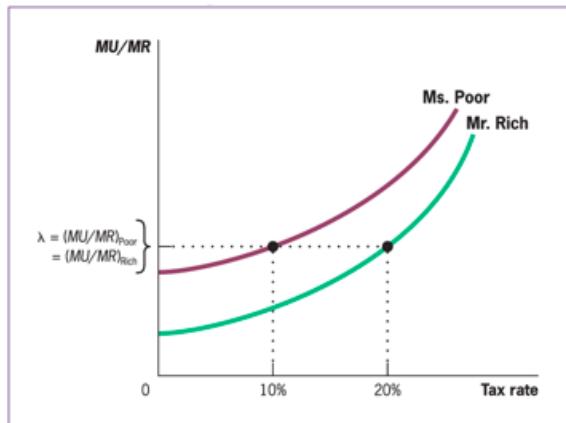


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The Laffer curve assumes that no tax revenue is raised at the extreme tax rates of 0% and 100%, and that there is a tax rate between 0% and 100% that maximizes government tax revenue. The shape of the curve is a function of taxable income elasticity – i.e., taxable income changes in response to changes in the rate of taxation.

As tax rates rise from 0 to  $\tau^*$ , tax revenues rise, but when tax rates rise above  $\tau^*$  toward 100%, tax revenues fall.

- 2) **Optimal income tax:** Choosing the tax rates across income groups to maximize social welfare subject to a government revenue requirement. At high tax rates, tax revenue falls with tax rate. The optimal policy is to set the income for group  $i$  such that  $MU_i/MR_i = MU_j/MR_j$  when marginal utility per dollar tax bill is equalized across individuals or income groups.
- The optimal income tax system trades off the efficiency cost against the benefit of tax for redistribution purposes. With behavioral effects, taxes reduce resources supplied.
  - Vertical equity:** assuming the law of diminishing marginal utility holds, social welfare is maximized when those who have a high level of consumption and thus a low marginal utility are taxed more heavily and when those have a low level of consumption and thus a high marginal utility are taxed less heavily.
  - Behavioral responses:** as taxes rise on any one group, individuals in that group may respond by earning less income, resulting in DWL.
  - Example: Imagine a world with no income tax, where the gov wants to introduce a small tax.



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$MU_{Rich} \ll MU_{Poor}$  (diminishing MU)

$MR_{Rich} >> MR_{Poor}$  (Ms. Rich has a higher income base for taxation than Ms. Poor)

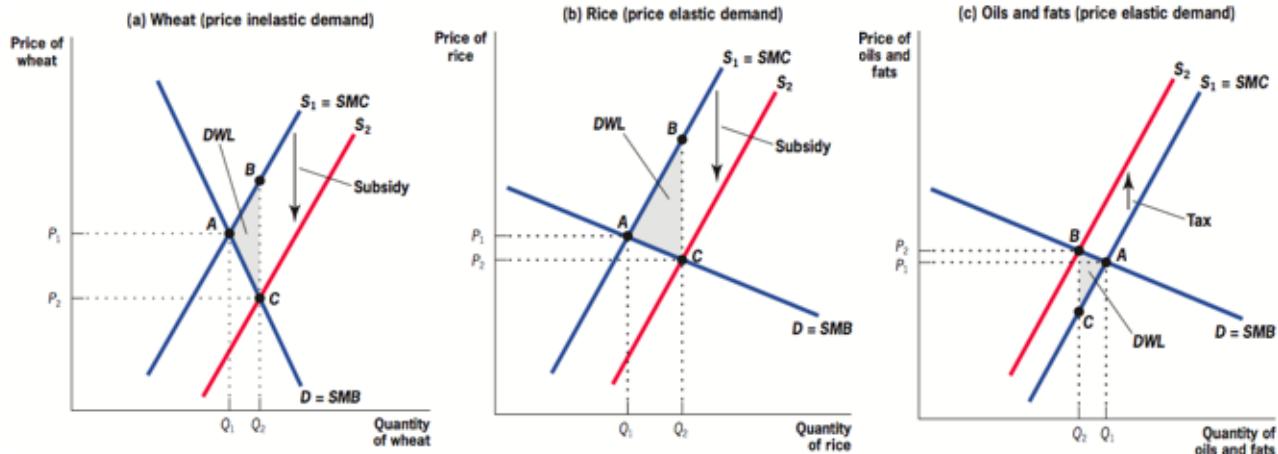
The ratio of marginal utility to marginal revenue rises as tax rates rise for any taxpayer, but this ratio for Ms. Rich is everywhere below the ratio for Ms. Poor. Optimal income tax rates are those that equate this ratio across taxpayers. Here, the optimal rates are 10% for Ms. Poor and 20% for Ms. Rich.

- 3) **Optimal consumption tax:** Choosing the tax rates across goods to minimize deadweight loss for a given government revenue requirement.  $\frac{MDWL_i/MR_i}{MDWL_j/MR_j} = \lambda$
- It balances two rules in minimizing deadweight loss in all affected markets.
  - Elasticity rule: lower taxes on goods with more elastic demand.  $\tau^* = -1/\eta_i * \lambda$
  - Broad base rule: better to tax a wide variety of goods moderately than few goods heavily.
  - Imagine that the government had only two goods to tax—cereal and caviar. Elasticity of demand for caviar is much higher than that for cereal. The first rule would suggest taxing cereal more than caviar. This means taxing more heavily the good consumed by the poor. This might hurt vertical equality. Again, a trade-off.
  - Ramsey Rule** states that the marginal DWL per dollar of tax revenue associated with an additional dollar of taxes on a commodity should be equal for all commodities.

4) Case study: Price reform in Pakistan

Commodities are taxed or subsidized throughout the developing world. Deaton (1997) studied the demand for subsidized goods in Pakistan, looking at their elasticity and the income of people who consume it. What were the efficiency consequences of subsidies and taxes there?

Good	Subsidy	Price Elasticity	Policy Change	Welfare Gain	Include Distribution Concerns
Wheat	40%	-0.64	Reduce subsidy	Small	Don't reduce subsidy
Rice	40%	-2.08	Reduce subsidy	Large	Reduce subsidy
Oil/fat	-5%	-2.33	Reduce tax	Large	Reduce tax further



- In panel (a), the market for wheat, demand is fairly inelastic and supply is subsidized, leading quantity to increase from  $Q_1$  to  $Q_2$  with a deadweight loss of  $BAC$ .
- In panel (b), the market for rice, demand is very elastic, so when supply is subsidized the quantity rises by much more (from  $Q_1$  to  $Q_2$ ), and the deadweight loss is larger ( $BAC$ ).
- In panel (c), the market for oils and fats, demand is also very elastic, so even the small tax leads to a large reduction in quantity from  $Q_1$  to  $Q_2$ , with a deadweight loss of  $BAC$ .

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**Data Visualization**

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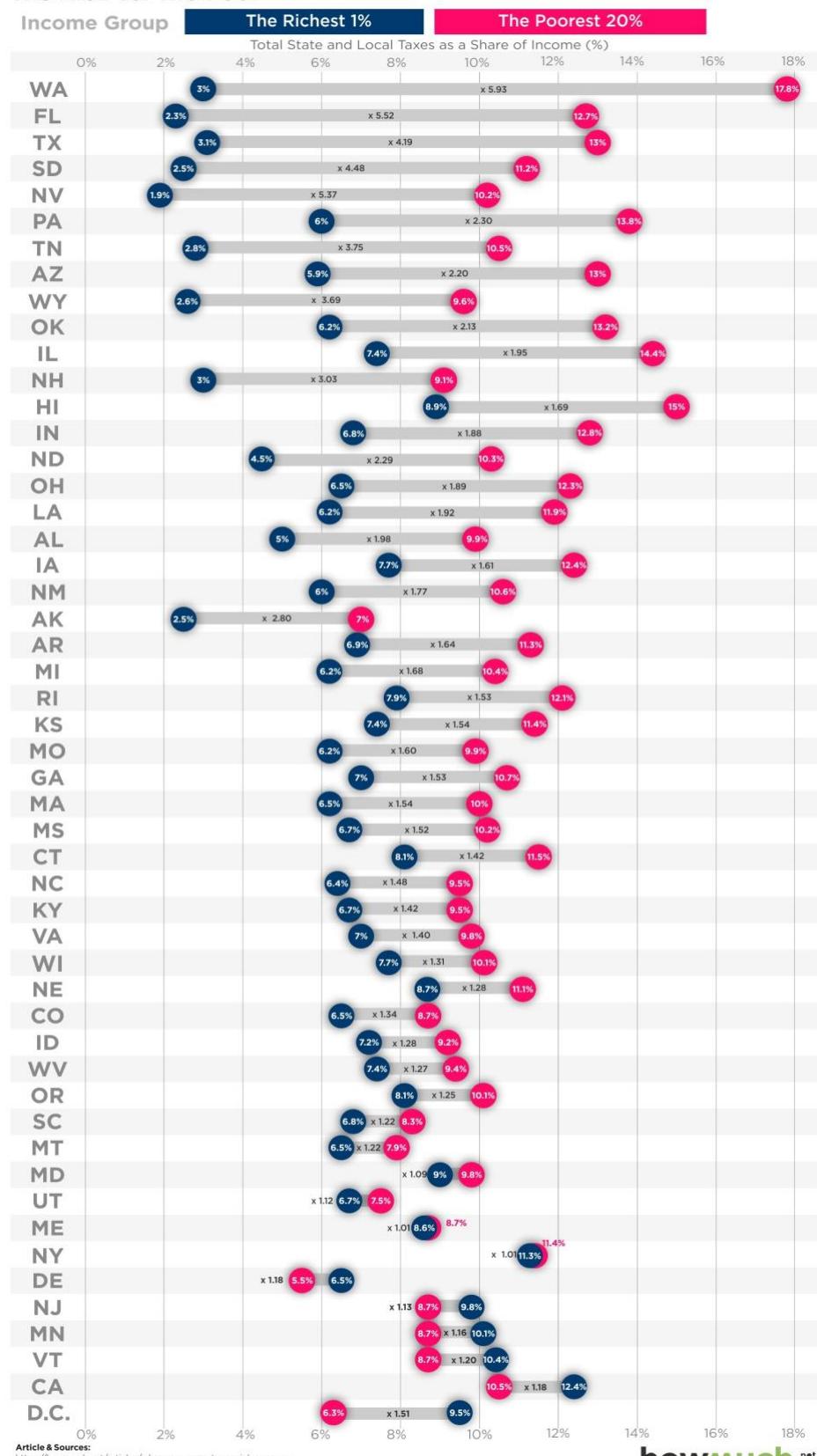
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## Who Pays More Taxes in America? The Rich vs. The Poor



Article & Sources:  
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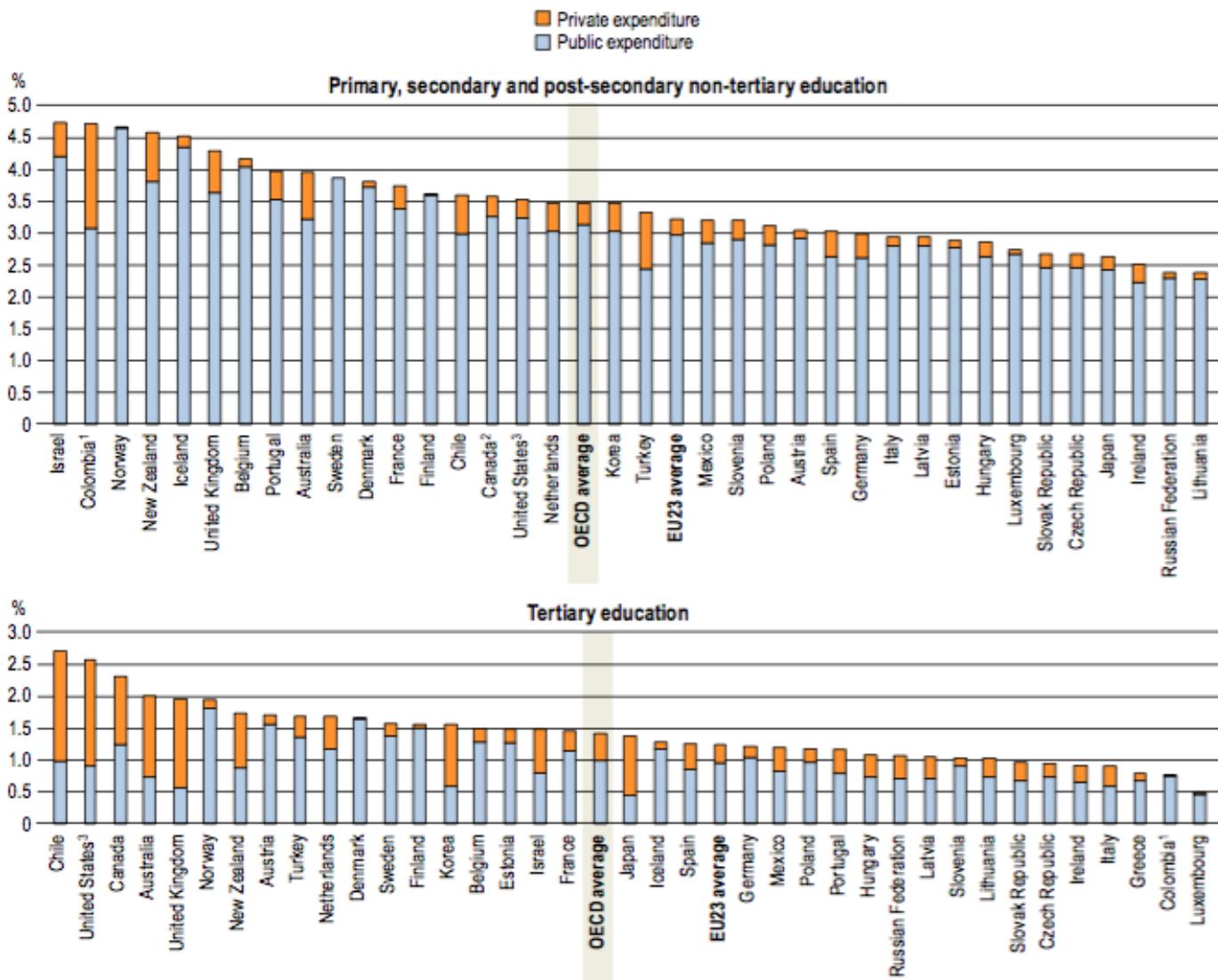
## Lecture 6 Public Education Policy

Biwei Chen

### Outline

- International Comparison
- Public Policy in Education
- Models & Empirical Evidence

### Total expenditure on educational institutions (%GDP) by source of funds (2017, after transfers)



Note: International expenditure is aggregated with public expenditure for display purposes.

1. Year of reference 2018.

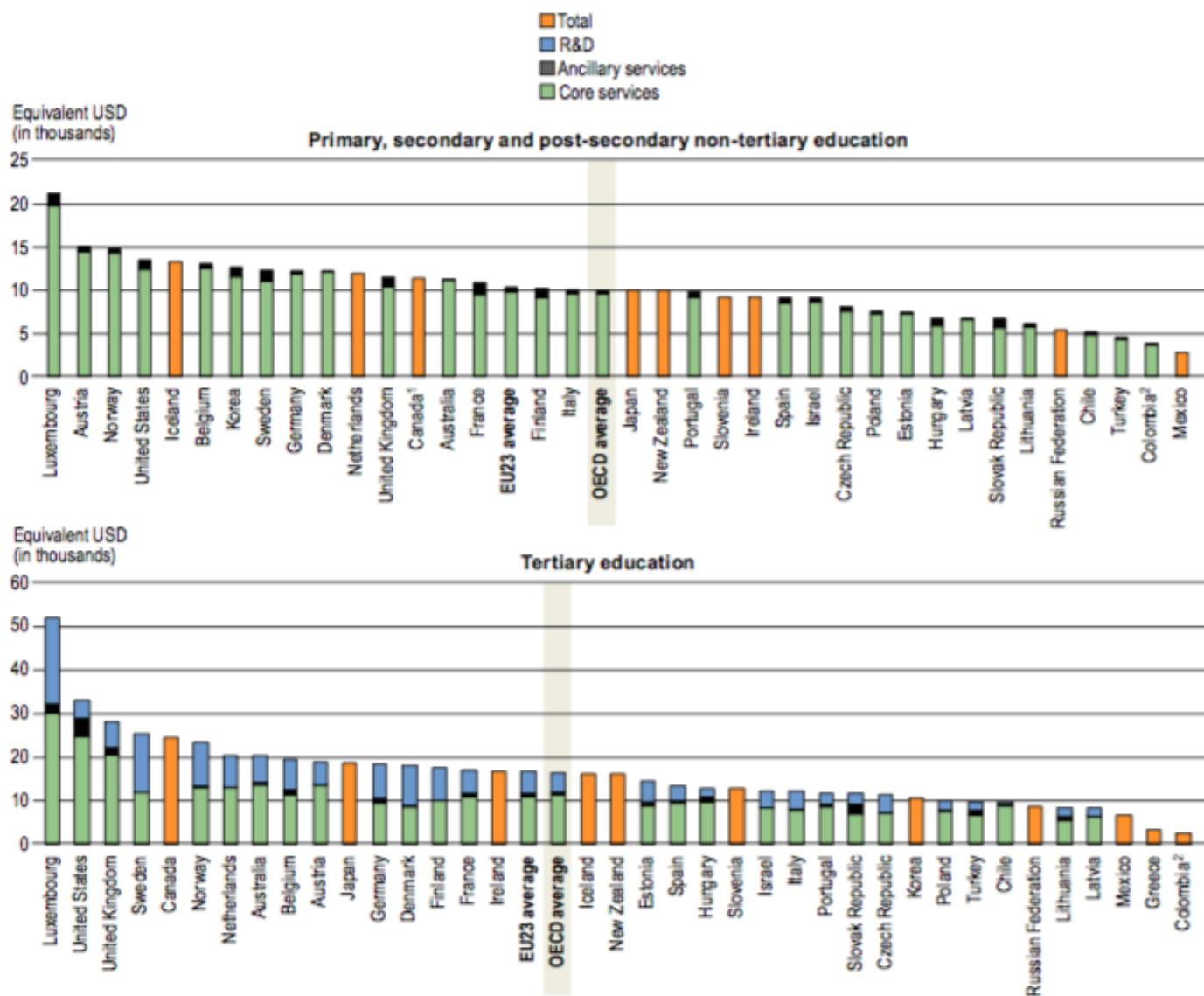
2. Primary, secondary and post-secondary non-tertiary education includes pre-primary programmes.

3. Figures are for net student loans rather than gross, thereby underestimating public transfers.

Countries are ranked in descending order of total expenditure on educational institutions as a percentage of GDP.

Source: OECD/UIS/Eurostat (2020), Table C2.2. See Source section for more information and Annex 3 for notes (<https://doi.org/10.1787/69096873-en>).

### Total expenditure on educational institutions per full-time equivalent student, by type of service (2017)



1. Primary, secondary and post-secondary non-tertiary education includes pre-primary programmes.

2. Year of reference 2018.

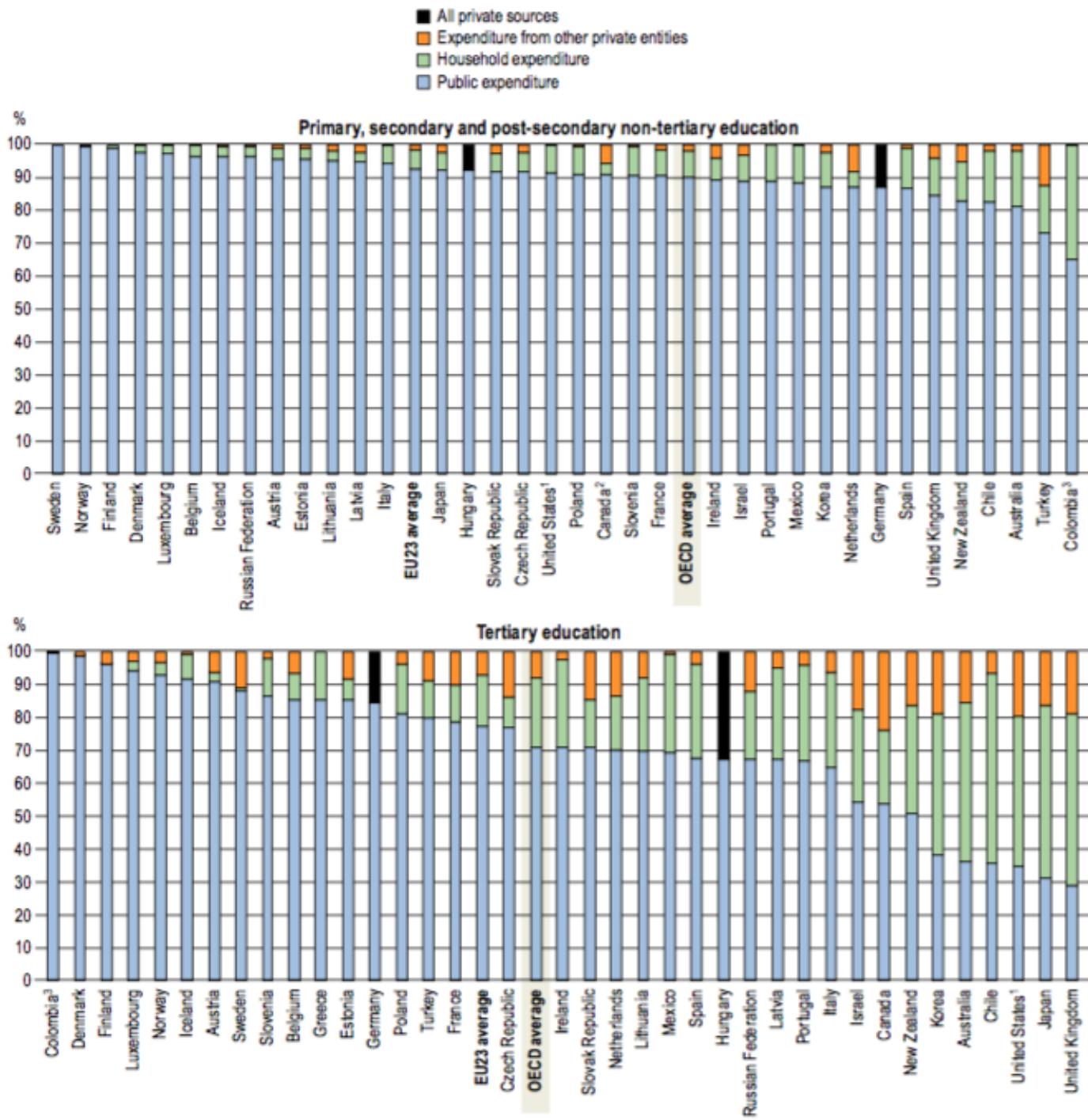
Countries are ranked in descending order of total expenditure on educational institutions per full-time equivalent student.

Source: OECD/UIS/Eurostat (2020), Table C1.2. See Source section for more information and Annex 3 for notes (<https://doi.org/10.1787/69096873-en>).

In OECD countries, overall expenditure per student on educational institutions from primary to tertiary levels averages 26% of per capita GDP, which can be broken down into 23% at primary, secondary and post-secondary non-tertiary levels and 36% at the tertiary level. Countries with low levels of expenditure per student may still be investing relatively large amounts as a share of per capita GDP.

The largest share of funding on primary to tertiary educational institutions in OECD countries comes from public sources, although private funding at the tertiary level is substantial. Within this overall average, however, the share of public, private and international funding varies widely among countries.

## Distribution of public and private expenditure on educational institutions (2017)



Note: International expenditure is aggregated with public expenditure for display purposes.

1. Figures are for net student loans rather than gross, thereby underestimating public transfers.

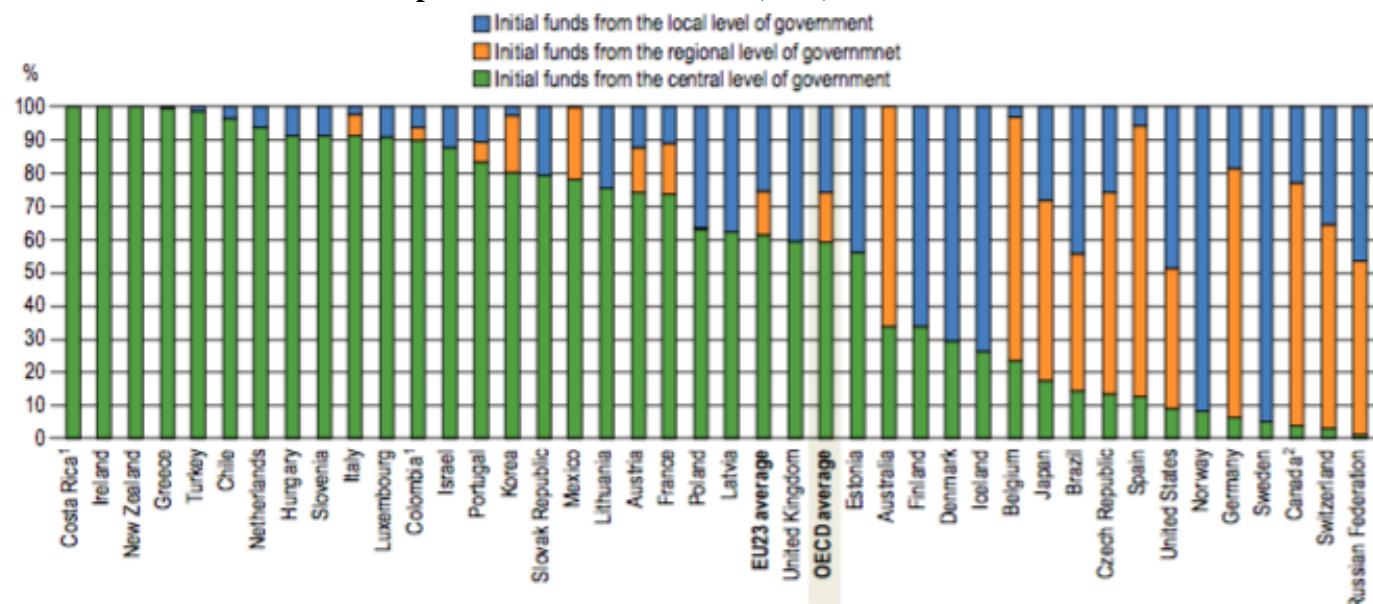
2. Primary, secondary and post-secondary non-tertiary education includes pre-primary programmes.

3. Year of reference 2018.

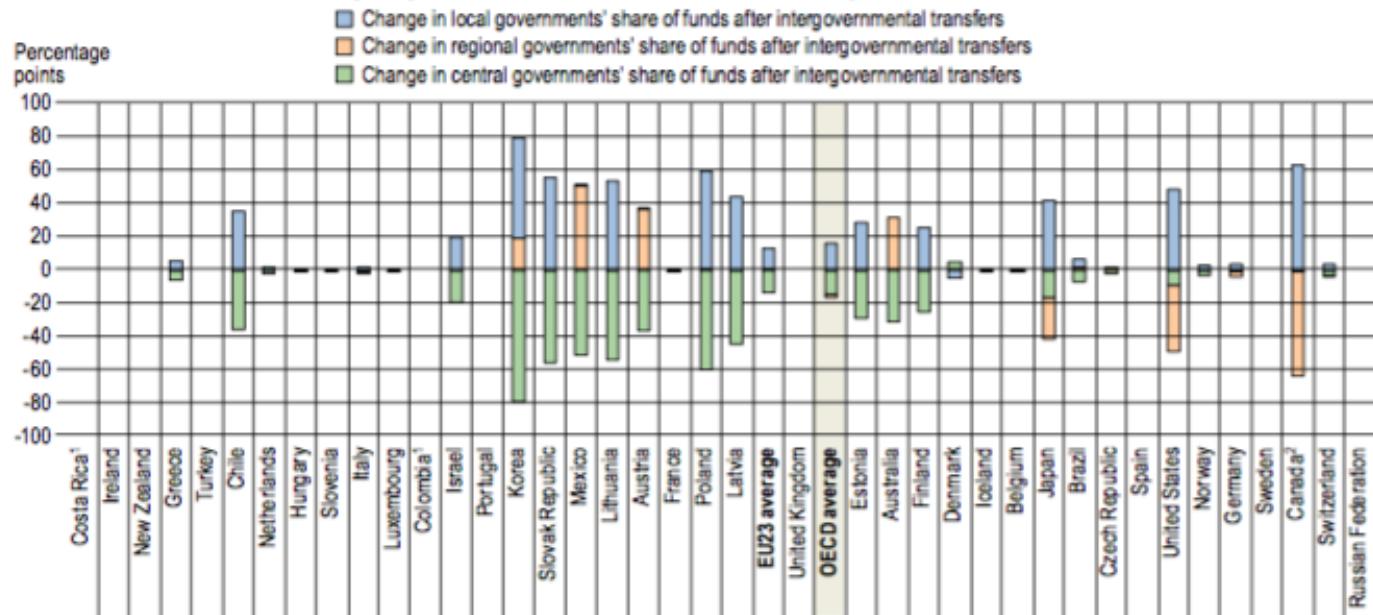
Countries are ranked in descending order of the proportion of public and international expenditure on educational institutions.

Source: OECD/UIS/Eurostat (2020), Table C3.1. See Source section for more information and Annex 3 for notes (<https://doi.org/10.1787/69096873-en>).

### Distribution of initial sources of public funds for education (2017)



### Change in government levels' share of funds after intergovernmental transfers



1. Year of reference 2018.

2. Primary, secondary and post-secondary non-tertiary education includes pre-primary programmes.

Countries are ranked in descending order of the share of initial sources of funds from the central level of government.

Source: OECD/UIS/Eurostat (2020), Table C4.2. See Source section for more information and Annex 3 for notes (<https://doi.org/10.1787/69096873-en>).

The division of responsibility for education funding between levels of government (central, regional and local) is an important factor in education policy. On average across OECD countries, more funds are transferred from central to regional and local levels of government for non-tertiary education than for tertiary education. Tertiary education is much more centralised than non-tertiary education, as the proportion of public funds coming from the central government is relatively large, both before and after transfers to lower levels of government. On average across the OECD, the central government manages 88% of funds before transfers and this barely changes once intergovernmental transfers are taken into account.

## I. The Rising Cost of College and Student Debt in the U.S.

### 1. The briefing of rising college cost <https://www.visualcapitalist.com/rising-cost-of-college-in-u-s/>

- 1) Since 1980, college tuition and fees in the U.S. have increased by 1200%, while the CPI 236%.
- 2) In the shift to online classes, 2020 saw the lowest tuition increase in the last four decades

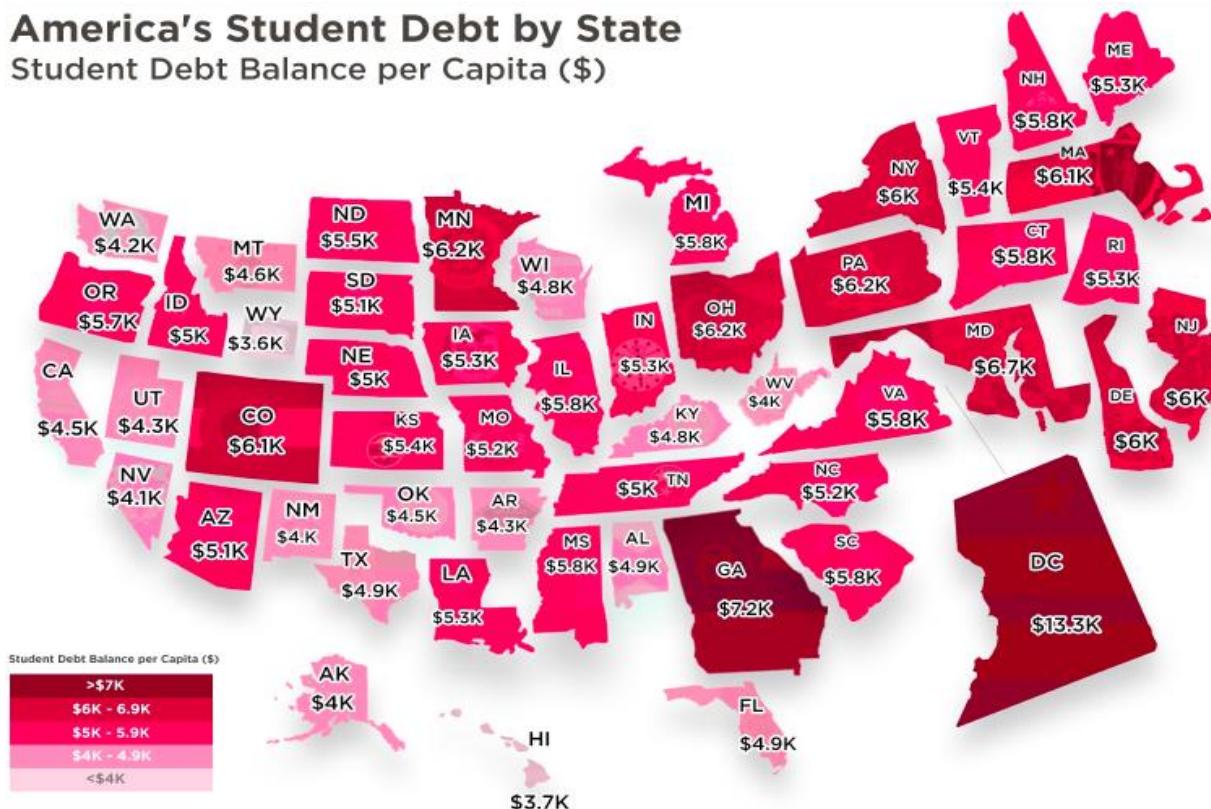
### 2. Why is the cost of college rising?

- 1) Decrease in state funding: State funding per student fell from \$8,800 (2007-08) to \$8,200 (2018-19), while the share of tuition in college revenues increased.
- 2) Increase in demand: The demand for a college education has increased over time. Between 2000-2018, undergraduate enrollment in degree-granting institutions increased by 26%.
- 3) Increase in federal aid: a study from the FRBNY, every \$1 in subsidized federal student loans increases college tuition by \$0.6. Student loan debt has doubled since the 2008 recession.
- 4) Institutional expenditures (the costs of providing education) have also escalated.

