Economics: How Economies Work

Figures current as of October 2026

How economists reason and what their tools explain, from a single market to the whole economy. The course covers scarcity and opportunity cost; trade and specialization; supply, demand, and how strongly people respond to prices; what markets do well and what happens when governments set prices; firms, competition, and market power; costs that fall on others, public goods, and what happens when one side knows more; how pay, interest, and rent are set; how the whole economy is measured; inflation, unemployment, and the business cycle; the schools of economic thought; money and central banks; budgets and debt; and long-run growth. The year 2026 serves as the running test of every tool.

MODULE 1 — Scarcity, Choice, and Cost

Goal: Learn the economist's way of reasoning about choices, and weigh whether economics is a science.

Scarcity and opportunity cost; thinking at the margin and ignoring sunk costs; incentives and their side effects; the production possibilities frontier and the trade-off between guns and butter; claims of fact and claims of value; models; how economists test ideas; and the full cost of a four-year degree, worked through.

MODULE 2 — Trade and Specialization

Goal: Understand why specialization and trade make people richer and who loses, and weigh whether tariffs can bring back industry and good jobs.

The division of labor; absolute and comparative advantage; the gains from trade; the China shock and the places it hit; and two producers' trade, worked through.

MODULE 3 — Supply, Demand, and Prices

Goal: Learn how prices form and what they do, and weigh whether computers could now plan an economy.

Demand, supply, and what shifts each; equilibrium, shortages, and surpluses; prices as signals; what markets need; central planning's record; and the egg market of 2025-26, worked through.

MODULE 4 — Elasticity: How Much People Respond

Goal: Measure how strongly buyers and sellers respond to prices, and weigh whether taxes on soda, tobacco, and alcohol change behavior enough to justify them.

Price elasticity of demand and supply; what makes people responsive; total revenue; income and cross-price elasticity; why oil prices swing so hard; who bears a tax, with the tariffs of 2025-26; and the cocoa cycle of 2024-26, worked through.

MODULE 5 — Markets and Welfare

Goal: Learn what buyers and sellers gain from a sale and what a tax costs, and weigh whether some things should not be for sale.

Consumer and producer surplus; when a market makes the total as large as it can be; efficiency and fairness; a tax's revenue, burden, and deadweight loss; subsidies; and a tax on one market, worked through.

MODULE 6 — When Governments Set Prices

Goal: Follow what happens when governments cap a price or set a floor under it, and weigh rent control and the minimum wage.

Ceilings and the shortages, queues, falling quality, and black markets that follow; laws against price gouging and the fuel spike of 2026; floors, from farm supports to the minimum wage; employers' power over pay; and New York's rent freeze of 2026, worked through.

MODULE 7 — Firms, Costs, and Competition

Goal: Learn how a firm's costs shape what it supplies, and how competition disciplines profit.

Why firms exist; diminishing returns; fixed, variable, average, and marginal cost; economies of scale; economic profit; perfect competition, the shutdown point, entry, and exit; and a trucking firm's costs, worked through.

MODULE 8 — Market Power

Goal: Understand how firms with power over price behave and how antitrust law responds, and weigh whether American business has become too concentrated.

Barriers to entry; how a monopolist prices and what it costs everyone else; price discrimination; natural monopoly and its regulators; oligopoly, game theory, and cartels, with OPEC+; platforms; antitrust in 2025-26; and a cartel's payoffs, worked through.

MODULE 9 — Externalities, Public Goods, and the Commons

Goal: Learn when markets fail because costs and benefits fall on others, and weigh whether to price carbon, subsidize clean energy, or regulate.

Externalities and four remedies; bargaining as a fifth; public goods and free riders; common resources and the evidence that communities can govern them; carbon policy in Europe, Canada, and the United States; and New York's congestion charge, worked through.

MODULE 10 — Information, Incentives, and How People Decide

Goal: Understand what happens when one side knows more and how real people decide, and weigh whether governments should nudge.

Adverse selection, moral hazard, signaling, and screening; principals and agents; targets that get gamed; behavioral economics and the power of defaults; and an insurance pool's spiral, with the marketplace of 2026, worked through.

MODULE 11 — Wages, Interest, and Rent

Goal: Learn how pay, interest, and rent are set and how income is divided, and weigh why labor's share has fallen.

What a worker adds and what a worker earns; why pay differs; interest as the price of time and present value; land and economic rent; the shares of labor and capital; inequality among households; and a degree's value today, worked through.

MODULE 12 — Measuring the Whole Economy

Goal: Learn how a nation's output is measured and what the numbers miss, and weigh whether a trade deficit means a country is losing.

GDP three ways and its parts; real and nominal, per person, and at purchasing power; the identity that links trade, saving, and investment; what GDP leaves out; the statistics under strain in 2025-26; and the third-quarter GDP report of 2026, worked through.

MODULE 13 — Inflation and Unemployment

Goal: Understand how inflation and unemployment are measured and caused, and weigh what drove the inflation of 2021-23.

Price indexes and their biases; the 2% target; the causes of inflation and the quantity equation; who gains and who loses; hyperinflation and Argentina's stabilization; Japan's deflation; unemployment and its natural rate; the Phillips curve; and a household's own inflation rate, worked through.

MODULE 14 — Booms and Busts: Aggregate Demand and Supply

Goal: Learn how shocks move a whole economy, and weigh whether 2026 is a replay of the 1970s.

The business cycle and how recessions are dated; aggregate demand and supply; demand shocks and supply shocks; the multiplier; stagflation; the recessions of 2008-09 and 2020; and two shocks traced through an economy, worked through.

MODULE 15 — Why Economists Disagree: The Schools

Goal: Map the schools of economic thought and how each has fared, and weigh whether economics needs a new paradigm.

Classical economics, Marx, and Keynes; Hayek and the Austrians; Friedman and the monetarists; rational expectations and real business cycles; the New Keynesian synthesis; Minsky, secular stagnation, Modern Monetary Theory, and behavioral economics; the tests of the 1970s, 2008, and 2021-23; and one shock seen through each school, worked through.

MODULE 16 — Money, Banks, and the Central Bank

Goal: Understand what money is and how a central bank moves the economy, and weigh rules against discretion and how independent a central bank should be.

Money and how banks create it; the central bank's tools; how a change in rates reaches the economy, and how long it takes; the Taylor rule; what monetary policy cannot do; independence and the rulings of 2026; and the Taylor rule at October 2026 numbers, worked through.

MODULE 17 — Budgets, Deficits, and Debt

Goal: Learn what government budgets can and cannot do for the economy, and weigh how much debt is too much.

Taxes, spending, and transfers; automatic stabilizers and chosen stimulus; multipliers; crowding out and Ricardian equivalence; deficits and debt in 2026; the arithmetic of debt; and the debt ratio's path, worked through.

MODULE 18 — Long-Run Growth

Goal: Understand why some economies grow rich, and weigh whether AI will raise productivity growth much.

Compounding and the rule of 70; the long record of living standards; where growth comes from; the Solow model and catch-up; ideas and institutions; America's productivity eras; and what 1% against 2% growth means over a working life, worked through.

MODULE 19 — Where Things Stand, and What to Watch

Goal: Close with the argument, the contradictions, and a dated watch list.

The course's argument on a page; the contradictions no single module states; what to watch from October 2026 on; and a last word.

A note on the sources: American output and incomes come from the Bureau of Economic Analysis (BEA), the Commerce Department's statistics agency, and prices, jobs, and productivity from the Bureau of Labor Statistics (BLS) in the Labor Department. Household incomes and poverty come from the Census Bureau, and the federal budget from the Congressional Budget Office (CBO), Congress's nonpartisan budget scorekeeper, and the Treasury. Interest rates come from the Federal Reserve, the central bank, called the Fed. Its Federal Open Market Committee (FOMC) sets its policy rate. Recessions are dated by a committee of the National Bureau of Economic Research (NBER), a private research organization, and the world's figures come from the International Monetary Fund (IMF). Studies are named by their authors and where they were published, so a reader can find them.

Every figure names its date. Market prices are those of the close of October 14, 2026 unless another date is given, and the economic releases run through October 29, 2026, the day the first estimate of third-quarter growth was published. Forecasts and projections are labeled as such, and figures from advocates or companies are attributed to them.

The year 2026 runs through the course as a test of its tools. Eggs and cocoa show prices at work (Modules 3 and 4), and New York's rent freeze and the minimum wage show governments setting prices (Module 6). The oil cartel's split shows game theory (Module 8), congestion pricing shows a tax on a harm (Module 9), and the health insurance marketplaces show adverse selection (Module 10). The third-quarter GDP report shows how output is measured (Module 12), and the oil shock shows a supply shock moving through an economy (Module 14). The Federal Reserve's first rate rise since 2023 shows monetary policy under pressure (Module 16), and a $40 trillion debt shows the arithmetic of borrowing (Module 17).

Economists agree on more than the public debate suggests, but the course argues eighteen questions on which they or the public divide. Six concern markets and their limits: whether tariffs can bring back industry, whether computers could plan an economy, whether taxes on soda and tobacco work, what money should not buy, whether business has grown too concentrated, and why labor's share of income has fallen. Five concern government's reach: rent control, the minimum wage, how to cut carbon, whether governments should nudge, and how a central bank should be run. Five concern the whole economy: whether a trade deficit means losing, what caused the inflation of 2021-23, whether 2026 is a replay of the 1970s, how much debt is too much, and whether AI will raise productivity. Two concern the discipline itself: whether economics is a science, and whether it needs a new paradigm. Each is argued in its module: both cases as their advocates make them, then the evidence, then the course's reading, stated once. The course is analysis, not investment or financial advice.

The Economy at a Glance, October 2026

The American and world figures the course relies on, each with its date and source

Measure	Figure	Period	Source and release
Real GDP growth	3.4% at an annual rate, after 2.2% in the second quarter	Third quarter 2026	BEA, advance estimate, October 29, 2026
Nominal GDP	$32.6 trillion at an annual rate	Second quarter 2026	BEA
Consumer spending	$22.0 trillion at an annual rate, 67.5% of GDP	Second quarter 2026	BEA
Unemployment	4.2%; 7.6% on the broadest measure, which counts discouraged and involuntary part-time workers	September 2026	BLS, October 2, 2026
Payroll jobs	159.0 million, up 29,000 in the month	September 2026	BLS
Consumer prices	Up 3.7% on the consumer price index (CPI) and 2.6% excluding food and energy; energy up 20.4%	Year to September 2026	BLS, October 14, 2026
Prices of consumer spending	Up 3.6% on the index of personal consumption expenditures (PCE) and 3.1% excluding food and energy	Year to September 2026	BEA, October 29, 2026
Pay	Average hourly earnings $37.81, up 3.0%	September 2026	BLS
The Fed’s policy rate	Target range 3.75-4.00%, raised on September 16 and held on October 28	October 28, 2026	Federal Reserve
Long-term rates	Ten-year Treasury yield 5.19%; 30-year mortgage rate 7.40%	October 14 and 15, 2026	Treasury; Freddie Mac
Oil	Brent crude futures $116.72 a barrel	October 23, 2026	Futures settlement
Stocks	The Standard & Poor’s (S&P) 500 index at 7,718.94, after a record close of 7,818.93 on October 6	October 14, 2026	S&P Dow Jones Indices
Federal deficit	$1.99 trillion, 6.2% of GDP; net interest $1.14 trillion	Fiscal year 2026	CBO, October 8, 2026
Federal debt	$40 trillion gross; $32.48 trillion held by the public, about 100% of GDP	October 13, 2026	Treasury
Tariffs	Duties collected 7.1% of the value of imports, after a peak of 11.4% in October 2025	August 2026	Penn Wharton Budget Model
Labor productivity	Up 2.1% in 2025 and 2.2% in the year to the second quarter of 2026	2025-26	BLS
Labor’s share	52.8% of nonfarm business income, the lowest since 1947	Second quarter 2026	BLS
Household income and poverty	Median household income $87,460; official poverty rate 10.2%	2025	Census Bureau, September 15, 2026
World growth	3.1% forecast for 2026: the United States 2.3%, China 4.5%, the euro area 1.1%	2026	IMF, *World Economic Outlook*, October 13, 2026

Market prices are closes; quarterly growth is at an annual rate (Module 12). The terms after the Who’s Who explain how such figures are reported.

Who’s Who

The officials, economists, and institutions the course names, as of October 29, 2026

Officials

Name	Who they are	Why they matter
Kevin Warsh	Chair of the Federal Reserve since May 22, 2026; his term as chair runs to May 2030	Leads the FOMC, which raised rates in September and held them in October (Module 16)
Jerome Powell	Chair of the Fed from 2018 to May 2026; a governor since 2012, his term running to January 2028	Led the Fed through the pandemic and the inflation of 2021-23 (Modules 13 and 16)
Lisa Cook	A Fed governor since May 23, 2022	The governor the President tried to remove; she voted for a rate rise in October (Module 16)
Beth Hammack	President of the Federal Reserve Bank of Cleveland since August 21, 2024, and a voting member of the FOMC in 2026	Voted with Cook for a rate rise in October (Module 16)
Scott Bessent	Secretary of the Treasury since January 28, 2025	Manages the government’s borrowing, up against the debt limit in 2027 (Module 17)
Kevin Hassett	Director of the National Economic Council since January 20, 2025	The President’s chief economic adviser in the White House
Christopher Phelan	Chair of the Council of Economic Advisers, confirmed in 2026	Leads the White House’s staff of economists
Phillip Swagel	Director of CBO since June 3, 2019, his term running to January 3, 2027	His office produces the budget figures and projections of Module 17
Brett Matsumoto	Commissioner of Labor Statistics since August 11, 2026	Leads BLS after his predecessor’s firing in 2025 (Module 12)
Christine Lagarde	President of the European Central Bank since November 2019, her term running to October 2027	Sets monetary policy for the euro area
Kazuo Ueda	Governor of the Bank of Japan since April 2023	Leads the central bank that ended negative interest rates in 2024 (Module 13)
Kristalina Georgieva	Managing Director of the IMF since October 2019	Leads the institution whose forecasts and warnings the course cites
Zohran Mamdani	Mayor of New York City since January 1, 2026	Appointed five of the nine members of the board that froze stabilized rents (Module 6)
Javier Milei	President of Argentina since December 10, 2023	Led the stabilization that cut Argentina’s inflation (Module 13)

Economists the course draws on

Name	Who they are	Why they matter
Adam Smith (1723-1790)	Scottish philosopher, author of *The Wealth of Nations* (1776)	The division of labor and the invisible hand (Modules 2 and 5)
David Ricardo (1772-1823)	British economist and member of Parliament	Comparative advantage and the theory of rent (Modules 2 and 11)
Karl Marx (1818-1883)	German philosopher and economist, author of *Capital* (1867)	The critique of capitalism and its crises (Module 15)
Alfred Marshall (1842-1924)	Cambridge economist, author of *Principles of Economics* (1890)	Popularized the supply and demand diagram (Module 3)
John Maynard Keynes (1883-1946)	Cambridge economist, author of *The General Theory* (1936)	Deficient demand and the case for stabilization (Modules 14 and 15)
Friedrich Hayek (1899-1992)	Austrian-born economist; Nobel Prize 1974	Prices as carriers of knowledge; the Austrian theory of the cycle (Modules 3 and 15)
Milton Friedman (1912-2006)	University of Chicago economist; Nobel Prize 1976	Monetarism and the natural rate of unemployment (Modules 13 and 15)
Ronald Coase (1910-2013)	British-born economist at Chicago; Nobel Prize 1991	Why firms exist, and bargaining over externalities (Modules 7 and 9)
Robert Solow (1924-2023)	Economist at the Massachusetts Institute of Technology (MIT); Nobel Prize 1987	The model of growth and catch-up (Module 18)
Elinor Ostrom (1933-2012)	American political scientist; Nobel Prize 2009	Communities that govern their own commons (Module 9)
Robert Lucas (1937-2023)	University of Chicago economist; Nobel Prize 1995	Rational expectations and the Lucas critique (Module 15)
Daniel Kahneman (1934-2024)	Psychologist; Nobel Prize in economics 2002	The psychology behind behavioral economics (Modules 6 and 10)
George Akerlof	Economist; Nobel Prize 2001	The market for lemons (Module 10)
David Card	Berkeley economist; Nobel Prize 2021	Natural experiments on the minimum wage (Modules 1 and 6)
Daron Acemoglu	MIT economist; Nobel Prize 2024	Institutions and growth, and a skeptical estimate of AI's effect (Module 18)
Olivier Blanchard	Former chief economist of the IMF	The causes of the 2021-23 inflation, and the case that debt is cheap when interest is below growth (Modules 13 and 17)
Lawrence Summers	Harvard economist and former Treasury Secretary	Secular stagnation and the warning that the 2021 stimulus was too large (Modules 13 and 15)
Richard Thaler	University of Chicago economist; Nobel Prize 2017	Behavioral economics and nudges (Module 10)
John Taylor	Stanford economist	The Taylor rule for setting interest rates (Module 16)
Stephanie Kelton	Stony Brook University economist	The leading popular advocate of Modern Monetary Theory (Module 15)

Institutions

Name	What it is
Federal Reserve and FOMC	America's central bank, run by a seven-member Board of Governors in Washington and twelve regional banks; its Federal Open Market Committee, the Board plus five regional presidents, sets the policy rate (Module 16)
BEA and BLS	The statistics agencies that produce GDP and the PCE index (BEA) and the jobs, price, and productivity figures (BLS) (Modules 12 and 13)
CBO	Congress's nonpartisan budget office, which scores legislation and projects the budget (Module 17)
NBER	A private research organization whose Business Cycle Dating Committee dates American recessions (Module 14)
IMF	The International Monetary Fund, which lends to countries in crisis and publishes the *World Economic Outlook*
Kent A. Clark Center for Global Markets	A center at the University of Chicago Booth School of Business that polls a panel of leading economists on policy questions
Penn Wharton Budget Model	A University of Pennsylvania group that estimates the economic effects of policies, including tariffs

Terms

How economic figures are reported

Term	Meaning
Percent and percentage point	A rise in a rate from 4% to 5% is one percentage point, or 25% of the original rate. Changes in rates are given in points
Basis point	One-hundredth of a percentage point. A quarter-point rise in an interest rate is 25 basis points
Year on year, month on month	A year-on-year change compares a figure with the same month or quarter a year earlier; a month-on-month change compares it with the month before
Seasonally adjusted	Corrected for regular seasonal swings, such as holiday hiring or summer driving, so that one month can be compared with the next
Advance, preliminary, revised	The first estimates of GDP and jobs rest on incomplete data and are revised as more arrives, sometimes for years (Module 12)
Index number	A figure set to 100 in a base period, so that later values show the change since then. The CPI is set to 100 for 1982-84
Median and mean	The median is the middle value when all are lined up; the mean is the average. Where a few values are very large, as with incomes and wealth, the mean exceeds the median
Fiscal year	The federal government's budget year, which runs from October 1 to September 30; fiscal 2026 ended on September 30, 2026
Constant dollars	Values adjusted for inflation to the prices of a single year, so that changes reflect real quantities (Module 12)

Module 1 — Scarcity, Choice, and Cost

The Economic Way of Thinking

Recommended Reading / Reference

Book: Charles Wheelan, *Naked Economics: Undressing the Dismal Science* (third edition, 2019), a lively plain-language tour of how economists think, with almost no equations

Reference: College Board, *Trends in College Pricing and Student Aid 2025* (November 6, 2025), the source of the worked example's published prices

1a. Scarcity and Opportunity Cost

Economics begins with scarcity. People want more than their time, money, land, and labor can provide, so every use of a resource is a choice against some other use. Lionel Robbins, a British economist, defined the subject in 1932 as the study of how people use scarce means that have alternative uses. The definition fits a household's weekly budget, a company's capital spending, and a country's choice between schools and defense.

