

Introduction to Public Economics

Governments play a crucial role in much economic life.

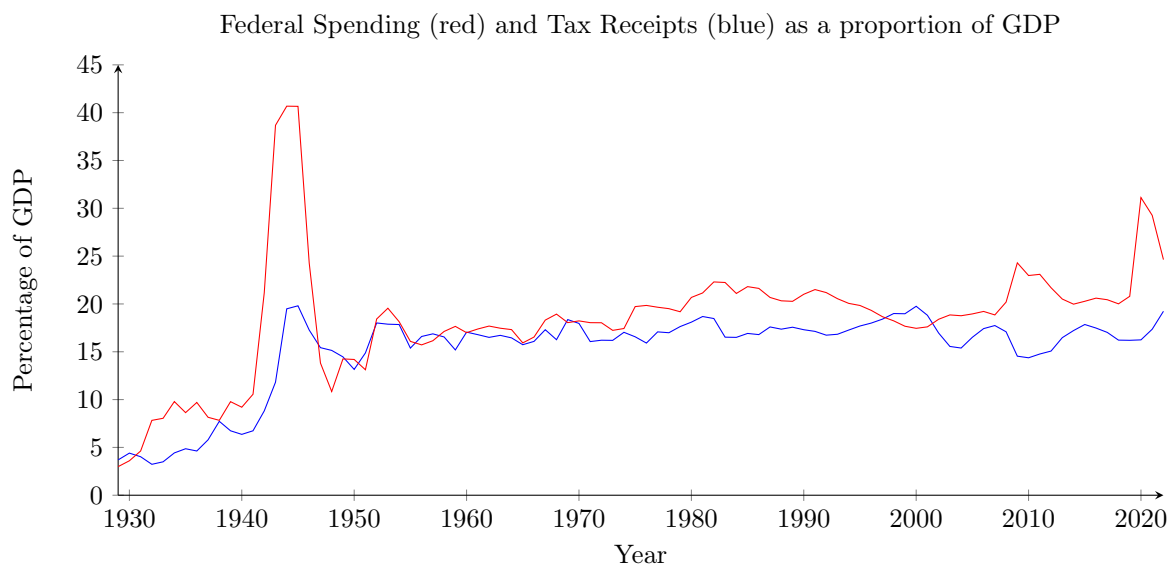
- Regulatory structure (financial markets, pharmaceuticals, labor markets, civil rights).
- Taxes.
- Public goods and social welfare spending.
- Macroeconomic stabilization.

Public finance is the study of the role of government in a market economy, primarily focusing on taxes and spending.

Reasons to study public economics:

- Governments have a lot of power in the realm of economic welfare.
- Nearly every economic transition is mediated by the government.
- It can inform debates about the appropriate role of government regarding taxes, healthcare, climate change, etc.
- The government is large.
 - It employs 1/6 of the US Workforce.
 - Tax revenue is approximately 27% of the United States's Gross Domestic Product.

The government (as measured by tax revenue/GDP) greatly increased in size between 1910 and 1940 (due to the establishment of the welfare state and various wars).



Two Motivations for Government Intervention

- Market Failure
- Redistribution

The First Welfare Theorem states that *in the absence of market failure*, markets will yield a result along the **utility possibilities frontier** (i.e., the set of all maximized utilities given the current market).

However, there are a lot of market failures:

- Externalities (pollution, network effects from vaccination)
- Public Goods (public safety)
- Asymmetric Information (market for lemons)
- Individual Mistakes (failure to save)
- Imperfect Competition (oligopoly, cartelization)

Policymakers also have to consider the *equity-efficiency tradeoff* in redistribution (i.e., some redistributive acts might reduce total utility)

Government as Social Cooperation

- Economists tend to have a narrow view of human behavior, but social cooperation undergirds much of the levels of societal coordination beyond individuals (i.e., families, communities, countries, global superstructures)
- Human societies of old depended on social cooperation for protection and taking care of the young, sick, and old.
- Modern states are the primary form of coordination today.
- Humans reveal their social nature (or social solidarity) via the size of the government (informal and formal).