Year	Avg. Undergrad Tuition and Fees (Public)	Avg. Undergrad Tuition and Fees (Private)	CPI % Change (College Tuition and Fees)	CPI % Change (All Items)
1980	\$1,856	\$10,227	0%	0%
1990	\$2,750	\$16,590	150.2%	63.5%
2000	\$3,706	\$21,698	382.5%	117%
2010	\$5,814	\$25,250	828.6%	178.8%
2020	\$9,403	\$34,059	1198.9%	231.82%

3. How much student debt does each state hold? Almost half of all university-educated Americans rely on loans to pay for their higher education, with very few graduating debt-free. As of 2019, total U.S. student debt has more than doubled in the last decade—reaching a record high of \$1.5 trillion. ([w](#))

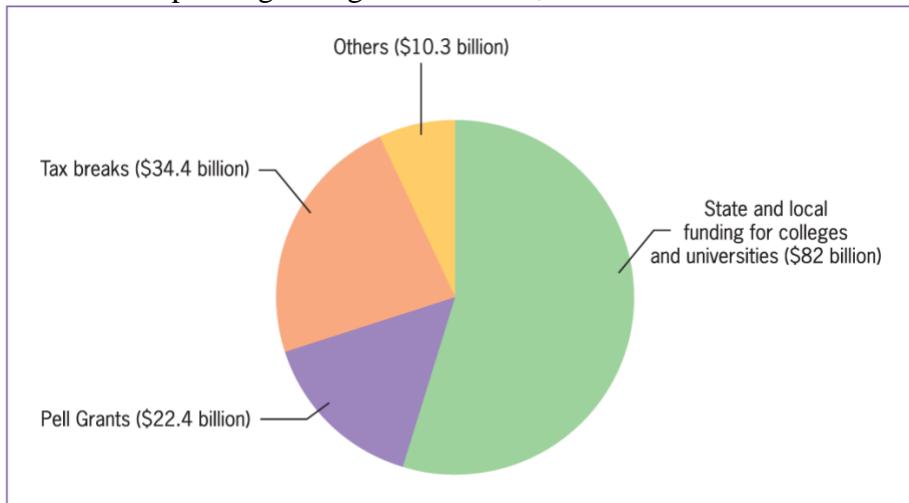
**America's Student Debt by State**  
Student Debt Balance per Capita (\$)



## II. U.S. Education Policy: Overview

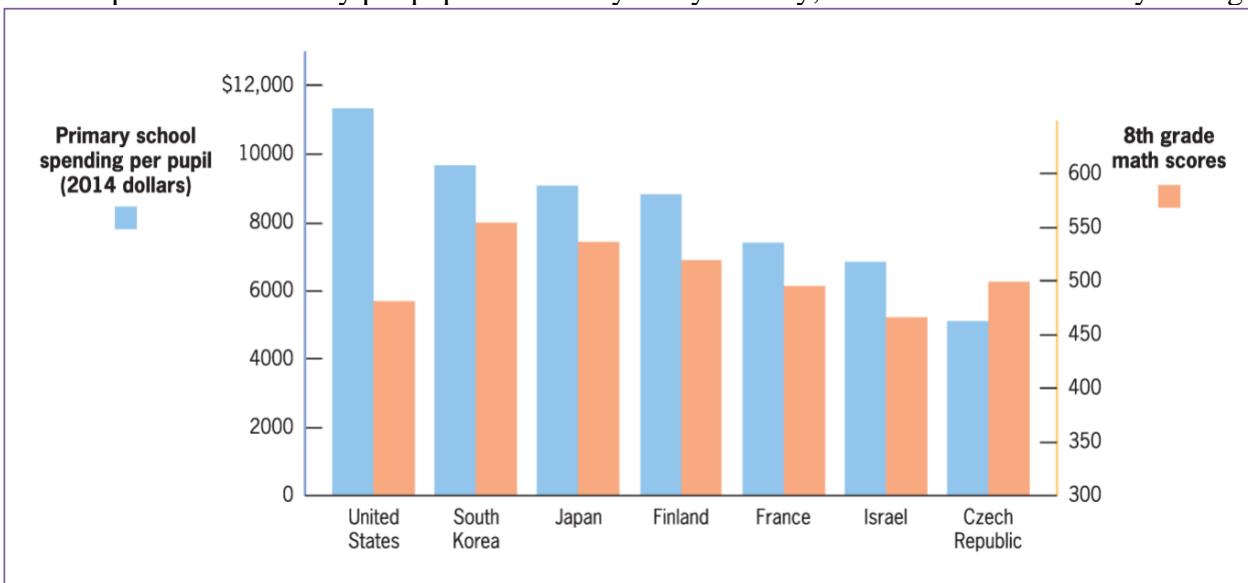
The provision of education, an impure public good, is one of the most important functions of the gov.

### 1. Government spending on higher education, 2017



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### 2. The US spends more money per pupil than nearly every country, but its outcomes are only average.



Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

### 3. The role of the government spending on higher education (CH11.5)

- 1) Much of the discussion is on primary and secondary education. In fact, about 43% of spending is for higher education. Higher education in the United States is viewed as an enormous success.
- 2) Forms: State provision; pell grants (subsidies to low-income families); direct student loans; tax relief (credit and deductions)

### 4. Market failures and interventions

- 1) The major motivation for government intervention in higher education is not to produce positive externalities but rather to correct the failure in the credit market for student loans.
- 2) Given that the major market failure for higher education is in credit markets, shifting state resources away from direct provision and toward loans would likely improve efficiency.

### III. Education Policy: Theoretical Analysis

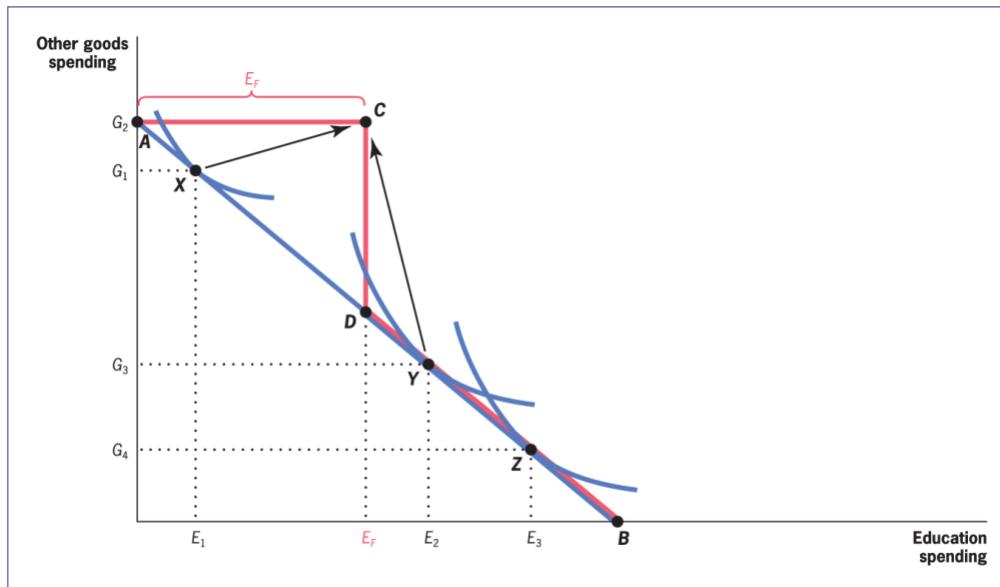
#### 1. Arguments for government intervention in education

- 1) Positive externality: long-term productivity, citizenship, immigration.
- 2) Credit market constraints: lack of collateral for education loans
- 3) Short-sighted parents: that's why their children end up in poverty
- 4) Social equity: redistribution promotes income mobility

#### 2. Policy effects (how should the government intervene and what would be the effects?)

##### 1) Free public education and the crowded-out effect

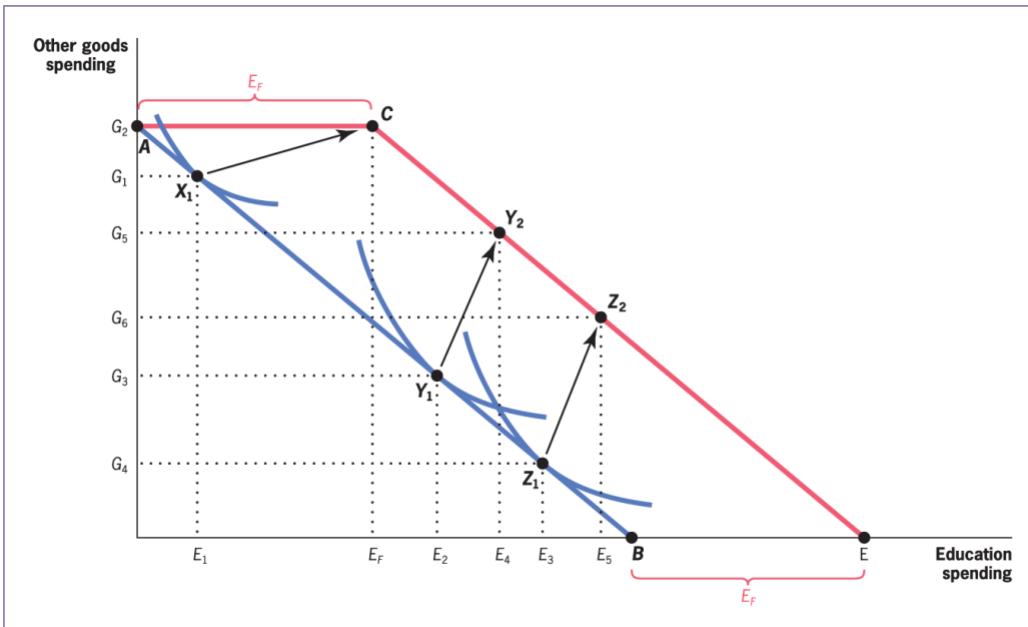
- a. Assumptions: three types of family X, Y, Z with the same budget constraints; each family attaches a different weight to education and therefore their spending differ  $E_1 < E_2 < E_3$
- b. Model: household utility maximization subject to a given budget constraint of income
- c. Equilibrium: X, Y, Z determined by their respective preferences (utility maximization)
- d. Public policy: a fixed amount of free public education ( $E_F$ ) provided by the government (quantity instrument); assume also free public education is of the same quality as private education, and free public education is either a take-it or leave-it choice facing individuals.
- e. New equilibrium:  $X \rightarrow C$ ;  $Y \rightarrow C$ ;  $Z = Z$ . Why? (Intuition: utility maximizing households increase education consumption if and only if it can raise their indifference curve levels.)
- f. Change in education consumption:  $X+, Y-, Z?$  At the society level, policy uncertainty exists.
- g. Free public education can squeeze private education (X switched and Y decreased)
- h. **Crowding out effect** only happens to family Y (free public education squeezes private spending)
- i. Implication: free public education will not necessarily make every family increase spending on education. (One size does not fit all. A standardized solution cannot help everybody.)
- j. How to overcome the crowded-out problem arising from the free public education?



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### 3. Educational vouchers: choose more of what you like

- 1) Definition: a fixed amount of money provided by the government to families with school-age children, who can spend it at any type of school, public or private.
- 2) Policy effects: conditional lump-sum grant to the families—it raises incomes but forces the families to spend it only on education, shifting in parallel the budget constraint to the right by  $E_F$
- 3) Model equilibrium: everybody chooses to have more education, implied by utility maximization
- 4) Policy implication: conducive to human capital accumulation and introduce more competition
- 5) How would the outcome be different if educational vouchers are tradeable?



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### 4. Public debates over educational vouchers

- 1) Proponents make two arguments for them
  - a. Consumer sovereignty: Vouchers allow individuals to more closely match their educational choices with their tastes.
  - b. Competition: Vouchers allow the education market to benefit from the competitive pressures that make private markets function efficiently.
- 2) Arguments against educational vouchers
  - a. Vouchers may lead to excessive school specialization: By focusing on particular market segments, schools give less focus to the key elements of education.
  - b. Vouchers will lead to segregation: Critics argue that vouchers have the potential to reintroduce segregation along many dimensions, such as race, income, or child ability.
  - c. Vouchers may be an inefficient and inequitable use of public resources: With vouchers, total public-sector costs would rise, as the government would pay part of the private school costs that families currently pay.
  - d. The education market may not be competitive: The education market is described more closely by a model of natural monopoly, with efficiency gains to having only one monopoly provider.
  - e. The costs of special education (programs to educate disabled children): Each child would be worth a voucher amount that represents the average cost of educating a child in that town in that grade, but all children do not cost the same to educate. Students with disabilities cost about twice as much to educate as students without.

### III. Education Policy: Empirical Evidence

#### 1. Measuring the Returns to Education (K-12)

- 1) How to maximize the effectiveness of K-12 system to produce the best outcomes for students?
- 2) Using test score data to evaluate primary education raises a common concern: Are test scores a good measure of learning? Do improvements in test scores reflect better test-taking ability or acquisition of skills that have value later in life?
- 3) Chetty et al. (2011) examine this issue using data on 12,000 children who were in Kindergarten in Tennessee in 1985. Link school district and test score data to tax records. Ask whether KG test score performance predicts later outcomes <https://opportunityinsights.org/paper/kindergarten/>

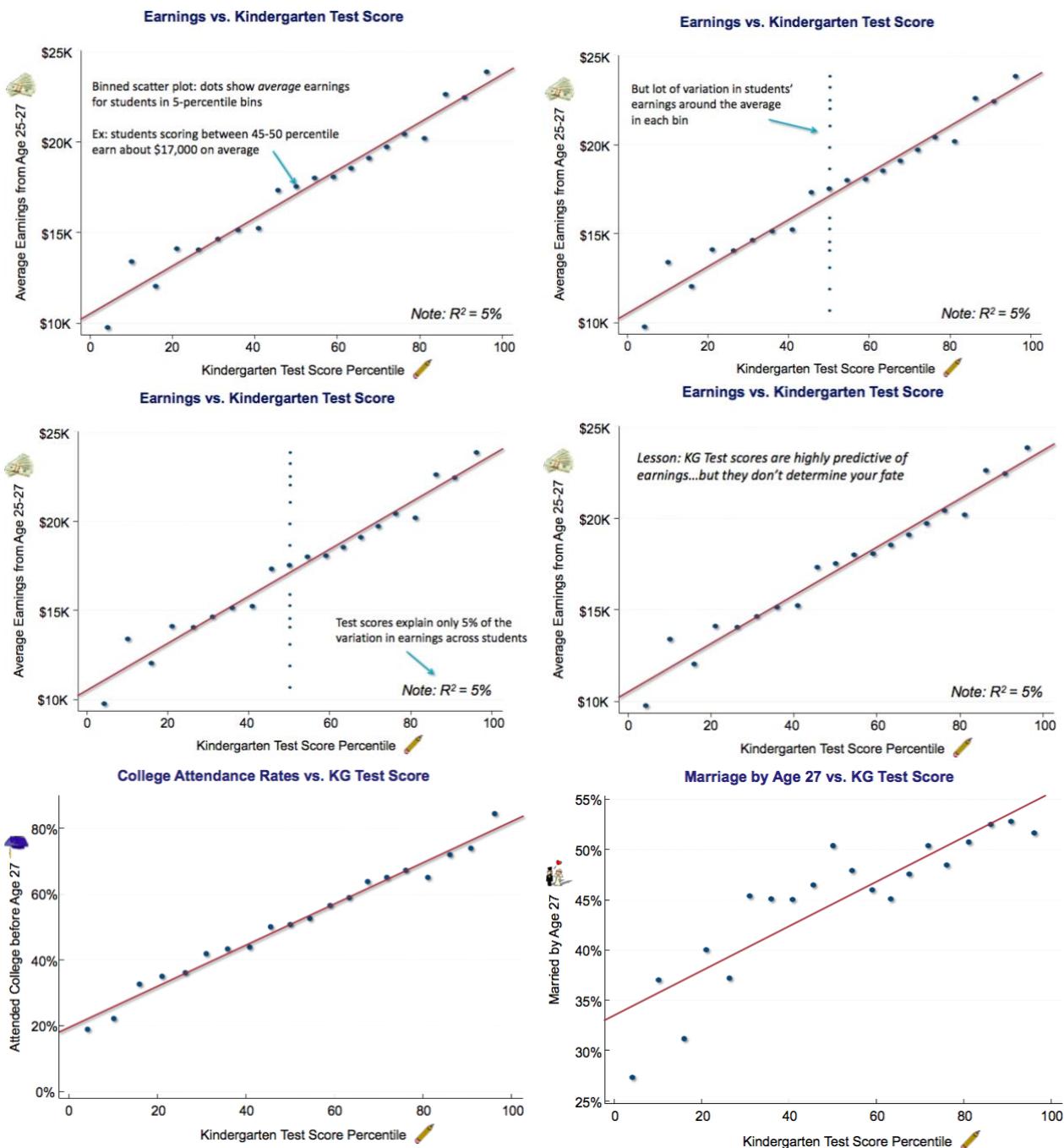
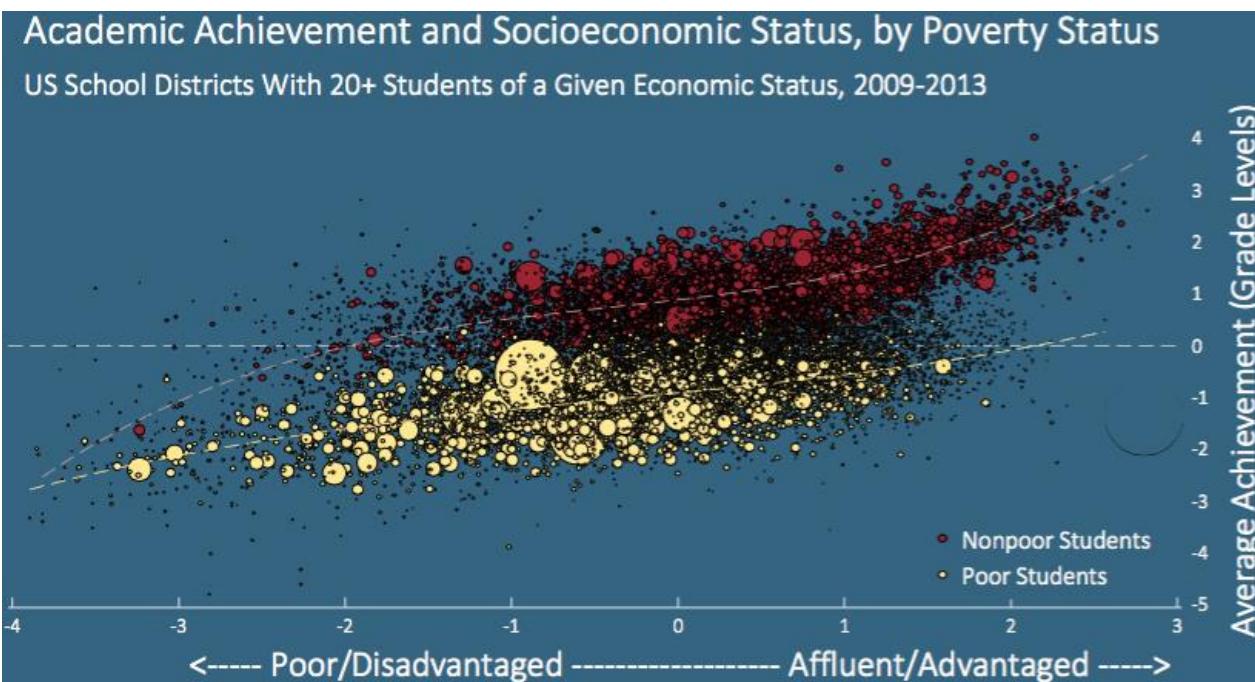
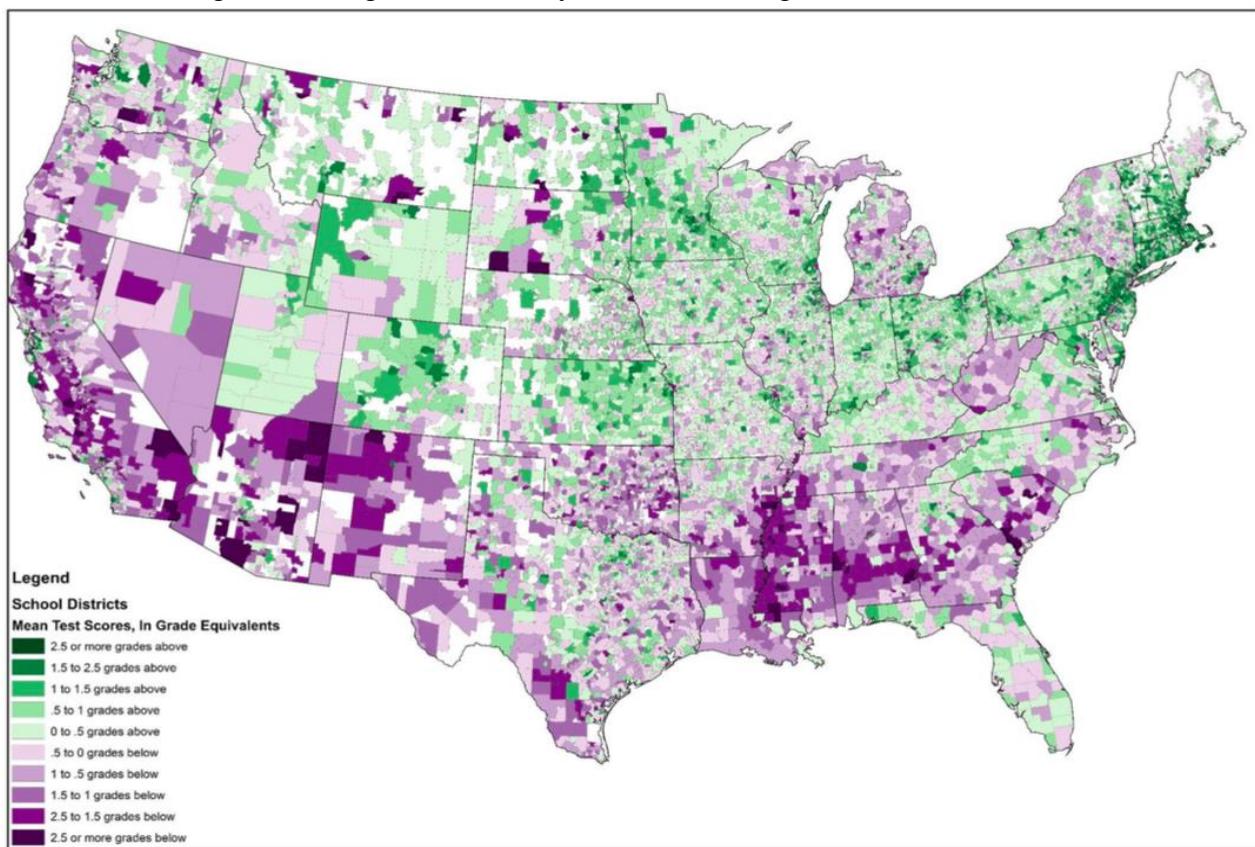


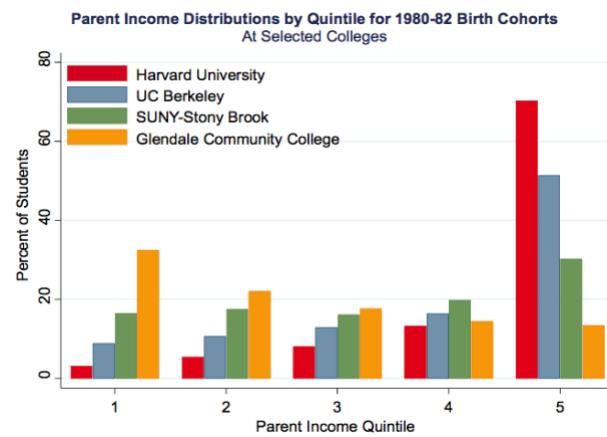
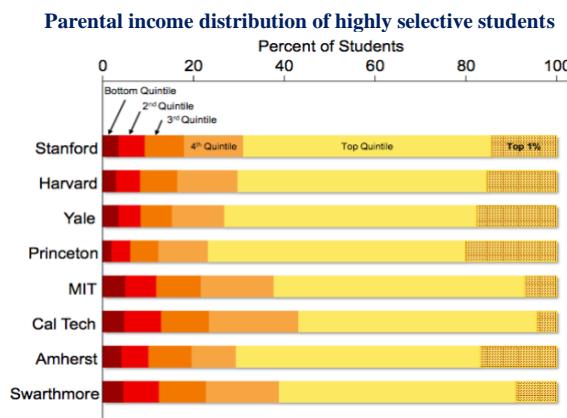
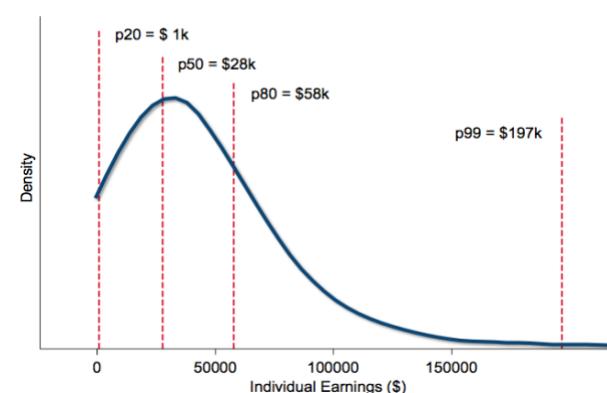
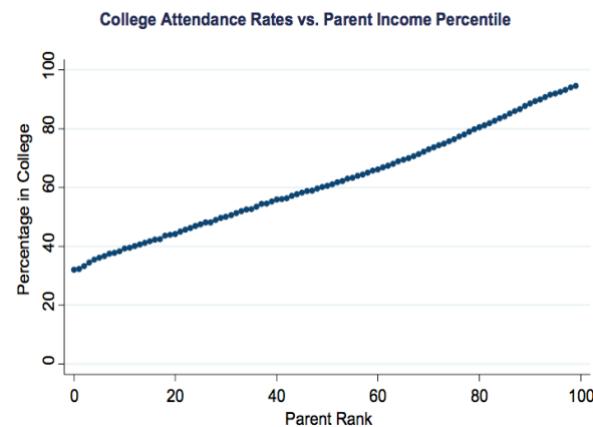
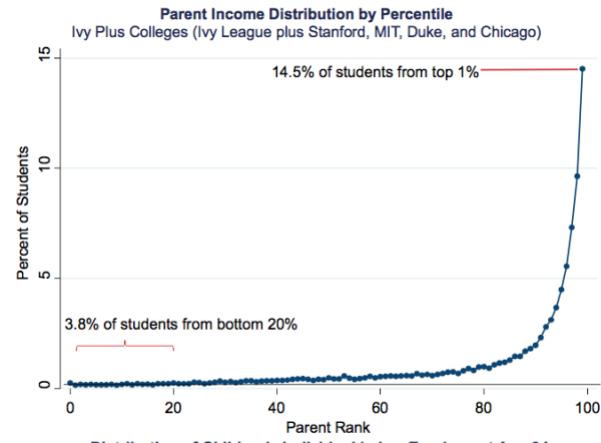
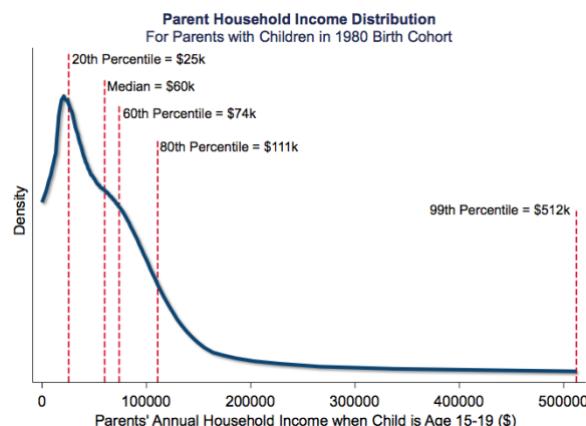
Figure: Average test scores by school district, grades 3-8 (2009-2013)

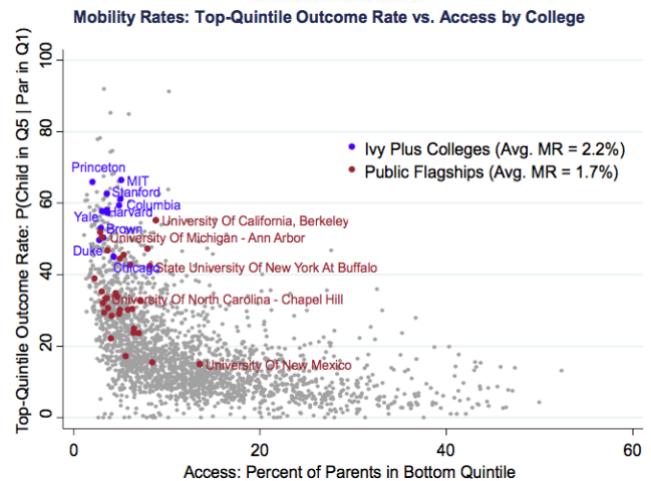
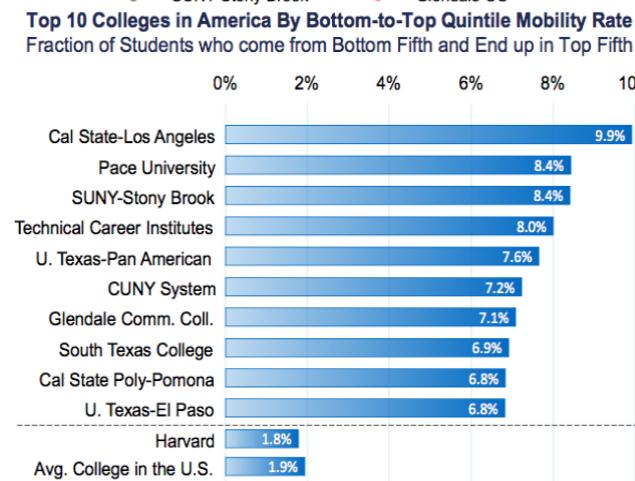
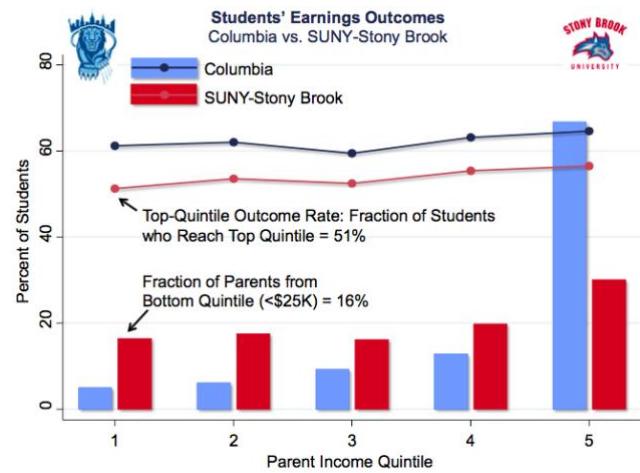
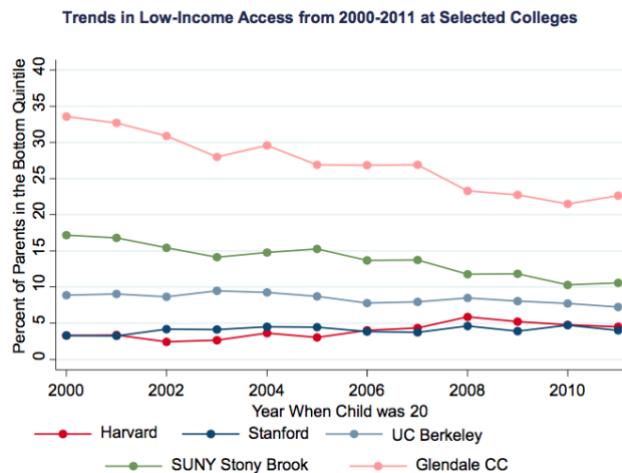
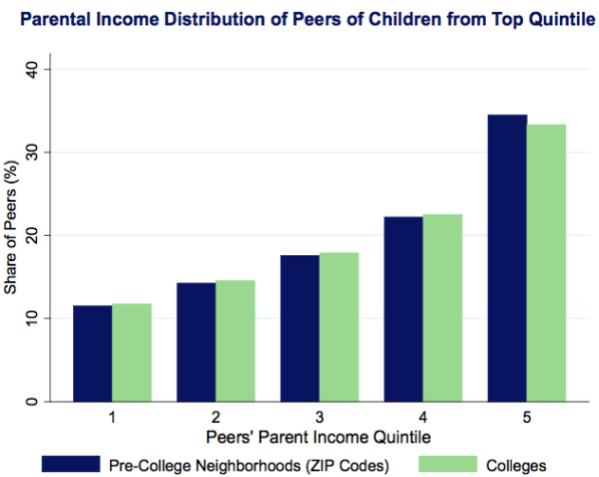
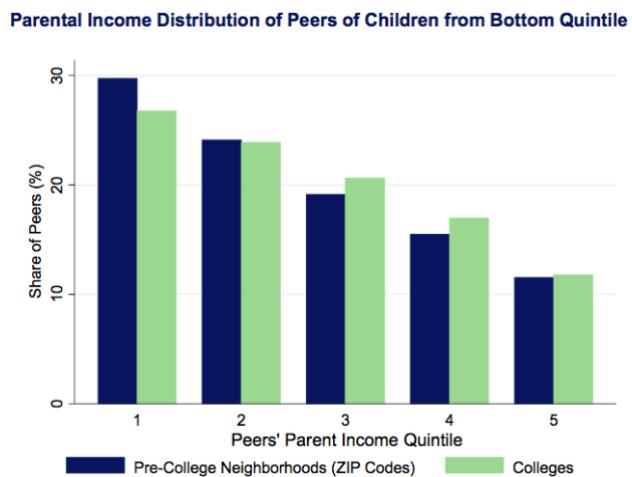


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## 2. U.S. higher education and social mobility (Chetty, et. al., 2020)

- 1) How does the U.S. higher education system affect intergenerational income mobility?
- 2) Effect of higher education system on mobility depends upon three factors
  - a. Parental income distributions by college (input)
  - b. Students' earnings outcomes conditional on parental income by college (output)
  - c. Portion of variation in students' earnings outcomes that is due to colleges' causal effects
- 3) Chetty et al. (2017) estimate these three parameters using data covering all college students in the U.S. from 1999-2013 (30 million students)
- 4) College mobility rate: the fraction of its students who come from bottom quintile family in earnings and end up in top quintile themselves. **Mobility Rate = Low Income Access x Top-Quintile Rate**