The central idea follows from it. The true cost of anything is what you give up to get it, which economists call its opportunity cost: the value of the best alternative forgone. An evening at the movies costs the ticket and also whatever else the evening would have been spent on. A government's dollar spent on one program is a dollar not spent on another, not returned to taxpayers, or borrowed with interest. Opportunity costs often involve no money at all, which is why they are easy to overlook. The saying that there is no such thing as a free lunch is a reminder that someone always gives something up, even when the price on the menu is zero.

1b. Thinking at the Margin

Most choices are not all or nothing but a little more or a little less: one more hour of study, one more worker, one more ton of steel. Economists call this thinking at the margin. A sensible choice weighs the marginal benefit, the gain from one more unit, against the marginal cost, the cost of that one unit, and keeps going while the benefit exceeds the cost.

Marginal thinking solves an old puzzle that troubled Adam Smith: why water, essential to life, is cheap, while diamonds, which no one needs, are dear. The answer is that prices reflect the value of one more unit, not the total value of all of them. Water is so plentiful that one more gallon is worth little, while diamonds are scarce enough that one more is worth a great deal. Marginal thinking also explains why an airline sells empty seats at the last minute for far less than the average fare: the plane is flying anyway, so one more passenger costs it little beyond a snack and a little fuel.

The same logic says to ignore sunk costs, costs already paid that cannot be recovered whatever you do next. A company that has spent $500 million on a project should continue only if the money still to be spent will bring back more than it costs. The $500 million is gone either way. People find this hard, and the mistake of throwing good money after bad is sometimes called the Concorde fallacy, after the supersonic airliner that Britain and France kept funding long after it was clear it would never pay.

1c. Incentives and Their Side Effects

People respond to incentives: rewards and penalties change behavior, often in ways no one intended. In 1989 Mexico City barred most cars from the road on one weekday each week, chosen by the last digit of the license plate, to cut air pollution. When the economist Lucas Davis studied the results (*Journal of Political Economy*, 2008), he found no measurable improvement in air quality. Many households had bought a second car, often an older and dirtier one, to drive on the banned day. The rule changed the incentive to own a car more than the incentive to drive one.

The lesson recurs throughout the course. Price ceilings create queues (Module 6), insurance changes how people use care (Module 10), and rewarded targets get gamed (Module 10). Asking “what will people do differently now?” is the first habit of economic thinking, and the one most often skipped when policies are designed.

1d. A Nation’s Trade-offs

A nation faces the same arithmetic as a household, on a larger scale. Economists picture it with the production possibilities frontier, a curve showing the largest combinations of two goods an economy can produce with its workers, machines, and know-how. The classic pair is guns and butter: defense and everything else. Any point on the curve uses every resource fully, so producing more of one good means producing less of the other, and the slope of the curve measures the opportunity cost. A point inside the curve means some resources are idle, as in a recession, when the economy could have more of both. A point outside it cannot be reached until the economy grows.

The curve is usually bowed outward, because resources are not equally suited to every use. The first workers and factories moved from consumer goods to defense are those best suited to defense, so each further unit of defense costs more consumer goods than the last. At their summit in The Hague in June 2025, the members of the North Atlantic Treaty Organization pledged to spend 5% of GDP on defense and related purposes by 2035, 3.5% on defense itself. For a member now spending 2%, meeting the pledge means moving about 3% of GDP a year from other uses, through higher taxes, more borrowing, or less of something else.

1e. Facts and Values

Economists separate two kinds of claims. A positive claim describes how the world works and can, in principle, be tested: a tax on cigarettes reduces smoking among teenagers. A normative claim says what ought to be done: the government should tax cigarettes more. Most public arguments about the economy mix the two, and much apparent disagreement among economists turns out to be about values rather than facts.

To study the facts, economists build models, deliberate simplifications that keep only what matters for the question at hand, as a subway map keeps the stations and drops the streets. A model is judged by whether it predicts well, not by whether its assumptions are literally true. Most models hold other things equal, which economists call *ceteris paribus*, to isolate one cause at a time, and many errors in reading economics come from forgetting that the other things rarely stay equal.

1f. How Economists Test Ideas

Economists can rarely run experiments on whole economies, so they look for natural experiments: events that change one thing for some people and not for others, much as a trial assigns a drug. When New Jersey raised its minimum wage and neighboring Pennsylvania did not, David Card and Alan Krueger compared fast-food restaurants on either side of the border (Module 6). Where they can, economists now run randomized trials too, assigning a program to some villages, schools, or households by lottery and comparing them with the rest.

The shift toward such methods since the 1990s is called the credibility revolution, and it has been honored twice. Abhijit Banerjee, Esther Duflo, and Michael Kremer won the 2019 Nobel Prize “for their experimental approach to alleviating global poverty.” In 2021 Card won a share for his empirical work on labor markets, and Joshua Angrist and Guido Imbens the rest, for their methods of analyzing cause and effect.

1g. Is Economics a Science? The Cases as Their Advocates Make Them

The case that it is: economists who defend the field’s standing point to shared methods, testable claims, and a growing body of evidence from natural experiments and trials. They point to broad agreement on mechanisms: when the Clark Center at the University of Chicago polls leading economists across the political spectrum, it finds near-unanimity on many questions, such as the effects of rent control and tariffs. And they note that economics replicates better than some other social sciences. When Colin Camerer and colleagues repeated 18 laboratory experiments published in two leading economics journals, 11 of them, 61%, produced the same result (*Science*, 2016).

The case that it is not: critics, among them the economist Deirdre McCloskey, who studied how economists persuade, argue that much of economics is argument dressed in mathematics. Its models rest on assumptions about rational, self-interested people that psychology contradicts (Module 10). Its forecasts fail when they matter most, and economists’ politics color which models they trust. A science that could not see the crash of 2008 coming, they say, has some way to go.

What the evidence says: the replication rate is respectable but not high, and on average the replications found effects about two-thirds the size first reported. Economists do agree on many mechanisms, and their disagreements are concentrated in values and in forecasts of the whole economy, whose record Module 15 examines. The credibility revolution has made claims about cause and effect much more reliable than they were a generation ago.

The course’s reading: economics is a science of mechanisms and measurement. It is strong at saying what tends to happen and roughly how much, weak at forecasting when, and values enter when choosing what to do.

Worked example — The Full Cost of a Four-Year Degree

The College Board puts the average published tuition and fees for 2025-26 at $11,950 a year at a public four-year college for students from the same state, and $45,000 at a private nonprofit college. Housing and food add $13,900 and $15,920, but most of that is not an opportunity cost of college, since a student would need somewhere to live and something to eat in any case; only the difference from what living elsewhere would cost counts. The largest cost carries no price tag: the earnings given up. Suppose a high-school graduate could earn an illustrative $32,000 a year working full time instead, below the median for full-time workers aged 25 to 34 with only a high-school diploma (Module 11), since younger workers earn less. Four years at a public college then cost $47,800 in tuition and fees ($11,950 × 4) plus $128,000 in forgone earnings ($32,000 × 4), or $175,800, of which the forgone earnings are 73%. At a private nonprofit college the total is $308,000 ($45,000 × 4 + $128,000). Grants cut the tuition many students actually pay, and part-time work cuts the earnings they give up, but the lesson holds: the time costs more than the tuition. Module 11 sets this cost against what the degree earns.

Module 1 Key Points

Scarcity, Choice, and Cost

• The cost of anything is what you give up for it, its opportunity cost, which often involves no money at all.

• Good decisions weigh the extra benefit of a little more against its extra cost, and ignore costs already sunk.

• People respond to incentives in ways rules may not intend: Mexico City’s driving ban led households to buy second cars.

• The production possibilities frontier shows a nation’s trade-offs; NATO’s 5% pledge must come from other uses.

• The 2019 and 2021 Nobels honored trials and natural experiments, the methods of economics’ credibility revolution.

• The course’s reading: economics is a science of mechanisms and measurement, weak at forecasting; values enter in choosing.

Module 1 Quiz

Check Your Understanding

1. What is the opportunity cost of a choice?

A) The value of the best alternative you give up to make it, whether or not money changes hands
B) Its price
C) The total of every option you did not choose
D) The money spent on it plus any taxes owed

2. Why should sunk costs not affect a decision?

A) Because they are always smaller than future costs
B) Because accountants exclude them from profit
C) Because they can be recovered later by selling the asset
D) They cannot be recovered

3. What did Lucas Davis find after Mexico City banned each car from driving one weekday in 1989?

A) Air quality improved sharply
B) Traffic fell by a fifth
C) Many households bought a second, often older car, and air quality did not improve
D) Drivers switched to the subway in large numbers, cutting both traffic and pollution by about a third within two years

4. What does a point inside a production possibilities frontier mean?

A) A combination the economy cannot reach with its resources
B) Some resources are idle
C) Full employment
D) The most efficient combination of the two goods the economy can produce

5. What is the course's reading on whether economics is a science?

A) Yes, as exact as physics
B) A science of mechanisms and measurement, strong on what tends to happen and how much, weak on forecasting when, with values entering in choosing what to do
C) No: it is politics with equations
D) Only its forecasts are scientific

Module 2 — Trade and Specialization

Why No One Makes Everything Alone

Recommended Reading / Reference

Book: Douglas A. Irwin, *Free Trade Under Fire* (fifth edition, 2020), an economic historian's account of what trade does, whom it helps and hurts, and what protection costs

Reference: David Autor, David Dorn, and Gordon Hanson, "The China Shock: Learning from Labor-Market Adjustment to Large Changes in Trade," *Annual Review of Economics* (2016)

2a. The Division of Labor

The Wealth of Nations opens in a pin factory. A worker making pins alone, Adam Smith wrote, could make perhaps one a day, and certainly not twenty. Divide the job into its eighteen steps, drawing the wire, straightening it, cutting it, pointing it, and so on, and ten workers could make upwards of 48,000 pins a day, 4,800 each. Specialization raises output because workers grow skilled at one task, waste no time switching between tasks, and find it worth inventing machines for tasks they repeat.

The modern economy carries the idea to an extreme. In a famous essay of 1958, "I, Pencil," Leonard Read pointed out that no single person on earth knows how to make a pencil: the cedar, the graphite, the paint, the brass, and the rubber come from thousands of people in many countries, coordinated by prices rather than by any plan (Module 3). A phone draws on far more.

2b. Absolute and Comparative Advantage

A producer has an absolute advantage in a good if it can make more of it with the same resources. It has a comparative advantage if it can make it at a lower opportunity cost, giving up less of other goods to do so. David Ricardo showed in 1817 why the distinction matters. In his example Portugal could make both wine and cloth with less labor than England, an absolute advantage in both. But Portugal gave up less cloth for each barrel of wine than England did, while England gave up less wine for each bolt of cloth. If each country specialized in the good it made at the lower opportunity cost and traded for the other, both could have more of both.

The striking conclusion is that everyone has a comparative advantage in something, because opportunity costs are relative. A country that is better at everything still gains by concentrating on what it is most better at, and a country that is worse at everything still has goods it is least worse at. The price at which the two trade must fall between their two opportunity costs, or one side would do better making the good itself. The worked example at the end of the module puts numbers on it.

2c. Trade Within and Across Borders

Nothing in the logic depends on borders. A lawyer who types faster than her assistant still hires the assistant, because an hour of her time is worth more spent on law. A firm that could run its own cafeteria contracts the job out, and a region that could grow its own food buys it from farmers elsewhere. In each case, specializing and trading lets the parties consume combinations of goods beyond what they could produce alone, outside their own production possibilities frontiers (Module 1). Trade between countries is the same arrangement with customs officers in the middle.

2d. Who Loses

Comparative advantage shows that trade raises a country's total income, not that everyone in it gains. The gains are broad and thinly spread: lower prices for consumers, cheaper inputs for firms, and jobs in exporting industries. The losses are concentrated on workers and towns in the industries that face new competition, and economists long underestimated how lasting they could be.

The clearest evidence comes from China's entry into world markets. Daron Acemoglu, David Autor, David Dorn, Gordon Hanson, and Brendan Price estimated that the rise in Chinese imports from 1999 to 2011 cost the United States 2.0 to 2.4 million jobs, close to a million of them in manufacturing once the factories' suppliers are counted, and the rest in local businesses that lost customers (*Journal of Labor Economics*, 2016). The places hardest hit, many of them furniture and textile towns in the Southeast, still had lower employment a decade later. In theory the winners from trade could compensate the losers and still come out ahead. In practice the main federal program for workers who lost jobs to imports, Trade Adjustment Assistance, was small, and it began to wind down in July 2022 when Congress let it lapse.

2e. Can Tariffs Bring Back Industry and Good Jobs? The Cases as Their Advocates Make Them

The case that they can: the administration, many manufacturers that compete with imports, and a minority of economists argue that broad tariffs protect industries a nation needs for its security, rebuild an industrial base hollowed out by the China shock, give leverage in bargaining with trading partners, and raise revenue. Customs duties brought in $264 billion in 2025, against $79 billion in 2024. Manufacturing jobs rose in 2026 after falling in 2025, they note, and new plants take years to build.

The case that they cannot: most economists answer that tariffs raise costs for every firm that uses the protected goods and invite retaliation against exporters. When the Clark Center asked its panel in March 2018 whether new tariffs on steel and aluminum would improve Americans' welfare, not one economist agreed. The 2018 tariffs added about 1,000 jobs making steel. Applying a Federal Reserve Board study by Aaron Flaaen and Justin Pierce (2019), Kadee Russ and Lydia Cox estimated that dearer steel and aluminum alone cut manufacturing employment by 0.6%, about 75,000 jobs, before counting retaliation.

What the evidence says: the effective tariff rate, duties collected divided by the value of imports, rose from 2.3% in January 2025 to a peak of 11.4% in October 2025, and stood at 7.1% in August 2026 (Penn Wharton Budget Model). The Supreme Court struck down the emergency tariffs on February 20, 2026. A temporary duty under Section 122 of the Trade Act of 1974 took their place from February 24, and new duties under Section 301 followed when it expired on July 24. Manufacturing employment fell by 93,000 in 2025 and had regained 72,000 by September 2026, leaving it 21,000 below its level of January 2025 (BLS). Who paid for the tariffs is a question about elasticity (Module 4).

The course's reading: tariffs can protect particular industries, at a cost to the industries and consumers that buy from them, and have not yet produced a broad manufacturing revival. A narrow case for protecting goods essential to security is stronger than the case for broad tariffs.

Worked example — Two Producers, One Trade

Take two illustrative countries, each with 100 hours of labor. An hour of American work makes 4 circuit boards or 2 shirts; an hour of Vietnamese work makes 1 circuit board or 1.5 shirts. America is better at both, but its opportunity costs differ: a board costs America half a shirt and Vietnam one and a half shirts, so America has the comparative advantage in boards and Vietnam in shirts. Without trade, each splits its hours evenly: America makes 200 boards and 100 shirts, Vietnam 50 boards and 75 shirts, a world total of 250 boards and 175 shirts. Now let Vietnam make only shirts, 150, and America spend 70 hours on boards and 30 on shirts, making 280 boards and 60 shirts. The world now has 280 boards and 210 shirts, more of both. At a price of one board for one shirt, between the two countries' opportunity costs, America trades 70 boards for 70 shirts. America ends with 210 boards and 130 shirts, against 200 and 100 on its own; Vietnam ends with 70 boards and 80 shirts, against 50 and 75. Both gain, though America is better at making everything.

Module 2 Key Points

Trade and Specialization

• Specialization raises output: Smith’s ten pin makers made about 48,000 pins a day by dividing the work.

• Comparative advantage, a lower opportunity cost, lets both sides gain from trade even when one is better at everything.

• Trade’s gains are broad and diffuse, its losses concentrated: Chinese imports cost 2.0-2.4 million American jobs in 1999-2011.

• The 2018 steel and aluminum tariffs added about 1,000 steel jobs but cost about 75,000 manufacturing jobs through dearer inputs.

• Manufacturing employment was 21,000 below its January 2025 level in September 2026, after the new tariffs.

• The course’s reading: tariffs protect particular industries at their customers’ cost and have not produced a broad revival.

Module 2 Quiz

Check Your Understanding

1. What gives a country a comparative advantage in a good?

A) A lower opportunity cost
B) Producing more of it per worker than any other country can
C) Having more workers in that industry than its trading partners
D) A larger share of world exports in it than in any other good it sells

2. In Ricardo's example, why did Portugal gain from trading wine for English cloth even though it made both with less labor?

A) Because England paid in gold, which Portugal needed to back its currency
B) English cloth was of higher quality
C) Its opportunity cost of making wine was lower
D) Because Portugal's workers preferred making wine and would not work in cloth mills at any wage

3. About how many American jobs did Acemoglu, Autor, Dorn, Hanson, and Price estimate were lost to Chinese import competition from 1999 to 2011?