Activity 1

Activity: Introduction to Public Economics

Econ 308

Brandon Lehr

Dani Rodrik and Stefanie Stantcheva (2021) begin their recent working paper as follows:

One of the biggest challenges that countries face today is the very unequal distributions of opportunities, resources, income and wealth across people. Inclusive prosperity — whereby many people from different backgrounds can benefit from economic growth, new technologies, and the fruits of globalization — remains elusive. To address these issues, societies face choices among many different policies and institutional arrangements to try to ensure a proper supply of productive jobs and activities, as well as access to education, financial means, and other endowments that prepare individuals for their participation in the economy. In this paper we offer a simple, organizing framework to think about policies for inclusive prosperity.

1. This framework is illustrated with the 3x3 matrix below. Where might the following public policies fit in this matrix?
 - (a) cash transfers to low income people
 - (b) estate/inheritance taxation (based on estate of deceased)
 - (c) healthcare; primary education
 - (d) minimum wage; apprenticeships
 - (e) on-the-job training; labor laws; protectionist trade policy
 - (f) progressive income taxation; wealth taxes; corporate taxes
 - (g) public higher education
 - (h) R&D tax credits; antitrust policy
 - (i) social insurance (e.g., unemployment insurance, disability insurance, Social Security)
 - (j) universal basic income

		At what stage of the economy does policy intervene?		
		Pre-Production Stage: shape the endowments with which people enter the workforce	Production Stage: shape the employment, investment, and innovation decisions of firms	Post-Production Stage: redistribute income and wealth after they have been realized
Which income group is the target of the policy?	Bottom	(c)	(d)	(a)(f)(i)(j)
	Middle	(c)(g)	(d)(e)	(f)(i)(j)
	Top	(c)	(h)	(b)(f)(i)(j)

2. At which stage do you think it is most important for policy to intervene? Why?

Pre-production: helps to equalize endowments to equalize opportunity

Microeconomic Foundations: Consumer Theory

Utility function $u(X, Y)$ translates consumption quantities into utility.

Indifference curve A graphical representation of all bundles of goods that make an individual equally well off. Mathematically, an indifference curve is the set of all bundles (X, Y) such that $u(X, Y) = U$ for some utility level U .

Marginal Rate of Substitution MRS_{XY} is the negative slope of the indifference curve — it's the rate at which the consumer will trade Y for X .

$$MRS_{XY} = \frac{\partial u / \partial X}{\partial u / \partial Y}$$

Budget Constraint the set of all bundles for which the total amount spent equals income

- Let I indicate income and P_X and P_Y represent the prices of goods X and Y respectively.
- The budget constraint is the line segment $P_X X + P_Y Y = I$.
- The slope of the budget constraint is $-\frac{P_X}{P_Y}$.

Utility Maximization A rational consumer maximizes utility subject to the budget constraint via the parallel conditions of tangency ($MRS_{XY} = \frac{P_X}{P_Y}$) and the budget constraint ($P_X X + P_Y Y = I$).

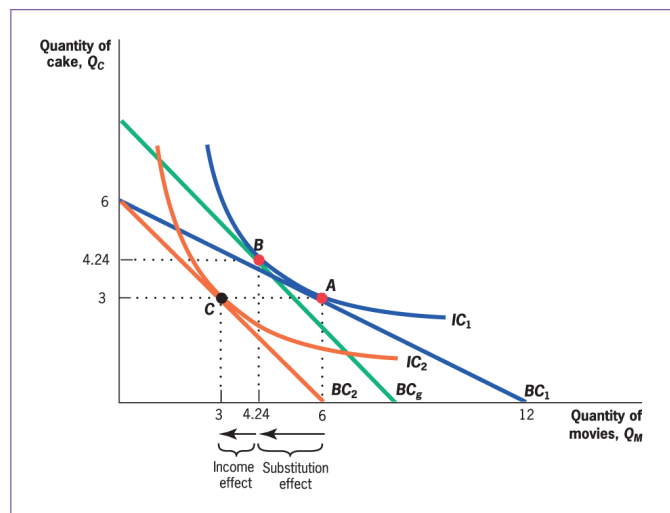
Demand Functions Utility maximization generates demand functions (quantity in terms of price) $X(P_X, P_Y, I)$ and $Y(P_X, P_Y, I)$. There are two primary canonical utility functions.