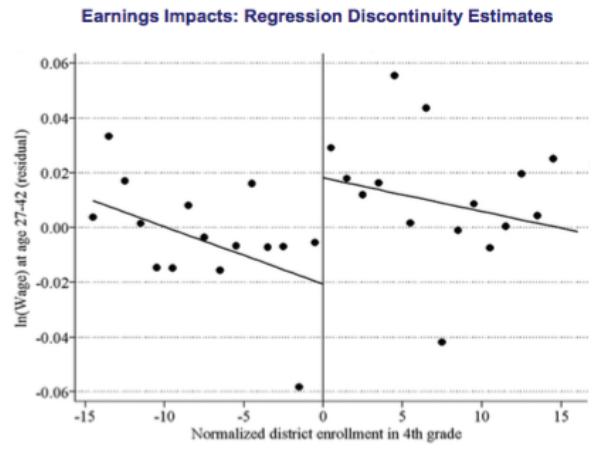
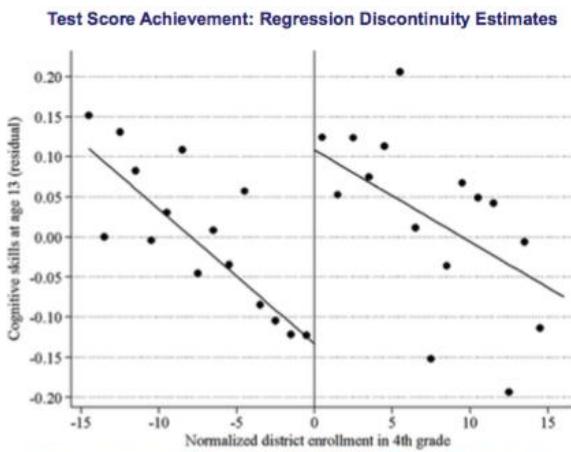
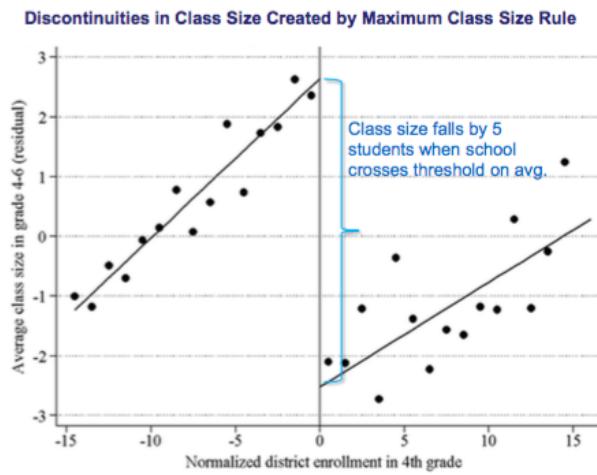


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### 3. Estimating the effects of school quality

- 1) Effects of Class Size: Tennessee STAR Experiment. Limitation of STAR experiment: sample is too small to estimate impacts of class size on earnings precisely
- 2) Fredriksson et al. (2013) use administrative data from Sweden to obtain more precise estimates  
No experiment here; instead use a quasi-experimental method: regression discontinuity
- 3) RDD design: Sweden imposes a maximum class size of 25 students. School that have 26 students in a grade are likely to be comparable to those that have 25 students
- 4) Lessons: Reducing class sizes in primary school by hiring more teachers can have large returns



### Student Presentations

#### 4. Estimating the Effects of Voucher Programs

#### 5. Effects of Education Levels on Productivity

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202102 WSJ: How Public Universities Became So Expensive ([w](#))  
201910 CNBC Why college tuition keeps rising ([w](#))

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<https://opportunityinsights.org/climb/>  
<https://opportunityinsights.org/education/>  
<https://opportunityinsights.org/paper-category/education/>

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## AEA Research Highlights

201708 Mentoring at the margins. ([w](#))  
202012 Elite education and affirmative action ([w](#))  
202101 Social well-being and academic success ([w](#))  
201707 Does educational choice lead to success? ([w](#))  
202103 The globalization of American universities ([w](#))  
201509 What do effective charter schools have in common? ([w](#))  
201609 A new way to measure the impact of charter schools ([w](#))  
201509 Should schools implement tougher grading standards? ([w](#))  
202104 Why the United States has the best research universities? ([w](#))  
201509 Does English-only schooling help U.S. immigrants succeed? ([w](#))  
201609 Can international exam rankings tell us how to improve American education? ([w](#))

Hanushek, Eric A. 1996. "Measuring Investment in Education." Journal of Economic Perspectives, 10 (4): 9-30. <https://www.aeaweb.org/articles?id=10.1257/jep.10.4.9>

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## Data Visualization

## 2015 Student Debt Hits New Record (w)

2021 The Rising Cost of College in the U.S. [\(w\)](#)

2017 How Much Student Loan Debt is Too Much? (w)

2020 The Top 100 U.S. Colleges, Ranked by Tuition (w)

2019 How Much Student Debt Does Each State Hold? [\(w\)](#)

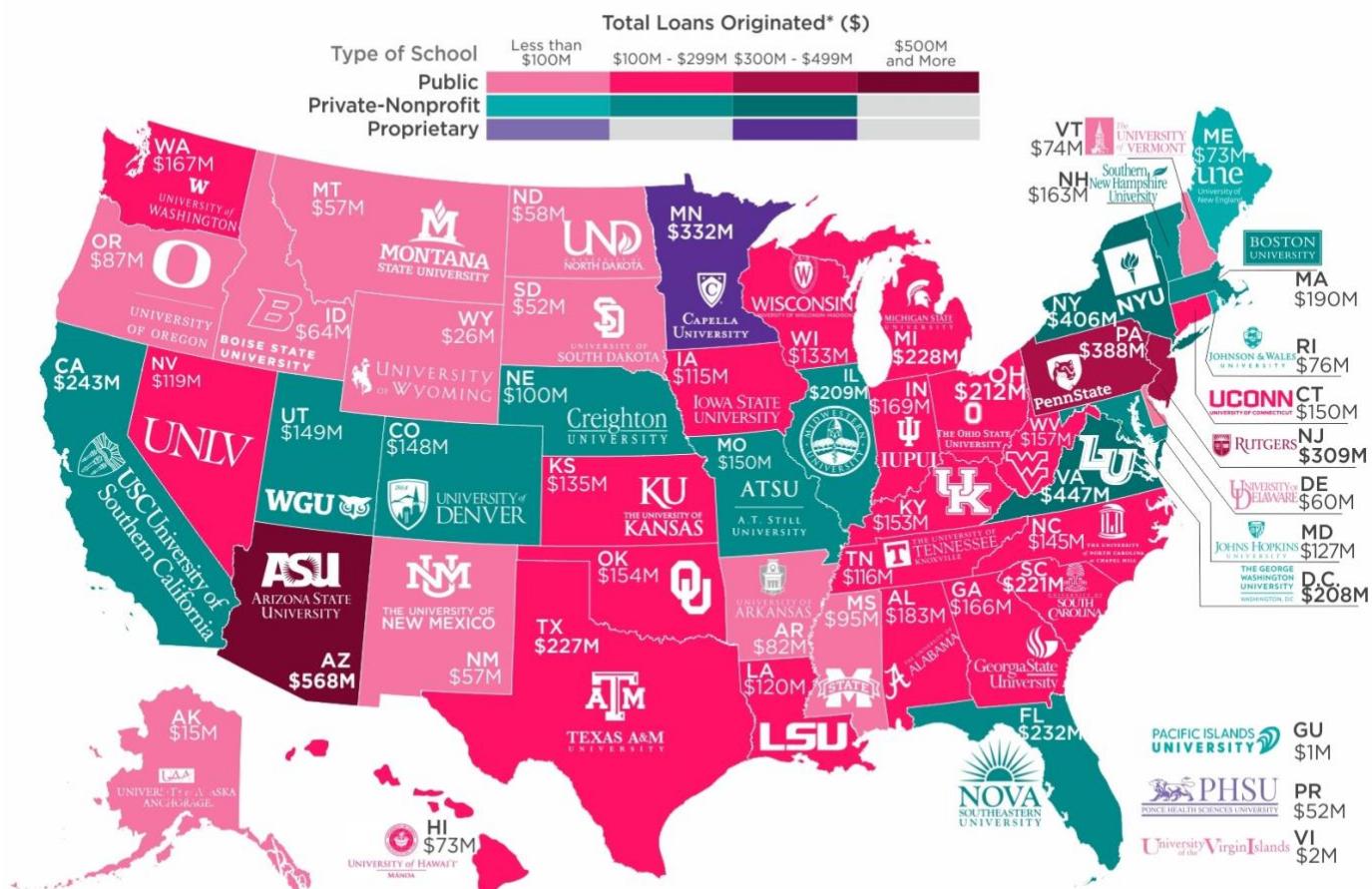
2021 What Schools Create the Most Student Loans in the U.S.? [\(w\)](#)

2017 The Rising Costs of Sending Your Kids to a Private School ([w](#))

2017 Which Colleges Give You the Best Value for Your Money? [\(w\)](#)

## **The University With the Most Student Loan Originations in Every State**

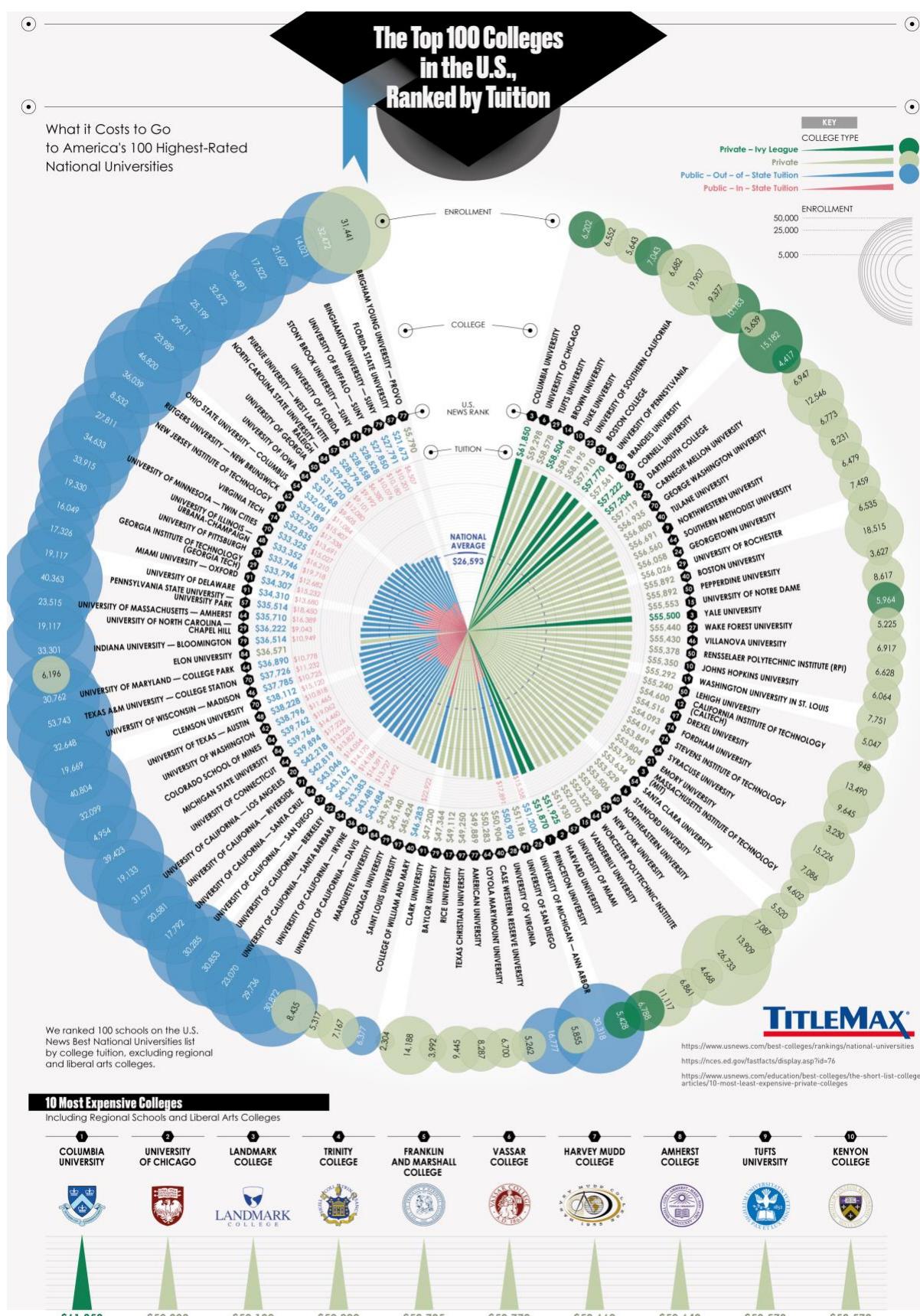
Total Value of Loans Originated in Academic Year 2020-2021 & School Types



\*The dollar amount of the loans initiated for the loan type during the award year for the time period reported on the spreadsheet.

**Article & Sources:** <https://howmuch.net/articles/university-with-the-most-student-loan-origination-and-disbursement> (GDP), <https://edocket.access.gpo.gov/2018/2018-19333.pdf>

howmuch.net



## Lecture 7 Social Insurance

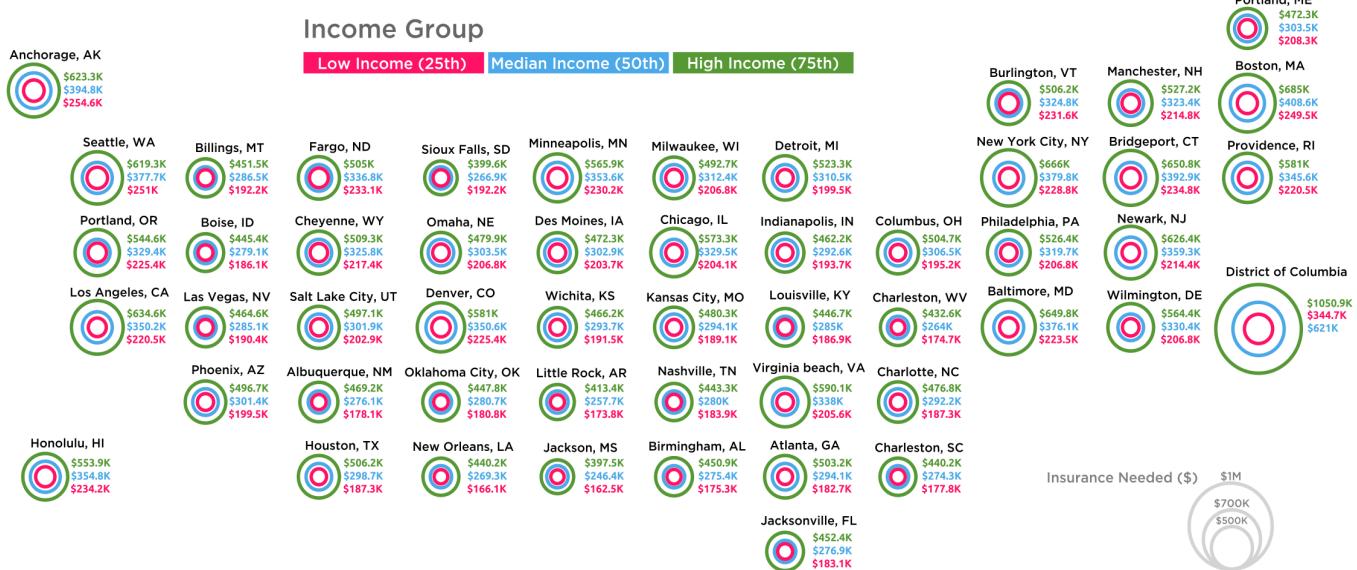
Biwei Chen

### Outline

- Data and Facts
- Theory and Models
- Government Remedies

*Life is filled with risks. Uncertainty is the rule because nobody can predict with confidence his or her future state of wealth or health. Families once bore the primary responsibility for caring for their individual members in bad times, but modern industrial society has scattered family members to different jobs in different locations. Certain risks we have agreed to confront as a society, rather than as individuals. Citizens have decided, through the political system, that we need financial protection against some of life's difficulties that are hard to face as individuals. These include old age, ill health, unemployment, disability that makes it impossible to work, injury on the job, and the death of a family breadwinner. For all these conditions, we rely on help from social insurance programs, which are financed by workers and employers.* <https://www.nasi.org/learn>

## Life Insurance Needed for Each Income Group per State



Article & Sources:  
<https://howmuch.net/articles/life-insurance-needed-for-each-income-group-per-state>  
<https://howmuch.net/sources/life-insurance-needed-for-each-income-group-per-state>

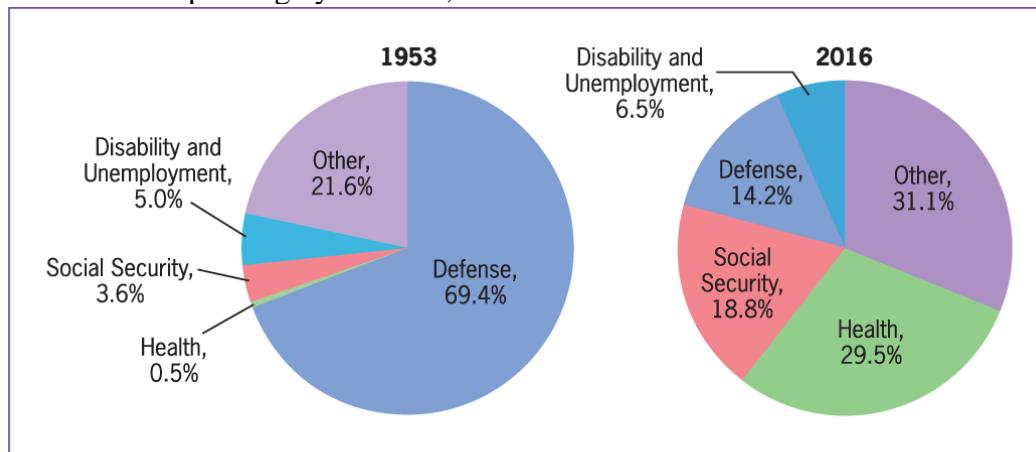
howmuch.net

<https://howmuch.net/articles/life-insurance-needed-for-each-income-group-per-state>

*Everyone needs life insurance. But how much each individual would need varies from person to person. You will want to find the right life insurance policy that accounts for how much money you earn and the cost of living in your area. The figure above compared three income groups based on wage distribution provided by the U.S. Bureau of Labor & Statistics. These buckets represent the 25th, median, and 75th percentiles of expected earnings for the average worker in each state. Using the tool from SmartAsset we took a sample of people born in 1984 who do not own a house and have \$25,000 in savings. The insurance assumes income over a 20-year period, where you receive 50% of the monthly earnings with no dependents. Lastly, we exclude Social Security Benefits, and assume inflation of 2% and an annual return on savings of 4%.*

## I. Social Insurance Programs

### 1. Government spending by function, 1953 and 2016



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- 1) Government today devotes a much larger portion of its budget to social insurance than it did 50 years ago. Government spending now focuses on social insurance programs.
  - 2) Social insurance programs: Government interventions in the provision of insurance against adverse events and earnings loss due to illness, disability, aging, accidents, unemployment, and disasters.
  - 3) Features: participants buy insurance via payroll taxes or mandatory contributions by the employers
  - 4) Program eligibility: Conditional on making contributions and the occurrence of measurable events
  - 5) For most programs, eligibility is NOT means-tested. Means-tested: Refers to programs in which eligibility depends on one's means, the level of one's current income or assets.
2. What is insurance and insurance premium?
    - 1) Insurance is a promise to make some payment in case of a particular event, in exchange for a payment, called a premium. Insurance premiums: Money that is paid to an insurer so that an individual will be insured against adverse events.
    - 2) Insurance products in the US include health insurance, auto insurance, life insurance, and casualty and property insurance. Annual private premiums for these products total more than \$1.6 trillion.

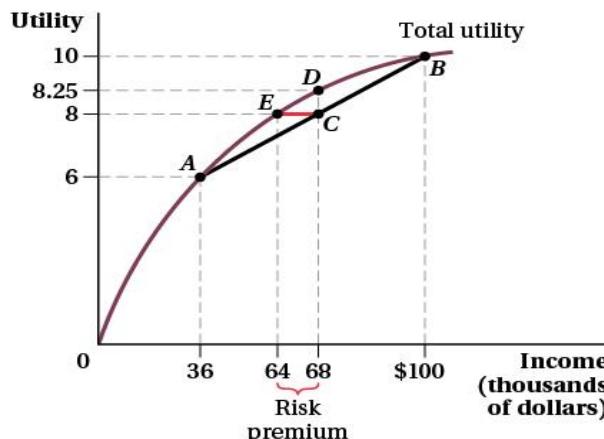
## II. Insurance Theory and Model

1. Why insurance? It helps individuals' insurance consumption across states of the world.
  - 1) **Consumption smoothing:** The translation of consumption from periods when consumption is high, and thus has low marginal utility, to periods when it is low, and thus has high marginal utility.
  - 2) **The law of diminishing marginal utility** implies concave utility function: The consumer always prefers a moderate amount of consumption for sure than a 50–50 chance of having a lot or nothing.
  - 3) **States of the world:** The set of outcomes that are possible in an uncertain future.
  - 4) **Risk aversion:** The extent to which individuals are (un)willing to bear risk.
2. The expected utility model
  - 1) Expected utility model: The weighted sum of utilities across states of the world, where the weights are the probabilities of each state occurring.  $E(U) = \sum (P_i \cdot U_i)$   $\forall$  all states i.
  - 2) State probability: the chance of the event when it happens. All state probabilities  $\sum P_i = 1$
  - 3) Expected income: a weighted average of incomes across different probability states
  - 4) Expected utility: a weighted average of utilities across different probability states
  - 5) Optimal consumption decision is made today to maximize expected future utility

- 6) Example: Adam's utility is a function of his income, which he can use to purchase goods. It takes the form  $U=\sqrt{I}$ , where income is measured in thousands. Suppose Adam's income is \$100000 a year but he faces a 50/50 chance of a tornado. If a tornado hits, his income is reduced to \$36000, as he has to pay for the damages it causes; if it does not hit, his income remains at \$100000.
- Adam's expected income =  $E(I)=P_L \cdot I_L + P_H \cdot I_H = (0.5 \times \$36000) + (0.5 \times \$100000) = \$68000$
  - Adam's expected utility =  $E(U)=P_L \cdot U_L + P_H \cdot U_H = (0.5 \times 6) + (0.5 \times 10) = 3+5 = 8$
  - What would be the minimum income supporting Adam's expected utility?

### 3. Certainty equivalent and risk premium

- 1) Adam is utility indifferent between a certain income of \$64000 and the riskier expected income of \$68000; his expected utility is the same for each. Therefore, he would be willing to pay up to \$4000 to reduce the risk in his income stream to zero.  $E[U(I)] = U(CE) \rightarrow CE$
- 2) This is because Adam gets less incremental utility from income at high levels and more at low levels. The lost utility associated with the low income is larger than the gained utility associated with the high income. As the variability of potential income increases, the risk premium increases.
- 3) An economic agent who is willing to pay to reduce risk is risk-averse. Expecting a utility loss from uncertainty or equivalently, being willing to pay for a risk reduction.  $RP = E(I) - CE$

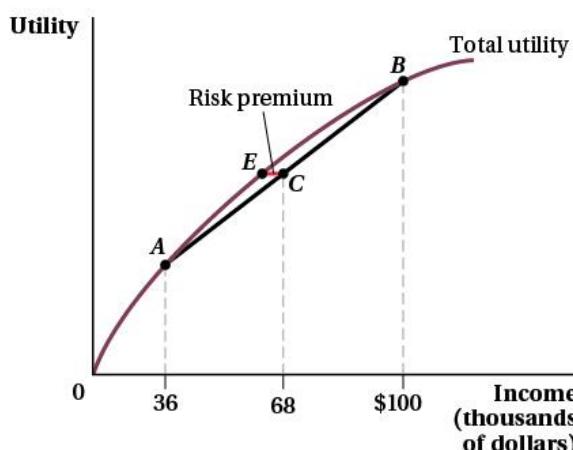


- **Certainty Equivalent (CE)** is the guaranteed income level at which a consumer would receive the same expected utility as from an uncertain income. For Adam, this would have been \$64000.
- **Risk Premium (RP)** is the amount a consumer must be compensated for bearing risk without taking a loss in expected utility. For Adam, this would have been \$4000 =  $\$68000 - \$64000$
- Jensen inequality:  $E[U(I)] < U[E(I)] \forall U''(I) < 0$

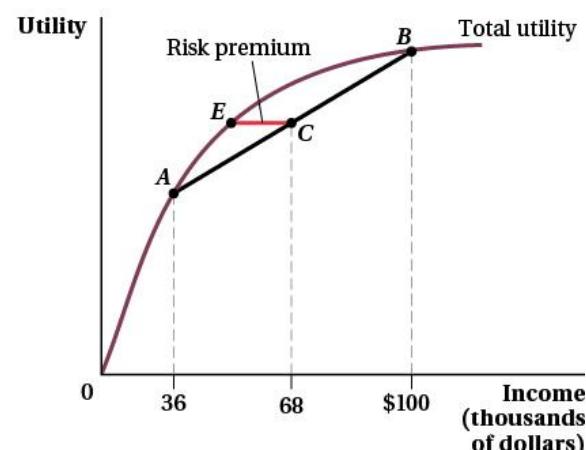
### 4. Utility function and risk aversion

The degree of risk aversion: A concave utility function reflects the preferences of a risk-averse agent. This implies a link between the degree of risk aversion and the shape of a utility function.

(a) Less risk-averse



(b) More risk-averse



Source: Goolsbee, Levitt & Syverson (2020) CH14, Microeconomics, 3e, Worth

## 5. Insurance pricing under perfect competition

To analyze Sam's choice, assume  $U=\sqrt{C}$  and premiums are actuarially fair. Insurance costs  $m$  (unit cost) for each dollar of coverage. There is a 1% chance that Sam gets hit by a car, resulting in \$30000 in medical expenses. Assume zero administrative cost and zero economic profit (perfectly competitive market).

The Expected Utility Model					
If Sam . . .	And Sam is . . .	Consumption (C)	Utility $\sqrt{C}$	Expected Utility	
Doesn't buy insurance	Not hit by a car ( $p = 99\%$ )	\$30,000	173.2	$0.99 \times 173.2 + 0.01 \times 0 = 171.5$	
	Hit by a car ( $p = 1\%$ )	0	0		
Buys full insurance (for \$300)	Not hit by a car ( $p = 99\%$ )	\$29,700	172.34	$0.99 \times 172.34 + 0.01 \times 172.34 = 172.34$	
	Hit by a car ( $p = 1\%$ )	\$29,700	172.34		
Buys partial insurance (for \$150)	Not hit by a car ( $p = 99\%$ )	\$29,850	172.77	$0.99 \times 172.77 + 0.01 \times 121.86 = 172.26$	
	Hit by a car ( $p = 1\%$ )	\$14,850	121.86		

- 1) If Sam buys \$b insurance coverage against adverse events, his premium would be  $m \cdot b$
- 2) For the insurance company, the **expected payout** is  $E(\text{payout}) = 0.01 \cdot 30000 + 0.99 \cdot 0 = \$300$
- 3) **Actuarially fair premium ACP:** an insurance premium set equal to the insurer's expected payout
- 4) Insurance pricing via actuarially fair premium implies break-even cost for the insurance company.
- 5) To break even, the insurance company must collect \$30000 total revenue (charge 100 individuals \$300 each) and then pay out  $1\% \cdot 100 \cdot 30000 = \$30000$  to the unfortunate person (1 out of 100).
- 6) Therefore, if Sam fully insures the risk, he pays  $m \cdot 30000 = \$300$ , which is optimal. Why?  $U_{\text{Max}}$
- 7) **Optimal insurance** (perfect competition): with actuarially fair premiums, the efficient insurance market outcome is for the consumer to buy full insurance to achieve full consumption smoothing.
- 8) Risk-averse people may still want to buy some insurance even if it is not actuarially fair. People differ in their risk aversion, and if insurance premiums are extremely unfair, then only the most risk averse will want it. In practice, risk attitude and behavior differ among different individuals, rendering insurance pricing and policy difficult, if not impossible, to be efficient. **Risk premium is the amount that risk-averse individuals will pay for insurance above and beyond the ACP.**

## III. Asymmetric Information in the Insurance Market

Two types of consumers demand for insurance—the careless and the careful. One hundred careless people have a 5% chance of being in a car accident. One hundred careful people have a 0.5% chance. The medical expenses per person are \$30000 had an accident happened.

- 1) If the insurance company knows each person's risk attitude/type, it can charge them separate actuarially fair prices (full information). If the insurance company doesn't know their type, it could try charging a price that is fair on average or try charging separate prices (asymmetric information).
- 2) What happens if the insurance company could charge each type their actuarially fair prices?
  - a. If accidents happen, insurance company pays out  $(5\% \cdot 100 + 0.5\% \cdot 100) \times 30000 = \$165000$
  - b. Charge the careless \$1500, earn \$150000 per 100 careless people, pay out  $5 \cdot 30000 = \$150000$
  - c. Charge the careful \$150, earn \$15000 per 100 careful people, pay out  $0.5 \cdot 30000 = \$15000$
- 3) What if the insurance tries to charge different prices but cannot tell who is careless?
  - a. Split the accident costs \$30000 equally across different types (charge \$15000 each)
  - b. Earn \$15000 per 100 careless people (careless people pretend to be careful, pay \$150); the insurance company will have to pay out \$150000 and lose  $150000 - 15000 = \$135000$
  - c. Earn \$15000 per 100 careful people (careful people pay \$150), pay out \$15000
  - d. The insurance company earns \$300000 but pays out \$165000, end up losing \$135000

- 4) What if the insurance company tries to charge average price?  $(1500+150)/2=\$825$
- Insurance is a good deal for careless people, so they buy it, pay \$825.
  - Careful people decline it. Earn nothing from careful people. Why?
  - Earn \$82500 per 100 careless people, pay out \$150000, lose \$67500
  - Insurance company ends up losing money and insurance market fails
- 5) Summary: Insurance pricing under full information vs asymmetric information

**TABLE 12-2****Insurance Pricing with Separate Groups of Consumers**

Information	Pricing Approach	Premium per Careless (100 people)	Premium per Careful (100 people)	Total Premiums Paid	Total Benefits Paid Out	Net Profits to Insurers
Full	Separate	\$1,500	\$150	\$165,000 $(100 \times \$1,500 + 100 \times \$150)$	\$165,000	0
Asymmetric	Separate	\$1,500	\$150	\$30,000 $(0 \times \$1,500 + 200 \times \$150)$	\$165,000	-\$135,000
Asymmetric	Average	\$825	\$825	\$82,500 $(100 \times \$825 + 0 \times \$825)$	\$150,000	-\$67,500

- Pooling equilibrium: A market equilibrium in which all types of people buy full insurance even though it is not fairly priced to all individuals.
  - Separating equilibrium: A market equilibrium in which different types of people buy different kinds of insurance products designed to reveal their true types.
2. Information asymmetry can lead to a key market failure called adverse selection
- Adverse selection:** The fact that insured individuals know more about their risk level than does the insurer might cause those most likely to have the adverse outcome to select insurance, leading insurers to lose money if they offer insurance. **Under information asymmetry, adverse selection leads to market failure since healthy people may not be willing to buy insurance.**
  - Selling to both requires that low-risk people subsidize high-risk people. Low-risk people may not want to do this. Sometimes, only high-risk people end up with insurance. If low-risk people have a high enough risk premium, they will subsidize high-risk people in a pooling equilibrium.
3. Self-insurance: The private means of smoothing consumption over adverse events, such as through one's own savings, the labor supply of family members, or borrowing from friends.
- Example of unemployment insurance: People can insure against unemployment in many ways. They can draw on their own savings. They can borrow, either in collateralized forms (such as borrowing against the equity they have in their homes) or in uncollateralized forms (such as on their credit card). Other family members can increase their labor earnings. They can receive transfers from their extended family, friends, or local organizations.
  - How much self-insurance is in place determines how effective social insurance is.
    - For an individual with no self-insurance, each dollar of unemployment insurance goes directly to reducing the decline in consumption from unemployment. No crowd-out.
    - For an individual with complete self-insurance, each dollar of UI replaces a dollar of self-insurance. Complete crowd-out.
    - For an individual with partial self-insurance, each dollar is split between smoothing consumption and reducing self-insurance. Partial crowd-out.

4. Lessons for consumption-smoothing role of social insurance: The importance of social insurance for consumption smoothing will depend on two factors

- 1) Predictability of the event: It is easier for people to self-insure against a predictable event, such as increasing their savings. More predictable risks reduce the benefits of providing social insurance.
- 2) Cost of the event: It is more difficult to self-insure against high-cost events, such as becoming injured and unable to work. Costly risks increase the benefits of providing social insurance.

#### IV. Why Government Intervention in the Insurance Market? Costs and Effects.

##### 1. Arguments for government intervention

- 1) Address adverse selection and improve market efficiency, which involves redistribution from the healthy to the sick in the insurance market, which may be quite unpopular.
- 2) Mitigating externalities: Vaccines have positive spillovers, car crashes negative ones.
- 3) Administrative costs: Government-run Medicare has much lower costs than private insurance.
- 4) Redistribution: Governments may want to redistribute from the healthy to the sick.
- 5) Paternalism: Government may feel people would choose to buy too little insurance for themselves.

##### 2. A cost of insurance is moral hazard

- 1) **Moral hazard:** Adverse actions taken by individuals or producers in response to insurance against adverse outcomes. “Nothing emboldens sin so much as mercy.”
- 2) The existence of moral hazard means that it **may not be optimal** for the government to provide the full insurance that is demanded by risk-averse consumers.
- 3) **What determines moral hazard?**
  - How easy it is to observe whether the adverse event has happened.
  - How easy it is to change behavior in order to establish the adverse event.

3. Moral hazard is multidimensional: In examining the effects of social insurance, four types of moral hazard play a particularly important role.

- 1) Reduced precaution against entering the adverse state. Because you have medical insurance, you reduce preventive activities to protect your health.
- 2) Increased odds of entering the adverse state. Because you have workers' compensation, you are more likely to claim that you were injured on the job.
- 3) Increased expenditures when in the adverse state. Because you have medical insurance, you use more medical care.
- 4) Supplier responses to insurance against the adverse state. Because of workers' compensation, firms aren't as careful about protecting workers against workplace accidents.

##### 4. The consequences of moral hazard

- 1) Moral hazard is costly for two reasons. The adverse behavior encouraged by insurance lowers social efficiency because it reduces the provisions of a socially efficient labor supply.
- 2) When social insurance encourages adverse events, which raise the cost of the social insurance program, it increases taxes and lowers social efficiency further.