A) About 50,000
B) About 10 million, most of manufacturing
C) Fewer than 100,000 on net, because new export jobs replaced nearly every job lost
D) 2.0 to 2.4 million, counting suppliers and local businesses

4. What did studies of the 2018 steel tariffs find?

A) Steel employment doubled, while manufacturers that use steel were unaffected
B) They raised steel prices but had no measurable effect on jobs anywhere in the economy
C) About 1,000 steel jobs gained, many more lost downstream
D) Steel imports rose because foreign producers absorbed the whole tariff and cut their prices

5. What is the course's reading on whether tariffs can bring back industry?

A) They can protect particular industries at a cost to their customers, and have not yet brought a broad revival
B) Never, under any circumstances
C) Only if every trading partner retaliates
D) Yes: broad tariffs restored manufacturing employment to its 1979 peak within two years of the 2025 increases, as their advocates predicted

Module 3 — Supply, Demand, and Prices

How Prices Form, and What They Do

Recommended Reading / Reference

Book: Tim Harford, *The Undercover Economist* (revised edition, 2012), a journalist-economist's account of how prices and markets work in everyday purchases, from a cup of coffee to a used car

Paper: Friedrich A. Hayek, "The Use of Knowledge in Society," *American Economic Review* (September 1945), the short essay that explains what prices communicate, and still one of the most cited papers in economics

3a. Demand

Demand is the quantity of a good that buyers want at each possible price. The law of demand says that, other things equal, buyers want less of a good when its price rises. Part of the reason is substitution: a dearer good loses out to alternatives. Part is income: a higher price leaves buyers able to afford less. Plotted with price on the vertical axis and quantity on the horizontal, demand is a downward-sloping line, the demand curve.

A change in the good's own price moves buyers along the curve. Anything else that changes how much they want at every price shifts the whole curve. Higher incomes raise demand for most goods, which economists call normal goods, and lower it for a few, such as bus rides and store brands, which they call inferior goods. A rise in the price of a substitute raises demand, as dearer beef sends shoppers to chicken; a rise in the price of a complement, something used with the good, lowers it, as dearer gasoline cuts demand for large cars. Tastes, expectations of future prices, and the number of buyers shift demand too.

3b. Supply

Supply is the quantity sellers offer at each price. The supply curve slopes upward: a higher price covers the higher cost of producing more from existing farms and factories, and draws in new producers. What shifts the whole curve is anything that changes the cost or possibility of producing: the prices of inputs such as feed, fuel, and labor; technology; the number of sellers; expectations; taxes; and, for farm goods, weather and disease. A drought or an epidemic among animals shifts supply to the left, so less is offered at every price.

3c. Equilibrium

The two curves cross at the equilibrium price, where the quantity buyers want equals the quantity sellers offer. At any higher price sellers offer more than buyers take, a surplus, and unsold goods push the price down. At any lower price buyers want more than sellers offer, a shortage, and the competition for scarce goods pushes the price up. The market settles where neither pressure remains. The diagram became famous through Alfred Marshall's *Principles of Economics* (1890), and it remains the economist's first tool for any question about prices.

What happens	Effect on price	Effect on quantity	Example
Demand rises	Up	Up	Incomes rise and more people buy new cars

What happens	Effect on price	Effect on quantity	Example
Demand falls	Down	Down	Office workers stay home and downtown lunch spots lose customers
Supply rises	Down	Up	A bumper harvest of coffee beans
Supply falls	Up	Down	An epidemic among laying hens

When both curves shift at once, one of the two effects is certain and the other depends on which shift is larger.

3d. Prices as Signals

Friedrich Hayek, the Austrian economist whose school Module 15 describes, explained in 1945 what makes the price system remarkable. The knowledge an economy runs on is scattered among millions of people: the farmer who knows his soil, the shipper who knows where a vessel sits empty, the cook who can switch to another ingredient. No planner could gather it. Prices gather it without anyone trying. Suppose tin becomes scarcer, because a mine floods or a new use appears. Its price rises, and every user of tin economizes, switching to substitutes where they can, without needing to know why. A price carries information, gives everyone a reason to act on it, and rations what is scarce to those who value it most.

3e. What Markets Need

Markets are not the absence of rules. They need property rights, so that people can keep what they earn and sell what they own; contracts that courts will enforce; competition, so that no seller can set its own price (Module 8); and enough information for buyers to know what they are getting (Module 10). Where these are missing, markets work badly or not at all, which is one reason the rule of law matters so much for growth (Module 18).

3f. Planning’s Record

The Soviet Union ran the largest experiment in doing without prices. Its planning agency, Gosplan, drew up balances of supply and use for about 2,000 key commodities, leaving thousands more to other agencies, and prices were set by decree and rarely changed. The result was chronic shortage: queues for meat and shoes, years-long waits for cars and apartments, and factories that met their targets with goods no one wanted. Planners measured output by weight or count, so nail factories made too many small nails, or too few large ones, depending on which measure they were set.

China took the opposite path. From May 1984 state firms could sell some producer goods at prices up to 20% above or below the state’s price, and from March 1985 they could sell output above their plan quota at market prices, while quota output stayed at state prices. The dual-track system let markets grow up alongside the plan until they replaced most of it. China then grew faster, for longer, than any large economy on record.

3g. Could Computers Plan an Economy? The Cases as Their Advocates Make Them

The case that they could: advocates of planning, among them the writers Leigh Phillips and Michal Rozworski in *The People’s Republic of Walmart* (2019), point out that giant companies already plan internally at enormous scale. Walmart and Amazon coordinate millions of products, suppliers, and deliveries

by algorithm, not by internal prices. The Soviet planners lacked computers; today's data and artificial intelligence could match supply to demand without the waste of competition or the failures markets show (Module 9).

The case that they could not: economists in the tradition of Ludwig von Mises, who made the argument in 1920, and Hayek reply that planning fails for reasons computers cannot fix. Much knowledge is local and hard to put into words, and much of it is created by the market itself, as entrepreneurs test ideas and prices reveal what works. Without prices, no one has a reason to reveal what he knows or to act on it. Firms plan inside, they add, but buy and sell at market prices at their edges, and their plans rest on those prices.

What the evidence says: the Soviet planners struggled with the balances of 3f, while a modern economy offers millions of products, many of them new each year. Companies that plan internally rely on outside prices to value their inputs and judge their divisions, and some use internal prices of their own. China's growth came from loosening planning, not perfecting it. Computers have made markets work better, through price comparison, online auctions, and real-time pricing, rather than replacing them.

The course's reading: computing solves planning's arithmetic but not its problems of knowledge and incentives. Prices remain the cheapest way to gather and reward what millions of people know.

Worked example — Eggs, 2025-26

Avian flu struck American laying flocks in early 2025, infecting 30.3 million birds from January to early April. The table-egg flock fell to 291.5 million hens on February 1, 2025, its lowest since 2015, a leftward shift in supply. Because people keep buying eggs at almost any price, the fall in supply raised the price far more than it cut the quantity. The average price of a dozen Grade A large eggs reached $5.90 in February and a record $6.23 in March 2025 (BLS). The high price did three jobs at once. It rationed the eggs there were, as bakeries and households cut back. It drew in imports, which reached 20.2 million dozen-equivalent in July 2025, the most in a month since 2015, from Brazil, Mexico, and other countries. And it made restocking flocks profitable. By October 1, 2026 the flock had grown back to 319.1 million hens, about 9.5% above its February 2025 low, and the price had fallen to $2.27 a dozen in August and September 2026, 64% below the peak (($6.23 − $2.27) ÷ $6.23). A rise of under a tenth in the flock went with a fall of nearly two-thirds in the price, a sign of how little the quantity of eggs people buy responds to price. Module 4 turns that response into a number.

Module 3 Key Points

Supply, Demand, and Prices

• Buyers want less of a good as its price rises; income, related prices, tastes, and expectations shift the whole demand curve.

• Sellers offer more at higher prices; input costs, technology, sellers' numbers, weather, and disease shift supply.

• Prices settle where quantities match: shortages push them up and surpluses push them down.

• Hayek's point: prices carry scattered knowledge, telling millions to economize on what has grown scarce without knowing why.

• Bird flu drove eggs to a record $6.23 a dozen in March 2025; rebuilt flocks brought them down to $2.27.

• The course's reading: computers solve planning's arithmetic, not its problems of knowledge and incentives; prices still do that work.

Module 3 Quiz

Check Your Understanding

1. Which of these shifts the demand curve for a good, rather than moving buyers along it?

A) A fall in the good's own price, which raises the quantity buyers want
B) A rise in its price
C) A change in the cost of making it, passed on to buyers through the price
D) A rise in buyers' incomes

2. What did Friedrich Hayek argue prices do?

A) Measure the labor in a good
B) Carry scattered knowledge, telling millions of people to economize on what has grown scarce without their needing to know why
C) Ensure fairness
D) Reflect what the government decides goods are worth

3. What happens in a market when the price is held above its equilibrium?

A) Buyers want more than sellers offer, so queues form
B) Sellers cut their costs until the gap disappears
C) A surplus
D) The demand curve shifts out to meet the higher price

4. What did China's dual-track reform of 1985 allow?

A) Foreign ownership of state firms
B) Free prices for all goods at once
C) An immediate end to all central planning, with every state firm sold to private owners within a year
D) Sales of output above the plan quota at market prices

5. What is the course's reading on whether computers could plan an economy?

A) No: computing solves the arithmetic, not the problem of knowledge and incentives
B) Yes, with enough data
C) Yes: firms such as Walmart already plan an economy larger than most countries without prices of any kind
D) Only if planners can see every consumer's purchases in real time and set millions of prices by algorithm

Module 4 — Elasticity: How Much People Respond

Measuring the Strength of Supply and Demand

Recommended Reading / Reference

Book: N. Gregory Mankiw, *Principles of Economics* (tenth edition, 2024), the most widely used introductory textbook, whose chapters on elasticity and taxation go further into the arithmetic

Reference: International Cocoa Organization (ICCO), *Quarterly Bulletin of Cocoa Statistics* (August 31, 2026), the source of the worked example's production and grinding figures

4a. Measuring Response

Module 3 said that buyers want less when a price rises. It did not say how much less, and the answer decides almost everything that follows: whether a tax raises much money, who ends up paying it, and how far a price must move to clear a shortage. Economists measure the response with the price elasticity of demand. Write E for the elasticity, %ΔQ for the percentage change in the quantity buyers want, and %ΔP for the percentage change in price that caused it. Then E = %ΔQ ÷ %ΔP.

Because quantity falls when price rises, the elasticity of demand is negative, and economists usually quote its size alone. Demand is elastic if the size is above 1, so that quantity moves proportionally more than price, and inelastic if it is below 1. To avoid getting a different answer depending on which way the price moved, percentage changes are measured against the average of the old and new values, the midpoint method. The eggs of Module 3 give an example. On the midpoint method, the laying flock grew 9.0% from its low of February 2025 to October 2026, while the price fell 93% from its peak. If the flock is taken as the quantity sold, the elasticity was about −0.1 (9.0 ÷ −93): very inelastic.

4b. What Makes People Responsive

Four things make demand more elastic. The first is substitutes: buyers flee a product whose price rises if they can switch to something similar. The second is necessity: luxuries are more elastic than necessities. The third is the share of the budget: people notice a 10% rise in rent more than a 10% rise in the price of salt. The fourth, and often the largest, is time, since buyers find more ways to adjust the longer a price stays high.

Gasoline shows all four, and how elasticity can change. Jonathan Hughes, Christopher Knittel, and Daniel Sperling estimated that a 10% rise in the price of gasoline cut the amount Americans bought in the short run by 2% to 3% in 1975-80, but by less than 1% in 2001-06, as suburban living and longer commutes left fewer ways to cut back quickly. Over several years people respond more, by buying smaller cars or moving closer to work. Cigarettes show how elasticity differs by age. Studies summarized by the Centers for Disease Control and Prevention put the elasticity at about −0.25 for adults overall and −0.58 for those aged 18 to 24, and Frank Chaloupka and Michael Grossman found high-school students more responsive still. Young people have less money and less firmly fixed habits.

4c. Total Revenue

Elasticity tells a seller what a price change does to revenue, the price times the quantity sold. When demand is inelastic, a higher price loses few sales, so revenue rises; when demand is elastic, a higher price loses so many sales that revenue falls. This is why a bumper harvest can leave farmers poorer, since the price of an inelastic crop falls by proportionally more than the harvest grows, and why oil producers have long tried to hold back output together (Module 8).

4d. The Elasticity of Supply

The elasticity of supply measures the same thing for sellers: the percentage change in the quantity offered divided by the percentage change in price. Supply is elastic when output is easy to expand, because factories have spare capacity or new sellers can enter quickly, and inelastic when it is not. Time matters most. In a month, an oil field pumps what it can; in a few years, new wells are drilled. A cocoa tree takes three to five years to bear its first pods, so a high price this year brings more cocoa only years later.

4e. Income and Cross-Price Elasticity

Two other elasticities measure responses to things other than a good’s own price. The income elasticity of demand divides the percentage change in quantity by the percentage change in income. It is positive for normal goods, above 1 for luxuries such as foreign travel, whose share of spending rises with income, and negative for inferior goods. The cross-price elasticity divides the change in one good’s quantity by the change in another good’s price. It is positive for substitutes, such as tea and coffee, and negative for complements, such as cars and gasoline.

4f. Why Oil Prices Swing So Hard

When both demand and supply are inelastic, a small change in quantity needs a large change in price to restore balance. The percentage change in price is roughly the percentage shift in supply divided by the sum of the two elasticities. If the elasticity of demand is −0.05 and that of supply 0.05 in the short run, a shift that cuts supply by 5% must raise the price by about 50% (5 ÷ 0.1). That is the arithmetic behind oil’s great price swings. When the war with Iran closed most traffic through the Strait of Hormuz in 2026, the physical price of a cargo of North Sea crude, called Dated Brent, reached a record $144.42 a barrel on April 7, about double the last futures price before the war, $72.48 on February 27. Users could find few substitutes in weeks, and producers outside the Gulf could add little oil quickly.

4g. Who Bears a Tax

Elasticity also decides who really pays a tax, which economists call its incidence. The law can say who must hand the money to the government, but not who bears it. A tax on a good drives a wedge between what buyers pay and what sellers keep, and the side that responds less to price bears more of it. A useful approximation: the share borne by buyers equals the elasticity of supply divided by the sum of the elasticities of supply and demand, each taken by size. If buyers cannot cut back but sellers can easily sell elsewhere, buyers pay nearly all of it, whatever the law says.

Tariffs are taxes on imports, and the rule applies to them. Foreign exporters who can sell elsewhere respond strongly to a fall in what they keep, so most of an American tariff tends to fall on Americans. The Federal

Reserve Bank of New York estimated in February 2026 that American firms and consumers bore about 90% of the cost of the 2025 tariffs, a share that slipped from 94% in January to August to 86% later in the year as some exporters cut their prices. Importers and retailers absorbed part of that 90% in their margins rather than passing it all on to shoppers.

4h. Do Taxes on Soda, Tobacco, and Alcohol Work? The Cases as Their Advocates Make Them

The case that they do: public-health researchers and the World Health Organization argue that taxes on tobacco, alcohol, and sugary drinks cut consumption, most among the young and the poor, who respond most to price and suffer most from the harm. Mexico's tax of one peso a liter on sugary drinks, about 10%, cut purchases by 6% in its first year and by 12% by December 2014, and by 9% among low-income households (M. Arantxa Colchero and colleagues, *BMJ*, 2016). Philadelphia's tax of 1.5 cents an ounce, from 2017, cut sales of taxed drinks by 38% compared with untaxed Baltimore, even after counting purchases just outside the city (Christina Roberto and colleagues, *JAMA*, 2019).

The case that they do not, or not enough: critics, from the beverage and tobacco industries to economists worried about fairness, answer that such taxes fall hardest on low-income households, who spend a larger share of their budgets on the taxed goods. Buyers shop across the border: sales in the suburbs around Philadelphia rose by 308 million ounces. They switch to untaxed products, as Mexican purchases of untaxed drinks rose 4%. And the health gains from soda taxes, lower weight and less diabetes, have yet to be shown. Some object on principle to governments taxing adults' choices for their own good.

What the evidence says: the case for tobacco taxes is strong. Higher cigarette prices reduce smoking, above all among young people, and smoking does great harm to the smoker and to others. Soda taxes clearly reduce purchases of the taxed drinks, but studies have not yet shown lasting effects on weight or disease. The complaint about fairness is partly offset by the same elasticity that drives it: the poor cut back most, so they gain most of the health benefit and pay less of the tax than their old habits implied.

The course's reading: tobacco taxes clearly work. Soda taxes cut purchases, but their health effects are unproven, so their case rests on how much paternalism one accepts and on what the revenue pays for.

Worked example — The Cocoa Cycle, 2024-26

Most of the world's cocoa grows in West Africa, where disease and bad weather cut the 2023/24 harvest to 4.36 million tonnes, while grinders, the firms that process beans into cocoa butter and powder, used 4.81 million. The deficit, about 0.49 million tonnes after the ICCO's allowance of 1% for beans lost in processing, had to come out of stocks. With demand and supply both inelastic in the short run, the futures price in New York reached a record of about $12,906 a tonne in December 2024. Then both sides responded. Demand: Europe's grindings fell 5.9% in 2025 to their lowest since 2015, and Asia's fell 17.7% in the third quarter of 2025, as chocolate makers cut the cocoa in their recipes; some British biscuit bars could no longer be called chocolate. Supply: output rose to 4.73 million tonnes in 2024/25, up 8.5% ((4.73 − 4.36) ÷ 4.36), helped by Ecuador, whose farmers planted heavily as prices rose, while grindings fell 3.3%, to 4.65 million tonnes, leaving a small surplus. The price collapsed to $2,952 a tonne on February 24, 2026, 77% below its peak ((12,906 − 2,952) ÷ 12,906), and in March Côte d'Ivoire cut the price it guarantees its farmers by 57%. Cheap cocoa then brought buyers back: Asia's grindings rose 29.2% in the third quarter of 2026, and the price recovered to about $5,459 on October 29. A swing of about a tenth in output moved the price by more than three-quarters, and the full response of buyers and growers took more than a year.

Module 4 Key Points

Elasticity: How Much People Respond

• Elasticity is the percentage change in quantity divided by the percentage change in price; below 1 in size, demand is inelastic.

• Demand is more elastic with substitutes, for luxuries and large budget shares, and over longer periods.

• Inelastic demand and supply make oil prices swing: the physical price about doubled in 2026’s supply shock.

• The less responsive side bears more of a tax; American firms and consumers bore about 90% of the 2025 tariffs.

• Cocoa hit a record near $12,900 a tonne in December 2024, then fell 77% as buyers and growers responded.

• The course’s reading: tobacco taxes clearly work; soda taxes cut purchases, but their health effects remain unproven.

Module 4 Quiz

Check Your Understanding

1. What is the price elasticity of demand?

A) The price at which demand is zero

B) The percentage change in quantity demanded divided by the percentage change in price that caused it

C) How fast prices rise each year

D) The change in total spending when incomes rise by 1%

2. Why did Hughes, Knittel, and Sperling find American gasoline demand less responsive to price in 2001-06 than in 1975-80?