- Cobb-Douglas: $u(X, Y) = A \ln(X) + B \ln(Y)$, or $u(X, Y) = X^A \cdot Y^B$. The demand function for this utility function yields that P_X has no effect on Y and P_Y has no effect on X .
- Quasilinear: $u(X, Y) = v(X) + BY$ where $v'(X) > 0 > v''(X)$ (i.e., concave down, sloping up). The demand function for this utility function yields that I has no effect on X assuming an interior solution.

Price Effects The impact of a change in P_X on demand for X is composed into two effects:

- Substitution Effect: change in consumption due to the change in relative prices, with utility held equal. When the price of a good increases, the substitution effect is always negative, and vice versa.
- Income Effect: change in consumption due to a change in purchasing power as a result of the price change, where relative prices are held constant at the final price ratio. Income effects can be positive or negative depending on the type of good.
- The total effect is equal to the income effect and the substitution effect.

Income and Substitution Effects



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

Price Elasticity The price elasticity of demand is the % change in demand caused by a 1% change in price of a good.

$$E^D = \frac{dD}{dP} \frac{P}{D}$$

Elasticities are *unit-free*, typically negative, and tend not to be constant along a demand curve.

Game Theory

Some decision problems involve strategic interactions between individuals.

- For example, Antonia and Bruno might care about giving to a local charity, and give G_A and G_B respectively.
- Their utility functions depend on each other $u_A(G_A, G_B), u_B(G_A, G_B)$.
- The **Nash Equilibrium** yields each individual choosing an action that maximizes their utility *given the other person's behavior*.

Social Welfare

Economists incorporate distributional concerns by use of social welfare functions.

$$SWF = f(U_1, U_2, \dots, U_n)$$

We have two canonical social welfare functions:

- Utilitarian SWF: $SWF = U_1 + U_2 + \dots + U_n$.
 - Marginal utility decreasing in income \rightarrow redistribution from the rich to the poor.
 - Taking \$1 from a rich person decreases their utility by a small amount, but transferring to a poor person increases their utility by a large amount.
- Rawlsian SWF: $SWF = \min\{U_1, U_2, \dots, U_N\}$
 - Social welfare is maximized by maximizing the well-being of the worst-off person.
 - Rawlsian social welfare is more redistributive than utilitarian social welfare.

There are a few other philosophies regarding the fairness of economic distribution in society.

Just deserts Individuals should be compensated in line with their contributions.

Commodity egalitarianism Society should ensure that individuals meet a set of basic needs, but beyond that point income distribution is irrelevant.

Equality of opportunity Society should ensure that all individuals have equal opportunities for success.

Present Discounted Value

The present discounted value of a future value of money F that is received and spent in n periods is:

$$PDV = \frac{F}{(1+r)^n}$$

For the **discount rate** r , typically the interest rate.

For a stream of future expenses F_i , we use the following formula:

$$PDV = \sum_{i=1}^n \frac{F_i}{(1+r)^i}$$

If the values of F_i are equal, then $PDV = \frac{F}{r}$, via the geometric series formula.

Activity 2

Activity: Theoretical Tools of Public Economics

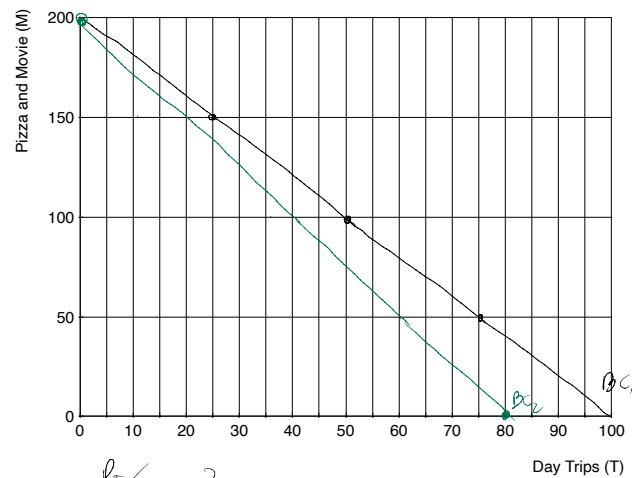
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1 Gruber 2.14: Consumer Choice

You have \$4,000 to spend on entertainment this year (lucky you!). The price of a day trip (T) is \$40 and the price of a pizza and a movie (M) is \$20. Suppose that your utility function is $u(T, M) = T^{3/4} \times M^{1/4}$.