5. Putting it all together: The benefit of social insurance is the amount of consumption smoothing provided by social insurance programs. The cost of social insurance is the moral hazard caused by insuring against adverse events. **Therefore, optimal social insurance systems should partially, but not completely, insure individuals against adverse events.**

**Asymmetric information in insurance markets has two important implications: Adverse selection and moral hazard. The ironic feature of asymmetric information, therefore, is that it simultaneously motivates and undercuts the rationale for government intervention through social insurance.**

Gruber (2019) CH12 Social Insurance

National Academy of SI

<https://www.nasi.org/learn>

<https://www.nasi.org/research/disability>

<https://www.nasi.org/research/inequality>

<https://www.nasi.org/research/social-security>

<https://www.nasi.org/research/workers-compensation>

<https://www.nasi.org/research/medicare-health-policy>

<https://www.nasi.org/research/unemployment-insurance>

<https://www.nasi.org/research/poverty-income-assistance>

## Data Visualization

How Much Life Insurance? It Depends on These Factors

<https://howmuch.net/articles/life-insurance-needed-for-each-income-group-per-state>

The True Cost of Being a Car Owner in America 2017

<https://howmuch.net/articles/true-cost-of-being-a-driver>

Visualizing Car Insurance Rate by State 2020

<https://howmuch.net/articles/car-insurance-rates-in-2020>

Average Homeowners Insurance Rates for Each State 2020

<https://howmuch.net/articles/homeowners-insurance-rates-2020>

Visualizing Car Insurance Cost by State 2015

<https://howmuch.net/articles/the-cost-of-car-insurance-in-each-state-in-one-map>

States with The Highest (and Lowest) Motorcycle Insurance Rates 2017

<https://howmuch.net/articles/motorcycle-insurance-cost-2017>

Find Out Which States Have the Most Expensive Car Insurance Rates 2018

<https://howmuch.net/articles/average-cost-of-car-insurance-in-america>

Data

<https://www.irp.wisc.edu/wadc/>

<https://www.irp.wisc.edu/research/economic-support/social-insurance-programs/>

Chart of Available Program Data by Year

<https://www.irp.wisc.edu/wp/wp-content/uploads/2020/09/wadc-available-data-chart-09092020.pdf>

Technical Report on Lessons Learned in the Development of the Institute for Research on Poverty's Wisconsin Administrative Data Core

[https://www.irp.wisc.edu/wp/wp-content/uploads/2020/08/TechnicalReport\\_DataCoreLessons2020.pdf](https://www.irp.wisc.edu/wp/wp-content/uploads/2020/08/TechnicalReport_DataCoreLessons2020.pdf)

## Lecture 8 Social Security

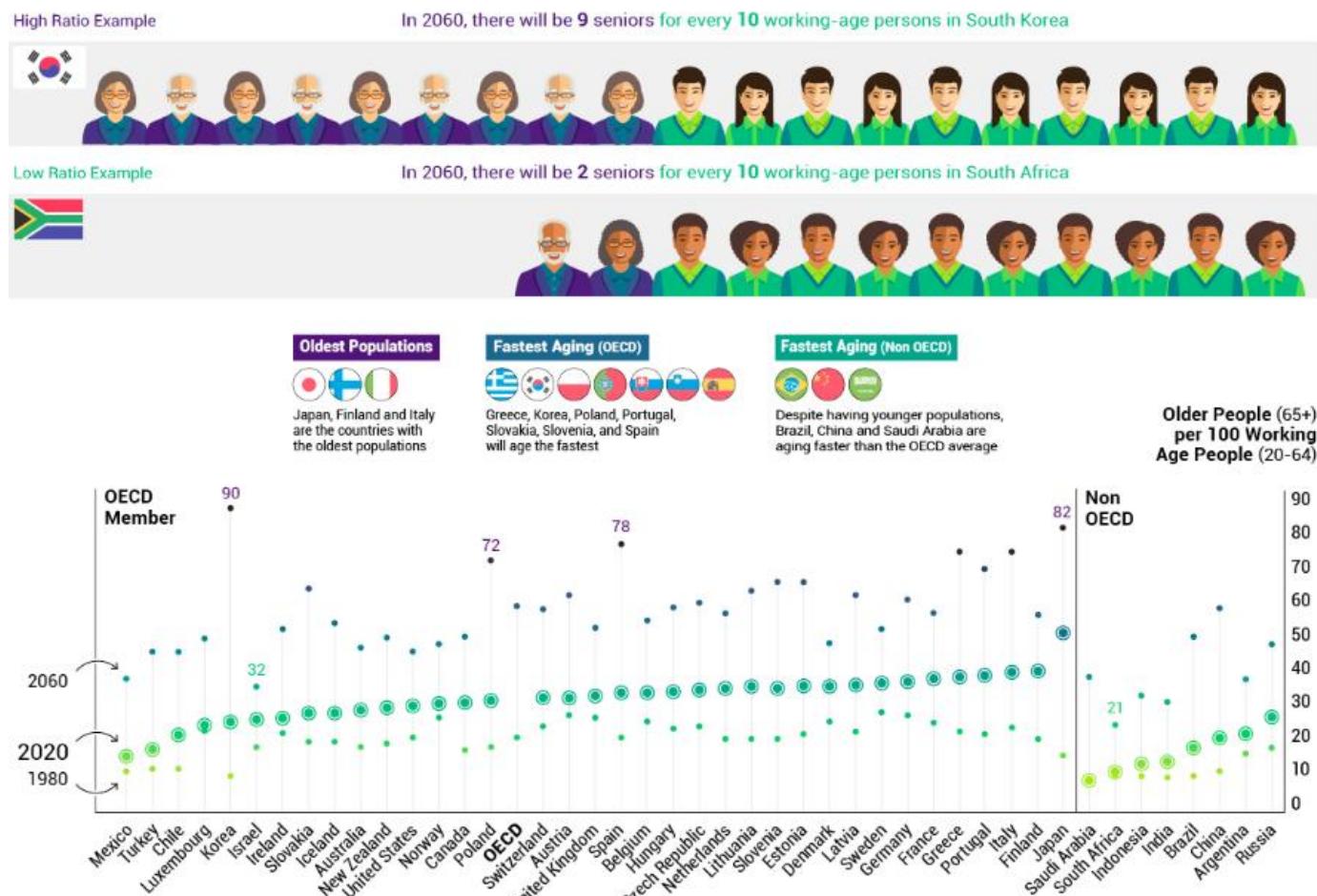
Biwei Chen

### Outline

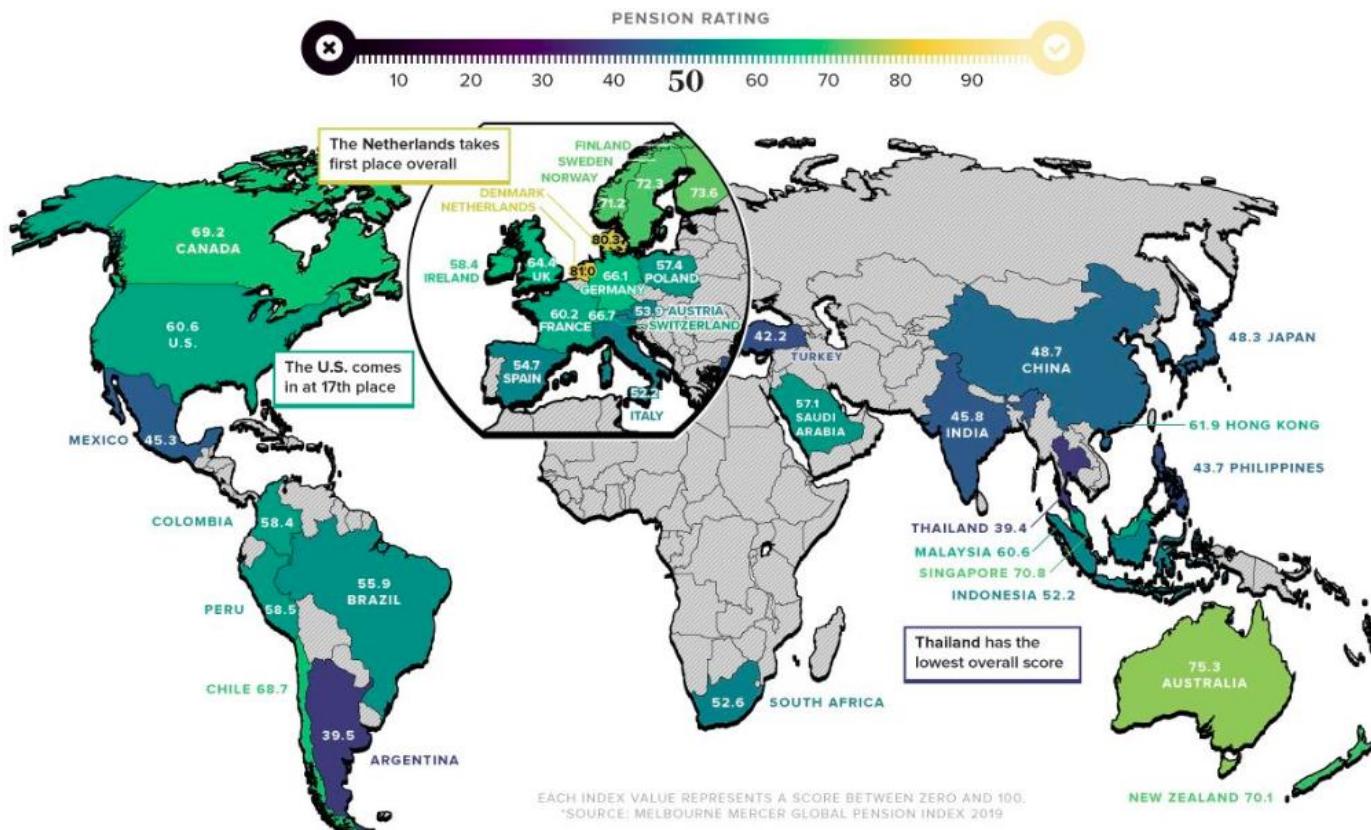
- History, Data, Facts
- Social Security System
- Costs-Benefits Analysis
- Social Security Reforms

*Social Security is the largest social insurance program in the United States and the largest single expenditure item of the federal government. Not surprisingly, this program has major implications for the standard of living of the elderly, as well as for the non-elderly who pay the taxes to support this program. Social Security faces a long-run financing problem to which there are no easy solutions. The question of how to resolve this problem will be one of the most contentious sources of political debate for at least the first part of the twenty-first century.*

In many countries, the old-age to working-age ratio will almost double in the next 40 years



<https://www.visualcapitalist.com/aging-global-population-problem/>



<https://www.visualcapitalist.com/ranked-countries-pension-plans/>

The global population is aging—by 2050, one in six people will be over the age of 65. As our aging population nears retirement and gets closer to cashing in their pensions, countries need to ensure their pension systems can withstand the extra strain. This graphic uses data from the Melbourne Mercer Global Pension Index. MMGPI organized three measures to rank the pension system of 37 different countries, representing over 63% of the world's population.

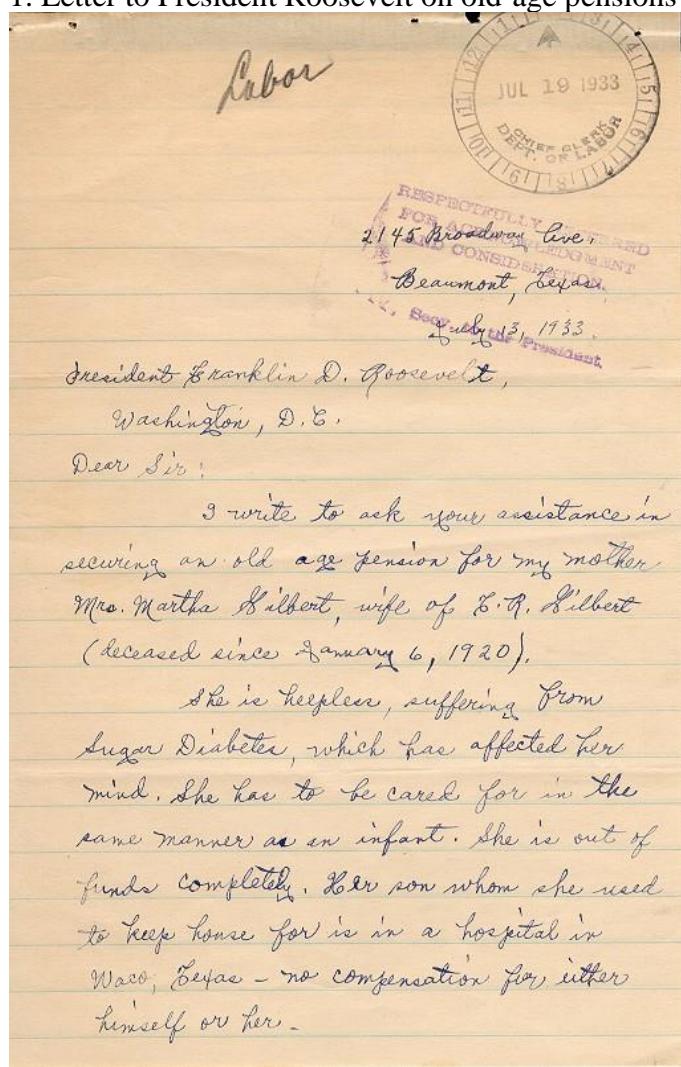
- Adequacy: The base-level of income, as well as the design of a region's private pension system.
- Sustainability: The state pension age, the level of advanced funding from government, and the level of government debt.
- Integrity: Regulations and governance put in place to protect plan members.

Pension systems across the globe are under an increasing amount of pressure. It's time for countries to take a hard look at their pension systems to make sure they're ready to support their aging population. All countries have room for improvement—even the highest-ranking ones. Some general recommendations from MMGPI on how to build a better pension system include:

- Increasing the age of retirement: Helps maintain a more balanced worker-to-retiree ratio.
- Enforcing mandatory occupational schemes: Makes employers obligated to provide pension plans for their employees.
- Limiting access to benefits: Prevents people from dipping into their savings preemptively, thus preserving funds until retirement.
- Establishing strong pension assets to fund future liabilities: Ideally, these assets are more than 100% of a country's GDP.

## I. The U.S. Social Security System: History and Current States

## 1. Letter to President Roosevelt on old-age pensions



I am a widow; have spent all my savings in caring for her. I have kept boarders & roomers in a private home to keep my four children for I have always been a lady; this is why I appeal to you to place your dear mother in my dear mother's place. With no money and no place to go unless it be to the poor house, I cannot rent my rooms now for she demands constant care & attention. Please do something about this request as soon as possible.

She will be 82 years old on August 9th.

Yours truly,  
Mrs. M. A. Zoller Sr.

I do not own my home & at present I cannot meet my bills (overdue). I don't know what to expect next.  
Thank you in advance.

**Old Age Dependent Pensions**



Judge J. S. Lehman

... are not gifts nor charity. They are for compensation well earned. Must civilization perish for the want of a just distribution of the necessities of life? It is estimated that 39 millions in America live below an American standard of living. Study our panacea for unemployment and starvation.

**THESE ADLETS ARE FREE FOR DISTRIBUTION**

Will our friends assist us in getting them where needed and help save costs of advertising?

Send stamp for information. Write name and address plain.

**JUDGE J. S. LEHMAN**  
HUMBOLDT, KANSAS

(Copyright 1932, by J. S. Lehman)

PRESIDENT  
**FRANKLIN D. ROOSEVELT**

As Governor of New York, Signed the Old Age Pension Bill of New York, and as President Will Strongly Favor Old Age Pensions.

DEMOCRATIC NATIONAL PLATFORM: "We advocate unemployment and old age insurance under state laws."

We need a pension law that gives every dependent man and woman 60 years old and over a pension of \$1.00 per day. Twenty-five states now have Old Age Pension Laws. All pension laws now in force that give less than \$1.00 per day, and the age limit is above 60 years, ought to be amended. Millions have been made dependent by deflation and unemployment and through no fault of their own. (Include Stamp).

2145 Broad Way AVE,  
Name Mrs. T. R. Gilbert Street  
R. F. D. City Beaumont State Texas  
She will be 82 - August 9, 1933 - Be a widow - no income - help needed

After President Roosevelt came into office millions of hopeful Americans wrote letters to President, offering advice and requesting help. Appeals for old-age pensions were especially frequent, and often quite poignant. This is a fairly typical example of the letters sent to the White House during the Depression. It is a letter sent by Mrs. M. A. Zoller on behalf of her aged mother. In the letter, she informs the President that her mother will be 82 in August and has no means of support, and she appeals for the President's help. <https://www.ssa.gov/history/lettertoFDR.html>

## 2. U.S. social security payments in 2020 <https://www.nasi.org/socialsecurityprimer>

- 1) More than 64 million people receive Social Security each month, in one of three categories:  
**a. Retirement insurance; b. Survivors insurance; c. Disability insurance**
- 2) Over 1 in 5 Americans gets SS benefits. About 1 in 4 families receives income from SS, including 45.9 million retired workers, 8.3 million disabled workers, 4.0 million widows and widowers, 2.5 million spouses, 1.2 million adults disabled since childhood, 2.8 million children.

How Much Does Social Security Pay?		
(July 2020)		
By Beneficiary Type:	Average Monthly Benefit	Average Yearly Benefit
Retired workers	\$1,516	\$18,192
Disabled workers	\$1,259	\$15,108
Widows or widowers (60 or older)	\$1,431	\$17,172
By Family Type:	Average Monthly Benefit for Family	Average Yearly Benefit for Family
Retired worker and spouse (62 or older)	\$2,544	\$30,528
Widowed mother or father (under 60) and two children	\$2,911	\$34,932
Disabled worker and one or more children	\$1,944	\$23,328

SSA, 2020a. SSA, 2020b.

5

## Reliance on Social Security By Gender and Family Type

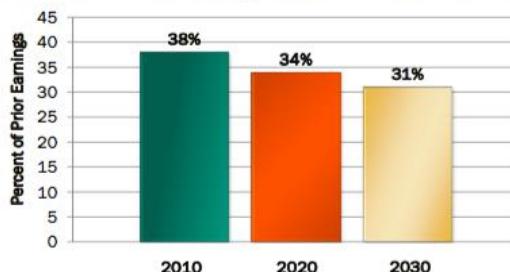
Percent of beneficiaries 65 or older whose Social Security benefits make up:

By Gender:	Half or more of their income	90% or more of their income
Unmarried women	61%	34%
Unmarried men	56%	29%
Percent of beneficiary households 65 or older whose Social Security benefits make up:		
By Family Type:	Half or more of their income	90% or more of their income
Married couples	48%	21%
Unmarried people	71%	43%

SSA, 2016: Tables 9.A2 and 9.B3.

9

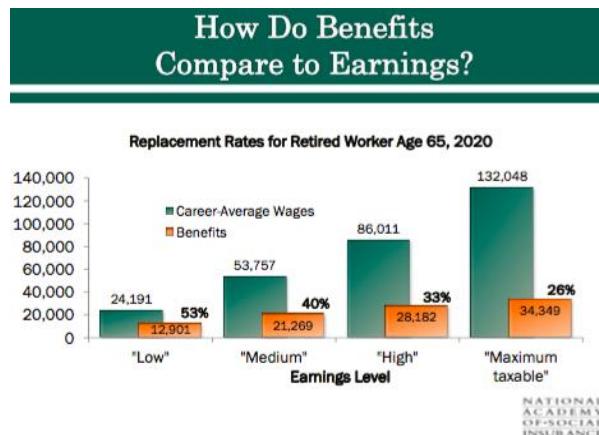
## Net Social Security Replacement Rates Will Fall

Medium Earner's Replacement Rate at 65  
(after Medicare Parts B & D premiums and taxation of benefits)

Mummell, 2013.

11

NATIONAL ACADEMY OF SOCIAL INSURANCE

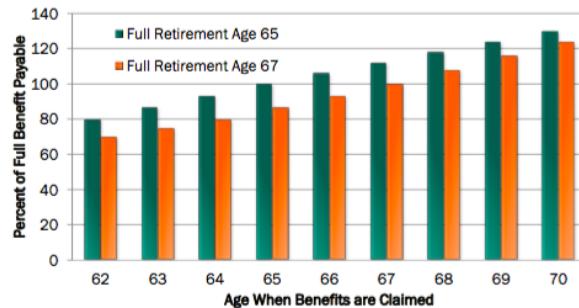


NATIONAL ACADEMY OF SOCIAL INSURANCE

SSA, 2020c.

6

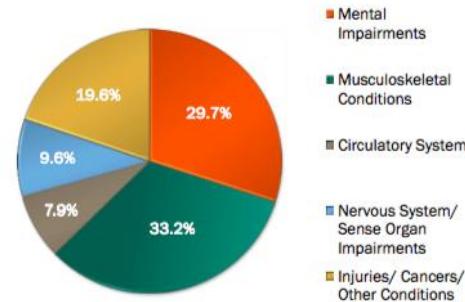
## Increase in Full Retirement Age (FRA) Lowers Retirement Benefits at Any Age Claimed



Gregory et al., 2010.

10

## What are the Most Common Disabilities for DI Recipients?

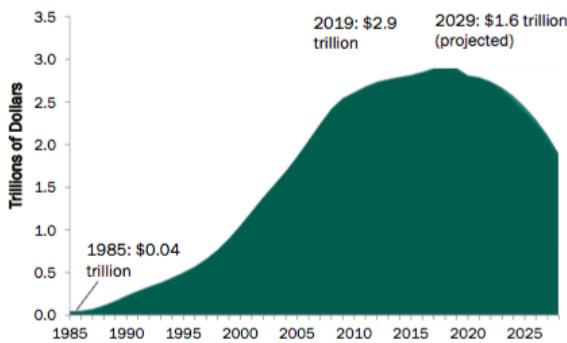


NATIONAL ACADEMY OF SOCIAL INSURANCE

SSA, 2019: Table 21.

13

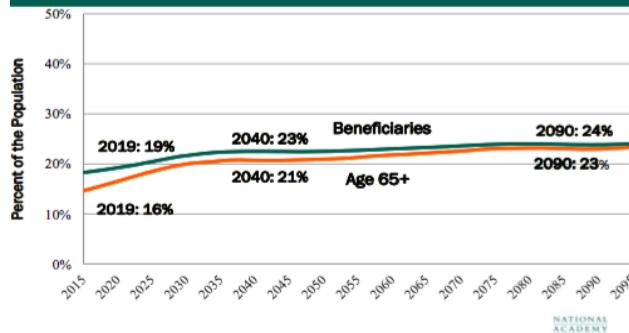
### How Large are Social Security Trust Fund Assets?



Board of Trustees, 2020: Table IV.A1.

23

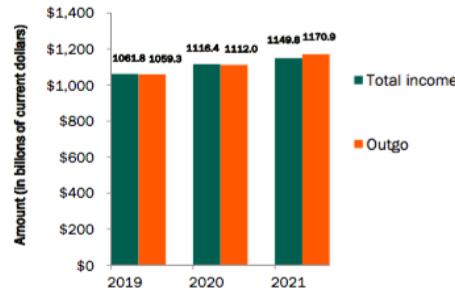
### Percent of the Population Receiving Social Security and Percent Age 65+, 2015-2090



Board of Trustees, 2020: Tables V.A3. and IV.B3.

29

### Social Security Income and Outgo

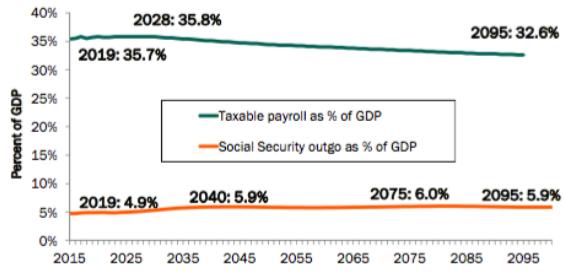


Board of Trustees, 2020: Table IV.A3.

24

### Taxable Payroll in the Broader Economy

#### Taxable Payroll and Social Security Outgo



Board of Trustees, 2020: Tables VLG4 and VLG5.

32

NATIONAL ACADEMY OF SOCIAL INSURANCE

### 3) The Social Security debate

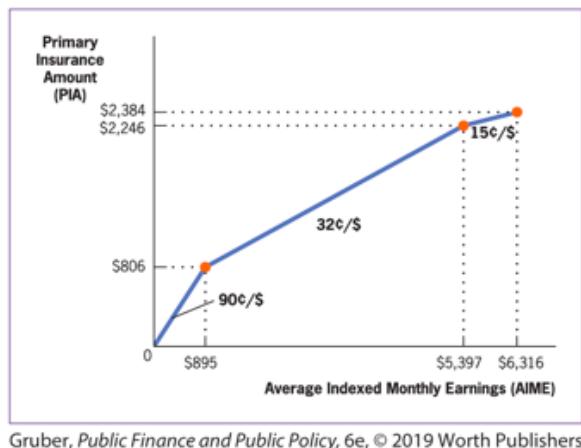
- The aging of the huge “baby boom” cohort will lead to a large rise in the number of retired elderly relative to the number of workers.
- The SS program faces a stark financing problem: over the next 75 years, the program has promised \$13.2 trillion more in benefit payments than it plans to collect in taxes from workers.
- Over the past decade, little progress has been made on SS reform. It is the largest single source of income for the elderly population in the US. Any reform that is perceived as reducing the generosity of the program is politically dangerous.

### 4) Summary of U.S. social security condition as of 2020

- Benefits are modest. Yet they are most beneficiaries’ main source of income.
- Social SS benefits will replace a smaller share of earnings in the future than they do today (replacement rates are declining because of the increase in the retirement age).
- Revenue increases or benefit cuts will be needed to balance SS’s future finances.
- Lawmakers have many options to raise revenues, lower future benefits, or increase benefits to improve adequacy.
- Americans value SS and are willing to pay for it. Americans report they would rather pay more than see future benefits reduced.

## II. The U.S. Social Security System: Details

1. Definition: A federal program that taxes workers to provide income support to the elderly. (Paid according to lifetime earnings not based on current financial need like social welfare programs.)
2. Origin and legislation
  - 1) 1935, at the height of the Great Depression
  - 2) Federal Insurance Contributions Act (FICA)
3. SS finance via government tax
  - 1) The Federal Insurance Contributions Act (FICA) tax on their earnings.
  - 2)  $12.4\% = 6.2\% \text{ (employers)} + 6.2\% \text{ (employee)}$  and on the first \$128,400 of earnings
4. Eligibility: 1) A person must have worked and paid the payroll tax for 10 years; 2) Age  $>= 62$
5. Payout age: FBA + EEA + DRC
  - 1) FBA (full benefit age) starts at 66 and four months (born in 1956) and 67 (born in 1960)
  - 2) EEA (early entitlement age) starts at 62, but with actuarial reduction (6.67% per year)
  - 3) DRC (delayed retirement credit) raises benefits for each year of delay by 8%
6. Payout benefits
  - 1) Annuity payment (until the recipient's death)
  - 2) Primary insurance amount (PIA) determines benefit levels.
  - 3) Replacement rate: The ratio of benefits received to earnings **prior to** the entitling event.



- Payment size depends on the recipient's average earnings over the 35 highest earning years, called the Average Indexed Monthly Earnings, or AIME.
- Benefits are a redistributive function of past earnings, as the replacement rate falls with AIME.
- Past earnings are translated to increased benefits at a slower rate as earnings rise.

7. How does SS work and adjust?
  - 1) Can you work and receive SS? If one starts receiving benefits at the EEA, there is a corresponding downward actuarial adjustment in the PIA.
    - a. The earnings test reduces the benefits of 62- to 64-year-olds by \$0.50 for each dollar of earnings they have above \$17040.
    - b. These benefits are returned later when the worker's earnings fall below this threshold.
  - 2) Are there benefits for family members? Spouses of claimants, children of deceased workers, and spouses who survive a Social Security recipient all receive benefits.
8. Pension systems can be funded or unfunded.
  - 1) **Funded:** Retirement plans in which today's savings are invested in various assets in order to pay future benefits.
  - 2) **Unfunded:** Retirement plans in which payments collected from today's workers go directly to today's retirees instead of being invested in order to pay future benefits (pay-as-you-go).
  - 3) **Partially funded:** Today's taxes fund some but not all of future benefits. This leads to redistribution from young to old.

### III. Social Security System: Overlapping Generation Simulation

#### 1. How does the SS system work over time?

- 1) Assumptions: Population and earnings grow by 5% per year. The system is unfunded with 10% payroll tax. SS begins with taxing the young to pay the old. In this two-period model, workers in period 1 pay no taxes when young but will receive benefits when old in period 2.
- 2) In period 2, each young worker pays \$2100 in taxes, so each retiree receives \$2205 in benefits—an infinite rate of return. In each period, the young become old and pass away in the next period.
- 3) In periods 3 and 4, the retirees pay taxes when young, so they receive a 10% rate of return, which is determined by population and wage growth. In period 5 (then end of the world), the last generation pays in when young but get nothing when old, so there is a rate of return of -100%.

■ ■ ■ TABLE 13-1

#### Social Security in a Two-Period World

Period	Number of Young Workers	Earnings per Young Worker	Taxes Paid for Young Worker	Total Taxes Paid	Number of Old Retirees	Benefits to Old Retirees	Taxes Paid by Old Retirees	Rate of Return
1	100	\$20,000	0	0	0	0	—	—
2	105	\$21,000	\$2,100	\$220,500	100	\$2,205	0	Infinite
3	110	\$22,050	\$2,205	\$242,550	105	\$2,310	\$2,100	10%
4	115	\$23,153	\$2,315	\$266,225	110	\$2,420	\$2,205	10%
5	121	\$24,310	0	0	115	0	\$2,315	-100%

- 4) Unfunded Social Security systems redistribute from young to old, and the first generation are the big winners. Unfunded systems create **legacy debt**: The debt incurred by the government because early generations of beneficiaries received much more in benefits than they paid in taxes.

#### 2. How does the Social Security System redistribute across generations over time?

To see how SS redistributes in practice, we introduce the Social Security Wealth (SSW) of different generations. SSW: The expected present discounted value of a person's future SS payments minus the expected present discounted value of a person's payroll tax payments. SSW is computed as follows:

- 1) Calculate the entire future stream of benefits that a person expects to receive before he or she dies.
- 2) Use a discount rate to calculate the present discounted value (PDV) of that stream of benefits.
- 3) Calculate the entire future stream of taxes that a person expects to pay before he or she dies.
- 4) Compute the PDV of that stream of taxes. Take the difference between these two to get the SSW.

■ ■ ■ TABLE 13-2

#### Redistribution Under Social Security for a Single Male

Earnings Level	Retirees Turn 65 in 1960	Retirees Turn 65 in 1995	Retirees Turn 65 in 2030
Low earner	\$70,024	\$47,340	\$21,986
Average earner	\$99,640	\$26,141	-\$69,321
High earner	\$106,874	-\$196	-\$205,882

Data from: Stuerle and Quackenbush (2013).

Redistribution from younger to older cohorts due to:

First cohort didn't pay in until 1937. Payroll tax has increased over time. Benefits increased over time.

- 5) Some examples of how SSW varies within groups that are the same ages include the following:
  - a. Females have more SSW than males because they live longer.
  - b. Married couples have more SSW than single people.
  - c. Single-earner couples have more SSW than two-earner couples.
  - d. Black recipients have a lower life expectancy than whites, so their SSW is lower.
  - e. The gains to the poor relative to the rich are overstated because the length of life rises with income.

#### IV. Why Government Intervention? Costs and Benefits

##### 1. Consumption-smoothing benefits of Social Security

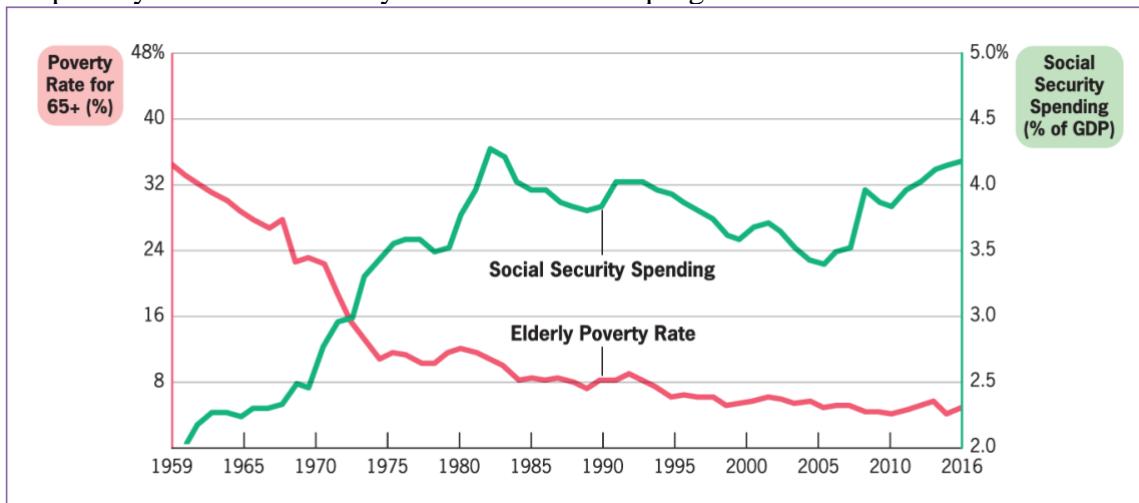
- 1) The fundamental motivation for SS is the notion that the elderly will not have sufficient income to support themselves in retirement or to support their dependents when they die.
- 2) Evidence on this front is reviewed by Poterba (2014), who shows that for those in the bottom half of the income distribution, there is little source of retirement support other than Social Security.
- 3) The government needs to force workers to provide for their retirement years by paying taxes when working that entitle them to benefits when retired.

##### 2. Rationales for Social Security

- 1) One justification for Social Security is market failure in the annuities market.
- 2) The longer a citizen lives, the less money the insurer makes from an annuity contract. This could lead to such a high price for annuities that most people would not want to buy them.
- 3) True reason: paternalism. Policy makers worry that people won't save enough. Most workers have very little savings other than Social Security (and private pensions).

##### 3. Does Social Security smooth consumption?

- 1) Perhaps SS just crowds out savings that individuals would otherwise set aside for their retirement.
- 2) Social Security might crowd out private savings by allowing people to count on a government transfer to support their income in old age.
- 3) The larger this crowd-out is, the less consumption smoothing SS provides for retired individuals.
- 4) Living standards of the elderly (1959–2016). The effect of SS on consumption smoothing can be seen in elderly poverty rates. The steepest reductions in poverty were during the 1960s and 1970s, when the program grew the fastest. There is a striking negative correspondence over time between the poverty rates of the elderly and the size of the program.

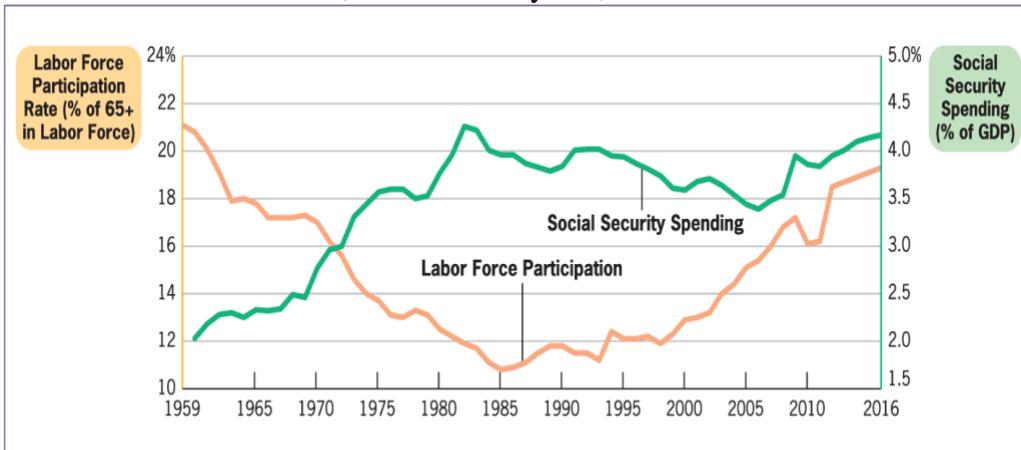


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- 5) Social Security benefits in the United States depend on age and earnings, both of which could be correlated with savings habits. In Italy, reforms in 1992 cut benefits of younger public-sector workers relative to older public-sector workers and private-sector workers. Results show partial crowd-out: 30–40% of the reduction in SSW was offset by higher private savings. Studies performed in the United Kingdom and Poland had similar results of partial crowd-out.
- 6) A study by Gallani et al. (2014) of a cash transfer program to rural elderly in Mexico found a large increase in consumption expenditures and little evidence of anticipatory reductions in self-insurance.