A) Gasoline was taxed more heavily in 2001-06

B) Cars were cheaper

C) Because Americans in 2001-06 had more public transit, so they had no need to drive less when prices rose

D) Driving patterns had hardened, leaving fewer ways to cut back

3. Who bears most of a tax, according to the theory of tax incidence?

A) Whoever writes the check to the government

B) The less responsive side

C) Sellers

D) Buyers always, because sellers pass every tax on in full

4. What did the Federal Reserve Bank of New York estimate about the cost of the 2025 tariffs?

A) Americans bore about 90%

B) Foreign exporters absorbed nearly all of it by cutting their prices

C) It was split evenly between American consumers and foreign producers

D) Chinese firms paid all of it

5. What is the course's reading on taxes on soda, tobacco, and alcohol?

A) They raise money but change nothing

B) They should be abolished as unfair

C) Tobacco taxes clearly work; soda taxes cut purchases, but their health effects are unproven and their case rests on how much paternalism one accepts

D) Only alcohol taxes work

Module 5 — Markets and Welfare

Who Gains from a Sale, and What a Tax Costs

Recommended Reading / Reference

Book: Alvin E. Roth, *Who Gets What—and Why: The New Economics of Matchmaking and Market Design* (2015), by the Nobel laureate who designed kidney exchanges, on markets where price cannot do all the work

Reference: Scientific Registry of Transplant Recipients (SRTR), *2024 Annual Data Report: Kidney* (2026), the source of the module's figures on the waiting list

5a. Willingness to Pay and Consumer Surplus

Every buyer has a most she would pay for something, her willingness to pay. A fan who would pay $200 for a concert ticket and buys one for $120 comes away $80 better off. Economists call that gain consumer surplus: what buyers would have been willing to pay minus what they actually pay, added up over all buyers. On the diagram of Module 3, it is the area below the demand curve and above the price. When a price falls, consumer surplus grows, both because existing buyers pay less and because new buyers, who valued the good below the old price, now buy it.

5b. Cost and Producer Surplus

Sellers have a mirror image. Each has a least he would accept, the cost of producing one more unit, including the opportunity cost of his time. A seller who would accept $70 and gets $120 gains $50. Producer surplus is the price minus that cost, added up over all sellers: the area above the supply curve and below the price. Together, consumer and producer surplus are the total surplus, the net gain from a market's trades.

5c. When the Total Is as Large as It Can Be

At the competitive equilibrium, every trade that is worth more to the buyer than it costs the seller takes place, and no trade that is worth less does. Raise the quantity beyond the equilibrium and the extra units cost more to make than buyers value them; cut it and trades worth more than their cost are lost. So a competitive market makes total surplus as large as it can be. This is the modern form of Adam Smith's invisible hand: people pursuing their own gain are led, by prices, to an outcome no one designed.

The result comes with conditions, and much of the rest of this course is about what happens when they fail. Sellers must compete rather than set prices (Module 8). The buyer and seller must bear all the costs and get all the benefits of their trade (Module 9). And both must know what they are trading (Module 10).

5d. Efficiency and Fairness

Efficiency, in this sense, means only that the total gain is as large as it can be. It says nothing about who gets it. A market can be efficient while leaving some people with very little, and the same total surplus can be divided in many ways. Most societies care about both, and the two can conflict. The economist Arthur Okun, in *Equality and Efficiency: The Big Tradeoff* (1975), compared redistribution to carrying water from the rich to the poor in a leaky bucket: taxes and benefits change incentives, so some of what is taken never

arrives. How much leakage is worth accepting for how much equality is a question of values, which economics can measure but not settle.

5e. What a Tax Does

The wedge a tax drives between what buyers pay and what sellers keep (Module 4) means fewer units are traded. The government collects revenue equal to the tax times the quantity still sold. Buyers and sellers lose surplus, divided between them according to their elasticities (Module 4). Their combined loss is larger than the revenue, because some trades that were worth more to buyers than they cost sellers no longer happen at all. That lost gain, which no one collects, is the deadweight loss of the tax.

The deadweight loss grows faster than the tax. On a straight-line diagram it is a triangle whose height is the tax and whose base is the fall in quantity, which itself grows with the tax, so doubling a tax roughly quadruples its deadweight loss. Economists therefore prefer low rates on broad bases to high rates on narrow ones. Past some point, raising a rate can even lower revenue, because the quantity taxed shrinks faster than the rate rises; the curve tracing this, named after the economist Arthur Laffer, is real, though most estimates place American tax rates below its peak. The federal gasoline tax, 18.4 cents a gallon since 1993 and never adjusted for inflation, is the largest federal excise tax: it raised $27 billion in fiscal 2025 (CBO, August 2026).

5f. Subsidies

A subsidy is a tax in reverse. Buyers pay less, sellers receive more, and the quantity rises above the equilibrium, so some units are made that cost more than buyers value them. That is a deadweight loss too, unless the subsidy corrects a benefit the market ignores, such as the protection a vaccinated person gives others (Module 9). Subsidies are popular because their costs are spread across taxpayers while their benefits are concentrated and visible.

5g. Are There Things Money Shouldn’t Buy? The Cases as Their Advocates Make Them

The case for letting prices work: economists from Gary Becker to Alvin Roth have argued that bans on payment have costs measured in human lives. In 2024, 143,982 adults were on the American waiting list for a kidney at some point; 27,660 received a transplant, a record, while 3,743 died waiting and 4,901 more were removed from the list as too sick (SRTR). Iran has allowed regulated payment to living donors who are not relatives since 1988 and reported that its waiting list had disappeared by the end of 1999. Where payment is allowed, supply follows: the United States pays plasma donors and supplies about 70% of the plasma used in the world. Surge pricing puts more drivers on the road when demand peaks, and resale moves concert tickets to the fans who value them most.

The case for limits: the philosopher Michael Sandel, in *What Money Can’t Buy* (2012), and many others argue that some things are degraded by being sold. Payment for organs preys on the poor, who sell because they must, as critics say most Iranian donors do. Markets can crowd out generosity: Richard Titmuss argued in 1970 that paying for blood would reduce the supply of donated blood and its quality. And prices that leap in a crisis or for a sold-out show strike most people as unfair, which is why the Federal Trade Commission has required ticket sellers and hotels to show the full price up front since May 12, 2025.

What the evidence says: payment does draw supply, for plasma most clearly, and the fear that small incentives crowd out generosity has mostly not been borne out: an American study of rewards for blood donors found that they raised donations (Nicola Lacetera, Mario Macis, and Robert Slonim, *Science*, 2013). Iran's claim to have ended its waiting list is disputed, and its donors are mostly poor. Some design can get much of the gain without a price. Kidney exchanges, which match pairs of incompatible donors and recipients so that each donor gives to a stranger, have raised transplants without payment, and Roth shared the 2012 Nobel Prize for such work.

The course's reading: whether to allow payment is a moral choice, but the cost of a ban, counted in lives on waiting lists and in supply forgone, must be weighed in making it. Designs short of a price, such as exchanges and paying donors' costs, are the practical middle ground.

Worked example — A Tax on One Market

Take an illustrative market in which buyers' demand is P = 10 − Q and sellers' supply is P = 2 + Q, with P the price in dollars and Q the quantity in millions of units. The curves cross at Q = 4 and P = $6. Consumer surplus is the triangle ½ × 4 × ($10 − $6) = $8 million, and producer surplus ½ × 4 × ($6 − $2) = $8 million, a total of $16 million. Now impose a tax of $2 a unit. Buyers pay P, sellers keep P − $2, so the supply curve, seen from the buyer's side, becomes P = 4 + Q. The market now clears at Q = 3, with buyers paying $7 and sellers keeping $5. The government collects $6 million ($2 × 3). Consumer surplus falls to ½ × 3 × ($10 − $7) = $4.5 million and producer surplus to ½ × 3 × ($5 − $2) = $4.5 million. The total of all three is $15 million, so $1 million has vanished: the deadweight loss, a triangle of height $2 and base 1 (½ × 2 × 1). Buyers and sellers bear the tax equally here, $1 each per unit, because the two curves are equally steep. Double the tax to $4 and the market clears at Q = 2, revenue rises to $8 million, and the deadweight loss rises to ½ × 4 × 2 = $4 million, four times as large.

Module 5 Key Points

Markets and Welfare

• Consumer surplus is what buyers would have paid minus what they pay; producer surplus is the price minus sellers’ cost.

• A competitive market maximizes total surplus, given competition, no spillovers, and good information.

• A tax costs more than it raises: lost trades create a deadweight loss that grows with the square of the tax.

• The federal gasoline tax, 18.4 cents a gallon since 1993, raised $27 billion in fiscal 2025.

• In 2024, 3,743 Americans died on the kidney waiting list and 4,901 were removed as too sick.

• The course’s reading: banning payment is a moral choice, but its cost, counted in lives and supply, must be weighed.

Module 5 Quiz

Check Your Understanding

1. What is consumer surplus?

A) The goods left unsold
B) A seller’s profit
C) Total spending by consumers in a year
D) The difference between what buyers would have been willing to pay and what they actually pay, summed over all buyers

2. Why does a tax create a deadweight loss?

A) Because the government wastes the revenue it collects on programs no one values
B) Some trades no longer happen
C) Because sellers always raise prices by more than the tax
D) Because buyers pay the full amount of the tax in every market

3. If a tax is doubled, roughly what happens to its deadweight loss?

A) It halves
B) It stays the same, because the extra revenue offsets the loss
C) It quadruples
D) It doubles, in proportion to the tax

4. How many adults on the American kidney waiting list died in 2024, by the transplant registry’s count?

A) 3,743, and 4,901 more were removed as too sick
B) About 40
C) Under 100
D) About 30,000, roughly as many as received transplants that year

5. What is the course’s reading on what money should not buy?

A) The choice is moral, but a ban’s cost must be counted
B) Everything should be for sale, since markets always allocate best
C) Kidney sales should be legal everywhere at once
D) Markets corrupt every good they touch, so prices should be banned from health, education, and transport

Module 6 — When Governments Set Prices

Ceilings, Floors, and Who Pays for Them

Recommended Reading / Reference

Book: David Card and Alan B. Krueger, *Myth and Measurement: The New Economics of the Minimum Wage* (1995; twentieth-anniversary edition 2016), the book that reopened the debate over minimum wages, with a new preface on the evidence since

Reference: New York City Rent Guidelines Board, *2026 Price Index of Operating Costs* (April 9, 2026) and its annual votes on rent-stabilized leases

6a. Ceilings

A price ceiling is a legal maximum. Set above the market price, it does nothing. Set below it, it creates a shortage: at the lower price buyers want more than sellers will offer (Module 3). The price no longer rations the good, so something else must. Buyers wait in line, sellers favor friends and regular customers, quality falls because sellers no longer need to compete on it, and black markets sell the good at the price the law forbids.

America learned this at the gas pump. On August 15, 1971, President Nixon froze wages and prices for 90 days, the first such freeze outside wartime, and controls on oil prices outlasted the rest. When the Arab oil embargo sent the world price of crude soaring (Module 14), controlled gasoline could not rise to clear the market. In a survey by the American Automobile Association in February 1974, about one station in ten had no gas and more than a quarter were limiting sales. After Iran's revolution cut its output (Module 14), California counties began rationing by license plate, odd numbers one day and even the next. The lines ended after President Reagan removed the remaining controls in January 1981.

6b. Price Gouging and the Fuel Spike of 2026

About 37 states, along with the District of Columbia, forbid "unconscionable" price rises during declared emergencies; there is no federal law. Economists generally oppose such laws, because a high price in a crisis rations scarce goods to those who need them most urgently and draws in supplies from elsewhere, as the egg imports of Module 3 show. Most people see it differently: in a famous survey by Daniel Kahneman, Jack Knetsch, and Richard Thaler (1986), 82% of respondents called it unfair for a hardware store to raise the price of snow shovels after a storm.

The fuel spike of 2026 tested both views. The average price of regular gasoline reached $4.33 a gallon in September, a record for the month, by the American Automobile Association's count. The President ordered the Justice Department to investigate oil companies for price gouging on June 24, and the department urged state attorneys general to join on July 3. The administration waived the Jones Act, the law requiring ships between American ports to be American-built and American-crewed, in March, and considered and then ruled out a ban on exports of diesel. Five states suspended their gasoline taxes. No one imposed a cap. When the Clark Center asked its panel on March 18, 2026 whether a cap on gasoline prices would lower prices without causing shortages, not one economist agreed.

6c. Floors

A price floor is a legal minimum. Set above the market price, it creates a surplus: sellers offer more than buyers want. Farm price supports are the classic case. America's sugar program limits imports and lends to processors at guaranteed prices, keeping the domestic price well above the world's. Refined sugar cost 52 to 60 cents a pound in the United States in 2022, against 24 cents on the world market, and the Government Accountability Office estimated that the program costs American users $2.5 billion to $3.5 billion a year. Without the import limits, the surplus would show up as unsold sugar; with them, it shows up as higher prices.

The minimum wage is a floor under the price of labor. In the simplest competitive model it raises pay for those who keep their jobs and reduces the number of jobs, because employers hire fewer workers whose pay now exceeds what they add. The federal minimum has been $7.25 an hour since July 24, 2009. Thirty states and the District of Columbia set higher minimums, up to $18.40 in the District, and many cities set higher ones still, such as Seattle's $22.14 from January 1, 2027.

6d. When Employers Set Pay

The competitive model assumes a worker can walk across the street to another employer at the same wage. Where that is hard, because employers are few, jobs are specialized, or moving is costly, an employer has some power to set pay, which economists call monopsony: one buyer, or few. A firm with that power hires fewer workers than a competitive market would, at lower pay, because raising pay to attract one more worker means raising it for all. A minimum wage set between the firm's wage and what workers add can then raise both pay and employment, since the floor removes the reason to hold hiring down. Above that level, the competitive logic returns and jobs are lost. So the theory alone cannot say what a minimum wage does; only evidence can.

6e. Rent Control: The Cases as Their Advocates Make Them

The case for rent control: tenant groups and many city politicians, among them New York's Mayor Zohran Mamdani, argue that housing is a necessity, that tenants facing large increases have little bargaining power, and that limits on rent keep families, schools, and neighborhoods stable. The evidence they cite includes the stability itself: in San Francisco, tenants covered by rent control were about 20% less likely to move than similar tenants who were not (Rebecca Diamond, Tim McQuade, and Franklin Qian, *American Economic Review*, 2019).

The case against: most economists answer that rent control shrinks and ages the housing it covers, so that renters as a whole pay more. In the same San Francisco study, landlords whose buildings became covered cut the rental housing they offered by 15%, by converting it to condominiums or redeveloping it, which likely raised rents across the city. In St. Paul, Minnesota, after voters capped rent increases at 3% a year in 2021, property values fell by about 6% to 7% (Kenneth Ahern and Marco Giacoletti, 2022), and the city exempted new construction for 20 years in 2022 and permanently in 2025. When the Clark Center polled its panel in 2012 on whether rent control had improved the supply and quality of affordable housing in cities such as New York, almost none agreed.

What the evidence says: the studies agree that rent control helps the tenants who hold controlled apartments and that landlords respond by supplying less. St. Paul's building permits fell from more than 2,000 units a year in 2020-21 to 357 in 2025, though the Federal Reserve Bank of Minneapolis cautions that

rising interest rates cut building everywhere and that the link to rent control rests on interviews more than hard data. Argentina's repeal of its rent law in December 2023 is the reverse experiment, and it cuts both ways. Advertised rents for a two-room apartment in Buenos Aires fell about 33% after inflation from December 2023 to August 2026 (the city's statistics office), and listings rose more than fourfold. But the rents tenants actually paid rose far faster than prices, 683% against 247% to August 2026, as old contracts reset (INDEC, Argentina's statistics agency). In New York, the Rent Guidelines Board, five of whose nine members Mamdani had appointed, voted 7-1 on June 25, 2026 for a 0% increase on one- and two-year leases beginning between October 1, 2026 and September 30, 2027. It was the first freeze to cover both lease lengths, for about a million apartments.

The course's reading: rent control transfers money from owners to sitting tenants and shrinks and ages the housing stock over time, so its benefits go to incumbents and its costs to newcomers and future renters. Building more is the only lasting cure for high rents.

6f. The Minimum Wage: The Cases as Their Advocates Make Them

The case that moderate minimum wages cost few jobs: David Card and Alan Krueger found no loss of jobs in New Jersey's fast-food restaurants after the state raised its minimum from $4.25 to $5.05 on April 1, 1992, in the border comparison of Module 1 (*American Economic Review*, 1994). Doruk Cengiz, Arindrajit Dube, Attila Lindner, and Ben Zipperer studied 138 state increases from 1979 to 2016 and found that the number of low-wage jobs held steady for five years afterward (*Quarterly Journal of Economics*, 2019). Michael Reich and his colleagues at Berkeley found no job loss from California's $20 minimum for fast-food workers, begun on April 1, 2024; in their April 2026 update, weekly pay was up about 11% and prices about 1.5%. Monopsony, they argue, explains why.

The case that minimum wages cost jobs: David Neumark and Peter Shirley reviewed the American research and found that 79% of 130 preferred estimates, drawn from about 70 studies, pointed to job losses, concentrated among teenagers, young adults, and the least educated (*Industrial Relations*, 2022). When Seattle raised its minimum, a team at the University of Washington found that hours in low-wage jobs fell, cutting the earnings of the least experienced workers (Ekaterina Jardim and colleagues, 2022). Jeffrey Clemens and three coauthors estimated that California's fast-food wage cut employment at limited-service restaurants by about 3% after one year and 3.5% after two. CBO estimated in 2021 that a federal minimum of $15 by 2025 would lift 0.9 million people out of poverty and cost 1.4 million jobs, its median estimate.

What the evidence says: the findings depend on how large the increase is relative to local pay, and on which comparison group a study uses. Increases that raise the minimum to a moderate share of the local median wage show small effects on jobs. Larger increases, and those in low-wage regions, show more. The losses fall heaviest on the youngest and least experienced, and they often come through fewer hours rather than fewer jobs. When the Clark Center asked in 2015 whether a federal minimum of $15 would substantially reduce employment among low-wage workers, its panel split: 30% agreed, 27% disagreed, and 43% were uncertain.

The course's reading: moderate minimum wages, relative to local pay, have cost few jobs and raised the pay of millions. Large increases carry real risks, worst for the least experienced workers, and the federal minimum binds in few places.

Worked example — New York’s Rent Freeze, in One Building’s Books

Take a rent-stabilized apartment renting for an illustrative $1,600 a month, in a building whose operating costs, for heat, insurance, taxes, repairs, and staff, take 65% of the rent, or $1,040, leaving the owner $560 a month before mortgage payments. The Rent Guidelines Board’s own index of operating costs for stabilized buildings rose 5.3% in the year to March 2026, with fuel up 11.0% and insurance up 10.5%. If costs rise by that much again, they reach $1,095 ($1,040 × 1.053), and with the rent frozen the owner’s margin falls to $505, down about 10%. Had the board allowed a 3% increase instead, the rent would have been $1,648 and the margin $553, almost unchanged. For the tenant, the freeze is worth $48 a month, $576 a year, and since consumer prices are rising (Module 13), the rent falls in real terms. The freeze is a transfer from owner to tenant. In older buildings with low rents and high costs, where margins are thin to begin with, repeated freezes can push margins below zero, and owners respond by cutting maintenance or taking apartments off the market when they can.