- a. Draw the budget constraint below. What combination of T and M will you choose?



$$\frac{P_T}{P_M} = 2$$

$$\frac{\partial u}{\partial M} = \frac{1}{4} \left(\frac{T}{M} \right)^{3/4}$$

$$\frac{\partial u}{\partial T} = \frac{3}{4} \left(\frac{M}{T} \right)^{1/4}$$

$$\frac{\frac{\partial u}{\partial T}}{\frac{\partial u}{\partial M}} = 3 \frac{M}{T}$$

$$2 = \frac{3M}{T}$$

$$40T + 20M = 4000$$

$$60M + 20M = 4000$$

$$80M = 4000$$

$$\boxed{M = 90}$$

$$\boxed{T = 75}$$

$$3M = 2T$$

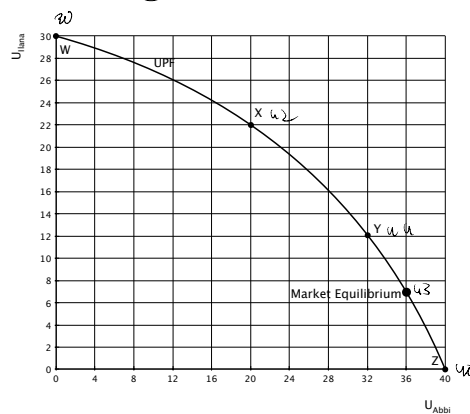
- b. Suppose that the price of day trips rises to \$50. Draw the new budget constraint in the same plot in part (a). What combination of T and M will you now choose?

$$\begin{aligned}
 p_T/p_M &= 3/2 \\
 M/p_M &= 3M/T \\
 8T &= 6M \\
 50T + 20M &= 4000 \\
 60M + 20M &= 4000 \\
 \boxed{M=50} \\
 \boxed{T=60}
 \end{aligned}$$

2 Bonus: Social Welfare Functions

The utility possibilities frontier (UPF) drawn below corresponds to an economy with only two individuals, Abbi and Ilana. There is a high level of inequality at the market equilibrium outcome, i.e., Abbi is rich, while Ilana is poor. Which of the four labeled points (W , X , Y , Z) is most preferred by a social planner with:

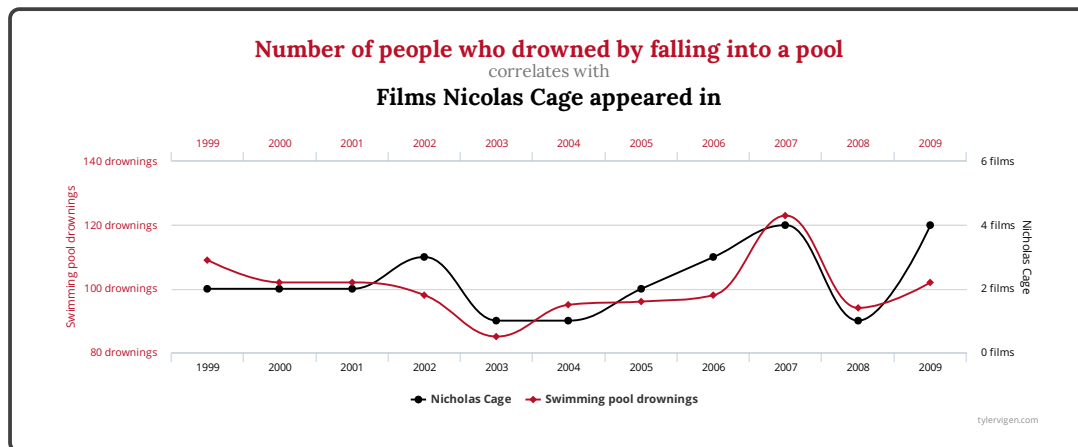
- a. a utilitarian social welfare function? (Y)
 b. a Rawlsian social welfare function? (X)



Empirical Tools of Public Economics

Identification Problem: When two variables, A and B , are correlated with each other, how do you identify which is causing which (or if both are being caused by something else)? Could the correlation be spurious?

Spurious Correlation



Randomized Controlled Trials

The gold standard of experimentation.

- One group obtains the treatment, one gets the placebo.
- The two groups must have close to identical traits aside from the treatment, which is part of the “control.”