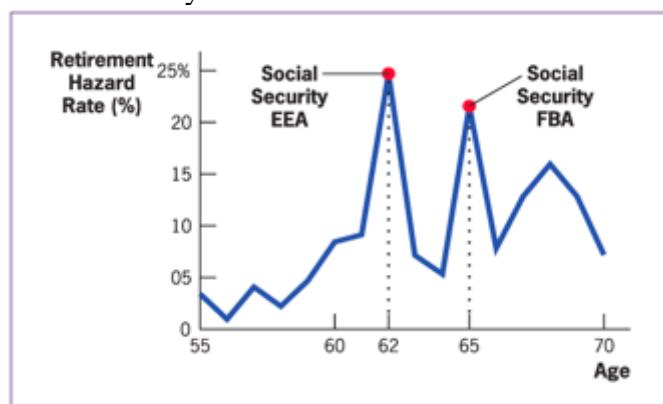
#### 4. What are the costs and benefits of working an additional year?

- 1) Costs: Pay an extra year of payroll taxes on earnings but receive one year less of SS benefits.
- 2) Benefits: Higher SS benefit level through the actuarial adjustment. Increase AIME.
- 3) In the 1960s and 1970s, the program grew rapidly, and labor force participation decreased. Both flattened in the mid-1980s, and in recent years, both are on the rise.



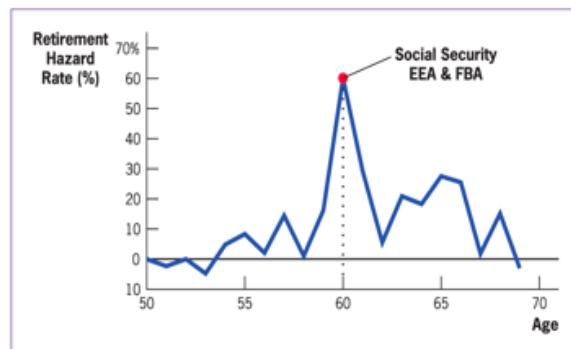
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#### 5. Social Security and retirement decision: moral hazard evidence



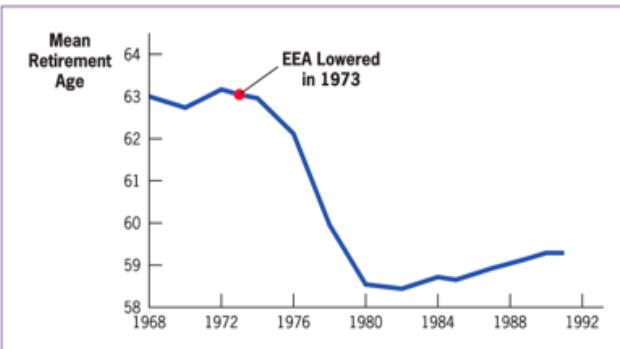
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The male hazard rate, or exit rate at each age given that a man has worked to that age, has a distinct spike at ages 62 (the Early Entitlement Age, EEA) and 65 (the previous Full Benefit Age, FBA), which are key ages for the Social Security system. In 1960, before the EEA of 62 was introduced for men, the hazard rate for men was highest at age 65 (the FBA), with no spike at age 62. By 1970, the spike at 62 had begun to emerge, and by 1980, it was larger than the spike at age 65.



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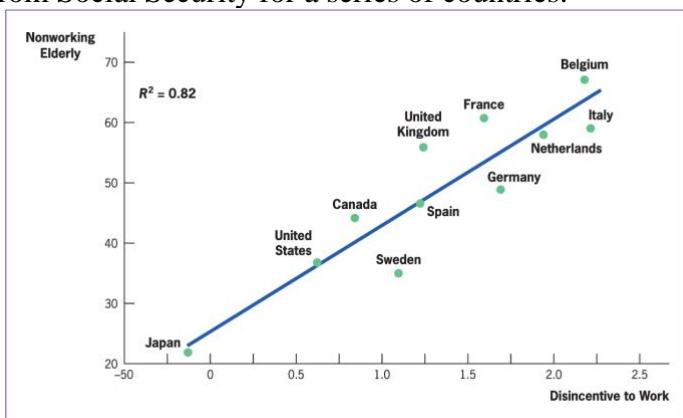
In France, there was an enormous exit rate from the labor force at age 60, which is both the EEA and the FBA.



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In Germany, benefits entitlement age lowered from 65 to 60 in 1973. Within seven years, average retirement age fell by five years.

6. Implicit Social Security taxes and retirement behavior: Gruber and Wise (1999) calculated the implicit tax from Social Security for a series of countries.



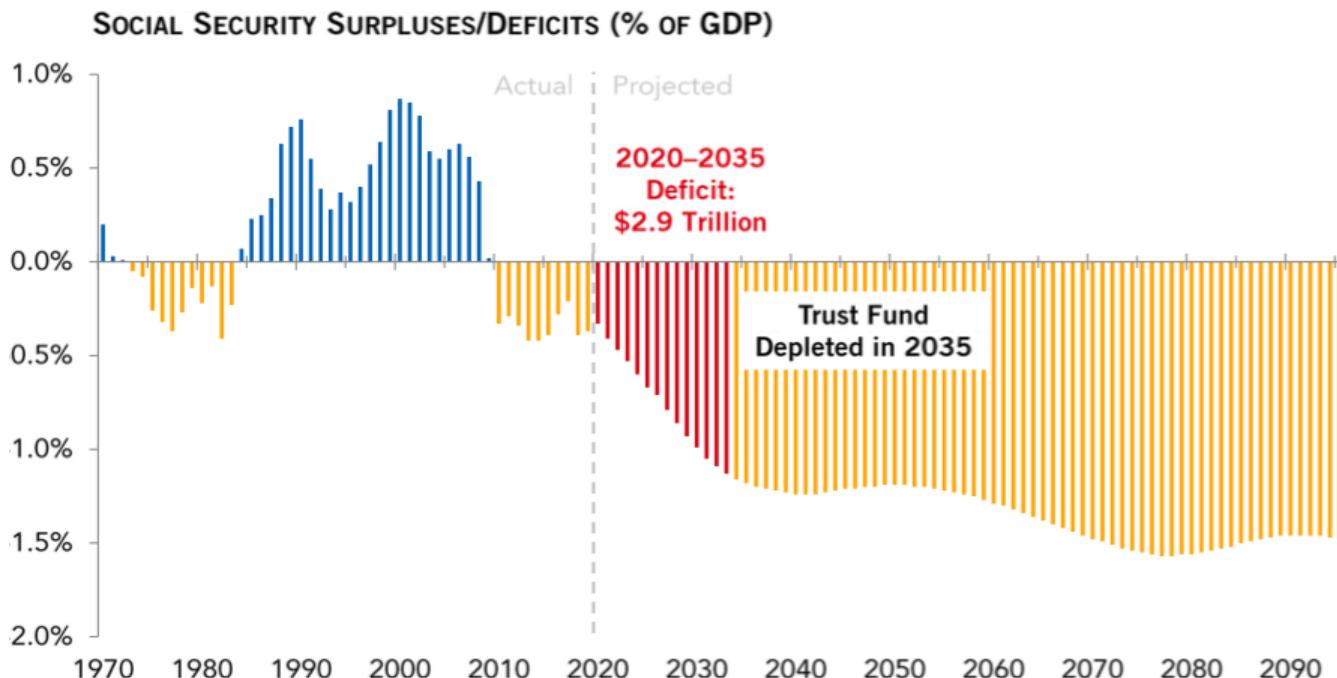
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- Across countries, there is a great deal of variation in the implicit tax rate. Those nations with greater disincentives to work tend to have much higher nonwork among older workers.
- Implicit tax close to zero for 62-year-olds in the United States 91% in the Netherlands. And countries with higher taxes have less elderly labor force participation.

7. Implications: 1) Evidence suggests that it is potentially very costly to design Social Security systems that penalize additional work beyond the retirement age; 2) Adjusting systems to more fairly reward work at old ages can mitigate much of the moral hazard effect of Social Security.

## V. Social Security Reforms

SS faces a major fiscal imbalance, as it is increasingly difficult for young generations to pay for the benefits of older generations due to rising life expectancy, falling birthrates and earnings growth rates. The number of persons over age 65 per working-age person age 15 to 64 more than triples over the century, from 13 per 100 in 1950 to 42 per 100 in 2060.



SOURCE: Social Security Administration, *The 2020 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds*, April 2020.

NOTES: Surplus/deficit numbers exclude interest income. The total deficit of \$2.9 trillion is the present value of the cash deficits between 2020 and 2034. The Old-Age & Survivors Insurance trust fund is projected to be depleted in 2034 and lead to a 24 percent cut in benefits that year; the Disability Insurance trust fund is projected to be depleted in 2065 at which time benefits would be reduced by 8 percent.

**1. Reform round I: The Greenspan Commission**

- 1) Commission in 1983 to improve Social Security's finances. Primary recommendation: Social Security system should move away from an unfunded system to some extent. The government should accumulate savings in the Social Security trust fund so that when the baby boomers retire, there would be enough money to pay their benefits.
- 2) Application: The Social Security Trust Fund and National Savings. In theory, one benefit of the partial funding of Social Security through the buildup of the trust fund is an increase in national savings. The trust fund is "off budget," not supposed to be part of budget discussion. But typically the government reports the deficit/surplus from the "unified budget," which incorporates off-budget categories. Makes it easy to treat the trust fund as an asset and to avoid fixing the deficit.

**2. Incremental reforms**

- 1) Raise SS tax revenues: Increase the tax rate on taxable wages and extend the base of taxable wages
- 2) Reduce SS benefits: Raise the retirement age to match longer life spans, lower benefits to all eligible recipients; change to a program where recipients' benefits decrease with higher incomes.
- 3) Invest the trust fund in stocks.
  - a. One problem with the Greenspan Commission's solution was that the trust fund is very inefficiently invested.
  - b. The return on Social Security is currently only about 2%, while the historical real return of stock investment is about 7%.
  - c. Investing half the trust fund in the stock market would result in the government owning almost 6% of the entire stock market. There is a concern that the government might abuse its position to manipulate capital markets for its own good.
- 4) Application: Early entitlement, liquidity vs behavioral biases
  - a. Many people exit the labor force at age 62, when they first have access to SS entitlements.
  - b. Two possible reasons: Many individuals would like to retire prior to this but are unable to because they do not have enough savings. This is known as a liquidity constraint. Individuals may not appreciate the benefits of delaying retirement or may have self-control problems. This is known as a behavioral bias. Studies support both reasons.

**3. Fundamental Reform: Privatization**

- 1) A proposal to reform Social Security by allowing individuals to invest their payroll taxes in various assets through individually controlled accounts
- 2) Moving to privatization would require paying off the legacy debt from the first generation of recipients.
- 3) Paying this off would offset the gains from privatization, so there would be no net gain in investment efficiency.
- 4) Privatization would also likely lead to much higher administrative costs, which could significantly cut returns on investments.
- 5) Application: Company stock in 401(k) plans
  - a. These plans allow individuals to save in self-directed investment choices.
  - b. But there are several problems with them. Some workers have as much as 80% of their assets in company stock. If the company fails, they will lose their job *and* their savings.

**4. The Trade-Offs Between Fundamental Reforms**

- 1) Middle ground between fundamental and partial reform: Government regulated accounts.
- 2) Each person would get an account, but the government would limit investment choices and force annuitization
- 3) Over the long run, an efficient retirement portfolio should contain some stock investments

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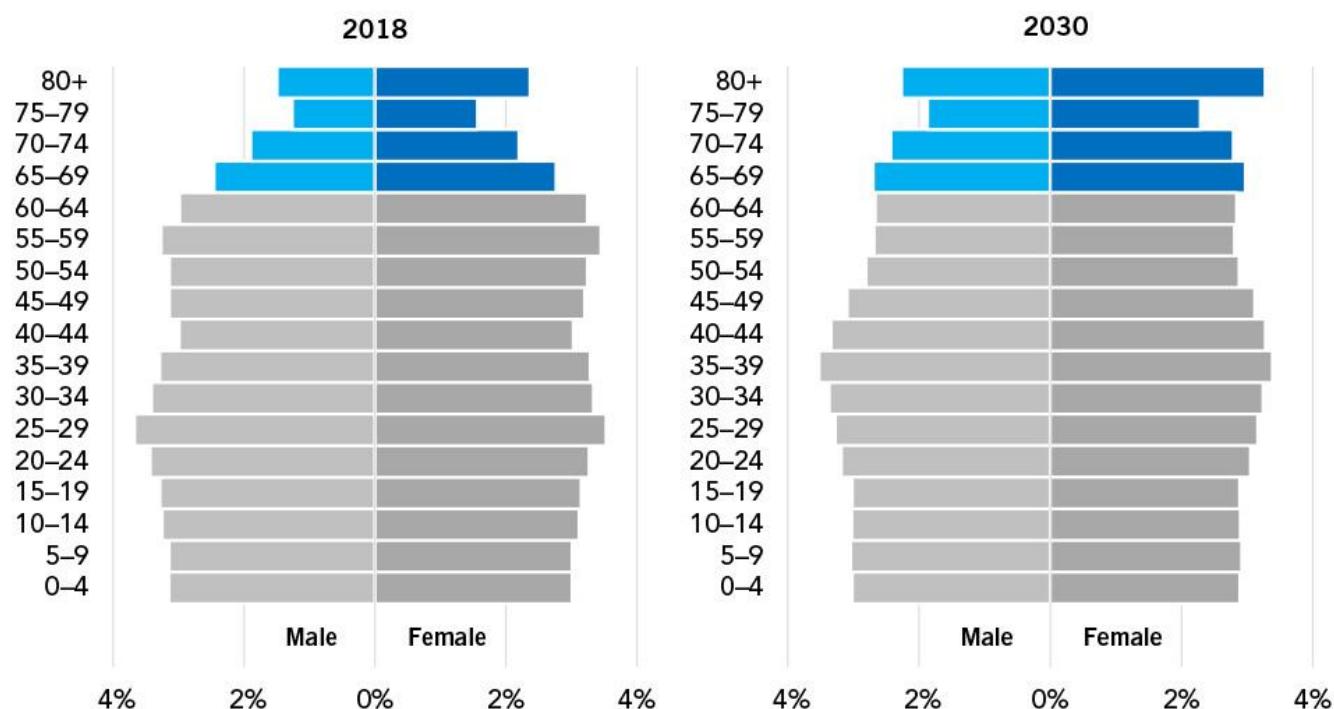
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### The share of people age 65 and older is projected to increase

U.S. POPULATION BY AGE GROUP (% OF TOTAL POPULATION)



SOURCE: U.S. Census Bureau, 2017 National Population Projections Datasets, March 2018.

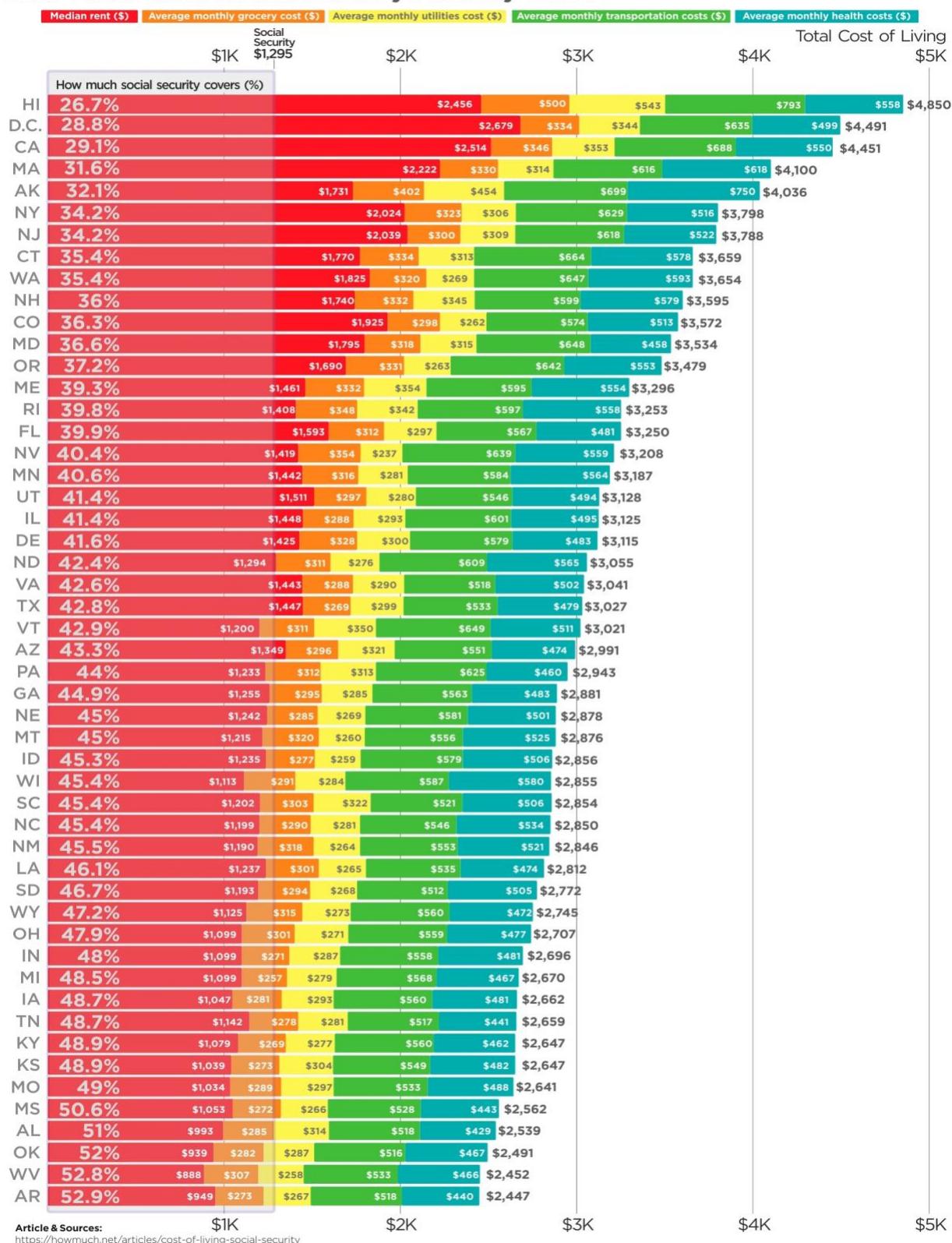
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# The Cost of Living vs. Social Security Benefits

## How Much Does Social Security Actually Cover?



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## Lecture 9 Health Care & Insurance

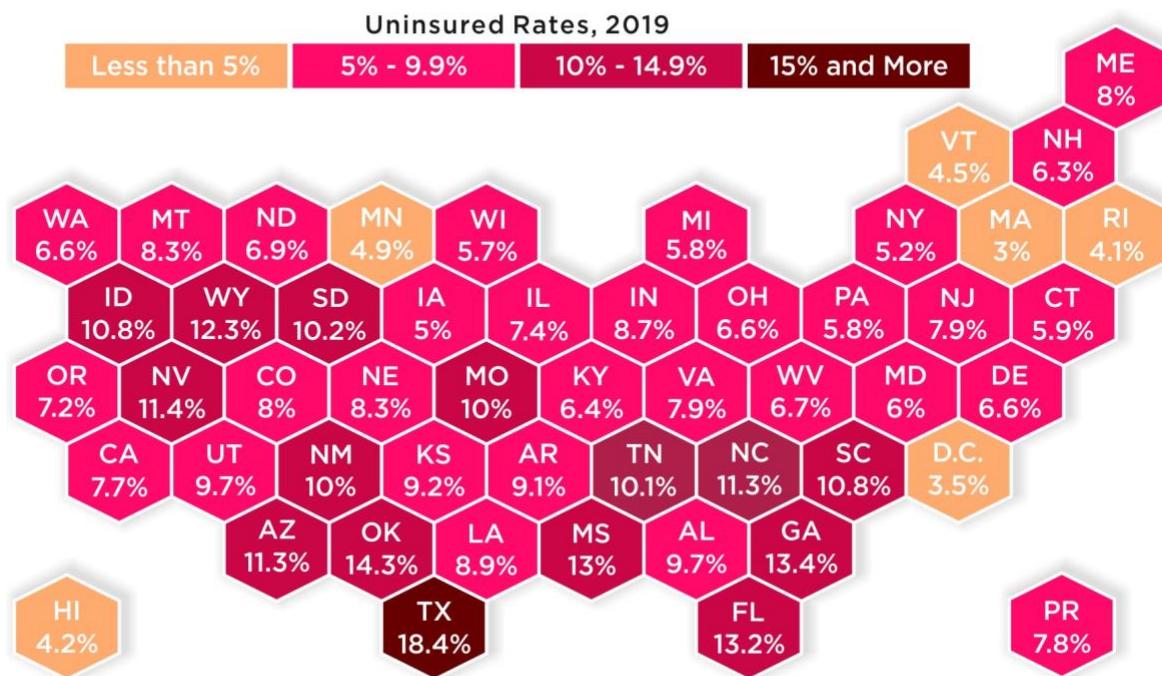
Biwei Chen

### Outline

- Data and Facts
- Plans and Details
- Theory and Models
- Empirical Evidence

# Health Insurance Coverage in the U.S.

## Percentage of Population Without Health Insurance



### Article & Sources

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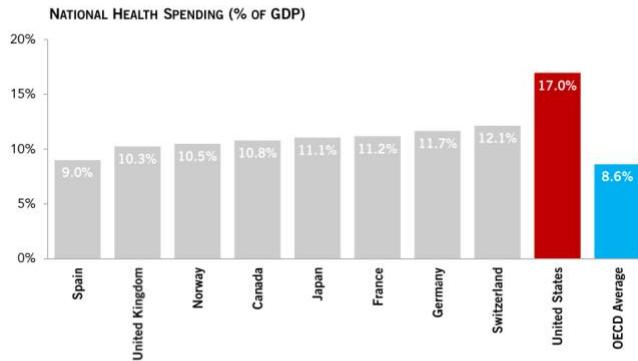
After Obamacare (ACA) was passed in 2010, the rate of uninsured people steadily declined for several years. But then, a couple years ago the trend reversed, and the number of uninsured Americans started to rise. Health insurance is a key cornerstone of personal financial security. The cost of medical care for certain conditions in the U.S. is prohibitively expensive. In fact, health issues are frequently cited as a leading contributor to bankruptcies. Regardless if someone has health insurance from an employer or directly through a government program, expanding insurance coverage to more people is a specific way to decrease poverty in the U.S. Texas easily has the highest rate of uninsured people in the country, with 18.4% of the entire state's population without coverage. The map shows that across the South, many states have double-digit percentages of uninsured people, including Oklahoma (14.3%), Georgia (13.4%) and Florida (13.2%). Massachusetts has the single best rate of insurance coverage in the country, with only 3% lacking coverage. There's a cluster of states in the Northeast with similarly low rates of the uninsured, highlighting a major regional gap between the North and South for health insurance coverage.

## I. An Overview of the U.S. Health Care System

### 1. How does the U.S. healthcare system compare to other countries (as of July 2020)?



**Healthcare expenditures in the United States are significantly higher than those of other developed countries**



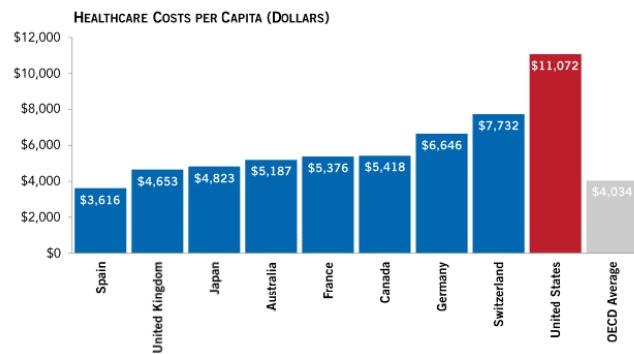
SOURCE: Organisation for Economic Co-operation and Development, OECD Health Statistics 2020, July 2020.  
NOTES: Data are for 2019. OECD average excludes the United States.

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**United States per capita healthcare spending is nearly three times the average of other developed countries**

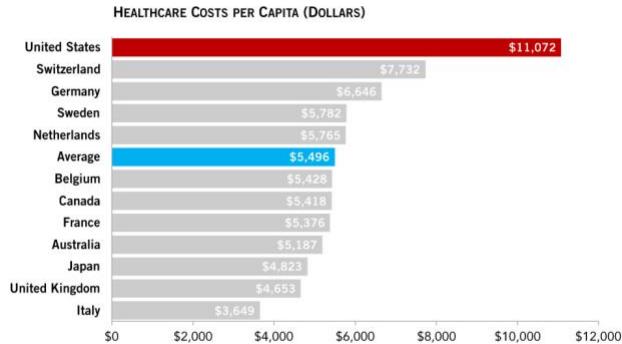


SOURCE: Organisation for Economic Co-operation and Development, OECD Health Statistics 2020, July 2020.  
NOTES: Data are for 2019. Chart uses purchasing power parities to convert data into U.S. dollars. OECD average excludes the United States.

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**U.S. per capita healthcare spending is almost twice the average of other wealthy countries**



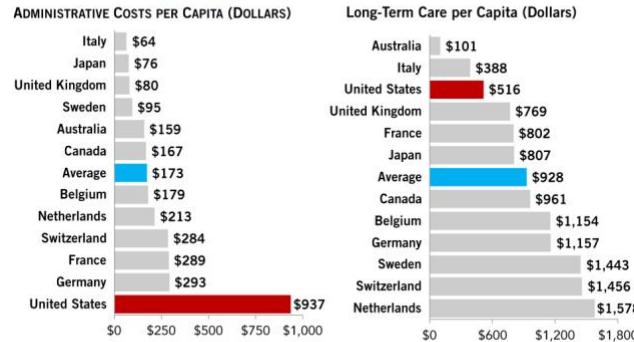
SOURCE: Organisation for Economic Co-operation and Development, OECD Health Statistics 2020, July 2020.  
NOTES: The five countries with the largest economies and those with both an above median GDP and GDP per capita, relative to all OECD countries, were included. Average does not include the U.S. Data are for 2019. Chart uses purchasing power parities to convert data into U.S. dollars.

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**The United States spends more on administrative costs, but less on long-term healthcare, than other wealthy countries**



SOURCE: Organisation for Economic Co-operation and Development, OECD Health Statistics 2020, July 2020.

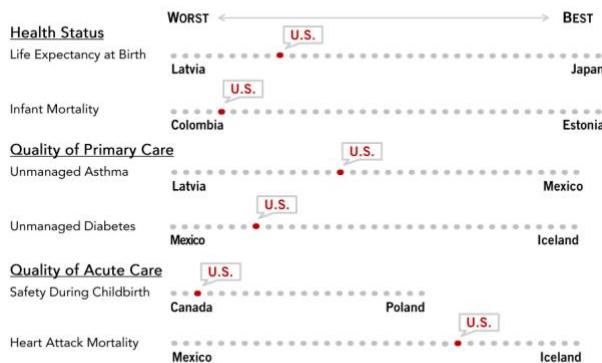
NOTES: The five countries with the largest economies and those with both an above median GDP and GDP per capita, relative to all OECD countries, were included. Average does not include the U.S. Data are for 2019 or latest available. Chart uses purchasing power parities to convert data into U.S. dollars.

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**Although the United States spends more on healthcare than other developed countries, its health outcomes are generally not any better**



SOURCE: Organisation for Economic Co-operation and Development, OECD Health Statistics 2020, July 2020.

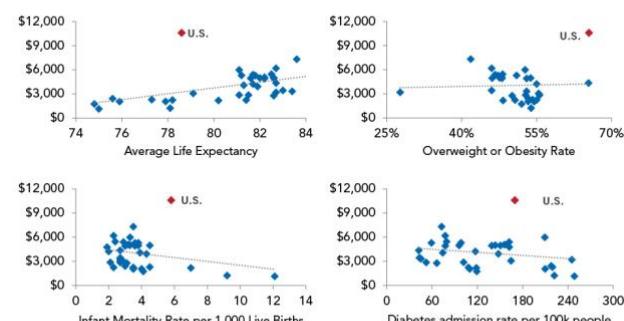
NOTES: Data are not available for all countries for all metrics. Data are for 2019 or latest available.

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**Despite higher healthcare spending per capita, the U.S. generally does not have better health outcomes**

HEALTHCARE SPENDING PER CAPITA (DOLLARS) BY HEALTH OUTCOMES



SOURCE: Organisation for Economic Co-operation and Development, OECD Health Statistics 2019, November 2019.

NOTES: Data are for 2018 or latest available for OECD countries. Data are not available for all countries for all metrics.

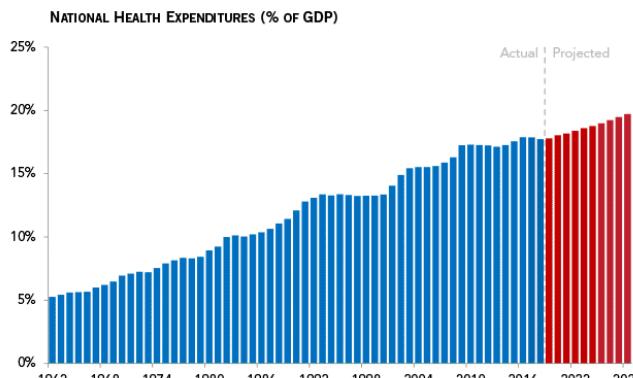
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## 2. Healthcare costs for Americans projected to grow at an alarmingly high rate



**Healthcare costs in the United States have increased drastically over the past several decades**



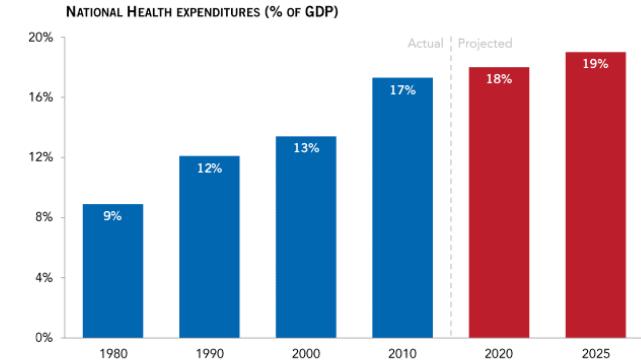
SOURCE: Centers for Medicare and Medicaid Services, National Health Expenditure Data, March 2020.

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**Total U.S. health spending (public and private) is projected to rise to nearly one-fifth of the economy by 2025**



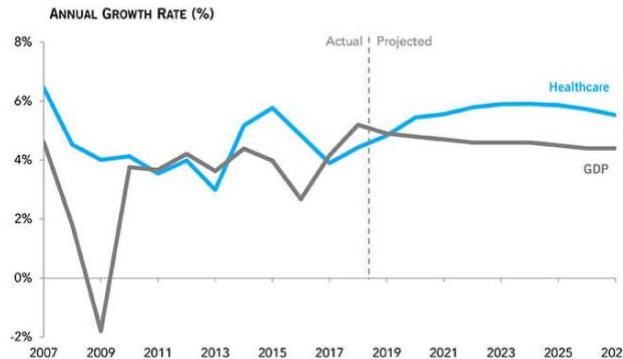
SOURCE: Centers for Medicare and Medicaid Services, National Health Expenditures, March 2020.

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**Healthcare spending is projected to grow faster than the economy over the next decade**



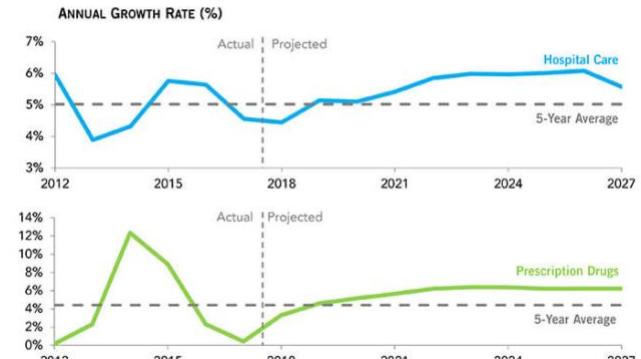
SOURCES: Centers for Medicare and Medicaid Services, National Health Expenditures, February 2019 and Bureau of Economic Analysis, National Income and Product Accounts, April 2019. Compiled by PGPF.

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**Different types of healthcare expenditures are expected to outpace their recent growth rates**



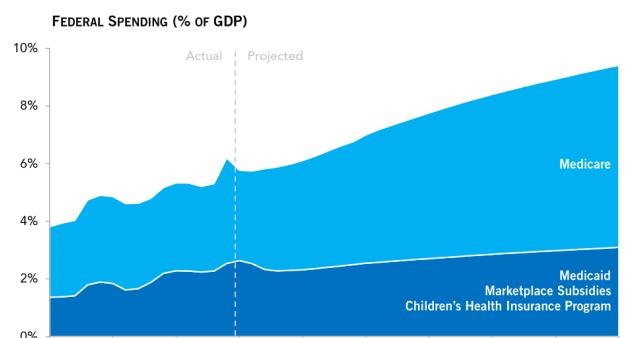
SOURCE: Centers for Medicare and Medicaid Services, National Health Expenditures, February 2019. Compiled by PGPF.

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**Between 2006 and 2051, spending on federal health programs is projected to more than double**



SOURCE: Congressional Budget Office, The 2021 Long-Term Budget Outlook, March 2021.

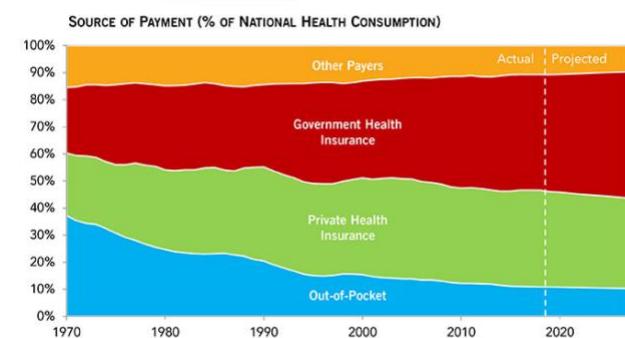
NOTES: Medicare spending is net of offsetting receipts. Marketplace Subsidies refers to spending to subsidize health insurance purchased through the marketplaces established under the Affordable Care Act and related spending.

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**Government health insurance is increasing as a share of health spending**



SOURCE: Centers for Medicare and Medicaid Services, National Health Expenditures, February 2019. Compiled by PGPF.

NOTES: Government health insurance programs include Medicare, Medicaid, and CHIP, as well as health care provided by the Department of Defense and the Department of Veterans' Affairs. CMS defines "out-of-pocket spending" to include direct spending by consumers for all healthcare goods and services not covered by insurance, including coinsurance and deductibles. Premiums paid by individuals for private health insurance are counted as part of private health insurance.