Module 6 Key Points

When Governments Set Prices

• A ceiling below the market price creates a shortage, rationed by queues, falling quality, and black markets.

• In March 2026 not one economist polled agreed that a cap on gasoline prices would lower prices without shortages.

• A floor above the market price creates a surplus; the sugar program kept American prices more than double the world’s in 2022.

• Rent control helps sitting tenants but shrinks supply: covered San Francisco landlords cut their rental housing by 15%.

• Minimum-wage evidence splits: moderate rises cost few jobs, while studies of California’s $20 fast-food wage disagree.

• The course’s reading: rent control helps incumbents at newcomers’ cost; moderate minimum wages cost few jobs, large ones more.

Module 6 Quiz

Check Your Understanding

1. What does a price ceiling set below the market price create?

A) A surplus of the good, as sellers produce more than buyers want
B) A shortage
C) Higher quality, as sellers compete on service instead of price
D) Lower prices with no other effect on supply or demand

2. What did the Clark Center's economists say in March 2026 about capping gasoline prices?

A) Most favored it
B) They were evenly split
C) Most said a cap would lower prices without shortages, as it had in the 1970s
D) Not one agreed that a cap would lower prices without shortages

3. How can a minimum wage raise both pay and employment, in theory?

A) By lowering prices
B) Only if workers move to other states
C) Where an employer has the power to set pay below what workers add, a floor up to that level can draw more people into work
D) By raising the demand for labor in every industry at once

4. What did New York's Rent Guidelines Board vote on June 25, 2026?

A) A rise of 3% on one-year leases and 4.5% on two-year leases
B) A freeze at 0%
C) An end to rent stabilization for new tenants
D) A cap of 9.5% on every apartment in the city for two years

5. What is the course's reading on the minimum wage?

A) It always destroys jobs
B) It has no effect on employment at any level, as the 1994 New Jersey study proved
C) Moderate rises cost few jobs; large ones carry real risk
D) It should be abolished, since monopsony never exists in practice and every study finds large losses

Module 7 — Firms, Costs, and Competition

What It Costs to Produce, and Why Competition Squeezes Profit

Recommended Reading / Reference

Book: Ronald H. Coase, *The Firm, the Market, and the Law* (1988), which collects his papers on why firms exist and on the cost of using markets, with an introduction by the author

Reference: American Transportation Research Institute (ATRI), *An Analysis of the Operational Costs of Trucking: 2026 Update* (July 15, 2026), the source of the worked example's costs

7a. Why Firms Exist

If markets coordinate so well (Module 3), why does so much economic activity happen inside firms, where managers give orders instead of prices? Ronald Coase answered in "The Nature of the Firm" (1937). Using markets has costs, which economists call transaction costs: finding someone to trade with, negotiating a price, writing a contract, and enforcing it. For work done often and in close coordination, it is cheaper to hire people and direct them than to strike a new bargain for every task. A firm grows until organizing one more activity inside costs as much as buying it outside. Every decision to make something or buy it, to employ a cleaner or hire a cleaning company, is a choice about where that line falls.

7b. Production and Diminishing Returns

In the short run some of a firm's inputs are fixed: a restaurant has one kitchen, a trucking company its trucks. In the long run every input can change. The extra output from one more unit of an input is its marginal product. With other inputs fixed, the marginal product of labor eventually falls, which economists call diminishing marginal returns. The first cooks in a kitchen add a great deal, but a tenth cook in the same space mostly gets in the way.

7c. Costs

A firm's costs come in two kinds. Fixed costs, such as rent or payments on a truck, must be paid whatever the firm produces. Variable costs, such as fuel and wages for hours worked, rise with output. Dividing by output gives average costs: average fixed cost falls steadily as output rises, while average variable cost eventually rises with diminishing returns, so average total cost traces a U. The most important cost of all is marginal cost, the cost of producing one more unit. It rises once diminishing returns set in, and it crosses average total cost at the bottom of the U, since producing a unit that costs less than the average pulls the average down, and one that costs more pulls it up.

Cost	Meaning	Trucking example
Fixed cost	Paid whatever the output, at least in the short run	Payments on the truck and trailer; insurance
Variable cost	Rises with output	Driver's pay per mile, fuel, repairs, tires, tolls
Average total cost	Total cost divided by output	Total cost per mile driven
Marginal cost	The cost of one more unit	The cost of driving one more mile

7d. Economies of Scale

In the long run, a firm chooses its size. Over some range, bigger is cheaper: average cost falls as output grows, because large fixed costs are spread over more units and larger operations allow more specialization. These are economies of scale. A factory making the most advanced computer chips costs more than $20 billion to build, so only a firm that sells enormous numbers of chips can make them at a competitive cost. Beyond some size, coordination grows harder and average cost stops falling or rises, diseconomies of scale. Where economies of scale are large relative to the market, an industry ends up with few firms, or one, a case Module 8 takes up.

7e. Economic Profit

Accountants measure profit as revenue minus explicit costs, the bills a firm actually pays. Economists also subtract opportunity costs (Module 1): the salary the owner could earn working for someone else, and the return the owner's money could earn invested elsewhere. A shop owner who clears $60,000 a year has made an accounting profit, but if she could earn $70,000 as a manager and $10,000 a year by investing her savings elsewhere, her economic profit is minus $20,000. An economic profit of zero is not a failure. It means the business earns exactly what its owners' time and money could earn elsewhere, a normal return.

7f. Perfect Competition

In a perfectly competitive market there are many sellers of an identical product, buyers know the prices, and firms can enter and leave freely. No seller can affect the price, so each takes the market price as given, and the price is also what each extra unit brings in. A firm maximizes profit by producing up to the point where price equals marginal cost: below it, an extra unit adds more to revenue than to cost; beyond it, the reverse.

When the price falls, two thresholds matter. In the short run a firm should keep producing as long as the price covers its average variable cost, because its fixed costs must be paid either way, and any revenue above variable cost helps pay them. Below average variable cost, it should shut down temporarily, since producing adds to its losses. In the long run nothing is fixed, and a firm should stay in business only if the price covers its average total cost.

Entry and exit then do the disciplining. When firms earn economic profits, newcomers enter, supply rises, and the price falls. When firms make losses, some leave, supply falls, and the price rises. Over time the price is pushed toward the lowest average total cost, and economic profit toward zero. Competition passes the gains from lower costs on to buyers, which is why consumers benefit from it and why firms try to escape it.

7g. Trucking's Boom and Bust

American trucking is close to the textbook model. Hundreds of thousands of carriers, many of them a single owner with one truck, sell a nearly identical service, and starting up takes little more than a truck and a federal operating authority. When freight boomed during the pandemic, the spot rate for a dry van, the price on loads booked for immediate shipment rather than under contract, reached a then-record $3.11 a mile in January 2022 (DAT, a freight marketplace). Entry exploded: new carriers registered at 10,000 to 11,000 a month for most of 2021, against about 3,000 a month before the pandemic (FTR, a transport research firm).

Then freight demand cooled, and the extra trucks drove rates down through a long freight recession. The spot rate was $2.29 a mile in December 2025, below the industry's average total cost. Carriers left, but slowly, because a carrier covering its variable costs keeps driving: the number of for-hire carriers barely changed in 2025, and it was still about 86,000, or a third, higher than before the pandemic. In 2026 the diesel shock lifted rates to $3.01 a mile in September, including fuel surcharges, 96 cents higher than a year earlier, with diesel at $6.29 a gallon.

Worked example — A Trucking Firm's Costs per Mile

ATRI's survey of carriers put the average cost of running a heavy truck at a record $2.336 a mile in 2025. The largest items were the driver's wages, 81.8 cents a mile; fuel, 48 cents; payments on the truck and trailer, 40 cents; repairs, 22 cents; driver benefits, 21 cents; and insurance, 11 cents; tolls, tires, and permits made up the remaining 9.8 cents. In the short run, the truck payments and insurance are fixed: a carrier owes them whether its truck runs or not, and together they come to 51 cents a mile at a normal year's mileage. Everything else is variable: 81.8 + 48 + 22 + 21 + 9.8 cents, or about $1.83 a mile. So a carrier should keep its truck on the road as long as the rate it gets covers about $1.83 a mile, and park it below that. To stay in business for the long run, when the truck must eventually be replaced, it needs about $2.34. At December 2025's spot rate (7g), the average carrier was losing about 5 cents a mile on its total costs but still earning 46 cents a mile above its variable costs, so it kept driving while its owner weighed whether to quit. That is why a competitive industry takes years, not months, to shed capacity after a boom.

Module 7 Key Points

Firms, Costs, and Competition

• Firms exist because using markets has costs; some work is cheaper to organize by command, as Coase explained.

• Adding workers to fixed equipment brings diminishing returns, so marginal cost eventually rises.

• Economic profit counts the owners' opportunity costs; an economic profit of zero means a normal return.

• A competitive firm produces where price equals marginal cost, and shuts down when price falls below average variable cost.

• Trucking's 2021 boom drew 10,000 new carriers a month; the bust that followed pushed rates below total cost by late 2025.

• Entry and exit push competitive prices toward average total cost; trucking's averaged about $2.34 a mile in 2025.

Module 7 Quiz

Check Your Understanding

1. Why do firms exist, according to Ronald Coase?

A) Because using markets has costs, of finding partners and negotiating and enforcing contracts, and some work is cheaper to organize by command inside a firm
B) Because the law requires it
C) To avoid taxes on market transactions
D) Because workers prefer salaries to freelance pay

2. When should a competitive firm stop producing in the short run?

A) When it makes a loss
B) When marginal cost rises
C) When price falls below the average total cost it must eventually cover, including every fixed payment it owes
D) When price falls below average variable cost

3. What is economic profit?

A) Revenue minus taxes
B) Revenue minus explicit costs, as accountants measure it
C) Revenue minus all costs, including the opportunity cost of the owners' time and capital
D) The profit a firm earns after the government adjusts it for inflation, competition, and the size of its market

4. What drives economic profit toward zero in a competitive industry in the long run?

A) Government price controls that cap profit
B) Entry and exit
C) Taxes
D) Rising wages that always absorb any gain from higher prices

5. By ATRI's figures for 2025, below about what rate per mile should a trucking firm park its trucks in the short run?

A) $0.51, its fixed cost
B) $3.11, the 2022 peak
C) $2.34, its total cost per mile
D) About $1.83, the cost of running a truck that it avoids by parking it: wages, fuel, repairs, and the like

Module 8 — Market Power

Monopoly, Oligopoly, Platforms, and Antitrust

Recommended Reading / Reference

Book: Thomas Philippon, *The Great Reversal: How America Gave Up on Free Markets* (2019), an economist's case that weaker competition has raised American prices, comparing industries in the United States and Europe

Reference: The Justice Department and the Federal Trade Commission (FTC), *Merger Guidelines* (December 18, 2023), the agencies' statement of how they judge whether a merger lessens competition

8a. Where Market Power Comes From

A firm has market power when it can raise its price above its marginal cost without losing all its customers, something no firm in Module 7's competitive markets can do. Market power lasts only if something keeps rivals out. The barriers include patents and copyrights, which give an inventor or author a temporary legal monopoly, and economies of scale so large that a newcomer cannot match the incumbent's costs (Module 7). They also include network effects (8g); control of a key input, such as a mine or a stadium; and government licenses that limit who may sell.

8b. How a Monopolist Prices

A monopolist, the only seller of a good with no close substitute, faces the whole market's demand curve. To sell one more unit it must lower its price, not just on that unit but on all the units it was already selling. So the extra revenue from one more unit, its marginal revenue, is less than the price. The monopolist maximizes profit by producing where marginal revenue equals marginal cost, and charges the highest price buyers will pay for that quantity. The result is a higher price and a smaller quantity than a competitive industry with the same costs would produce. Some trades worth more to buyers than they cost to make do not happen, a deadweight loss like the tax's in Module 5, and part of what would have been consumer surplus becomes the monopolist's profit.

8c. Price Discrimination

A firm with market power can do better still by charging different buyers different prices for the same good, according to what each will pay, which economists call price discrimination. Airlines charge business travelers, who book late and cannot change their plans, far more than vacationers who book months ahead. Colleges publish a high price and offer aid that cuts it for students who would not otherwise come. Senior discounts and coupons sort buyers the same way. Price discrimination can raise output, by selling to buyers who would not pay the single price, but it moves surplus from buyers to the seller. Online sellers can now tailor prices to each shopper using personal data, and in January 2025 the FTC published early findings from its study of the practice, which it calls surveillance pricing.

8d. Natural Monopoly and Its Regulators

In some industries one firm can serve a whole market more cheaply than two could, because the fixed cost is enormous and the cost of serving one more customer is small. Two sets of power lines or water pipes down the same street would waste money. Such a natural monopoly is usually either owned by the government or regulated: in America, state public utility commissions set electricity and water rates to cover the utility's costs plus an allowed return on its investment. Regulation tames the price but weakens the incentive to cut costs, since lower costs bring lower rates, and much of the art of regulation lies in restoring that incentive.

8e. Oligopoly and Game Theory

Most industries with market power have a few large firms rather than one: airlines, wireless carriers, oil producers. Each firm's best move depends on what its rivals do, and the tool for analyzing such choices is game theory. Its central idea is the Nash equilibrium, named after the mathematician John Nash, who described it in 1950 and shared the 1994 Nobel Prize: a set of choices in which no player can do better by changing its own choice, given what the others are doing.

The best-known game is the prisoner's dilemma. Two firms would earn the most by jointly holding output down and prices up. But each earns more by quietly producing extra, whatever the other does, so both produce extra, and both end up earning less than if they had cooperated. The dilemma explains why cartels, groups of producers that agree to limit output, are unstable, and why buyers benefit when they break down. Repeated play can sustain cooperation, since a cheat can be punished next time, but the temptation never goes away. Collusion is illegal in the United States under the Sherman Act (8h).

The Organization of the Petroleum Exporting Countries (OPEC), and the wider group called OPEC+ that adds Russia and other producers, is the world's most famous cartel, and its history is a long record of members producing above their quotas. On April 28, 2026, the United Arab Emirates (UAE) announced that it would leave both groups from May 1, after 59 years. Its energy minister called it a policy decision taken after a review of production policy. The UAE could pump about 4.85 million barrels a day against output of about 3.4 million, and it had long chafed at a quota that left so much capacity idle.

8f. Brands and Monopolistic Competition

Between perfect competition and monopoly lies the most common market of all: many firms selling products that differ, such as restaurants, clothing, or shampoo. Each has a little market power over customers who prefer its version, so it prices above marginal cost. But entry is free, so economic profits draw in rivals until profits approach zero, as in competition. Economists call this monopolistic competition. Brands and advertising are its weapons: they differentiate products and loyalty lets a firm charge more.

8g. Platforms and Network Effects

A product has network effects when each user makes it more valuable to the others: a social network with all your friends on it, a payment card that every shop accepts, a marketplace where every buyer and seller already gathers. Many of these are platforms serving two groups at once, such as app developers and phone owners, or advertisers and searchers, and they often charge one side little or nothing to attract the other. Network effects make markets tip toward one or two winners, because a newcomer with a better

product but few users has little to offer. That is why the antitrust cases of the 2020s have centered on platforms.

8h. Antitrust in 2025-26

American antitrust law rests on the Sherman Act of 1890, which forbids agreements in restraint of trade and monopolization, and the Clayton Act of 1914, which forbids mergers that may substantially lessen competition. Since the late 1970s courts have mostly judged cases by their effect on consumers, chiefly on prices, an approach called the consumer welfare standard. Critics who want antitrust to address size and power more broadly are called neo-Brandeisians, after Justice Louis Brandeis. The cases of 2025-26 tested both approaches.

Case	What happened
Google: search	Found an illegal monopolist in 2024; on September 2, 2025 the judge declined to order the sale of its Chrome browser, banned exclusive deals to be the default search engine, and required some sharing of data. Both sides have appealed
Google: advertising technology	Found to have monopolized parts of the market in 2025; on September 2, 2026 the judge declined to order the sale of its ad exchange and imposed six years of rules on its conduct, overseen by a monitor
FTC against Meta	The judge ruled for Meta on November 18, 2025, finding that it faces competition from TikTok and YouTube; the FTC has appealed
FTC against Amazon	Trial set for 2027 (Module 19)
Justice Department against Apple	Pretrial exchange of evidence runs to May 2027; no trial date
Live Nation and Ticketmaster	The Justice Department settled during the trial in March 2026; on April 15 a jury found for the states that the company had monopolized ticketing and overcharged fans $1.72 a ticket. Remedies, possibly a breakup, are to be decided by the judge
RealPage	Software that recommended rents to competing landlords; a settlement with the Justice Department was approved in May 2026, and California, New York, and New Jersey banned such rent-setting software

As of October 2026.

8i. Has American Business Become Too Concentrated? The Cases as Their Advocates Make Them

The case that it has: neo-Brandeisians, among them Lina Khan, who chaired the FTC from 2021 to 2025, and economists such as Thomas Philippon argue that competition has weakened across the economy. Jan De Loecker, Jan Eeckhout, and Gabriel Unger estimated that the average markup of price over marginal cost rose from 21% in 1980 to 61% in 2016 (*Quarterly Journal of Economics*, 2020). Profits' share of income rose, the rate at which new firms are founded fell, and many American industries, from airlines to wireless service, charge more than their European counterparts.

The case that it has not: defenders of the consumer welfare standard reply that the markup estimates overstate the change. James Traina found the rise modest once marketing and overhead costs are counted as costs, and Susanto Basu noted that the estimates imply implausibly high profits. Esteban Rossi-Hansberg, Pierre-Daniel Sarte, and Nicholas Trachter found that while national concentration rose, local concentration fell, as large chains entered towns that once had a single store. The firms that grew largest are often the most productive, many digital services are free to their users, and the judge in the Meta case found competition where the government had seen monopoly.

What the evidence says: the rise in measured markups is real but its size depends on how costs are counted. Concentration rose in many national industries while choice rose in many local markets. The courts have found monopolies where the evidence was specific, in search, in advertising technology, and in ticketing, and rejected the government's case where rivals were visibly gaining users.

The course's reading: market power has grown in some industries, notably digital platforms and ticketing, where courts have found monopolies. The economy-wide case is overstated, and enforcement case by case fits the evidence better than a sweeping theory either way.