Randomized controlled trials tend to be common in science, and have grown in popularity in the social sciences, but for economics, RCTs are often difficult to carry out (after all, you cannot split up the timeline).

Limitations of RCTs

External validity: it's difficult to apply the outcomes of a randomized controlled trial to other contexts.

Attrition: unequal loss of participants (i.e., people in the control group drop out more than the treatment group, or vice versa).

Unethically: little feedback on the part of participants, and the interests of participants aren't necessarily taken into account.

Observational Data

Data generated by individual behavior observed in the real world, not in specially-designed experiments.

- Time Series analysis: changes in two different stats over time and trying to find results from said changes.
- Cross-Sectional Regression Analysis: finding a relationship between two variables with many data samples.

$$Y_i = \alpha + \beta X_i + \epsilon_i$$

The OLS estimate, $\hat{\beta}$, is the slope of the data. In order for this relationship to be causal, the error term, ϵ_i , must be uncorrelated with X_i .

Quasi-Experiments

Changes in the economic environments that create nearly identical treatment and control groups for studying the effect of that environmental change, allowing economists to take advantage of quasi-randomization created by external forces.

Activity 3

Activity: Empirical Tools of Public Economics Econ 308

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1 Air Quality and Covid-19

There have been a number of recent studies that estimate a positive association between regions with poor air quality and Covid-19 mortality rates.¹

- a. Write-ups about such studies in the popular press often suggest that poor air quality increases the severity of illness from Covid-19. Why might this inference be unwarranted?

*There are other confounders like poverty, population density, etc.
that affect the rate of mortality*

- b. Suppose you were tasked with empirically testing the hypothesis that poor air quality impacts Covid-19 mortality rates.

- i. Suggest a randomized controlled trial to test this hypothesis. Assume away any legal, financial, or ethical constraints.

*Take two groups, put one in a polluted area
and one in a clean area and give both groups
Covid*

- ii. Suggest a plausible quasi-experiment to test this hypothesis.

*LA county mortality rate in Jan vs. without
masking.*

¹<https://www.lung.org/blog/covid-19-mortality-and-air-pollution>

2 Gruber 3.14: Tax Cut Effects

Your state introduced a tax cut in 2017. You are interested in seeing whether this tax cut has led to increases in personal consumption within the state. You observe the following information:

Year	Consumption in Your State
2012	330
2014	350
2016	370
2018	430

- a. Your friend argues that the best estimate of the effect of the tax cut is an increase in consumption of 60 units, but you think that the true effect is smaller because consumption was trending upward prior to the tax cut. What do you think is a better estimate?

40 units (trend before vs. trend after)

- b. Suppose that you find information on a neighboring state that did not change its tax policy during this time period. You observe the following information in that state:

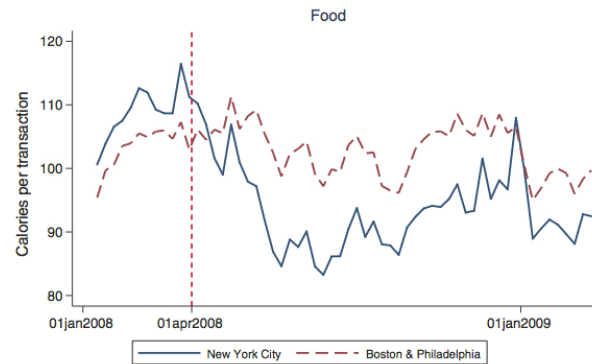
Year	Consumption in Neighboring State
2012	300
2014	320
2016	340
2018	350

Given this information, what is your best estimate of the effect of the tax cut on consumption? What assumptions are required for that to be the right estimate? Explain.

50 units (assuming similar trend would otherwise happen)

3 Bonus: Starbucks Calorie Posting

The Affordable Care Act (Obamacare) included nutritional labeling requirement for restaurants with at least 20 locations. A similar policy was enacted on April 1, 2008 in New York City (but nowhere else). Bollinger et al. (2011) study the effect of the New York City law on caloric purchases at Starbucks, summarizing their data in the figure below:



The average food calories per transaction were:

	New York City	Boston and Philadelphia
Before Law	107	102
After Law	87	96

- a. What is the difference-in-differences estimate of the causal effect of the NYC labeling law?

-14

- b. Do you find this to be a surprising result? Why or why not?

No, people tend to be self-conscious.