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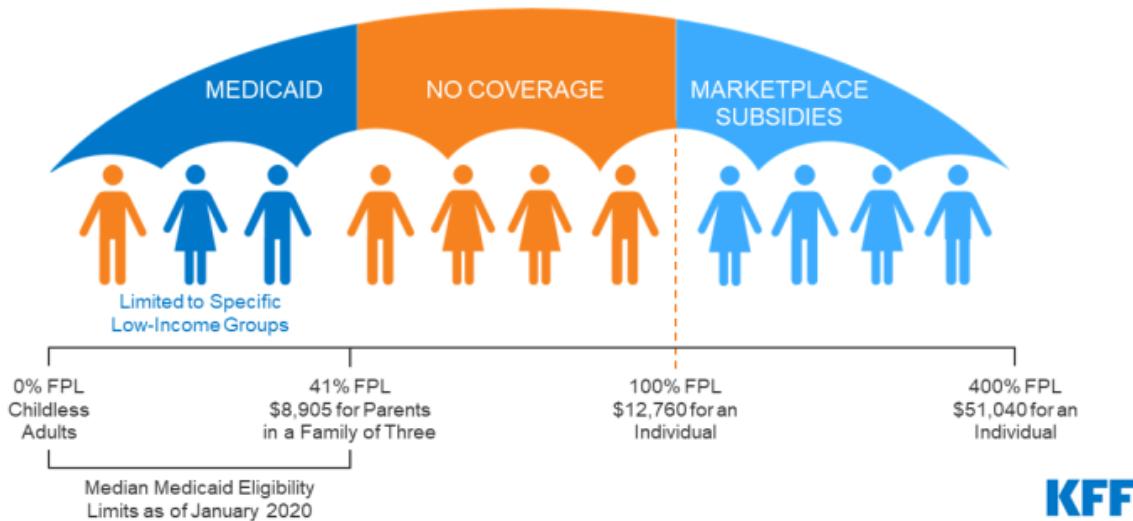
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3. Summary: Since 1950, medical technology has improved dramatically. Heart attack mortality fell by 70%, infant mortality fell by 80%. Health spending grew from 5 to 18% of GDP. Yet all is not well for the U.S. health care system. There are huge disparities in medical outcomes.

- 1) The United States is the only major industrialized nation without universal access to health care.
  - 2) The Affordable Care Act attempts to address the gaps in health care in the United States, but many are still without coverage.
  - 3) Health care spending is much higher in the United States than in the typical industrialized nation.
  - 4) Hospital and physician spending accounted for almost two-thirds of all health care spending.
  - 5) In terms of health care outcomes, the United States lags behind other countries internationally.
    - a. The United States has the highest per-person health care costs of this set of countries.
    - b. The United States has the highest rate of infant mortality.
    - c. The United States has the highest rate of preventable death.
    - d. The United States has the highest rate of going without care over the past year because of cost.
4. Expenditures are paid by consumers to doctors, hospitals, and other health care providers in three ways: 1) directly to providers as out-of-pocket payments; 2) through fees paid to private insurers that then pay providers, and 3) through taxes paid for government insurance and spending programs such as Medicare and Medicaid that cover provider charges.
5. The Affordable Care Act: In 2010, the Patient Protection and Affordable Care Act (ACA) was passed by Congress and signed by President Obama with two main purposes: 1) Provide health insurance to those not currently covered; 2) Decrease costs across the U.S. health care system

Figure 1

### Gap in Coverage for Adults in States that Do Not Expand Medicaid Under the ACA

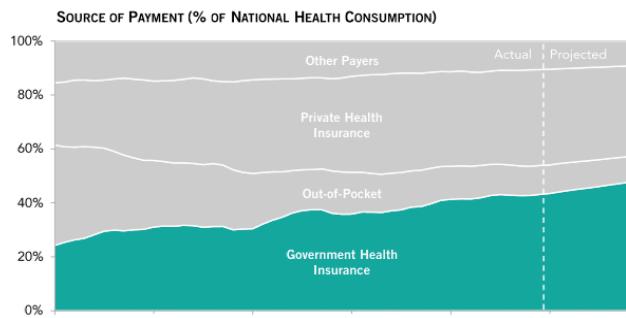


To improve coverage, starting in 2014, the ACA required Americans to purchase insurance and gave two key incentives to do so: 1) Those who do not purchase insurance must pay a tax penalty; 2) low-income households and individuals who purchase insurance will receive a monetary subsidy (otherwise known as a rebate) from the federal government. The ACA also created exchanges for firms to sell health insurance plans to newly subsidized households.

## I. U.S. Health Care System: Financing and Costs



The portion of health spending paid by the government is growing



SOURCE: Centers for Medicare and Medicaid Services, National Health Expenditures, March 2020.

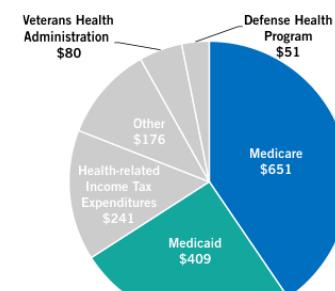
NOTES: Government health insurance programs include Medicare, Medicaid, CHIP, and healthcare provided by the Department of Defense and the Department of Veterans' Affairs. CMS defines "out-of-pocket spending" to include direct spending by consumers for all healthcare goods and services not covered by insurance, including coinsurance and deductibles. Premiums paid by individuals for private health insurance are counted as part of private health insurance.

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Medicare and Medicaid account for the majority of federal healthcare spending

2019 Federal Health Outlays: \$1,608 Billion



SOURCES: Office of Management and Budget, *Budget of the United States Government: Fiscal Year 2021*, February 2020; and The Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2019–2023*, October 2019.

NOTES: Health-related Income Tax Expenditures includes all tax expenditures classified under the Health function by the JCT. Medicare spending is net of offsetting receipts. Outlays for the Federal Employees Health Benefits program were offset by the program's income and is therefore not shown.

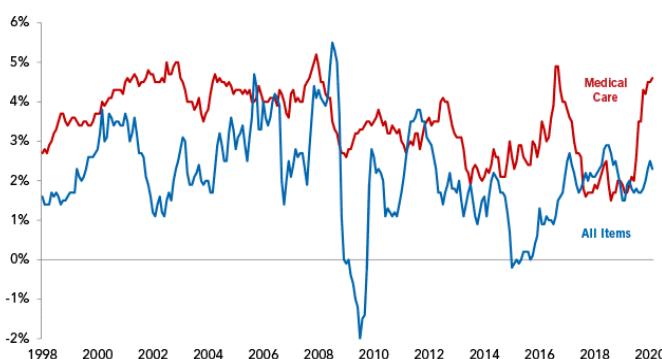
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Prices for medical care typically grow faster than inflation

YEAR-OVER-YEAR CHANGE IN CONSUMER PRICE INDEX



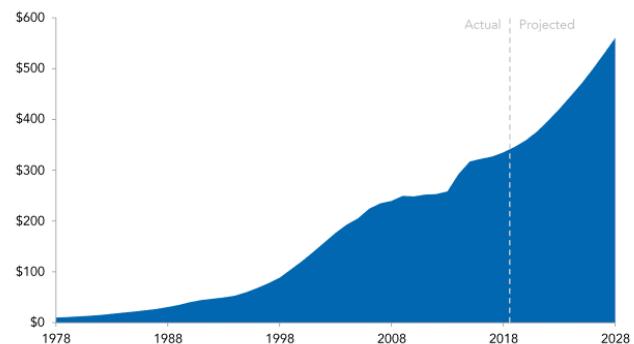
SOURCE: U.S. Bureau of Labor Statistics, *Consumer Price Index for All Urban Consumers*, March 2020.

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Prescription drug costs have increased significantly over the past several decades

TOTAL PRESCRIPTION DRUG EXPENDITURES (BILLIONS OF DOLLARS)



SOURCE: Centers for Medicare and Medicaid Services, National Health Expenditures, March 2020.

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Average cost of outpatient office visit in large employer plans, by acuity of visit, 2008 - 2018

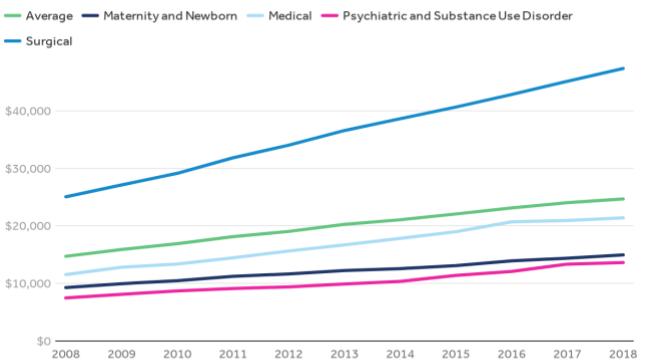


Average price for outpatient office visit includes only CPT codes for established patients. New Patient office visits are slightly more costly. See methods for a list of clinical settings included.

Source: KFF analysis of IBM MarketScan Commercial Claims and Encounters Database, 2008-2018.

Peterson-KFF  
Health System Tracker

Average cost of an inpatient admission in large employer plans, by type of admission, 2008 - 2018



Source: KFF analysis of IBM MarketScan Commercial Claims and Encounters Database, 2008-2018.

Peterson-KFF  
Health System Tracker

**1. How health insurance works: The basics**

- 1) Individuals, or firms on their behalf, pay monthly premiums to insurance companies.
- 2) In return, the insurance companies pay the providers of medical goods and services for most of the cost of goods and services used by the individual.
- 3) There are three types of patient payments
  - Deductibles—limit to cost individual pays
  - Copayment—fixed payment individual pays
  - Coinsurance—percentage of each bill individual pays

**2. Private insurance (most important)**

Private insurance is provided by employers and by the nongroup insurance market, through which individuals or families buy insurance directly rather than through a group, such as the workplace.

- 1) Employer-provided private insurance is the predominant source
  - a. Risk pooling: Create large insurance pools with a predictable distribution of medical risk
  - b. Tax subsidies to employer-provided health insurance, but it is to employees, not employers
- 2) The nongroup insurance market was traditionally not a well-functioning market. Nongroup insurance was not always available. Those in the worst health were often unable to obtain coverage (or obtain it only at an incredibly high price).
- 3) A central feature of the ACA was an effort to reduce these barriers to the nongroup insurance market. Banned pre-existing conditions exclusions and disallowed higher charges for less healthy enrollees. Provided tax credits that subsidize the cost of insurance.

**3. Public insurance (increasingly more important)**

- 1) Medicaid is a health insurance program targeted to lower-income recipients that is financed jointly by the federal government and the states.
- 2) Medicare is a federal program that provides health insurance to all people over age 65 and disabled persons under age 65.
- 3) TRICARE: Administered by the Department of Defense. Serves military retirees and the families of active-duty, retired, or deceased service members
- 4) CHAMPVA: Civilian Health and Medical Program for the Department of Veterans Affairs. A health care program for disabled dependents of veterans and certain survivors of veterans

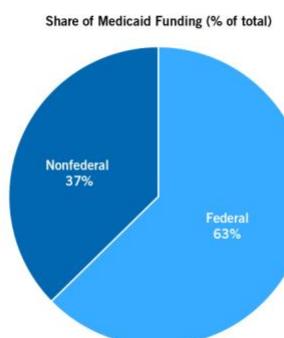
**4. The uninsured: There are 28 million in the United States without any insurance coverage. The uninsured have lower-than-average incomes. In 2016, nearly three-quarters of the nonelderly uninsured came from families where one or more members were full-time workers. About 13.3% of the uninsured are children.**

- 1) Why are individuals uninsured?
  - a. They may be counting on uncompensated care—the costs of delivering health care for which providers are not reimbursed.
  - b. Insurance may cost too much, given risks and prices.
  - c. Insurers may be unwilling to insure the worst risks because of fears of adverse selection.
  - d. They are not appropriately valuing insurance coverage.
- 2) There are several reasons to care about the uninsured.
  - a. There are physical externalities associated with communicable diseases.
  - b. There is a significant financial externality imposed by the uninsured on the insured.
  - c. Care is not delivered appropriately to the uninsured.
  - d. Paternalism and equity motivations.
  - e. Health insurance availability may inhibit productivity-increasing job switches, causing job lock: The unwillingness to move to a better job for fear of losing health insurance.

**MEDICAID** is our nation's largest insurer, covering 73 million Americans. Its benefits are targeted at groups eligible for cash welfare programs, including most low-income children in the United States, most low-income pregnant women, all very low-income families, and the low-income elderly and disabled.



A majority of Medicaid funding comes from the federal government



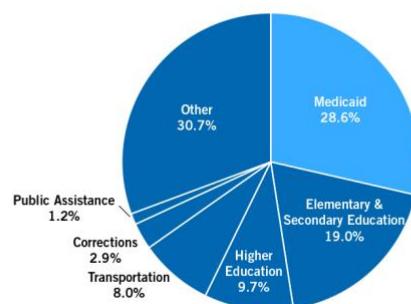
SOURCE: National Association of State Budget Officers, 2020 State Budget Report, Fiscal Years 2018–2020.  
NOTES: Data are for fiscal year 2020 and do not include administrative costs. The fiscal year for most states is July 1–June 30.

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Medicaid is typically the largest expenditure in state budgets

State Expenditures (% of Total)



SOURCE: National Association of State Budget Officers, 2020 State Budget Report, Fiscal Years 2018–2020.

NOTES: Data are for fiscal year 2020, and represent total state expenditures, which include federal funding. The fiscal year for most states is July 1–June 30.

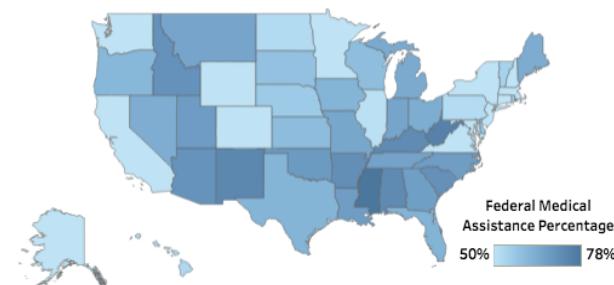
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States receive varying levels of assistance from the federal government for Medicaid

Federal Medical Assistance Percentages



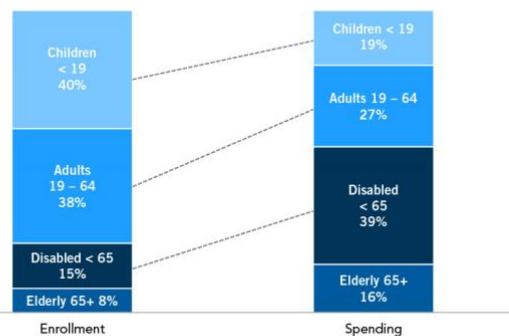
SOURCE: Kaiser Family Foundation, Federal Medical Assistance Percentage (FMAP) for Medicaid, December 2019.  
Note: The federal minimum FMAP is 50.

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The elderly and disabled make up 23 percent of Medicaid's enrollment, but account for 55 percent of the program's spending

% OF TOTAL MEDICAID SPENDING



SOURCE: Centers for Medicare & Medicaid Services, Medicaid and CHIP Beneficiary Profile: Characteristics, Health Status, Access, Utilization, Expenditures and Experience, February 2020.

NOTES: Data are for 2016. Numbers may not sum to 100 percent due to rounding.

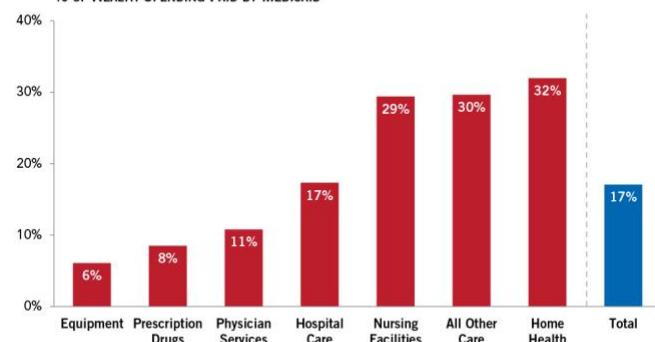
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Medicaid finances almost one-fifth of healthcare spending in the United States

% OF HEALTH SPENDING PAID BY MEDICAID



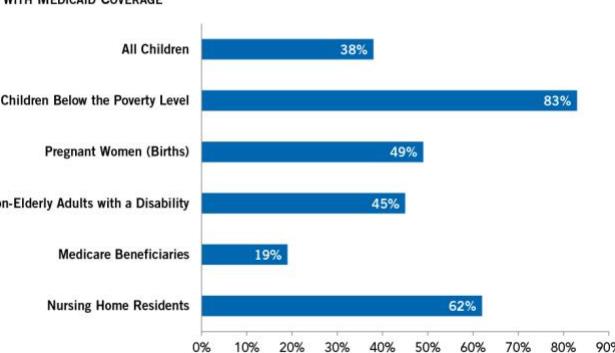
SOURCE: Centers for Medicare and Medicaid Services, National Health Expenditures, December 2020.  
NOTES: Data are for 2019. "Equipment" includes both durable medical equipment and other non-durable medical products. "All Other Care" includes dental services, other professional services, and other health, residential, and personal care expenditures.

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Medicaid provides health insurance for vulnerable populations

% WITH MEDICAID COVERAGE



SOURCE: Kaiser Family Foundation, 10 Things to Know About Medicaid: Setting the Facts Straight, March 2019.

NOTE: In 2017 the poverty level was \$20,420 for a family of three.

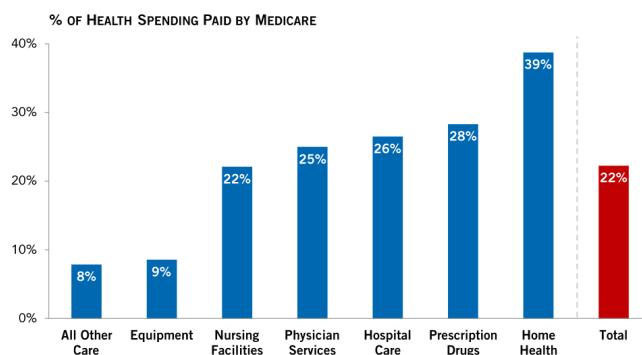
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**MEDCARE** is a federal program that provides health insurance to all people over age 65 and disabled persons under age 65. For more than 50 years, it has helped older adults, people with disabilities, and others obtain the health care they need while protecting them from the financial burden of high medical bills. Every citizen who has worked for 10 years in Medicare-covered employment (and their spouse) is eligible for Medicare at age 65. It is financed by a payroll tax on employees and employers.



### Medicare covers over 20 percent of most healthcare services



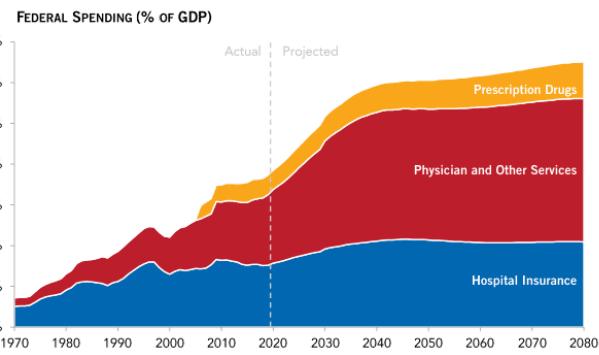
SOURCE: Centers for Medicare and Medicaid Services, National Health Expenditures, December 2020.

NOTES: Data are for 2019. "Equipment" includes both durable medical equipment and other non-durable medical products. "All Other Care" includes dental services, other professional services, and other health, residential, and personal care expenditures.

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### Medicare spending is projected to rise rapidly



SOURCE: Centers for Medicare and Medicaid Services, 2020 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, April 2020.

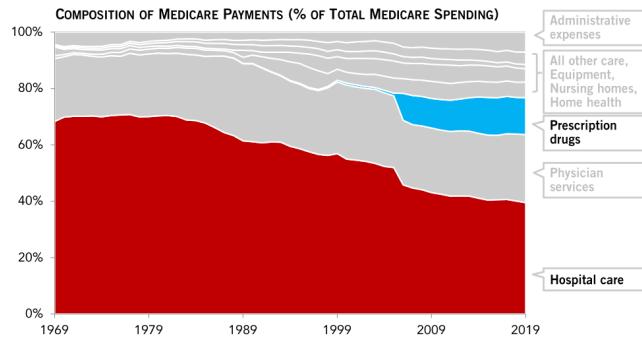
NOTE: The figures shown above are based on gross Medicare spending.

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### Over the past 50 years, the share of Medicare spending on hospital expenses has declined the most while the share spent on prescription drugs has increased the most



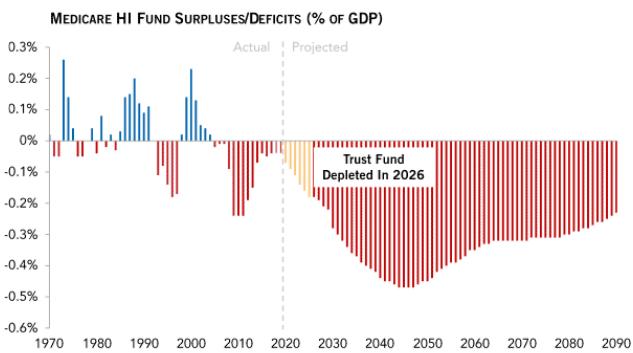
SOURCE: Centers for Medicare and Medicaid Services, National Health Expenditures, December 2020.

NOTES: "Equipment" includes both durable medical equipment and other non-durable medical products. "All Other Care" includes dental services, other professional services, and other health, residential, and personal care expenditures. "Administrative Expenses" includes the total net cost of health insurance expenditures.

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### Medicare's Hospital Insurance trust fund will be depleted in 2026



SOURCES: Social Security Administration, The 2020 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds, April 2020; and Centers for Medicare and Medicaid Services, 2020 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, April 2020.

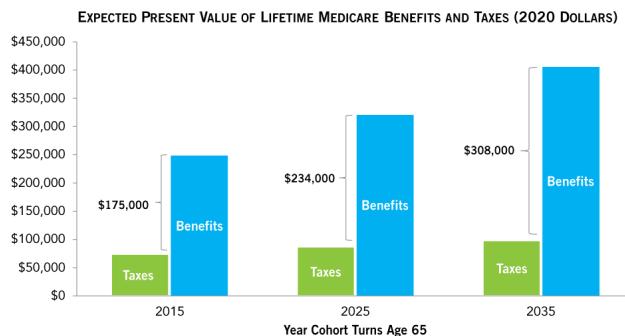
NOTE: Data exclude interest income.

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### On average, Medicare benefits far exceed taxes over an individual's lifetime



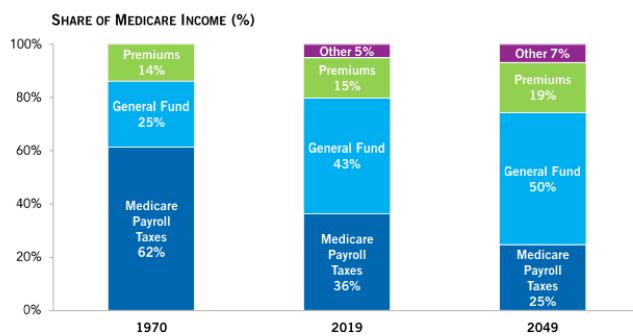
SOURCE: Tax Policy Center, Social Security and Medicare Lifetime Benefits and Taxes, November 2020.

NOTES: Taxes and Benefits reflect those of the average single woman with average earnings (\$56,000 in 2020 dollars). Data are reflected in 2020 dollars, adjusted to present value at age 65 using a 2 percent real interest rate. Adjusts for mortality after age 65. Assumes benefits scheduled in law will be paid. Assumes individuals work every year starting at age 22 and retires at age 65. An average earner has earnings equal to the Social Security Administration's national average wage index each year. Medicare benefits are net of premiums.

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### The general fund is the largest source of financing for Medicare



SOURCE: Centers for Medicare and Medicaid Services, 2020 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, April 2020.

NOTES: "Other" includes proceeds from the taxation of Social Security benefits, which help to finance Medicare Hospital Insurance costs, as well as drug fees and state transfers. Medicare income does not include interest income. Numbers may not sum to 100% due to rounding.

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**The UNINSURED** Nationally, 2.2 million poor uninsured adults were in the ACA “coverage gap” in 2019 in states that had not expanded Medicaid. They earned too much to be eligible for Medicaid but not enough to qualify for Marketplace premium tax credits. Three-quarters of them reside in four states: Texas, Florida, Georgia and North Carolina. <https://www.kff.org/uninsured/issue-brief/key-facts-about-the-uninsured-population/>

### Uninsured Rates among the Nonelderly by State, 2019

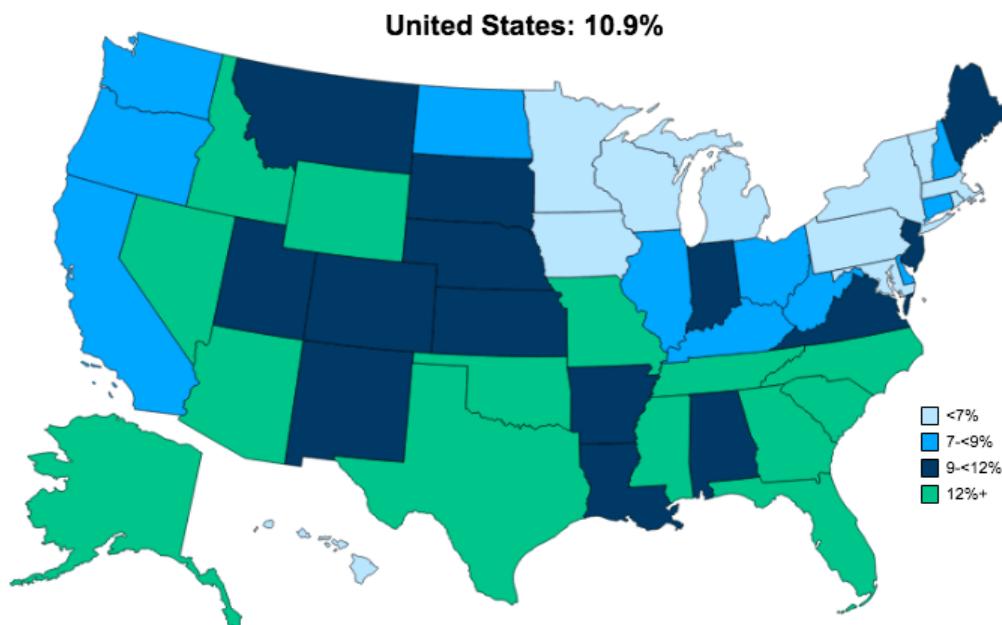


Figure 1  
Number of Uninsured and Uninsured Rate among the Nonelderly Population, 2008-2019



Figure 4  
Characteristics of the Nonelderly Uninsured, 2019

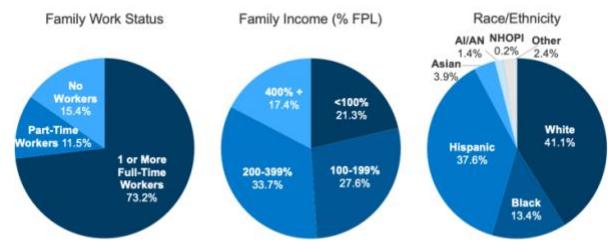


Figure 5  
Uninsured Rates among the Nonelderly Population by Selected Characteristics, 2019

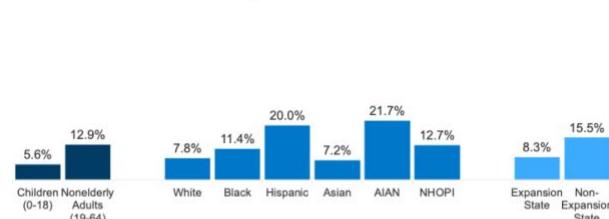
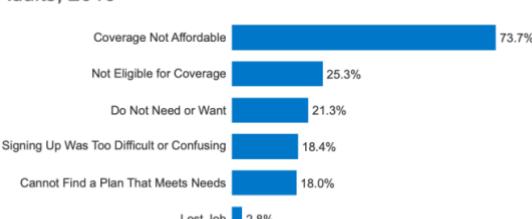
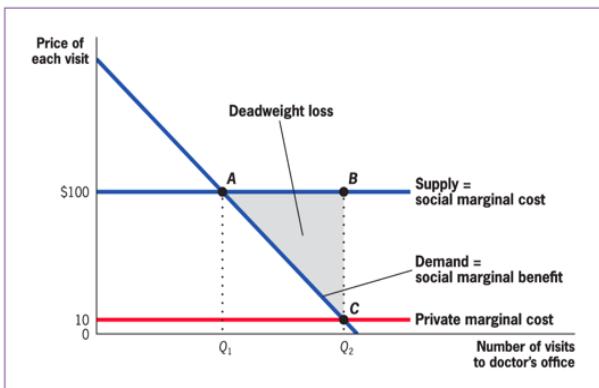


Figure 7  
Reasons for Being Uninsured among Uninsured Nonelderly Adults, 2019

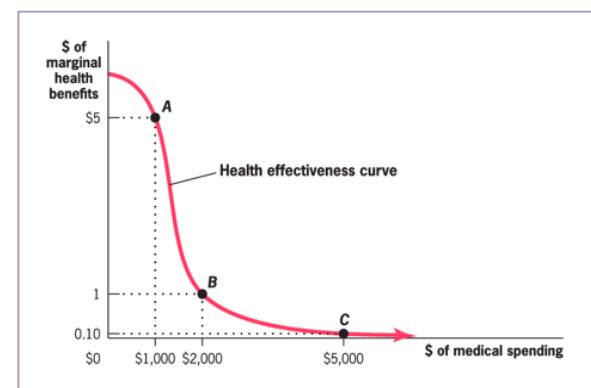


## II. How Generous Should Insurance Be to Patients? Cost-Benefit Analysis

1. The generosity of health insurance is measured along two dimensions: Generosity to patients and generosity to providers. Most generous plans (to patients) provide first-dollar coverage: Insurance plans that cover all medical spending, with little or no patient payment.
2. The consumption-smoothing benefit from first-dollar coverage of minor and predictable medical events is small for two reasons:
  - 1) Risk-averse individuals gain little utility from insuring a small risk.
  - 2) Individuals are much more able to self-insure such spending than to self-insure large and unpredictable medical events.
3. Moral hazard costs of health insurance for patients
  - 1) Trade-off of health insurance: The gains in terms of consumption smoothing versus the costs in terms of overuse of medical care
  - 2) People should not get medical care beyond point B, the point at which each dollar of spending buys a dollar of improved health.



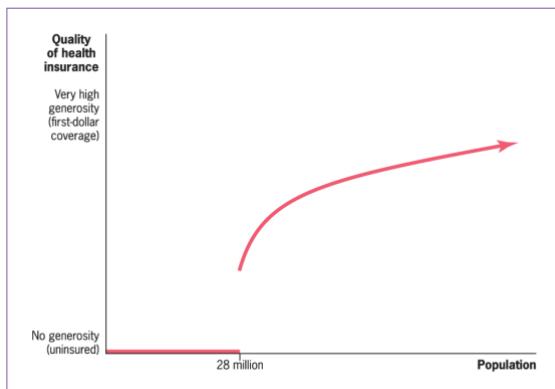
Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers



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### 4. Optimal Insurance

- 1) There exists a trade-off moral hazard against risk protection.
- 2) First-dollar coverage bad for moral hazard, not very valuable risk protection.
- 3) Therefore, optimal health insurance policy:
  - a. Individuals bear a large share of medical costs within some affordable range
  - b. Fully insured only against very large costs that are unaffordable



Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

- Most coverage appears more generous than is optimal, and many people don't have coverage.
- There is an increasing generosity of insurance for the insured population.
- Why are people either uninsured or "overinsured" (polarized protection)?
- The tax subsidy: For people with employer-sponsored health insurance, better to take payment in insurance than in wages.

5. Why is insurance so generous in the United States?
  - 1) The access motives
    - a. Moral hazard is measured only by the substitution effect of social insurance programs.
    - b. Insurance might affect behavior through an income effect: People use care that is now affordable. So, traditional analysis overstates the costs of moral hazard.
  - 2) Psychological motivations
    - c. Motivations for holding insurance that go beyond the simple expected utility model.
    - d. Buying insurance perhaps commits to saving for health emergencies.
6. How generous should insurance be to medical providers?
  - 1) Insurance often determines how much medical providers are paid. One payment system is retrospective reimbursement.
    - a. Retrospective reimbursement: Reimburse physicians for the costs they have incurred.
    - b. Encourages overutilization since providers are paid regardless of necessity or value of care.
  - 2) Managed care organizations are paid by prospective reimbursement, not retrospective
    - a. Prospective reimbursement: The practice of paying providers based on what treating patients should cost, not on what the provider spends.
    - b. Payment is the same regardless of spending, so there is an incentive to reduce costs.
    - c. Just as retrospective reimbursement offers incentives for excessive care, prospective reimbursement offers incentives for insufficient care. By delivering less care, the physician pockets a larger share of the payment.
  - 3) Managed care and prospective reimbursement
    - a. Managed care: An approach to controlling medical costs using supply-side restrictions, such as limited choice of medical provider. Two forms of managed care are popular:
    - b. Preferred provider organizations (PPO): A health care organization that lowers care costs by shopping for health care providers on behalf of the insured. Avoids difficulty of the shopping for doctors.
    - c. Health maintenance organization (HMO): A health care organization that integrates insurance and delivery of care by, for example, paying its own doctors and hospitals a salary independent of the amount of care they deliver. In the classic staff model, HMOs hire their own physicians and may have their own hospitals.
  - 4) The impacts of managed care
    - a. Spending: HMOs spend much less per enrollee than do traditional retrospective reimbursement plans. But HMOs have a strong incentive to select low-cost patients. Studies that use random assignment to HMO still find cost savings.
    - b. Quality: Do HMOs reduce spending by cutting wasteful care? Or, do they cut important care as well? Research find no consensus on whether HMOs provide lower-quality care.
  - 5) How should providers be reimbursed?
    - a. The advent of managed care has clearly lowered reimbursement to providers, and it has not measurably lowered the quality of care those providers deliver.
    - b. The key question for the future is whether additional “tightening” of the prospective reimbursement system is needed.

### III. Medicare and Health Care Policy Evaluation

#### 1. How Medicare works?

- 1) Largest public health insurance program in the United States. Administered at the federal level.
- 2) All U.S. citizens who have worked and paid payroll taxes for ten years and their spouses are eligible. Ineligible citizens can purchase Medicare coverage at its full cost.

#### 2. Medicare programs

- 1) Medicare Part A: Part of the Medicare program that covers inpatient hospital costs and some costs of long-term care; financed from a payroll tax.
- 2) Medicare Part B: Part of the Medicare program that covers physician expenditures, outpatient hospital expenditures, and other services; financed from enrollee premiums and general revenues.
- 3) Medicare Part C, also known as Medicare Advantage, is an option for private insurance.
- 4) Medicare Part D: Part of the Medicare program that covers prescription drug expenditures.