Worked example — A Two-Member Cartel

Take two illustrative oil producers, each assigned a quota of 10 million barrels a day, with production costs of $20 a barrel. Suppose the world price, in dollars, is 100 minus 2 times total output in millions of barrels a day. If both keep to their quotas, output is 20, the price is $60, and each earns $400 million a day (($60 − $20) × 10). If one cheats and pumps 12 while the other keeps to 10, output is 22 and the price falls to $56: the cheat earns $432 million (($56 − $20) × 12) and the loyal member $360 million (($56 − $20) × 10). If both cheat, output is 24, the price is $52, and each earns $384 million (($52 − $20) × 12). Cheating pays whatever the other does: $432 million beats $400 million if the other keeps the quota, and $384 million beats $360 million if the other cheats. So both cheat, and each ends up with $384 million instead of the $400 million they could have had together. That is the prisoner's dilemma. Buyers gain from it: if the two competed all the way, pumping until the price fell to their $20 cost, output would reach 40 and their profit would vanish. A member with far more capacity than its quota, as the UAE had, faces the strongest temptation of all.

Module 8 Key Points

Market Power

• Market power lets a firm price above marginal cost; it rests on patents, scale, network effects, key inputs, or licenses.

• A monopolist sells less at a higher price than a competitive industry would, creating a deadweight loss.

• Cartels are prisoner’s dilemmas: each member gains by cheating, which is why OPEC quotas leak and the UAE left in 2026.

• Courts found illegal monopolies in Google’s search and ad technology and in Live Nation’s ticketing, but cleared Meta in 2025.

• One estimate has average markups rising from 21% over marginal cost in 1980 to 61% in 2016; critics find far less.

• The course’s reading: market power has grown in some industries, such as platforms and ticketing; judge case by case.

Module 8 Quiz

Check Your Understanding

1. Why is a monopolist's marginal revenue below its price?

A) It must cut the price on all units to sell one more
B) Because the government taxes each additional unit it sells at a higher rate
C) Because its costs rise faster than those of competitive firms in the same market
D) Because buyers always demand a discount from any firm that dominates a market

2. What does price discrimination mean?

A) Selling only to buyers who agree not to resell, so the seller can control where the good ends up
B) Uniform pricing
C) Raising every price during an emergency to clear a shortage quickly
D) Charging buyers different prices for the same good

3. In the worked example's prisoner's dilemma, why do both cartel members end up cheating?

A) Because each earns more by cheating whatever the other does, so both cheat and each ends up with less than if both had kept to the quota
B) Because the law requires it
C) Because cheating raises the price
D) Because buyers refuse to deal with loyal members

4. What did a jury find against Live Nation and Ticketmaster on April 15, 2026?

A) That they had not broken antitrust law, since artists choose their own ticket sellers
B) Monopoly, and a $1.72 overcharge a ticket
C) That they must be broken up within ninety days of the verdict, as the Justice Department had asked
D) That their fees were legal but must be shown up front under the FTC's rule

5. What is the course's reading on whether American business has become too concentrated?

A) Not at all
B) Yes, everywhere
C) In some industries, such as platforms and ticketing; judge case by case
D) Yes: markups tripled, so every large company should be broken up into smaller rivals at once

Module 9 — Externalities, Public Goods, and the Commons

When Costs and Benefits Fall on Others

Recommended Reading / Reference

Book: Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (1990), the study of fisheries, forests, pastures, and irrigation systems that communities manage themselves, which won its author the Nobel Prize

Reference: The Metropolitan Transportation Authority's monthly metrics for New York's congestion relief zone (since January 2025): vehicle entries, crossing times, transit ridership, and toll revenue

9a. Costs That Fall on Others

Module 5 showed that a competitive market makes the gains from trade as large as they can be, on one condition: the buyer and the seller bear all the costs and get all the benefits of their deal. Often they do not. A factory that dumps waste in a river imposes a cost on the people downstream, who had no say in the sale of whatever the factory makes. A driver who enters Manhattan at rush hour slows every other car on the street. Economists call such a spillover an externality: a cost or benefit that falls on people outside the transaction.

A negative externality is a cost, such as pollution, noise, congestion, or the overuse of antibiotics that breeds resistant bacteria. A positive externality is a benefit, such as the protection a vaccinated person gives the unvaccinated, or the research one company does that others learn from. The logic is the same in both. When the cost to society is higher than the cost the seller pays, the market produces too much; when the benefit to society is higher than what the buyer gets, it produces too little. The gap between private and social cost is the externality, and every remedy tries to close it.

9b. Four Remedies

The first remedy is a tax equal to the harm, named after the Cambridge economist Arthur Pigou, who proposed it in *The Economics of Welfare* (1920). A Pigouvian tax makes the polluter pay the cost it imposes, so it cuts pollution wherever cutting is cheaper than paying, and leaves the choice of how to each firm. The second is a cap with tradable permits: the government fixes the total amount of pollution, issues permits for it, and lets firms trade them, so the price of a permit settles where the cap is met at the lowest total cost. America's market in permits for sulfur dioxide, created in 1990 to fight acid rain, and the European Union's carbon market, the Emissions Trading System (ETS), begun in 2005, are the best-known examples.

The third remedy is a rule: a limit on emissions, a required technology, or a standard such as fuel economy for cars. Rules are simple to understand and to enforce, but they tend to cost more, because they make every firm cut by the same amount whether its cuts are cheap or dear. The fourth, for positive externalities, is a subsidy, such as free vaccines or the tax credit for research, which pays people to do more of what benefits others.

Remedy	What it fixes	Strength	Weakness
Tax on the harm	The price of polluting	Cuts pollution where cutting is cheapest; raises revenue	The amount of pollution that results is uncertain; taxes are unpopular
Cap with tradable permits	The total amount of pollution	The amount is certain; trading finds the cheapest cuts	The permit price can swing widely
Rule or standard	What each firm must do	Simple, visible, and predictable	Costs more for the same cut
Subsidy	The reward for doing good	Popular; can speed up new technology	Costs taxpayers; pays some people for what they would have done anyway

9c. Bargaining Instead of Government

Coase, whose account of the firm opened Module 7, saw a fifth possibility in “The Problem of Social Cost” (1960). If rights are clearly assigned and bargaining is cheap, the parties to an externality can strike a deal themselves. If a rancher’s cattle trample a farmer’s crops, the farmer can pay the rancher to fence them in, or the rancher can pay for the crops, and either way the fence goes up if it costs less than the damage. Who holds the right decides who pays, but not whether the efficient thing gets done.

Coase’s point is usually read the other way round. Bargaining is cheap between a rancher and a farmer, but not among the millions of drivers who slow one another in a city, or the billions of people whose emissions warm the planet. Transaction costs (Module 7) are what make externalities a problem for policy rather than for private contracts.

9d. Public Goods and Free Riders

Some goods are an extreme case of positive externality. A public good is one that is non-rival, so one person’s use leaves as much for everyone else, and non-excludable, so no one can be kept from using it. National defense is the textbook case: an army protects every resident at once, and no resident can be left unprotected for refusing to pay. Basic research, published freely, is another, as are the weather forecasts built from government satellites. Because no one can be charged, everyone has a reason to let others pay, the free-rider problem, and a market supplies too little or none at all. That is why governments provide public goods or pay for them through taxes.

The line between public and private is not fixed by nature. Coase himself showed in 1974 that the lighthouses economists had used as their example of a public good were often private in Britain, paid for by fees collected from ships in port. Technology moves goods across the line too: a scrambled signal turned television broadcasts, once free to anyone with an antenna, into a service sold by subscription.

	Excludable	Non-excludable
Rival	Private goods: a sandwich, a car	Common resources: fish in the sea, groundwater, the atmosphere’s capacity to absorb carbon
Non-rival	Club goods: a streaming service, a toll road without congestion	Public goods: national defense, basic research, weather forecasts

9e. The Commons

Common resources are rival, so one person's use leaves less for others, but open to all. The biologist Garrett Hardin called the result "The Tragedy of the Commons" (1968): each herder adds another cow to the shared pasture because he gets all the gain from it and bears only a small share of the overgrazing, until the pasture is ruined for everyone. Fisheries are the modern case. The cod off Newfoundland, fished for five centuries, collapsed so far that Canada closed the fishery in 1992, and about 30,000 people lost their jobs.

The economist's standard answers are to turn the commons into property, or to regulate it. Iceland and New Zealand assign each fishing firm a share of a total catch set by scientists, and let the shares be traded, so that each owner gains from keeping the stock healthy. Elinor Ostrom, an American political scientist, showed that there is a third way. Studying Swiss alpine pastures, Japanese village forests, and Spanish irrigation systems, some run for centuries, she found communities that governed their commons without either private ownership or the state. They drew clear boundaries, made rules suited to local conditions, monitored one another, punished cheats by degrees, and settled disputes cheaply. Ostrom won the Nobel Prize in economics in 2009, the first woman to do so.

9f. Price Carbon, Subsidize Clean Energy, or Regulate? The Cases as Their Advocates Make Them

Carbon dioxide is the largest externality of all, and governments have tried every remedy in 9b on it.

The case for a price: most economists favor a carbon tax or a cap with permits as the cheapest way to cut emissions, because it lets each emitter find its own cheapest cut. In January 2019 more than 3,500 economists, among them 28 Nobel laureates and every living former chair of the Federal Reserve, signed a statement calling for a carbon tax whose revenue would be returned to the public as equal dividends. The European Union's market is their evidence that a price works. Emissions from the power plants and factories it covers have fallen by about half since 2005, and an allowance to emit a tonne cost €82.40 on October 5, 2026. Since January 2026 the EU has also charged importers of cement, iron and steel, aluminum, fertilizers, electricity, and hydrogen for the carbon in them, its Carbon Border Adjustment Mechanism (CBAM); importers start buying certificates in 2027 (Module 19).

The case for subsidies: advocates of subsidies say prices fail where they matter most, at the ballot box. Canada ended its consumer carbon charge in April 2025 after it became a political liability, and France's fuel-tax rise of 2018 set off the yellow-vest protests. Subsidies are popular, they argue, and they drive down the cost of new technologies through mass production, as the price of solar panels fell by about nine-tenths in a decade.

The case for rules: defenders of regulation say standards for cars, appliances, and power plants deliver cuts that are certain and visible, in sectors where people respond little to prices, without a tax that voters see at the pump.

What the evidence says: studies of the European market find that it cut emissions at a modest cost to output, and that subsidies and rules cost more per tonne avoided than a price. But the politics have mostly run the other way. In the United States, the July 2025 budget law ended the tax credits for electric vehicles bought after September 30, 2025 and for home solar and efficiency after 2025. It requires wind and solar projects to begin construction by July 4, 2026, or to be in service by the end of 2027, to qualify for credits, while keeping the credit for energy storage through 2033. In February 2026 the Environmental Protection Agency repealed the 2009 finding that greenhouse gases endanger health, and the limits on vehicle emissions that rested on it; health groups have sued, and the case is pending.

The course's reading: a price is the cheapest tool per tonne, and the economists are right about the mechanism. But a price works only if it survives elections, which is why most countries mix all three remedies, and why a price with visible rebates is the version most likely to last.

Worked example — New York's Congestion Charge as a Price on Delay

Since January 5, 2025, most cars entering Manhattan below 60th Street at peak hours pay $9 a day, with lower charges at night and per-trip charges for taxis and ride-hailing cars. The charge is a Pigouvian tax on the delay each driver imposes on others. By the count of the Metropolitan Transportation Authority (MTA), 27 million fewer vehicles entered the zone in 2025 than expected without the charge, 73,000 fewer a day, a fall of 11%. Those figures imply that about 664,000 vehicles a day would have entered without the charge (73,000 ÷ 0.11) and that about 591,000 still did. Morning crossings into the zone were 23% faster, and subway trips into it rose 9%. The charge raised $578 million, net of costs, against a target of $500 million. Spread over the roughly 216 million entries of the year (591,000 × 365), that is about $2.68 an entry, low because taxis and ride-hailing cars pay small per-trip charges and cars pay only once a day. Independent studies agree on the direction and differ on the size: one for the National Bureau of Economic Research (NBER), revised in August 2026, found speeds within the zone up 11%, with little effect on air quality, shopping, or foot traffic, and another found ambulances arriving 5-6% faster. The federal Department of Transportation tried to cancel the program in 2025; a federal judge vacated its cancellation in March 2026, and the government's appeal is pending.

Module 9 Key Points

Externalities, Public Goods, and the Commons

• An externality is a cost or benefit that falls on people outside a deal; markets overproduce harms and underproduce benefits.

• The remedies are a tax on the harm, a cap with tradable permits, rules, and subsidies; a price is usually cheapest.

• Public goods such as defense are non-rival and non-excludable, so free riders leave markets supplying too little.

• Ostrom showed communities can govern commons themselves; Newfoundland’s cod collapse in 1992 showed what happens when no one does.

• New York’s congestion charge cut vehicle entries 11% in 2025 and raised $578 million net of costs.

• The course’s reading: carbon pricing is cheapest per tonne but must survive elections, so most countries mix all three remedies.

Module 9 Quiz

Check Your Understanding

1. What is a negative externality?

A) A loss a firm makes when demand falls below its forecast
B) A cost that falls on people outside the deal
C) A price set below cost
D) A subsidy that rewards firms for producing more of a good than buyers want

2. What did Ronald Coase argue in "The Problem of Social Cost" (1960)?

A) That pollution should always be banned outright
B) That only a tax can fix an externality
C) That if bargaining is cheap and rights are clear, the parties can reach the efficient outcome themselves
D) That governments should own every factory that pollutes, so that a single owner bears every cost of its pollution and has no one to pass it to

3. What did Elinor Ostrom's research show?

A) That communities can govern shared pastures, forests, and fisheries with rules of their own, without either private ownership or the state
B) That commons always collapse
C) That only private property can save a fishery
D) That governments manage forests best

4. What happened to Canada's consumer carbon charge?

A) It doubled to C$170 a tonne in 2026, as first scheduled
B) It became the model for a federal tax in the United States
C) It was replaced by a tax on gasoline imported from the United States
D) It ended in April 2025

5. What happened to traffic in New York's first year of congestion pricing, by the MTA's count?

A) It rose 4%
B) About 27 million fewer vehicles entered the zone, 11% fewer
C) It fell by half
D) It fell at first, then returned to its old level within six months as drivers adjusted to the charge

Module 10 — Information, Incentives, and How People Decide

When One Side Knows More, and How Real People Choose

Recommended Reading / Reference

Book: Richard H. Thaler and Cass R. Sunstein, *Nudge: The Final Edition* (2021), the updated account of how the design of choices shapes what people choose, by the economist and the legal scholar who coined the term

Reference: KFF, a health-policy research organization, on the Affordable Care Act (ACA) marketplaces: “What We Know So Far About 2026 ACA Marketplace Enrollment, Premiums, and Deductibles” (May 19, 2026), and its later updates on who left

10a. When One Side Knows More

The markets of Modules 3-5 assume that buyers and sellers know what they are trading. Often one side knows more. The seller of a used car knows whether it has been reliable; the buyer does not. The buyer of health insurance knows more about her own health than the insurer does. Economists call this asymmetric information, and George Akerlof showed in “The Market for ‘Lemons’” (1970) that it can wreck a market.

His example was used cars. If buyers cannot tell a good car from a lemon, they will pay only what an average car is worth. Owners of good cars, offered an average price, keep them off the market. The cars left for sale are worse on average, so buyers lower their offers again, and more good cars leave. In the extreme, only lemons are sold. Akerlof shared the 2001 Nobel Prize with Michael Spence and Joseph Stiglitz for work on markets with unequal information. Much of what such markets look like, from warranties to brand names to inspection reports, exists to bridge the gap.

10b. Adverse Selection and Insurance

Insurance is where the lemons problem bites hardest, and it has its own name, adverse selection: the people most eager to buy insurance are those who expect to use it. If an insurer charges everyone the average cost, the healthiest find the price too high and leave, the average cost of those who stay rises, the premium rises with it, and the next-healthiest leave in turn. Taken to its end, the cycle is called a death spiral.

Societies use four remedies. Insurers can price each person’s risk, as they do for life and car insurance, which American law has forbidden for health insurance since 2014. Governments can require everyone to buy insurance, as Switzerland and the Netherlands do. They can subsidize premiums so the healthy find them worth buying. Or insurance can be sold to large groups formed for some other reason, such as an employer’s workforce, so that risks are mixed before anyone chooses. The worked example at the end of the module shows a spiral in numbers and what happened when America’s individual market lost part of its subsidy in 2026.

10c. Moral Hazard

The second problem of insurance runs the other way. Once insured, people behave differently, because someone else bears part of the cost, which is called moral hazard. The insured use more medical care, and people whose deposits are guaranteed care less how their bank invests them. In the Health Insurance Experiment run by RAND, a nonprofit research organization, in the 1970s and 1980s, families were randomly given plans with different cost-sharing. Families who paid 95% of their bills, up to a cap, spent about 30% less than families with free care, with little difference in health for the average participant, though the poorest and sickest gained from free care. Deductibles, copayments, and supervision of banks are the standard remedies.

10d. Signals and Screens

When one side knows more, it can try to prove it. Spence showed in 1973 that a costly action can serve as a signal: a college degree may earn more partly because finishing it shows employers persistence and ability, whatever was learned along the way. Evidence for signaling includes the sheepskin effect, the extra pay for the year that brings a diploma over other years of study. A long warranty is a signal too, since only a maker confident of its product can afford one. The side that knows less can screen instead, offering choices that make people sort themselves. An insurer that offers a cheap plan with a high deductible and a dear one with a low deductible lets the healthy and the sick reveal which they are, as Michael Rothschild and Stiglitz showed in 1976.

10e. Principals and Agents

Much of economic life is delegation. Shareholders hire managers, patients rely on doctors, and homeowners hire real estate agents. The person who delegates, the principal, cannot fully watch the person who acts, the agent, whose interests differ. When Steven Levitt and Chad Syverson studied Chicago home sales, they found that agents sold their own houses for about 3.7% more than comparable houses they sold for clients, after leaving them on the market about ten days longer. An extra $10,000 on a client’s sale earns an agent only a slice of the commission, not worth the extra days of work.

The usual remedy is to pay for results, and it carries its own danger. A measure that is rewarded tends to stop measuring what it used to, a rule named after the economist Charles Goodhart. Wells Fargo set aggressive sales targets for its branch staff, who opened about 3.5 million accounts that customers may not have authorized; in 2020 the bank agreed to pay $3 billion to settle the government’s charges. Targets for test scores, hospital waiting times, and arrests have bent behavior the same way.