#### 3. Medicare: high patient costs and little

- 1) Relative to private health insurance, the Medicare program has fairly high copayments and deductibles and a relatively lean benefits package.
- 2) This greatly lowers the consumption-smoothing value of Medicare since there is still some risk of very high medical expenditures if you are ill.
- 3) This is not as big a concern relative to Medicaid, as the Medicare program assists all elderly, both rich and poor.

#### 4. Medicare health outcomes

- 1) Despite broad support, there is surprisingly little evidence that the Medicare program actually improves the health of the elderly.
- 2) Medicare provides valuable risk protection: consumption smoothing alone worth half the cost.

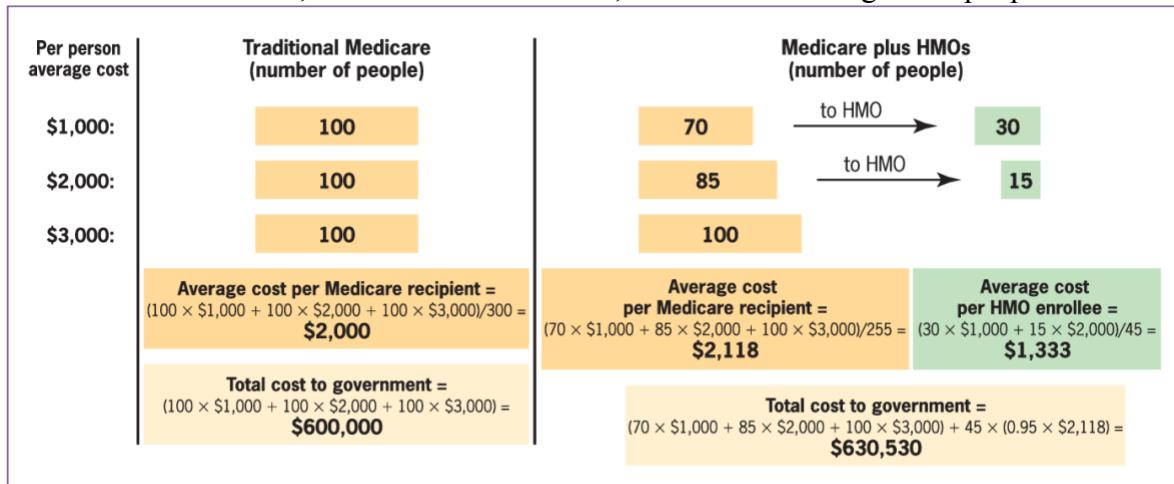
#### 5. Effectiveness and moral hazard costs

- 1) In 1983, Medicare switched from a retrospective to a prospective payment system (PPS): Medicare's system for reimbursing hospitals based on nationally standardized payments for specific diagnoses.
  - a. Diagnoses for hospital admissions grouped into 467 "Diagnosis Related Groups," or DRGs.
  - b. Each DRG receives a fixed payment, depending on cost of national cost of treatment and local expenses.
- 2) Why didn't the PPS solve the long-run cost growth problems of the Medicare program?
  - a. Medicare was paying a fixed price per diagnosis, but the choice of a diagnosis is something the hospital has some control over when patients are admitted. There was a large increase in reported severity of admission diagnoses for the elderly around the time of PPS!
  - b. Almost half of the DRG designations are based not purely on diagnosis but also on the actual treatment used for the patient. It reimburses hospitals per admission, providing incentive to raise hospital admissions.
  - c. Evidence: Short Stays in long-term care hospitals

#### 6. Medicare managed care

- 1) Starting in 1985, the federal government allowed Medicare enrollees a choice of Medicare HMOs as well. Managed care gives providers an incentive to reduce costs and are reimbursed at 95% of Medicare average.
- 2) HMO enrollees avoid Medicare's cost sharing. But HMOs restrict the choice of provider and potentially engage in other rationing to keep costs down.

- 3) Enrollment in Medicare HMOs rose steadily to 16% of all enrollees in 1999, dipped somewhat, and then rose again after 2003 due to an increase in reimbursement rates to the managed care providers; enrollment growth has been particularly rapid in recent years.
7. Do Medicare HMOs save money?
- 1) Medicare reimburses at 95% of average cost . . . but low-cost individuals may be drawn to HMOs in which case the government ends up overpaying for their coverage.
  - 2) Consider an example with 100 people in each group. Costs per group are \$1000, \$2000, or \$3000. And 30% of the low-cost, 15% of the middle-cost, and none of the high-cost people use HMOs.

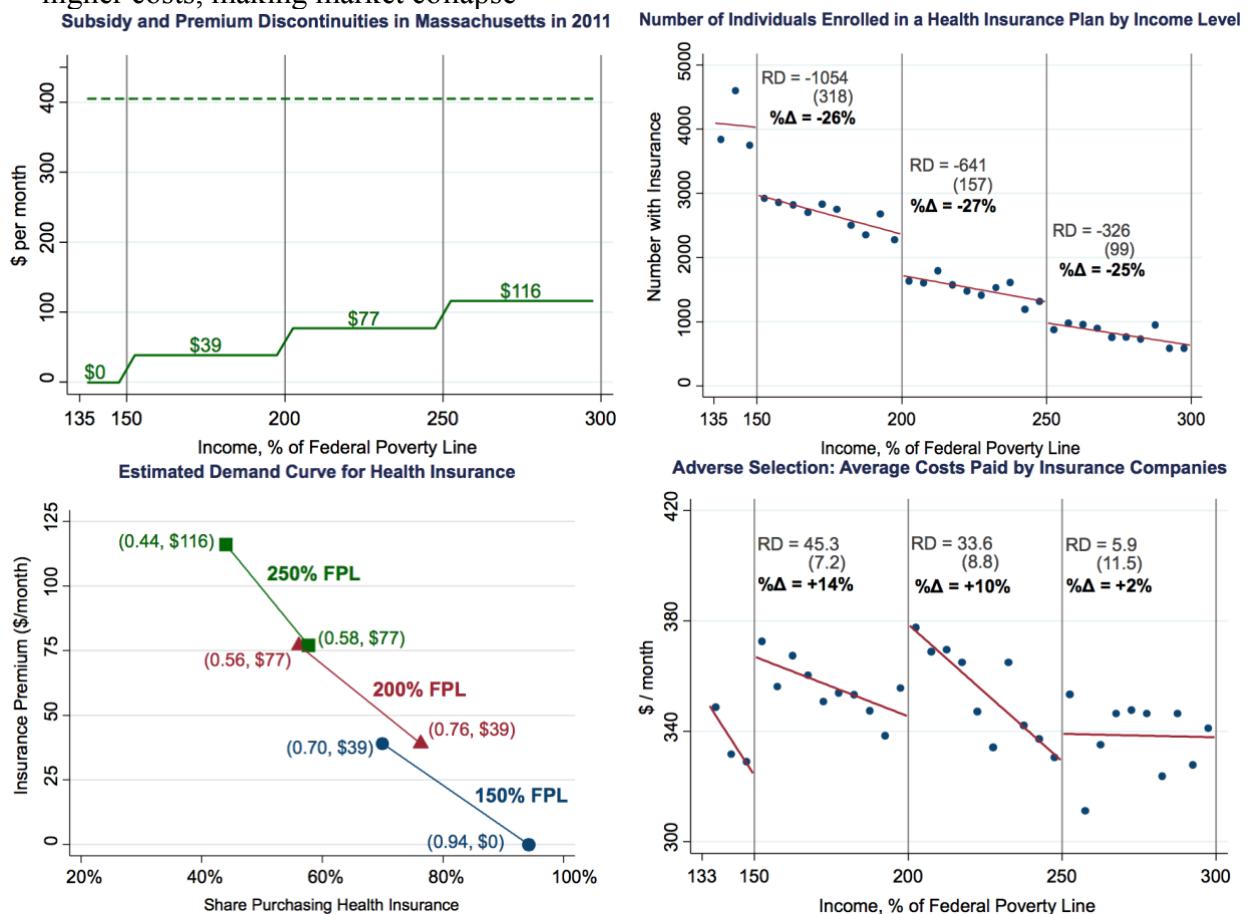


Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

8. Should Medicare move to a full choice plan? Premium support
- 1) The problem with managed care reimbursement is determining how much to pay insurers. Alternative? Premium support: A system of full choice among health care plans for Medicare enrollees whereby they receive a voucher for a certain amount that they can apply to a range of health insurance options (either paying or receiving the difference between plan premiums and the voucher amount).
  - 2) The advantages of a premium support system mirror the advantages of voucher systems for education. It respects consumer sovereignty by allowing individuals to choose the health plan that best matches their taste rather than forcing them into one government-provided option. It promotes efficiency in medical care delivery by allowing individuals to shop across plans. It solves the problem of “appropriate” reimbursement levels for managed care plans by simply letting the market work.
  - 3) The disadvantages of a premium support system include:
    - a. Adverse selection: Healthy individuals choose the less expensive plans, raising costs even further for sicker individuals, who prefer the more generous plans.
    - b. Poor decision making by seniors: Studies in a wide variety of contexts show that more choices lead to less participation in a market and to less satisfaction with the choices that are made.

#### IV. Empirical Evidence: Demand for health insurance

1. Finkelstein, Hendren, and Shepard (2017) show why government intervention is essential to sustain markets for insurance. The authors study Massachusetts public universal health insurance program (introduced in 2006; predecessor to the national Affordable Care Act)
2. Research design: exploit discontinuities in subsidies for insurance based on income level
3. Findings: Demand for health insurance among the poor falls very rapidly as price rises; reducing subsidies would drastically reduce the number of individuals insured; moreover, sicker people remain insured, increasing average costs for insurers – adverse selection
4. Government intervention is critical to sustain markets for health insurance for two reasons
  - 1) Low-income individuals are very sensitive to price; will not buy insurance if not subsidized or provided by government
  - 2) Healthiest low-income individuals are least likely to buy; insurance companies get stuck with higher costs, making market collapse



#### IV. Conclusion

1. Most individuals have private health insurance; for large firms, this is a well-functioning insurance market. For small firms and individuals, there are more market failures, contributing to 28 million Americans uninsured.
2. Risk-averse individuals greatly value the consumption-smoothing benefits of having their medical bills paid. There are clear moral hazard costs as well on both the patient and the provider side.
3. Cost sharing has been used to address moral hazard on the patient side, and managed care has arisen as a means of addressing moral hazard on the provider side.

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Animated Video: Health of the Healthcare System | 3:30 ([w](#)) ([w](#))

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## Data Visualization

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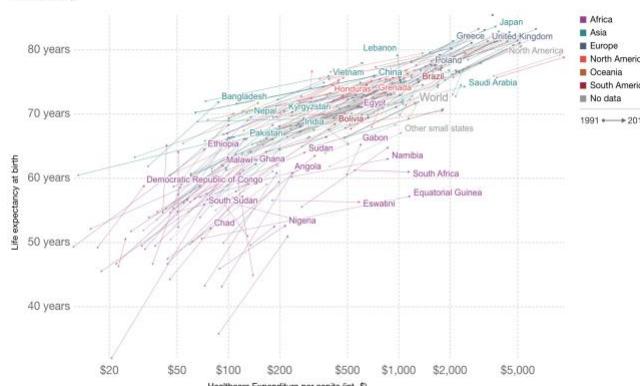
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Appendix A: Empirical Evidence on Health returns to investment <https://ourworldindata.org/health-meta>

## Life expectancy vs. healthcare expenditure, 1991 to 2014

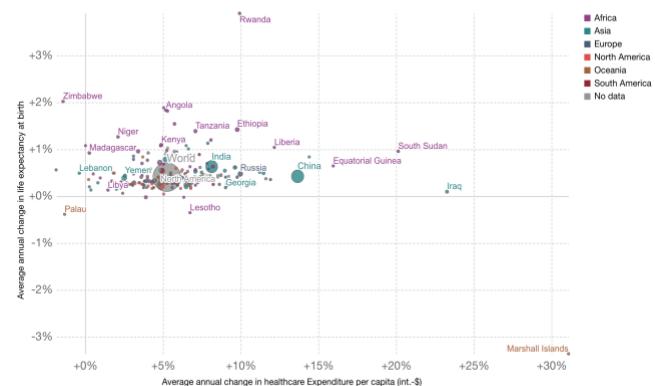
Total healthcare expenditure per capita is adjusted for price differences between countries and for inflation and measured in international-\$.



Source: World Bank

## Life expectancy vs. healthcare expenditure, 1991 to 2014

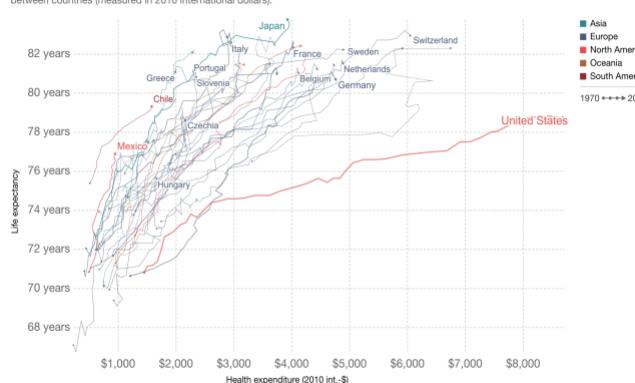
Total healthcare expenditure per capita is adjusted for price differences between countries and for inflation and measured in international-\$.



Source: World Bank

## Life expectancy vs. health expenditure, 1970 to 2015

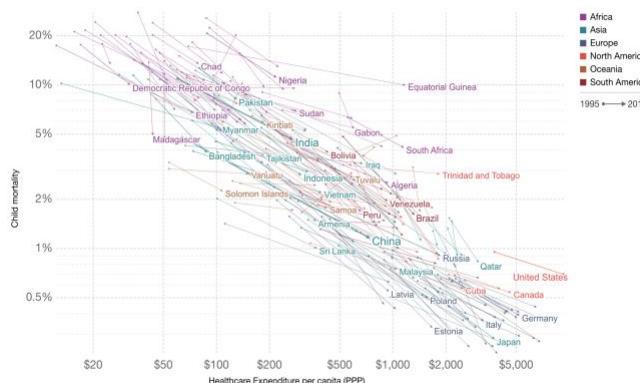
Health financing is reported as the annual per capita health expenditure and is adjusted for inflation and price level differences between countries (measured in 2010 international dollars).



Source: World Bank, Health Expenditure and Financing - OECDstat 2017  
OurWorldInData.org/the-link-between-life-expectancy-and-health-spending-us-focus • CC BY

## Child Mortality vs. Health Expenditure, 1995 to 2014

Child mortality is the share of newborns who die before reaching the age of five, measured versus total healthcare expenditure per capita (PPP).

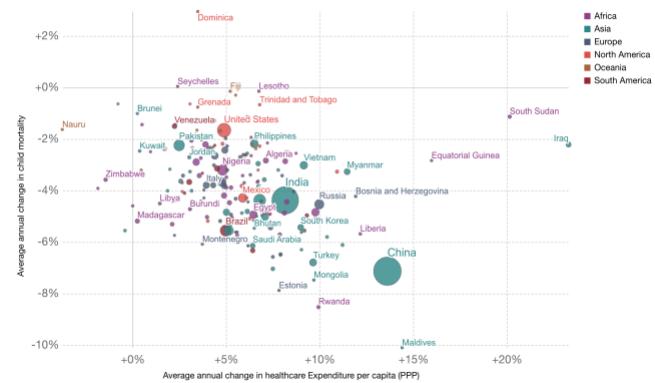


Source: World Bank; UN Inter-agency Group for Child Mortality Estimation

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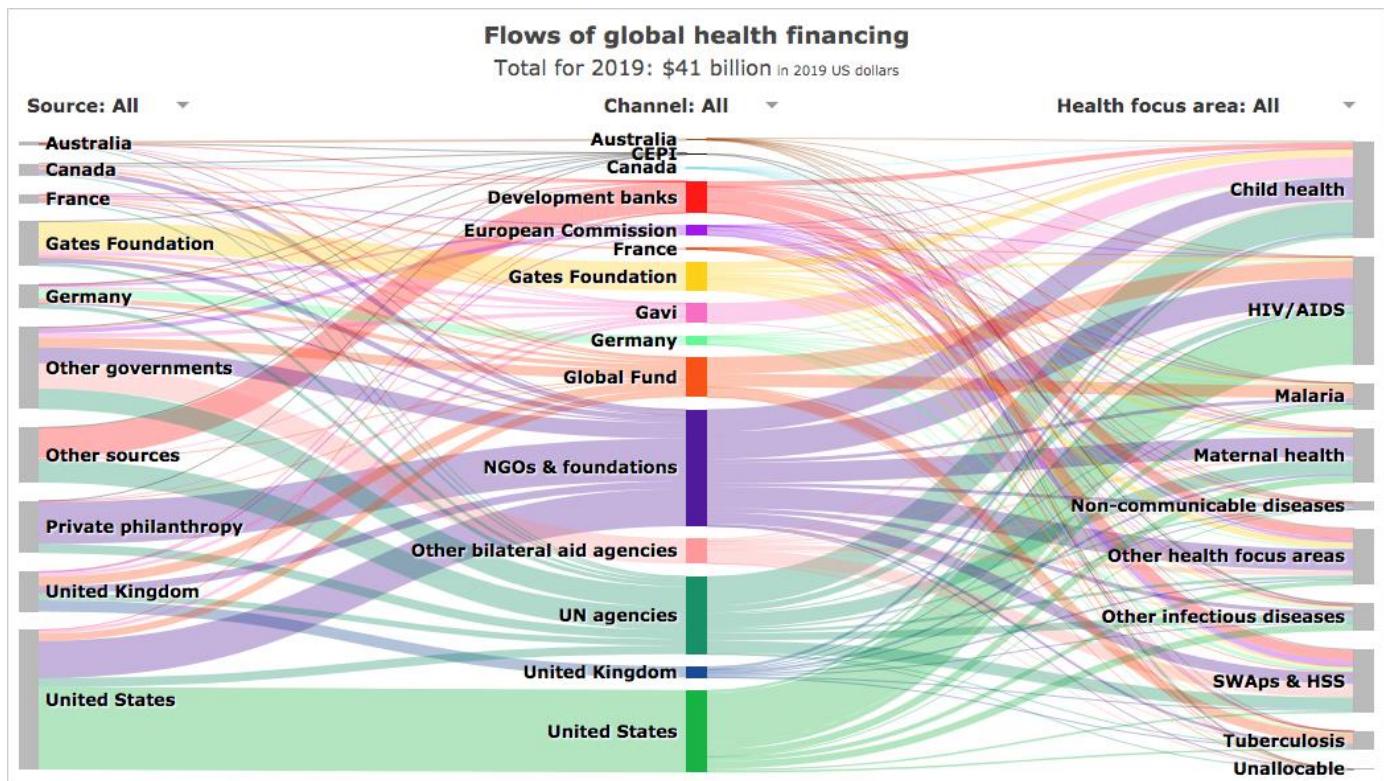
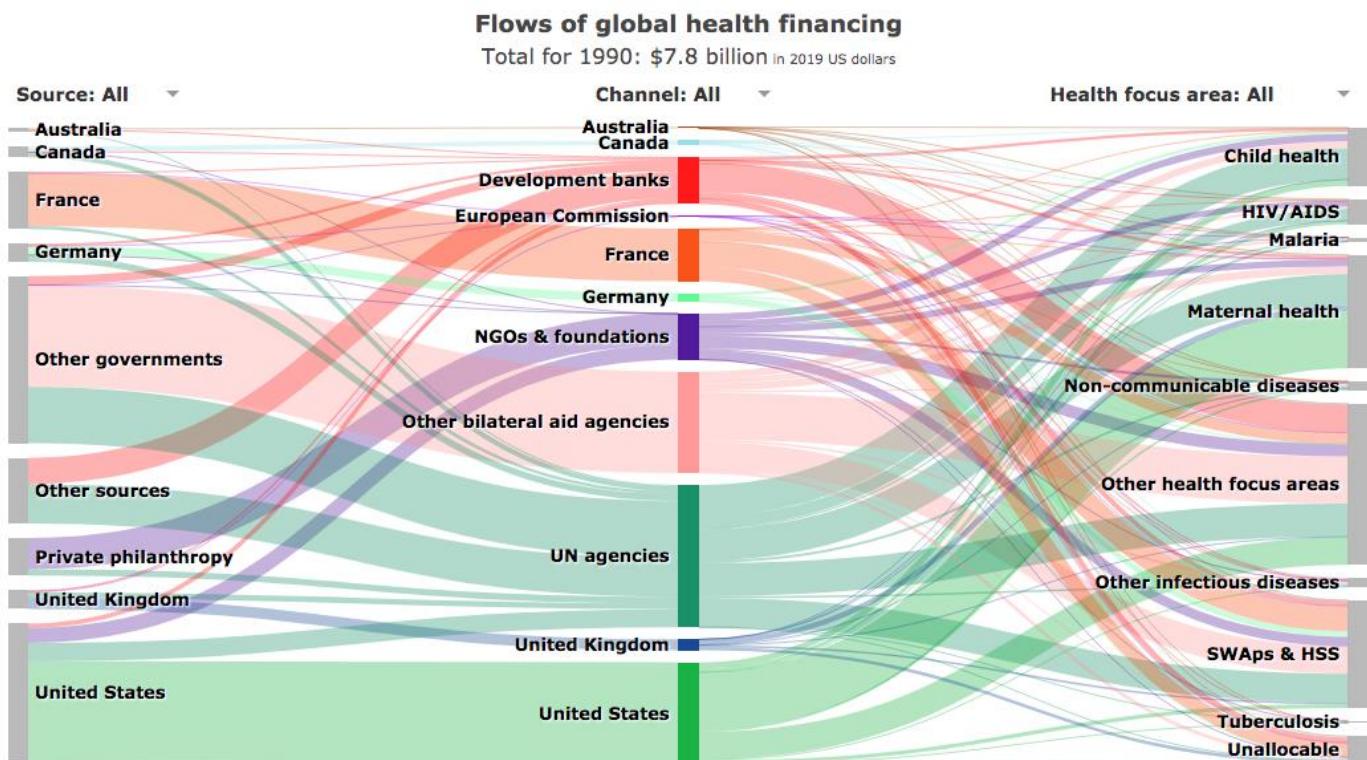
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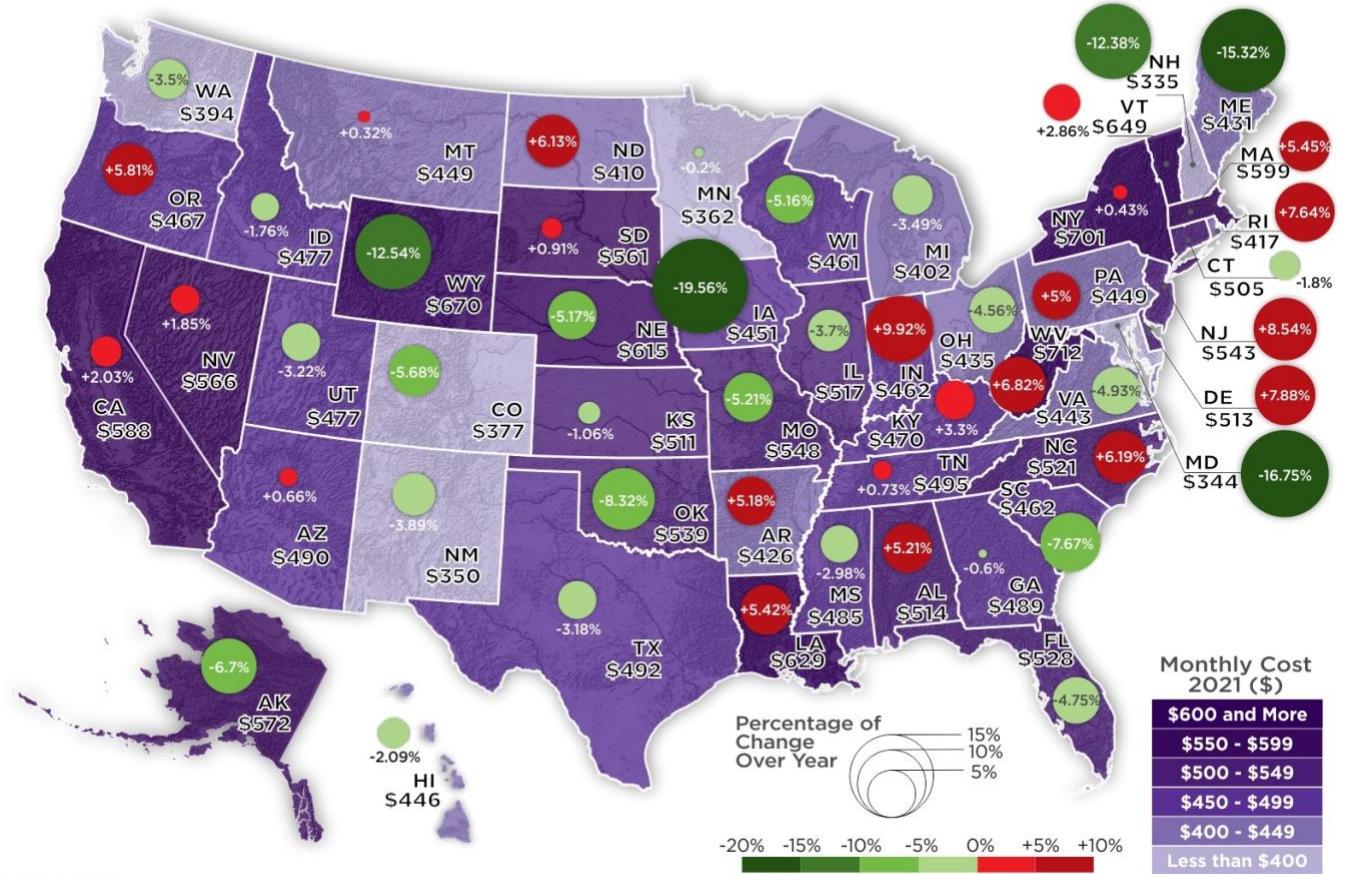
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<https://vizhub.healthdata.org/fgh/>

## Average Monthly Cost of Health Insurance by State

Policy Premiums for a 40-Year-Old Applicant & Percentage of Change (2020-2021)

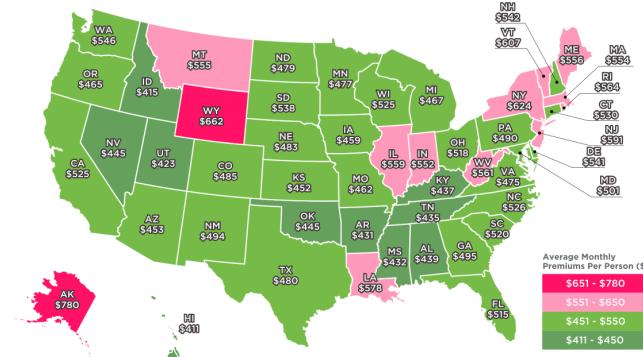


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**The Rising Cost of Senior Care in America:** The costs related to senior care continue to climb, but with more options available, the process is becoming more manageable. The trend toward a more customized senior assisted experience is shifting from the nursing home or assisted living facility, toward stay at home care. Nationwide the costs for a nursing home is the most expensive options for seniors, followed by full-time home health care, and then an assisted living facility. The least expensive is day care, usually provided at a center.

### Health Insurance Rates by State

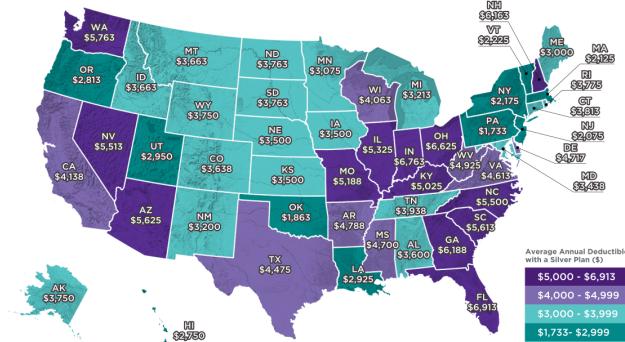
Average Monthly Premiums Per Person



Article & Sources:  
<https://howmuch.net/articles/health-insurance-rates-by-state>  
<https://www.usabenefits.com/>

### Health Insurance Rates by State

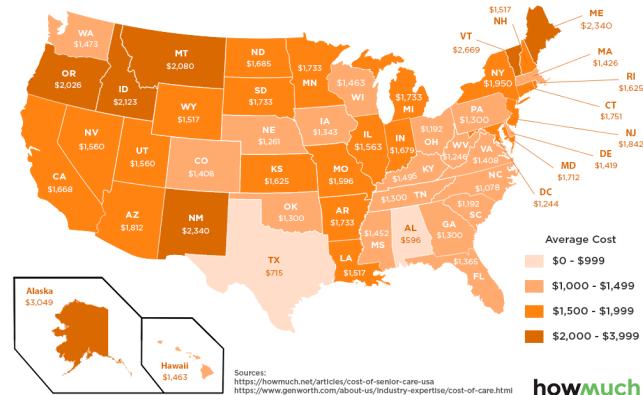
Average Annual Deductible with a Silver Plan



Article & Sources:  
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### The Monthly Cost of Senior Care in USA

Staying in an Adult Day Health Care

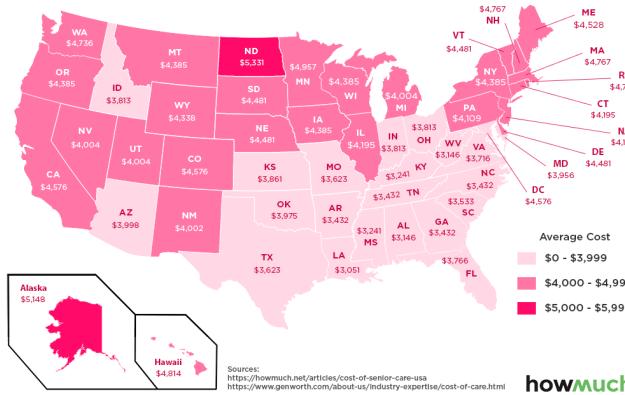


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howmuch.net

### The Monthly Cost of Senior Care in USA

Staying at Home with a Home Health Aide

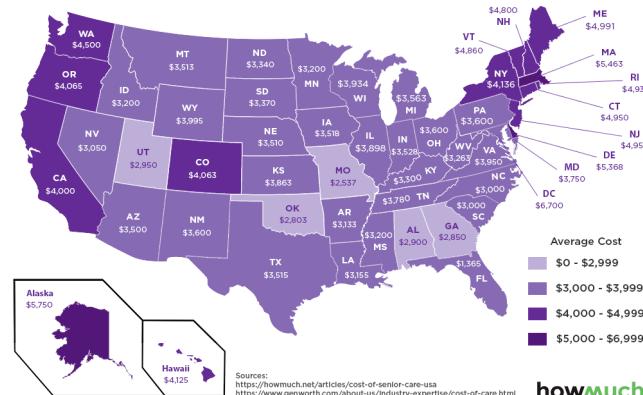


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### The Monthly Cost of Senior Care in USA

Staying in an Assisted Living Facility

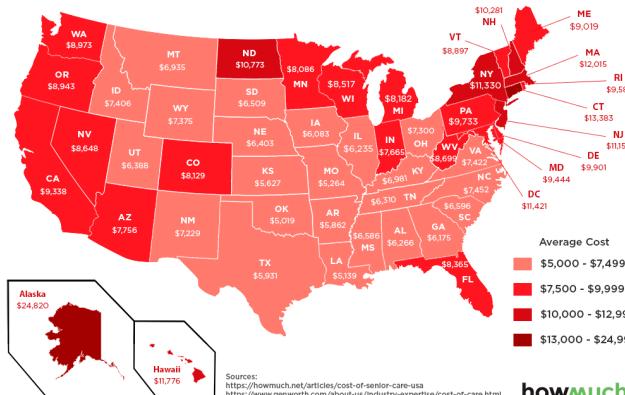


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### The Monthly Cost of Senior Care in USA

Staying in a Nursing Home



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## Lecture 11 Welfare Programs

Biwei Chen

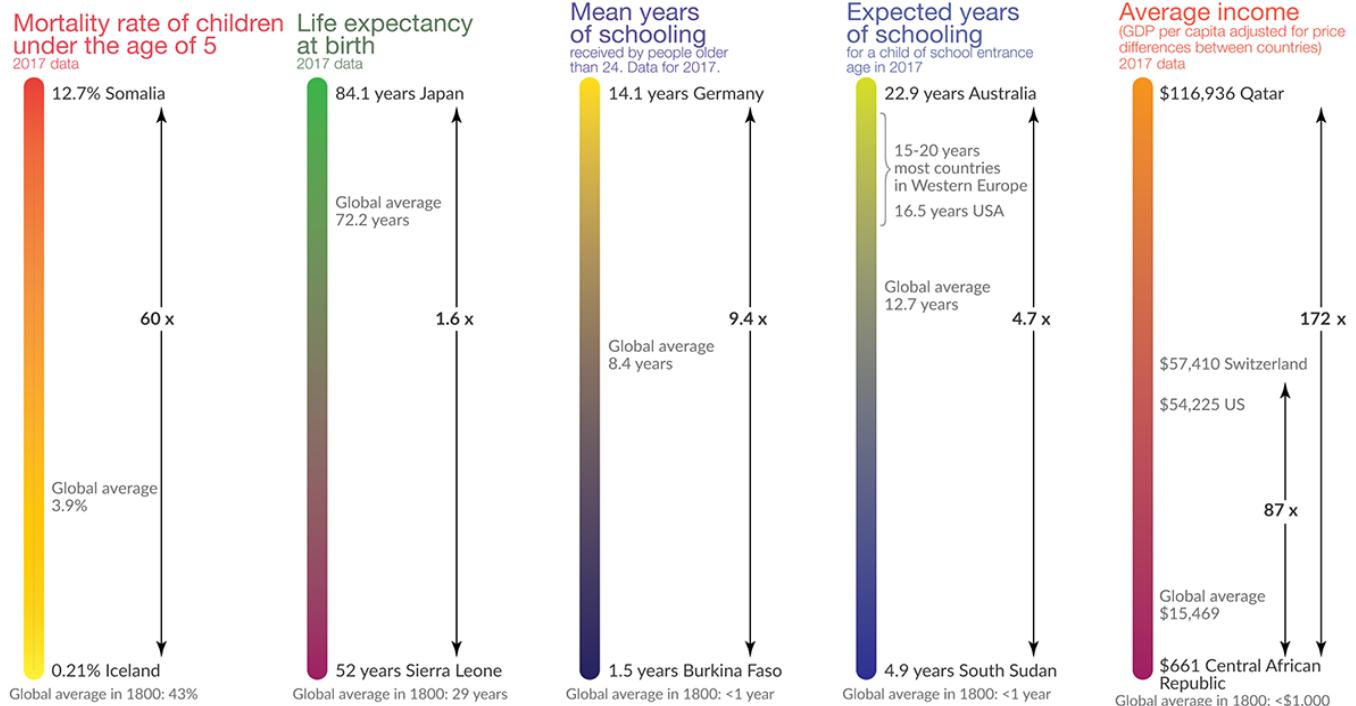
### Outline

- Global Inequality and Poverty
- Welfare Policy in the United States
- Moral Hazard: Theory and Model
- Policy Analysis: Empirical Evidence

## Global inequality in living conditions

between the world's worst-off and best-off countries

Our World  
in Data

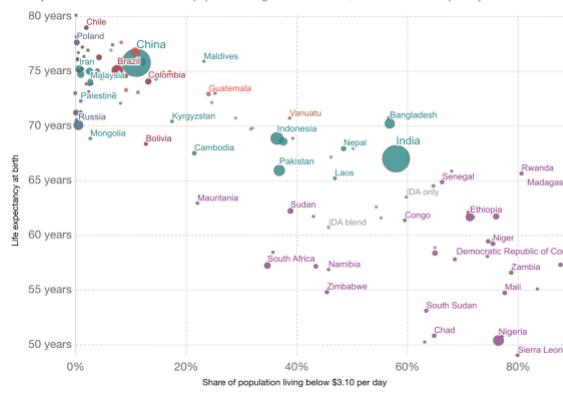


Data source: all data for 2017 is taken from various UN publications. Historical estimates for 1800 are from OECD – How was life? and Our World in Data. This is a visualization from OurWorldInData.org, where you find data and research on the world's largest problems.

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### Poverty vs. Life expectancy, 2014

Poverty is measured as the share of the population living on less than \$3.10\$ international dollars per day.

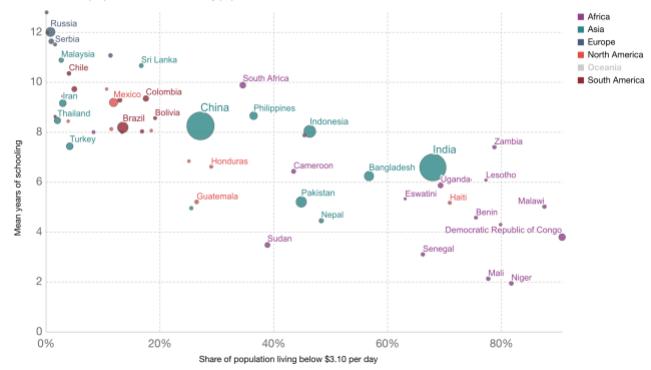


Source: World Bank

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### Poverty vs. educational attainment, 2014

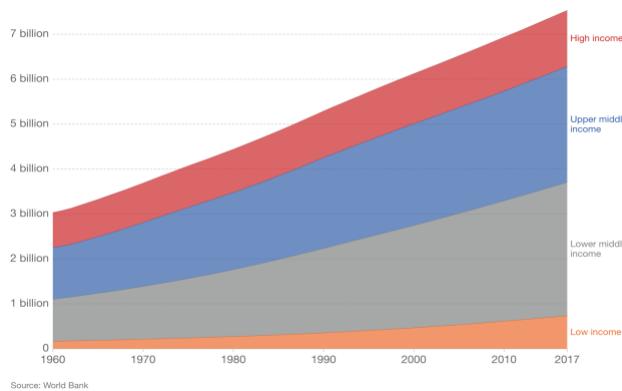
Poverty is measured as the share of the population living below \$3.10\$ international dollars per day. Educational attainment is measured as the mean years of schooling for the population aged 15-64. Bubble sizes are proportional to total country population. Colours represent world regions.



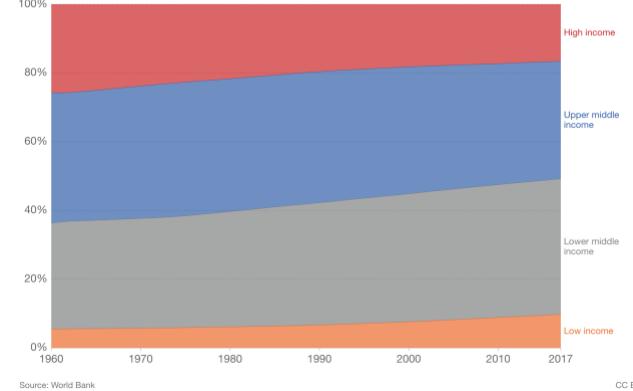
Source: Lee and Lee (2016), World Bank – WDI

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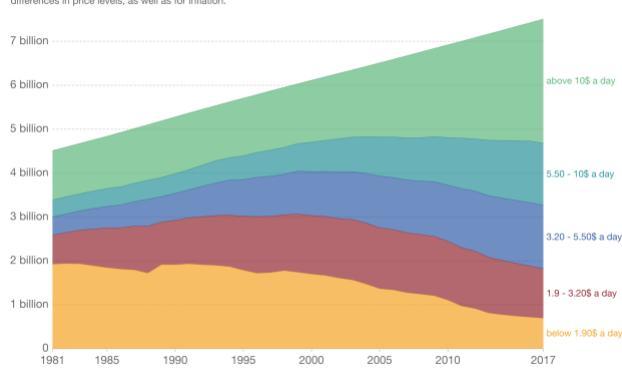
Population by income level, 1960 to 2017  
Total population, differentiated by World Bank income level.

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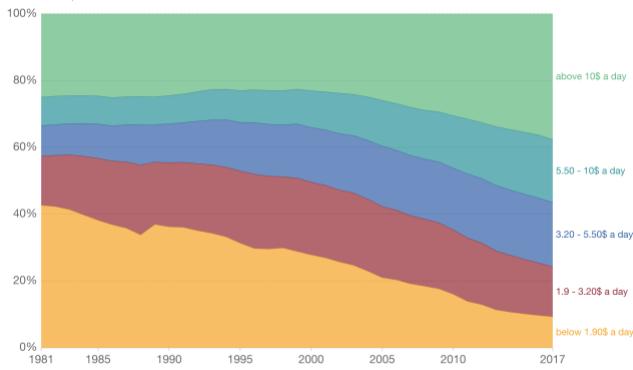
Population by income level, 1960 to 2017  
Total population, differentiated by World Bank income level.

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Distribution of population between different poverty thresholds, World, 1981 to 2017  
Poverty thresholds are all in 'international dollars' at constant 2011 PPP prices. This means all figures account for cross-country differences in price levels, as well as for inflation.

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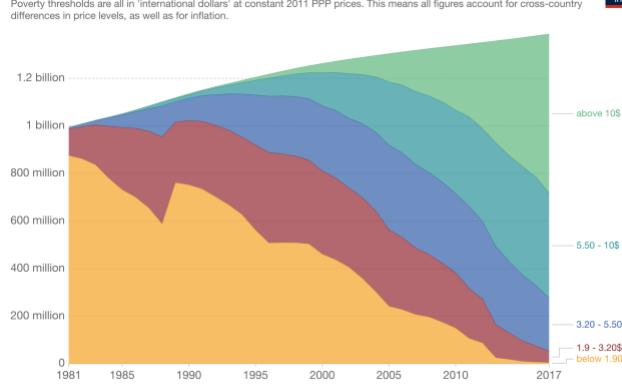
Distribution of population between different poverty thresholds, World, 1981 to 2017  
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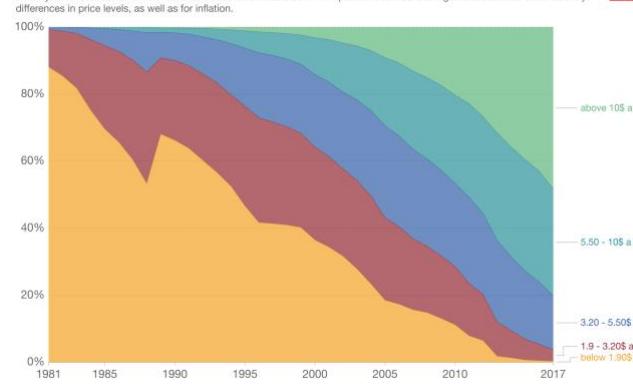
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Distribution of population between different poverty thresholds, China, 1981 to 2017  
Poverty thresholds are all in 'international dollars' at constant 2011 PPP prices. This means all figures account for cross-country differences in price levels, as well as for inflation.

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Distribution of population between different poverty thresholds, China, 1981 to 2017  
Poverty thresholds are all in 'international dollars' at constant 2011 PPP prices. This means all figures account for cross-country differences in price levels, as well as for inflation.



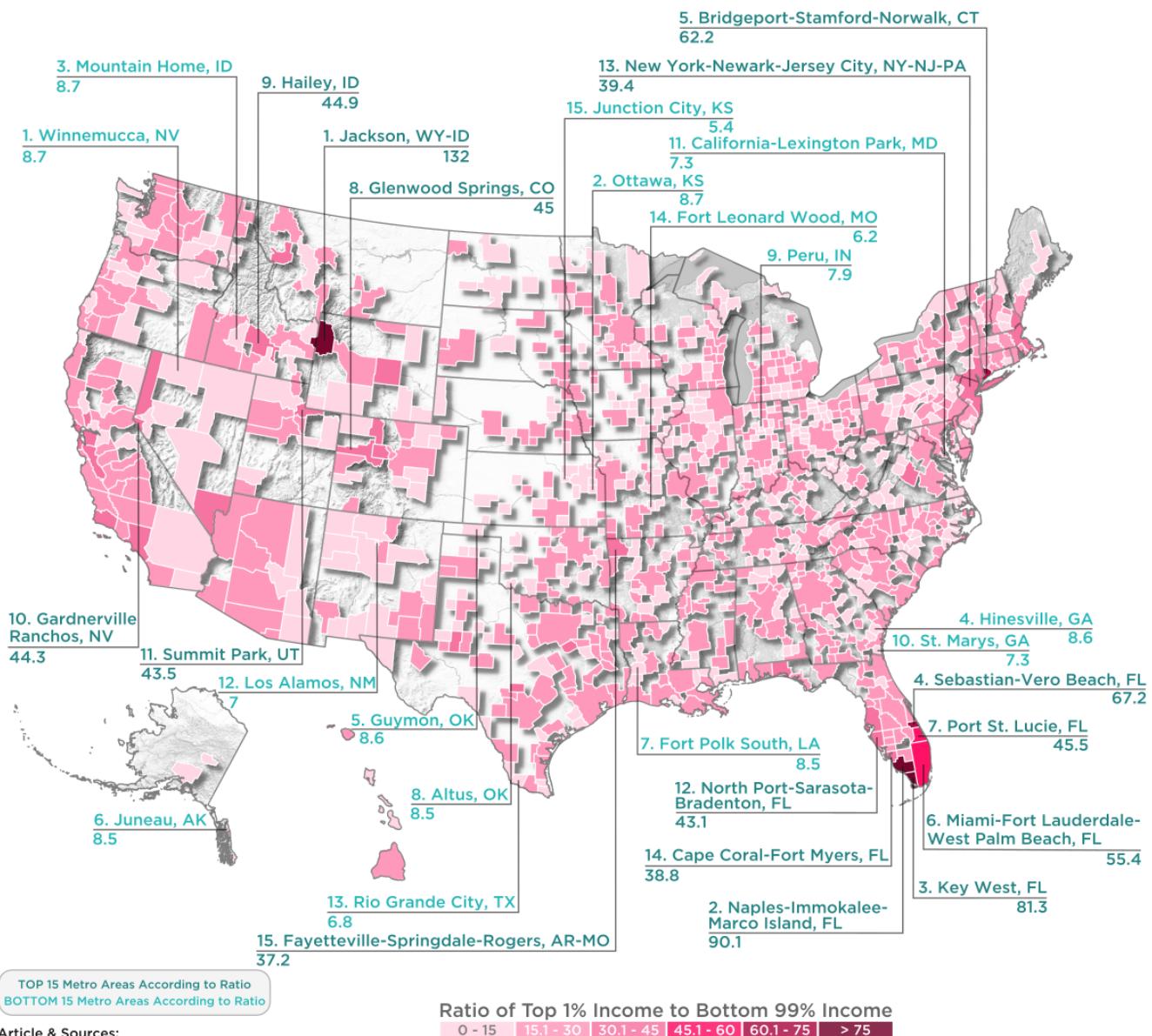
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Global inequality has been on the rise across the globe for several decades. Some countries have reduced the numbers of people living in extreme poverty. But economic gaps have continued to grow as the very richest amass unprecedented levels of wealth. Among industrial nations, the United States is by far the most top heavy, with much greater shares of national wealth and income going to the richest 1 percent than any other country. <https://inequality.org/facts/global-inequality/>

# Income Inequality in the United States

## How Much More the Top 1% Makes Compared to Everybody Else



Article & Sources:

<https://howmuch.net/articles/inequality-map-us-metro-areas>  
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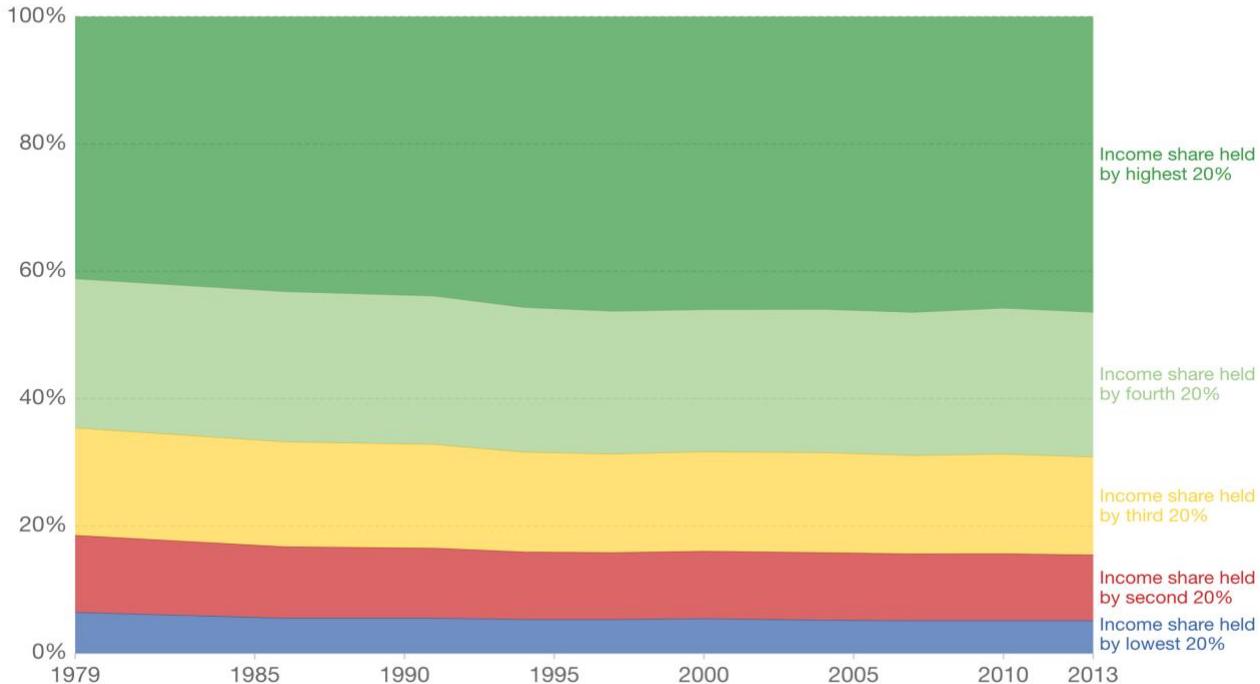
**howmuch**.net

Income includes the revenue streams from wages, salaries, interest on a savings account, dividends from shares of stock, rent, and profits from selling something for more than you paid for it. Unlike wealth statistics, income figures do not include the value of homes, stock, or other possessions. Income inequality refers to the extent to which income is distributed in an uneven manner among a population. We equate wealth with "net worth," the sum total of your assets minus liabilities. Assets can include everything from an owned personal residence and cash in savings accounts to investments in stocks and bonds, real estate, and retirement accounts. Liabilities cover what a household owes: a car loan, credit card balance, student loan, mortgage, or any other bill yet to be paid. In the United States, wealth inequality runs even more pronounced than income inequality. <https://inequality.org/facts/income-inequality/>

## Income shares by quintile, United States, 1979 to 2013

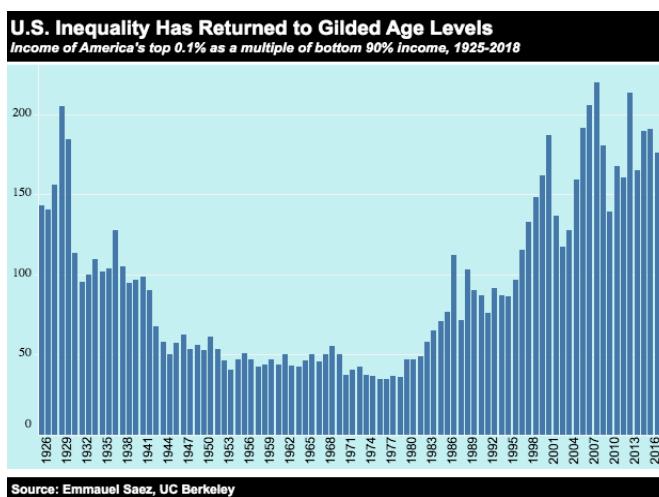
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Percentage share of income or consumption is the share that accrues to subgroups of population by quintiles. For example, in a country with 100 people, if you rank them by income the share of the lowest quintile corresponds to the sum of incomes of the bottom 20 people, as a proportion of total income in that country.

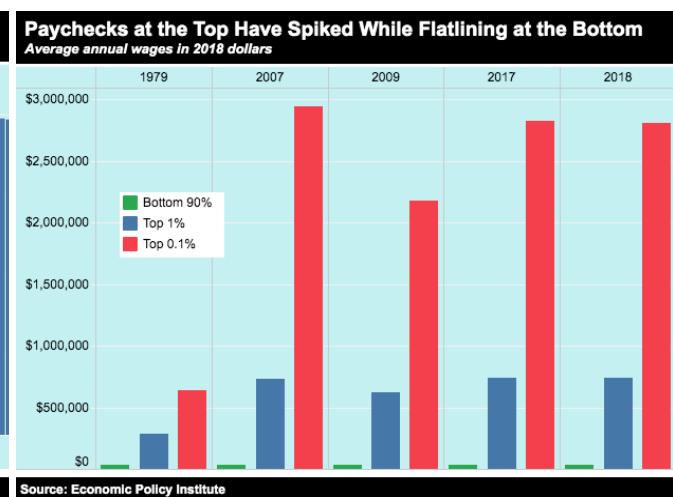


Source: World Bank Poverty and Equity database

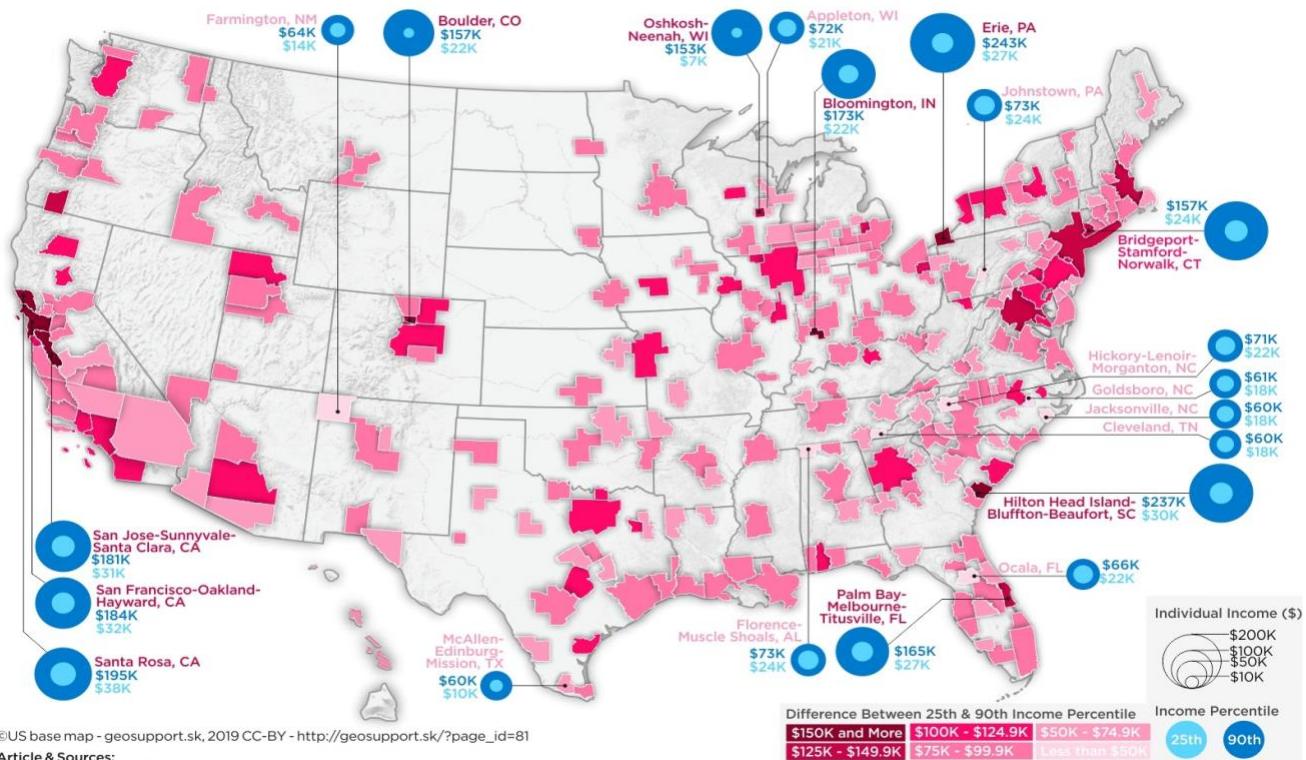
[OurWorldInData.org/income-inequality/](http://OurWorldInData.org/income-inequality/) • CC BY



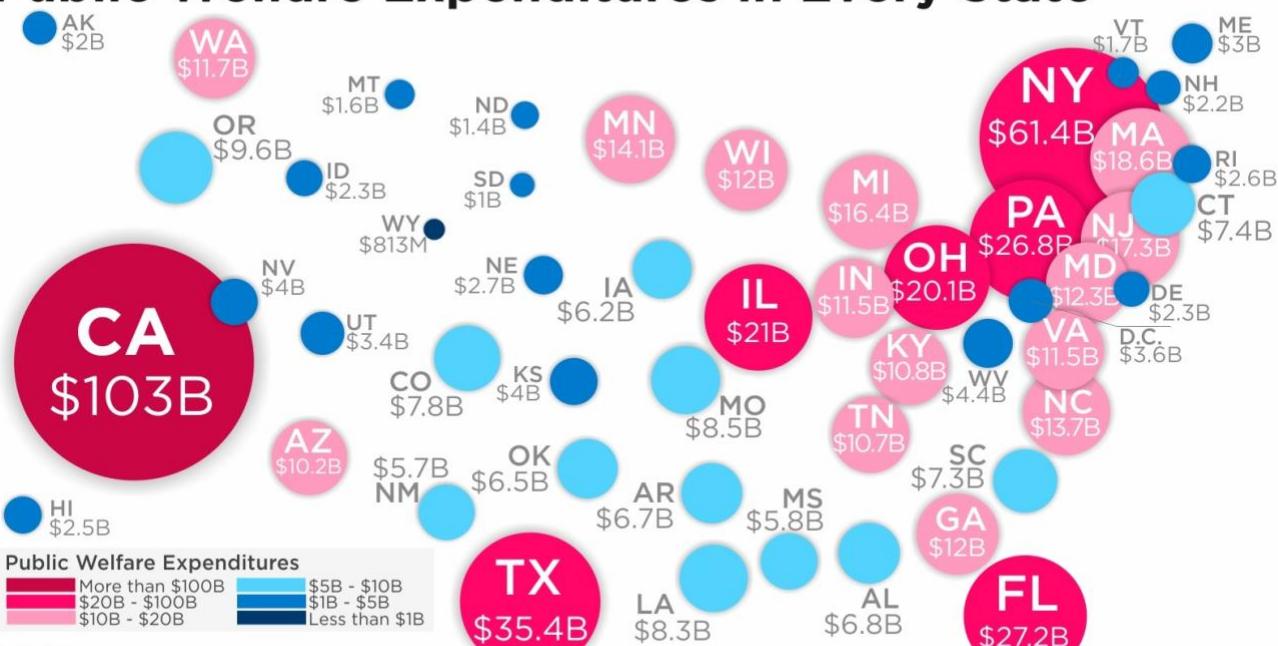
<https://inequality.org/facts/income-inequality/>



## Top 10 Most Equal/Unequal U.S. Metropolitan Areas by Income Difference Between 25th & 90th Individual Income Percentile



## Public Welfare Expenditures in Every State



What is public welfare? This can be a controversial topic with a lot of stereotypes, so let's get our definitions straight. If you rely on public welfare, then you turn to the government for help with paying your basic necessities, like food, housing and healthcare. The federal government runs programs that provide these types of things, and to varying degrees, so do some states. As you can clearly see, some places are more generous than others. California is the obvious standout on the West Coast, dropping north of \$100 billion on public assistance. Texas is the only other Western state with over \$30 billions of expenditures, followed by Washington at under \$12 billion. There's a significant cluster of high-spending states across the Northeast, including New York (\$61.4B) and Pennsylvania (\$26.8B). Florida stands out in the South at over \$27B, thanks in large part to its retirement communities. There's also a cluster of states in the Upper Midwest in light pink, where there are a lot of old manufacturing cities. The top ten states listed above spend more on public welfare (\$346.9B) than all of the bottom forty states (plus the District of Columbia) combined (\$262.7B). Regardless of how populated any particular state is, you want to pay attention to these numbers because they foreshadow future budget problems. When you consider the fact that many states run operating deficits and have enormous debt problems, you begin to wonder if some of these numbers are sustainable for the long term. <https://howmuch.net/articles/public-welfare-expenditures-in-every-state>

The dramatic discrepancy in resources raises a central question for public finance. Social welfare may be maximized by redistributing from high-income individuals to low-income individuals, but the private sector is unlikely to provide such income redistribution. Government can solve this problem by taxing its citizens to provide public redistribution. The most well-known source of redistributing income to low-income citizens is through cash welfare, government programs that make cash payments to low-income populations. (Gruber, 2019)

## I. Poverty, Inequality, and Welfare Programs

### 2. Absolute deprivation and poverty rates

- 1) Inequality does not measure absolute deprivation.
- 2) Absolute deprivation: The amount of income the poor have relative to some measure of "minimally acceptable" income. Measured by the share of people below poverty line.
- 3) Poverty line: The federal government's standard for measuring absolute deprivation. It was determined to be three times the cost of a minimally nutritionally accepted diet.
- 4) What matters—relative or absolute deprivation?
  - a. The "minimal" standard of living may be best defined relative to the living standard of others.
  - b. Greater relative income inequality itself may decrease individual well-being.

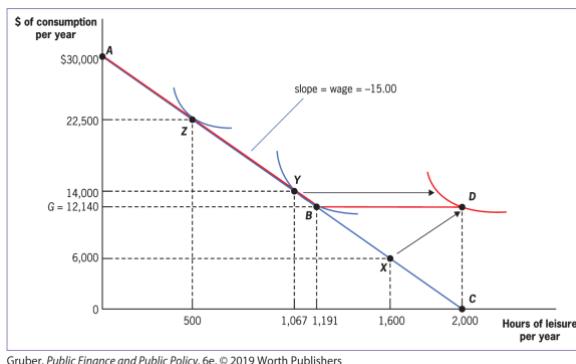
### 3. Types of welfare programs

- 1) Categorical welfare: Welfare programs restricted by some demographic characteristic, such as single motherhood or disability.
- 2) Means-tested welfare: Welfare programs restricted only by income and asset levels.
- 3) Cash welfare: Welfare programs that provide cash benefits to recipients.
  - a. Temporary Assistance for Needy Families (TANF): Low-income families, one parent absent.
  - b. Supplemental Security Income: Serves aged, blind, and disabled.
- 4) In-kind welfare: Programs that deliver goods, such as medical care or housing, to recipients.
  - a. Supplemental Nutrition Assistance Program (SNAP): Provides a debit card to buy food.
  - b. Medicaid: Largest categorical welfare program
  - c. Public Housing: "Section 8 vouchers" subsidize housing
  - d. Nutritional Programs: Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and School Lunch and Breakfast Programs

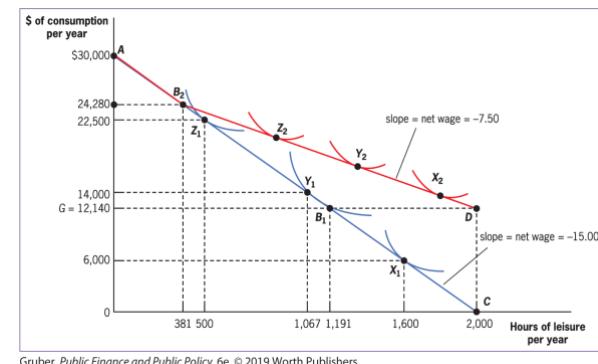
## II. Theoretical Analysis of the Moral Hazard Effects of a Means-Tested Transfer System

### 1. Means-tested transfer systems cause moral hazard

- 1) Consider a simplified version of TANF, with benefits  $B = G - t \times w \times h$ , where  $G$  is the guarantee,  $t$  is the benefit reduction rate,  $w$  wages, and  $h$  hours worked. This ignores behavioral responses.
- 2) Benefit guarantee (BG): Cash welfare benefit for individuals with no other income, which may be reduced as income increases. Benefit reduction rate (GRR): The rate at which welfare benefits are reduced per dollar of other income earned. Both of these vary dramatically between states.
- 3) Graph A is the labor supply decision with a 100% BRR and \$12140 BG (poverty line BG): All families with income below the poverty line and many individuals with income above the poverty line immediately stop earning income so they can get more leisure and consumption (X and Y). But person Z will be better off staying in the labor market. Why?
- 4) Graph B is the labor supply decision with a 50% BRR and \$12140 BG
  - a. With a BG of \$12140 and a BRR of 50%, once income reaches \$24280, individuals are no longer eligible for benefits. The slope of the budget constraint is the net wage.
  - b. Individuals X and Y will increase their labor supply (relative to the case of 100% BRR)
  - c. Individual Z will be induced to take the welfare and reduce labor supply
  - d. The net impact of new rate on labor supply is ambiguous and depends on relative sizes and preferences of worker group.
- 5) Implication: Lowering BRR can potentially (and partially) solve moral hazard problem



Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers



Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

### 2. The “Iron Triangle” of redistributive programs

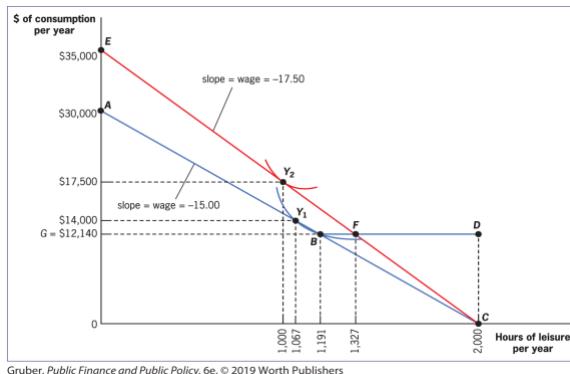
- 1) Reducing the benefit rate ends up redistributing less
- 2) Iron triangle: There is no way to change either the benefit reduction rate or the benefit guarantee to simultaneously encourage work, redistribute more income, and lower costs.
- 3) There are three approaches that might get around this iron triangle.
  - a. Moving to categorical welfare payments
  - b. Using ordeal mechanisms
  - c. Increasing outside options

### 3. What makes a good targeting mechanism?

- 1) Moral hazard arises because of the redistribution to poor people, but people control their income.
- 2) If we could target benefits to earnings capacity, there would be no moral hazard.
- 3) Two targets are people with disabilities and single mothers.
  - a. No way to change behavior in order to qualify.
  - b. Targets people with low earning capacity.

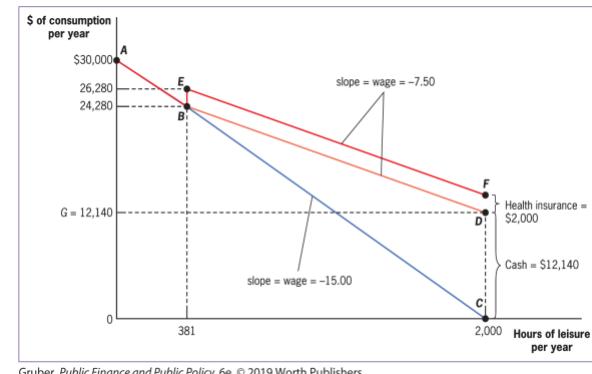
### 4. Ordeal mechanisms: Features of welfare programs that make them unattractive, leading to the self-selection of only the most needy recipients.

- 1) The paradox of ordeal mechanisms: If the government provides a benefit that is not attractive to the non-needy but helps out the truly needy, then targeting will be more efficient.
  - 2) The paradox of ordeal mechanisms is therefore that apparently making the less able worse off can actually make them better off.
4. Increase the outside options available to individuals
- 1) Training: Modest declines in welfare use; earnings increase.
  - 2) Labor Market Subsidies: Increase employment; reduces welfare use.
  - 3) Child Care: Increases mother's employment.
  - 4) Child Support: Shifts burdens to "deadbeat dads."
  - 5) Remove welfare lock: Higher wages make welfare a less attractive option relative to work
    - a. For many low-income mothers, health insurance is tied to nonwork through Medicaid.
    - b. Unlinking cash and in-kind benefits increases the value of working.
    - c. Under the current system, working more than a small amount produces a large penalty from lost Medicaid benefits.
  - 6) Graph A: Enhance worker's productivity leads to higher wage → increase opportunity set
  - 7) Graph B: Linking health insurance coverage through Medicaid to cash welfare → increase labor
  - 8) Causal effects in theory: Higher wages make welfare a less attractive option relative to work. Uncouple women's eligibility for health insurance from their receiving cash welfare payments; however, even the largest estimates suggest that such uncoupling only very modestly decreases the number on welfare rolls.



##### 5. Universal basic income

- 1) While the U.S. economy has grown steadily since the end of the Great Recession, those benefits are not being shared widely in society. Accompanying this growing inequality has been a sense that the existing welfare system is not equipped to address the income disparities in society.
- 2) There has been a resurgence of interest among progressive policy experts in establishing a universal basic income (UBI), which gives all citizens a flat grant of income, no strings attached.
- 3) A UBI that brings every U.S. citizen out of poverty would be very expensive, costing \$1.5 trillion per year. This is about the same as the Medicare and Medicaid programs combined.
- 4) For this reason, attention has turned to more constrained proposals. One of these is a universal child benefit, ensuring at least that children are adequately provided for.



III. Conclusion: Welfare programs have been a source of contentious debate for many years, and the past decade has witnessed the most radical reform of cash welfare since the program's inception. Despite the apparent success of the 1996 welfare reform, welfare debates will no doubt continue in the future.

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How Increasing the Federal Minimum Wage Could Affect Employment and Family Income [\(w\)](#)

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202102 Business incomes at the top [\(w\)](#)  
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