10f. How Real People Decide

The models of earlier modules treat people as calculating machines that weigh every cost and benefit. Behavioral economics, built on the psychology of Daniel Kahneman and Amos Tversky, studies how people actually choose, and finds steady departures. People weigh losses about twice as heavily as equal gains, which is called loss aversion. They favor the present over the future more than their own plans call for, which is called present bias, so they save less and put off what they mean to do. They put money in mental accounts and treat a tax refund differently from a paycheck. And they stick with whatever happens if they do nothing, the default.

Defaults are the strongest finding. When Brigitte Madrian and Dennis Shea studied a company that began enrolling new workers in its retirement plan automatically, letting them opt out, participation among new hires rose from 37% to 86% (*Quarterly Journal of Economics*, 2001). Congress took the lesson: since 2025, most new employer retirement plans must enroll workers automatically, at a contribution of 3% to 10% of pay that rises each year until it reaches at least 10%. Thaler and Sunstein call such designs nudges: changes in how choices are presented that steer people without forbidding any option or changing prices much.

10g. Should Governments Nudge? The Cases as Their Advocates Make Them

The case for nudging: Thaler, Sunstein, and the nudge units that Britain set up in 2010 and the United States in 2015 argue that someone must design every form and default, so they may as well be designed to help. Nudges are cheap, they leave every option open, and they work with human nature rather than against it. A letter telling late taxpayers that most of their neighbors pay on time, or a default enrollment in a savings plan, can do at almost no cost what a subsidy does at great expense.

The case against: critics answer that nudging is manipulation dressed as help, and that officials have biases too. Others say the effects are small and the published studies overstate them. The behavioral economists Nick Chater and George Loewenstein, themselves early enthusiasts, argued in 2023 that the focus on nudging individuals distracted from changing the rules and prices that shape behavior far more.

What the evidence says: the size of the effects depends on who is counting. A review of more than 200 studies by Stephanie Mertens and colleagues found a moderate average effect (*Proceedings of the National Academy of Sciences*, 2022). Maximilian Maier and colleagues reanalyzed the same studies and found that once the likely unpublished failures were accounted for, no clear effect remained for nudges in general, though they allowed that some kinds may work. Stefano DellaVigna and Elizabeth Linos compared the trials of two nudge units with published academic studies (*Econometrica*, 2022). The units' nudges raised the behavior they targeted by 1.4 percentage points on average, against 8.7 points in the journals, because the journals publish the successes.

The course's reading: defaults work and deserve use where people's own goals are clear, as with saving for retirement. Most other nudges are small, and none is a substitute for getting prices and rules right.

Worked example — An Insurance Pool Unravels, and the 2026 Marketplace

Take an illustrative pool of 100 people: 50 who expect $2,000 a year of medical costs, 30 who expect $6,000, and 20 who expect $20,000. The average is $6,800 ((50 × $2,000 + 30 × $6,000 + 20 × $20,000) ÷ 100). Suppose each person will pay up to one and a half times his expected cost for the security of insurance. At a premium of $6,800 the first group, willing to pay $3,000, leaves. The average cost of those left is $11,600 ((30 × $6,000 + 20 × $20,000) ÷ 50), above the $9,000 the middle group will pay, so it leaves too. Only the 20 people who expect $20,000 remain, at a premium of $20,000. A subsidy that capped what each person pays at $3,000 would keep all 100 in the pool, at a cost to taxpayers of $380,000 ($3,800 for each of the 100). In the ACA's marketplaces, the larger subsidies that Congress added in 2021 expired at the end of 2025. Insurers raised benchmark premiums for 2026 by about 30% in the states that use the federal HealthCare.gov site and 17% in states that run their own (KFF, October 2025). Paying enrollment fell 13%, from 22.1 million in 2025 to 19.2 million in February 2026. People aged 18 to 34 made up 46% of the fall in sign-ups, and the actuarial firm Wakely found the average risk of those remaining up 6.3% in early 2026. The pool grew older and sicker, but it did not spiral, because the original credits still limit what a subsidized buyer pays to a share of income: when premiums rise, the credit rises with them.

Module 10 Key Points

Information, Incentives, and How People Decide

• When one side knows more, markets can unravel: buyers who cannot judge quality offer average prices, and good sellers leave.

• Adverse selection drives insurance toward death spirals; moral hazard makes the insured use more care or take more risk.

• Degrees and warranties signal quality; rewarded targets, such as Wells Fargo’s sales goals, get gamed.

• Defaults are powerful: automatic enrollment raised one firm’s retirement-plan participation among new hires from 37% to 86%.

• Without the extra subsidies, 2026 marketplace enrollment fell 13% and the pool grew sicker, but it did not spiral.

• The course’s reading: defaults deserve use where people’s goals are clear; most other nudges are small.

Module 10 Quiz

Check Your Understanding

1. In Akerlof’s market for lemons, why can the market unravel?

A) Because sellers of good cars must pay higher taxes than sellers of bad ones
B) Because dealers collude
C) Buyers cannot tell good cars from bad
D) Because the government caps used-car prices below what good cars are worth

2. What is moral hazard?

A) Hiding a risk from an insurer
B) A tax on risky behavior
C) Buying insurance because you know you are risky
D) Taking more risks, or using more care, because insurance bears part of the cost

3. What did Madrian and Shea find when a company enrolled new workers in its retirement plan automatically?

A) Participation rose from 37% to 86%
B) Most workers opted out within a year, leaving participation where it had been
C) Participation fell, as workers resented being enrolled without asking
D) Only the highest-paid workers stayed enrolled

4. What happened to paying enrollment in the ACA marketplaces in 2026, after the extra subsidies expired?

A) It rose to a record 25 million as more insurers entered the market
B) It collapsed to under 5 million in a classic death spiral
C) It fell 13%
D) It stayed level because subsidies rose

5. What is the course’s reading on nudges?

A) They should replace taxes and rules
B) They are manipulation and should be banned
C) They work as well as the early studies claimed
D) Defaults work and deserve use where people’s own goals are clear, but most other nudges are small and none replaces prices and rules

Module 11 — Wages, Interest, and Rent

How Pay, the Price of Time, and Income Shares Are Set

Recommended Reading / Reference

Book: Claudia Goldin and Lawrence F. Katz, *The Race between Education and Technology* (2008), the history of how schooling and technology have set the American wage gap, by a Nobel laureate and her coauthor

Reference: The Federal Reserve's *Distributional Financial Accounts* (quarterly), which divide American household wealth among groups by wealth, income, age, and education

11a. Pay and What a Worker Adds

Labor, capital, and land are factors of production, and their prices, wages, interest, and rent, are set in markets much like the markets for goods. The demand for labor is a derived demand: firms want workers for what they help produce. A competitive firm hires another worker as long as the value of the extra output, the worker's marginal product times the price of what she makes, exceeds her pay. That value is called the marginal revenue product. With diminishing returns (Module 7), each additional worker adds less, so the firm stops hiring where the wage equals the value of what the last worker adds.

The supply of labor comes from people choosing between work and everything else. A higher wage makes each hour of leisure more expensive, which encourages more work, but it also makes people richer, which lets them afford more leisure. Which effect wins differs from person to person, and the overall supply of labor responds only modestly to wages, more for second earners and people near retirement than for others.

11b. Why Pay Differs

If pay matched what each worker adds, differences in pay would reflect differences in productivity. Much of the gap does. Workers invest in skills, which economists call human capital, and are paid for them. Full-time workers aged 25 to 34 with a bachelor's degree earned a median $66,600 in 2022, against $41,800 for those with only a high-school diploma, about 59% more (National Center for Education Statistics). Unpleasant or dangerous work pays extra to attract anyone at all, a compensating differential, which is why loggers, roofers, and night-shift workers earn more than similar workers in safer or more convenient jobs.

Other gaps have nothing to do with productivity. Gary Becker argued in 1957 that competition should punish employers who discriminate, since they pass up good workers. Yet discrimination persists: when Patrick Kline, Evan Rose, and Christopher Walters sent 83,000 fictitious job applications to large American employers, applicants with distinctively Black names received fewer callbacks than identical applicants with distinctively white names, with the gap concentrated in a minority of companies (*Quarterly Journal of Economics*, 2022). Employers with power to set pay hold it below what workers add (Module 6). Unions raise their members' pay above what similar nonunion workers earn. And technology that lets the best performer reach a whole market, a singer on a streaming service or a lawyer on a global case, turns small differences in talent into enormous differences in pay, which the economist Sherwin Rosen called the economics of superstars (1981).

11c. Interest: the Price of Time

A dollar today is worth more than a dollar in a year, because today's dollar can be invested to earn interest, and because the future is uncertain. Interest is the price of time: what borrowers pay to spend before they have earned, and what savers earn for waiting. It also compares money across time. Write the present value of a sum (PV), its value in the future (FV), the interest rate per year r, and the number of years t. Then $PV = FV \div (1 + r)^t$. At 5% a year, $1 due in ten years is worth about 61 cents today ($\$1 \div 1.05^{10}$), because 61 cents invested at 5% grows to $1 in ten years.

The formula explains why rising interest rates hit asset prices. A bond, a share of stock, a building, or a college degree is worth the present value of the payments it will bring, and a higher interest rate shrinks the present value of every future payment, the more so the further away it is. When the ten-year Treasury yield rose in the autumn of 2026 (Module 16), the present value of long-lived assets fell with it.

11d. Land and Economic Rent

Land differs from labor and capital in one respect: its supply is fixed. More cannot be made at any price, so its price is set entirely by demand. Ricardo used the word rent for the return to land, and economists now use economic rent for any payment above what is needed to bring a resource into use. A star athlete who would play for a tenth of her salary earns mostly economic rent. Because a tax on economic rent does not reduce the supply of land, it causes no deadweight loss (Module 5). Henry George built a movement on the idea in *Progress and Poverty* (1879), proposing that a single tax on the value of land replace all others. Economists across the political spectrum still praise land-value taxes, and a few cities, Pittsburgh once among them, have taxed land more heavily than buildings.

11e. How Income Is Divided

Economists look at the division of income in two ways. The functional distribution splits it between labor, paid as wages, salaries, and benefits, and capital, paid as profit, interest, and rent. Labor's share of income in the nonfarm business sector fell to 52.8% in the second quarter of 2026, the lowest since records began in 1947 (BLS). The personal distribution splits income or wealth among households. Median household income was $87,460 in 2025 (Census Bureau). The top 1% of households held a record 32.5% of household wealth in the second quarter of 2026, while the bottom half held 2.3% (Federal Reserve). The official poverty rate was 10.2% in 2025, and 13.1% on the supplemental measure, which counts government benefits and necessary expenses.

11f. Why Has Labor's Share Fallen? The Cases as Their Advocates Make Them

Technology: Loukas Karabarbounis and Brent Neiman argued that the falling price of machines and software since the 1980s led firms around the world to replace workers with capital (*Quarterly Journal of Economics*, 2014), and Daron Acemoglu and Pascual Restrepo have shown how automation takes over tasks people used to do.

Dominant firms: David Autor and four coauthors found that the fall came from a shift of sales toward a few highly productive "superstar" firms in each industry, which pay a small share of their large revenues as wages (*Quarterly Journal of Economics*, 2020). The rise in markups (Module 8) points the same way.

Trade and bargaining: others point to the offshoring of the labor-intensive parts of supply chains, and to the decline of unions, whose share of American workers fell from 20.1% in 1983 to 10.0% in 2025.

Measurement: skeptics argue that part of the decline is an artifact. Matthew Rognlie found that much of capital's rising share was the income from housing, not business. Others have shown that counting research and software as investment, as the national accounts began to do in 1999 and 2013, raised measured capital income.

What the evidence says: the decline since about 2000 is real in most measures, but its size depends on the measure. The superstar-firm finding has held up across countries and industries, and the evidence on automation has grown. Offshoring explains part of the fall in manufacturing, and the decline of unions part of the fall in workers' bargaining power, but neither explains the timing well alone. The 2026 low also reflects prices rising faster than pay in the year to September (Module 13).

The course's reading: several causes have worked together. The rise of dominant firms and automation are the best supported, and measurement explains part of the decline.

Worked example — What a Degree Is Worth Today

Module 1 worked out the full cost of a four-year degree at public and private nonprofit colleges. Against it stands the extra pay. The median gap between full-time workers aged 25 to 34 with a bachelor's degree and those with only a high-school diploma was $24,800 a year in 2022 (11b). Suppose, illustratively, that the gap holds for a 40-year career after graduation and that money is discounted at a real rate of 3% a year. The present value of 40 years of $24,800, at graduation, is $\$24{,}800 \times [1 - (1.03)^{-40}] \div 0.03$, or about $573,000, and four years earlier, when the student enrolls, about $509,000 ($\$573{,}000 \div 1.03^{4}$). At a discount rate of 5% the present value at enrollment falls to about $350,000, and at 7% to about $252,000, below the full cost of a private college. Three cautions apply. The median hides a wide spread by field of study. Part of the gap reflects who goes to college, not what college does, and part may be signaling (Module 10). And students who do not finish pay much of the cost without the full premium. Even so, at public-college prices the degree pays for the typical graduate at any plausible rate.

Module 11 Key Points

Wages, Interest, and Rent

• A competitive employer pays a worker the value of what she adds; skills, risk, discrimination, power, and unions also set pay.

• Full-time workers aged 25-34 with a bachelor’s degree earned a median $66,600 in 2022, against $41,800 with only high school.

• Present value discounts future money: at 5% a year, $1 due in ten years is worth about 61 cents today.

• Land’s supply is fixed, so a tax on land values, as Henry George urged, causes no deadweight loss.

• Labor’s share of nonfarm business income fell to 52.8% in the second quarter of 2026, the lowest since 1947.

• The course’s reading: dominant firms and automation best explain labor’s falling share; measurement explains part.

Module 11 Quiz

Check Your Understanding

1. What does a competitive firm pay a worker, in the simple model of labor demand?

A) The value of what the worker adds
B) What the worker needs to live
C) Whatever the government sets as the minimum wage in its state, plus any tips the worker earns
D) The average pay of every worker in the firm, whatever each one adds

2. What is a compensating differential?

A) A union’s wage premium
B) Extra pay for a dangerous or unpleasant job
C) A bonus
D) The gap between what a firm pays men and women for the same work, which the law requires it to report

3. At an interest rate of 5% a year, about what is $1 received in ten years worth today?

A) About 61 cents, since 61 cents grows to $1 after ten years of 5% interest compounded
B) $1.63
C) 50 cents
D) 95 cents, since 5% is taken off once

4. What was labor’s share of nonfarm business income in the second quarter of 2026?

A) About 75%, as it has been since 1947
B) 52.8%, the lowest since 1947
C) 40%
D) About 65%, after rising for two decades as unions grew stronger across the economy

5. What is the course’s reading on why labor’s share has fallen?

A) Taxes alone
B) Unions alone
C) Several causes together, with dominant firms and automation best supported and measurement explaining part
D) It has not fallen at all; the figures are an artifact of how the statistics agency counts the pay of self-employed people and of chief executives

Module 12 — Measuring the Whole Economy

GDP, the Accounts, and What They Miss

Recommended Reading / Reference

Book: Diane Coyle, *GDP: A Brief but Affectionate History* (revised edition, 2015), a short history of how output came to be measured and what the measure leaves out

Reference: BEA, *Gross Domestic Product, Third Quarter 2026 (Advance Estimate)* (October 29, 2026), and its interactive tables of the national accounts

12a. What GDP Counts

Modules 1-11 studied single markets. The rest of the course studies the whole economy, and it begins with how the whole is measured. Gross domestic product (GDP) is the market value of all final goods and services produced within a country in a period. Each word matters. Market value means goods are added up at their prices, so a car counts more than a sandwich. Final means goods sold to their last user: the steel in a car is counted in the car's price, not again on its own, which would count it twice. Produced means made in the period, so a used car resold this year does not count, though the dealer's service in selling it does. And within a country means made inside its borders, whoever owns the factory.

12b. Three Ways to Measure It

GDP can be measured three ways, which should give the same answer, since every dollar spent on a final good is a dollar of someone's income and a dollar of something's value. The spending approach adds up what households, businesses, governments, and foreigners spend on final goods. The income approach adds up wages, profits, rents, interest, and the taxes and depreciation folded into prices. The production approach adds up the value each industry adds, its sales minus what it buys from other firms. In practice the three differ a little, and BEA reports the gap as a statistical discrepancy.

12c. The Parts

On the spending side, GDP is the sum of four parts: consumption (C), investment (I), government purchases (G), and net exports (NX), exports minus imports. Consumption, what households spend, is by far the largest: $22.0 trillion at an annual rate in the second quarter of 2026, 67.5% of GDP. Investment means new physical and intangible capital, not buying shares: business equipment, factories, software and research, new houses, and additions to firms' inventories. Government purchases count what governments buy, from fighter jets to teachers' time, but not transfers such as Social Security, which are counted when the recipients spend them. Net exports subtract imports because the other parts include imported goods that were not produced at home. The United States imported $901.5 billion more in goods and services than it exported in 2025.

12d. Real and Nominal

Nominal GDP measures output at the prices of the day; real GDP measures it at constant prices, so that growth reflects more goods rather than higher prices. The ratio of the two is the GDP price index, or deflator. American nominal GDP was $32.6 trillion at an annual rate in the second quarter of 2026. That quarter shows why the distinction matters: as the oil shock lifted prices, nominal GDP grew at an annual rate of 8.5% while real GDP grew 2.2%, so most of the nominal growth was inflation.

12e. Annual Rates and Revisions

American quarterly growth is reported at an annual rate: the change from one quarter to the next, compounded over four quarters. Growth of 0.84% in a quarter becomes 3.4% at an annual rate, since 1.0084 × 1.0084 × 1.0084 × 1.0084 is about 1.034. Most other countries report the plain quarterly change, so American figures look about four times as large as, say, Britain's for the same growth. The first estimate, the advance estimate, comes about four weeks after a quarter ends and rests on incomplete data. BEA revises it a month later, again a month after that, and in annual revisions for years. The second quarter of 2026 was first reported at 1.5% growth, later revised to the rate in 12d.

12f. Per Person and at Purchasing Power

To compare living standards, GDP is divided by population, GDP per person. To compare countries, it must also be converted into a common currency, and the choice of rate matters. Market exchange rates value a country's output at what its currency buys abroad. Purchasing power parity (PPP) rates value it at what its currency buys at home, where many goods and services, haircuts and housing among them, are cheaper in poorer countries. On the International Monetary Fund's figures, China produced 19.6% of the world's output in 2025 at purchasing power parity, against 14.6% for the United States, while at market exchange rates the American economy is about half again as large as China's.

12g. Trade, Saving, and Investment

The accounts contain an identity with large consequences. Output, Y, equals C + I + G + NX. National saving, S, is what is left of output after households and governments consume: S = Y − C − G. Substituting gives S − I = NX. A country whose investment exceeds its saving must borrow the difference from abroad, and it does so by importing more than it exports: its trade deficit is the mirror of its capital inflow. The identity does not say which causes which, but it does say that a trade deficit cannot shrink unless saving rises or investment falls. A tariff that leaves saving and investment unchanged mostly shifts the deficit from one trading partner to another. A government budget deficit lowers national saving, which is why large budget deficits and trade deficits often go together.

12h. What GDP Misses

GDP measures market production, and it was never meant to measure well-being. It leaves out unpaid work at home, from cooking to caring for children, which BEA's experimental accounts suggest would add about a quarter to GDP if valued at market wages. It counts the leisure people give up to work as no loss. It counts the cleanup after a disaster as output and the damage as nothing, and it records the depletion of forests and fisheries as income. It says nothing about who gets the income: average GDP per person can rise while the

median household's income stalls. And it values free digital services at zero, though Erik Brynjolfsson and colleagues found in experiments that the typical user would have to be paid about $40 to $50 a month to give up Facebook (*Proceedings of the National Academy of Sciences*, 2019).

Robert Kennedy said in 1968 that GDP measures everything "except that which makes life worthwhile." Alternatives exist, such as the United Nations' Human Development Index, which combines income with health and schooling. But GDP remains the best single measure of what an economy produces, and the other measures rise with it more often than not.

12i. The Statistics Under Strain

The numbers depend on agencies that came under strain in 2025-26. The federal shutdown of October 1 to November 12, 2025 stopped collection: BLS gathered no prices for the October consumer price index and ran no October household survey, so October 2025's inflation and unemployment figures were never produced, and some year-on-year inflation rates for October 2026 cannot be published either. For lack of money BLS stopped collecting prices in Lincoln, Nebraska, and Provo, Utah, in April 2025 and in Buffalo, New York, in June, and suspended about 15% of its sample elsewhere, so it filled more gaps with estimates. The President fired the BLS commissioner, Erika McEntarfer, on August 1, 2025, after a weak jobs report, saying without evidence that the figures were faked. Brett Matsumoto, a BLS economist since 2015, took office as commissioner on August 11, 2026 after a Senate vote of 51-47. The annual benchmarking of the payroll survey to tax records cut its count of jobs in the year to March 2025 by 898,000. The Government Accountability Office found in June 2026 that the jobs report still "generally meets" users' needs, but that falling response rates threaten it.

12j. Does a Trade Deficit Mean a Country Is Losing? The Cases as Their Advocates Make Them

The case that it does: the administration and other critics of trade deficits argue that a deficit means foreign factories are making goods Americans could make, so that jobs and industries move abroad. They see deficits with particular countries, $202.1 billion with China in 2025, as evidence of subsidies, currency management, and barriers abroad. And they warn that a country that buys more than it sells must sell its assets or borrow to pay the difference, mortgaging its future, a point Warren Buffett once made with a parable about a nation called Squanderville.

The case that it does not: most economists answer with the identity in 12g. A trade deficit means a country invests more than it saves, which can be a sign of strength: foreigners want to invest in America, and their money finances factories, housing, and the government's borrowing. American deficits have widened in booms, as in the late 1990s, and narrowed in slumps, as in 2009. A deficit with one country means little, as an individual runs a deficit with her grocer and a surplus with her employer, and the United States ran a surplus of $339.5 billion in services in 2025.

What the evidence says: the deficit in goods and services was 19.9% smaller in January-August 2026 than a year earlier, partly because imports had surged early in 2025 ahead of the tariffs, which flatters the comparison. As a net exporter of oil, the United States also earned more from the petroleum it sold abroad when prices rose. The deficit with China fell to its smallest in 21 years in 2025 as imports shifted to other suppliers. Over the long run, American trade deficits have tracked the gap between investment and saving, including the government's budget deficit, far more closely than they have tracked tariffs.

The course's reading: a trade deficit is not a scorecard of winning and losing; it reflects saving and investment. It deserves concern when it finances consumption rather than investment and rests on a large budget deficit, as the American deficit partly does.

Worked example — Reading the Third-Quarter GDP Report

BEA's advance estimate, released on October 29, 2026, put real GDP growth at an annual rate of 3.4% in the third quarter, up from the second quarter's pace (12d). The report splits that growth into contributions from each part, in percentage points that add up to the total. Consumer spending contributed 2.52 points. Private investment contributed 3.27, of which 1.61 came from inventories as firms built up stocks, 1.16 from equipment, much of it computers, and 0.21 from research and development. Government added about 0.9 points, helped by smaller sales of oil from the Strategic Petroleum Reserve, which the accounts count as negative government spending. Net exports subtracted 3.32 points, as exports of petroleum fell and imports rose. The pieces add up: 2.52 + 3.27 + 0.93 − 3.32 = 3.40. Two readings follow. The headline flatters the quarter, because inventory building adds to growth now and subtracts later, when firms stop. But underlying demand was strong: real final sales to private domestic purchasers, which leave out inventories, government, and trade, grew 4.9%. Prices told a calmer story than in the spring. The GDP price index rose at an annual rate of about 2.1%, against 6.1% in the second quarter, so nominal GDP grew 5.6%.

Module 12 Key Points

Measuring the Whole Economy

• GDP is the market value of final goods and services produced in a country; spending, income, and production measures agree.

• Consumer spending is about two-thirds of American GDP; nominal output was $32.6 trillion at an annual rate in mid-2026.

• Real GDP grew at a 3.4% annual rate in the third quarter of 2026, lifted by inventories and equipment, held back by net exports.

• A trade deficit equals investment minus saving (S − I = NX), so tariffs that leave saving unchanged do little to it.

• GDP misses unpaid work, leisure, environmental damage, distribution, and free digital services.

• The course’s reading: a trade deficit is not a scorecard, though one financing consumption and a budget deficit deserves concern.

Module 12 Quiz

Check Your Understanding

1. Why does GDP count only final goods and services?

A) Because intermediate goods are imported and so belong to other countries' output
B) Because the government taxes final goods only, so only they can be measured
C) Because final goods are the only ones whose prices the statistical agencies can observe each month
D) To avoid counting things twice

2. In the third quarter of 2026, what did net exports contribute to real GDP growth?

A) About −3.3 percentage points
B) Zero
C) About +1.6 points, the largest positive contribution
D) About +2.5 points, as exports of oil rose with the price, more than offsetting imports

3. What does the identity S − I = NX say about a trade deficit?

A) That tariffs shrink it one for one
B) That it shows foreign countries are cheating on trade rules
C) That it always shrinks when the dollar strengthens against other currencies
D) Investment exceeds saving

4. What happened to American statistics during the government shutdown of October-November 2025?

A) All figures were collected late
B) The Census Bureau took over the BLS surveys
C) BLS collected no prices for the October consumer price index and ran no household survey, so October's inflation and unemployment figures were never produced
D) Only the GDP report was delayed, by a week

5. What is the course's reading on whether a trade deficit means a country is losing?

A) Yes, always
B) No: it reflects saving and investment, though it can signal a problem when it finances consumption or a budget deficit
C) Only with China
D) Yes, because every dollar of deficit is a dollar of output that foreign workers took from American workers, as the accounts show

Module 13 — Inflation and Unemployment

Measuring Prices and Jobs, and the Trade-off Between Them

Recommended Reading / Reference

Book: Stephen D. King, *We Need to Talk About Inflation: 14 Urgent Lessons from the Last 2,000 Years* (2023), a former chief economist of HSBC, the British bank, on why inflation returns and what it does

Reference: BLS, *Consumer Price Index — September 2026* (October 14, 2026), and its tables of the relative importance of each item in the index

13a. Measuring Prices

Inflation is a rise in the general level of prices, measured by the change in a price index. The best known is the consumer price index (CPI), compiled by BLS from prices collected each month in 75 urban areas from about 6,000 housing units and about 23,000 retail establishments, a sample thinned since 2025 (Module 12). Each price is weighted by the share of spending it represents, and shelter, the cost of housing, dominates the index (table below), most of it the rent homeowners are estimated to pay themselves for the homes they own.

Item	Share of the CPI, December 2025
Shelter	35.6%
Food at home	8.3%
Medical care	8.4%
Energy (gasoline 2.9%)	6.4%
Food away from home	5.4%
New vehicles	3.8%
Used cars and trucks	2.8%
Apparel	2.4%
Everything else	26.9%

BLS, relative importance of components of the CPI, December 2025. As gasoline prices rose, energy's share grew to 7.4% by August 2026.

The Federal Reserve prefers a second index, the price index for personal consumption expenditures (PCE), which BEA compiles from the national accounts. It covers more, including spending made on households' behalf, such as employer-paid health insurance and Medicare, so it gives housing a much smaller weight, about 15%, and medical care a larger one. Its weights change every month as spending shifts, where the CPI's change once a year, and since 2000 the CPI has risen about 0.4 points a year faster on average. Both are also reported without food and energy, whose prices swing most, as core inflation, a better guide to where inflation is heading. In September 2026 the CPI was 3.7% above its level a year earlier and the core CPI 2.6%.

A fixed basket overstates how much more it costs to live as well as before, for three reasons. When one good's price rises, people switch to cheaper substitutes, which a fixed basket ignores. Improvements in quality are hard to separate from price rises. And new goods enter the index late. A chained version of the CPI, which lets the basket shift as people substitute, rose 3.5% in the year to September 2026, two-tenths less than the standard index.

13b. The 2% Target

The Federal Reserve has formally aimed for inflation of 2% a year, measured by the PCE index, since 2012, as most central banks aim for about 2%. They do not aim for zero, because the indexes overstate inflation slightly, because some inflation leaves room to cut interest rates below the rate of inflation in a slump, and because employers rarely cut pay, so a little inflation lets real pay adjust. In August 2025 the Fed revised its strategy, dropping a promise made in 2020 to let inflation run above 2% for a time to make up for periods below it, and keeping the 2% goal.

13c. What Causes Inflation

Economists distinguish three sources. Demand-pull inflation comes from spending that outruns what the economy can produce, as when buyers with stimulus checks meet factories with shortages. Cost-push inflation comes from a jump in the cost of something widely used, above all energy. And expectations keep inflation going: when workers and firms expect prices to rise, they set wages and prices to match, so the expectation fulfills itself.

Behind all three, over long periods, stands money. The quantity equation states that $M \times V = P \times Y$, where M is the money supply, V its velocity, the number of times a dollar is spent on final goods and services in a year, P the price level, and Y real output. If velocity and output grow steadily, faster growth of money means faster inflation, and across countries and decades the link is strong. Over a year or two it is weak, because velocity jumps around: the broad money supply (M2), $23.4 trillion in September 2026, grew rapidly in 2020-21 and then shrank, while inflation rose and fell on its own schedule.

13d. Who Gains and Who Loses

Inflation that people expect does limited harm, since contracts and wages build it in. Inflation that surprises them redistributes. It transfers wealth from lenders to borrowers, who repay in cheaper dollars, which is why a homeowner with a fixed-rate mortgage gains. It hurts people whose incomes adjust slowly, such as workers whose raises lag prices and retirees with pensions not tied to prices. The government gains as its debt shrinks in real terms (Module 17). And high, variable inflation is costly in itself: it makes planning hard, sends people running to spend money before it loses value, and distorts taxes that are not adjusted for it.

13e. Hyperinflation and Stabilization

Hyperinflation, prices rising by half or more in a month, has the same cause everywhere: a government that pays its bills by printing money. In Zimbabwe in November 2008, the economist Steve Hanke estimated, prices were doubling every 24.7 hours. Venezuela’s central bank reported inflation of 130,060% in 2018. The cure is always to stop financing deficits with new money and to make the stop believable, usually through a balanced budget, an independent central bank, or a fixed link to a foreign currency.

Argentina shows both the disease and the cure. Monthly inflation reached 25.5% in December 2023, and prices rose 211.4% over that year. The government of President Javier Milei, elected that November, cut spending sharply to balance the budget and stopped financing the deficit through the central bank. Monthly inflation fell to 1.9% in September 2026, and 33.4% over twelve months (INDEC). The cost was a deep recession in 2024 and a sharp rise in poverty before both began to recover.

13f. Deflation

Falling prices sound pleasant but can be dangerous. Deflation raises the real burden of debts, encourages people to put off purchases while prices fall, and traps a central bank that cannot cut interest rates much below zero. Japan's consumer prices fell in most years from 1999 to 2005 and from 2009 to 2012, and the Bank of Japan held its policy rate below zero, at −0.1%, from January 2016 to March 2024. Deflation that comes from rapid gains in productivity, as with computers, is harmless: it is a general fall in prices driven by weak spending that does damage.

13g. Measuring Unemployment

The unemployment rate comes from a monthly survey of about 60,000 households. A person is unemployed who has no job, is available to work, and has looked for work in the past four weeks; the labor force is the employed plus the unemployed; and the rate is the unemployed as a share of the labor force. It was 4.2% in September 2026. A broader measure, called U-6, adds people who want work but have stopped looking and part-time workers who want full-time jobs: it was 7.6%. Only 61.8% of adults were in the labor force at all. A separate survey of employers counts jobs: payrolls rose by 29,000 in September. With few new workers joining the labor force, as immigration has fallen, Fed Board economists estimate that fewer than 10,000 new jobs a month would now hold unemployment steady.

13h. Kinds of Unemployment, and the Natural Rate

Economists sort unemployment into three kinds. Frictional unemployment is the time it takes to find a job, normal even in good times. Structural unemployment arises when workers' skills or locations do not match the jobs on offer. Cyclical unemployment is the extra joblessness of recessions. The first two together make up the natural rate of unemployment, the rate at which inflation neither rises nor falls. CBO puts it at about 4.4% in 2026, and the median member of the Fed's policy committee put the long-run rate at 4.2% in September 2026, so unemployment in the autumn of 2026 was close to it.

Some unemployment persists even at the natural rate because wages do not fall to clear the market. Minimum wages and unions hold some pay above market levels (Module 6). And some employers pay above the market on purpose, to attract better workers, reduce quitting, and motivate effort, which economists call efficiency wages. Henry Ford's famous $5 day of 1914, double the going wage, cut turnover at his factories sharply.

13i. The Phillips Curve

In 1958 A. W. Phillips, a New Zealand economist at the London School of Economics, plotted British data from 1861 to 1957 and found that wages rose fastest when unemployment was low. American economists soon drew the same curve for prices, and in the 1960s many read it as a menu: lower unemployment could be bought with a little more inflation. Milton Friedman and Edmund Phelps warned that once people came to expect inflation, they would demand raises to match it, and unemployment would return to its natural rate with inflation higher than before. Their expectations-augmented Phillips curve offers no lasting trade-off (Module 15), and the 1970s proved them right, as inflation and unemployment rose together.

The curve has kept changing shape. In the 2010s it looked flat: unemployment fell to 3.5% with little rise in inflation. In 2021-22 it looked steep, as PCE inflation peaked at 7.2% in mid-2022 with unemployment low.

Then inflation fell without the recession many expected: core PCE inflation came down to 2.8% in 2024 while unemployment stayed near 4%, a fall economists called the immaculate disinflation. The modern reading is that the short-run trade-off exists, is steeper when the economy is near capacity, and holds only as long as expectations stay anchored.

13j. What Caused the Inflation of 2021-23? The Cases as Their Advocates Make Them

The case for demand: economists such as Lawrence Summers and Jason Furman, who warned in early 2021 that the American Rescue Plan was too large, argue that stimulus did it. American inflation rose further than in other rich countries, and Òscar Jordà and colleagues at the San Francisco Fed estimated that pandemic fiscal support had added about 3 percentage points to American inflation by the end of 2021. A labor market with two job openings for every unemployed worker kept it going.

The case for supply: others point to the shocks: ships and ports jammed, a shortage of computer chips that halted car factories, and energy and food prices driven up by Russia's invasion of Ukraine in 2022. Ben Bernanke and Olivier Blanchard found that these shocks drove most of the initial surge, and a study of eleven economies in 2024 found the same pattern everywhere. Adam Shapiro at the San Francisco Fed attributed about half of the excess inflation to supply and about a third to demand.

The case for corporate pricing: a third view, often called greedflation, holds that firms used the chaos to raise prices beyond their costs. Josh Bivens of the Economic Policy Institute, a labor-aligned research group, calculated that profits accounted for about 54% of price growth in the nonfinancial corporate sector from mid-2020 to late 2021, against about 11% normally.

What the evidence says: each view holds part of the truth. Supply shocks started the surge. Bernanke and Blanchard found that tight labor markets mattered little at first but became the main source of persistence by 2022, which supports the demand view's account of why inflation lasted. Measured markups rose in 2021, but a Kansas City Fed study found the timing consistent with firms anticipating higher costs, and a San Francisco Fed study found aggregate markups mostly flat, not a main driver.

The course's reading: supply shocks lit the inflation, stimulus and tight labor markets fed it and made it last, and corporate pricing was more a symptom than a cause.

Worked example — Two Households' Inflation Rates

The CPI measures the average household's basket, but no household is average. Take two illustrative households and apply the price changes BLS reported for the year to September 2026: shelter up 3.2%, food at home 1.8%, food away from home 3.5%, gasoline 34.2%, electricity and natural gas about 4.6%, medical care 1.5%, and the rest of the core basket about 2.1%, the rate implied for it by core inflation (13a). A suburban commuter household spends 30% of its budget on shelter, 10% on food at home, 6% on meals out, 8% on gasoline, 5% on electricity and gas, 6% on medical care, and 35% on everything else. Its inflation rate is the weighted sum: $0.30 \times 3.2 + 0.10 \times 1.8 + 0.06 \times 3.5 + 0.08 \times 34.2 + 0.05 \times 4.6 + 0.06 \times 1.5 + 0.35 \times 2.1$, or about 5.1%. A city renter without a car spends 45% on shelter, 10% on food at home, 8% on meals out, nothing on gasoline, 4% on electricity and gas, 5% on medical care, and 28% on everything else. Its rate is about 2.7%. Average hourly earnings rose 3.0% in the same year, so the commuter's real pay fell about 2.0% ($1.030 \div 1.051 - 1$), the renter's rose about 0.3%, and the average worker's fell about 0.7% against the official CPI (13a). An oil shock is felt most by those who drive most.

Module 13 Key Points

Inflation and Unemployment

• The CPI weights shelter at about 36%; the Fed targets 2% inflation in the PCE index, which weights housing far less.

• In the quantity equation M × V = P × Y, faster money growth brings faster inflation when velocity and output are steady.

• Argentina cut monthly inflation from 25.5% in December 2023 to 1.9% in September 2026 by ending the money-financed deficit.

• Unemployment was 4.2% in September 2026, close to the natural rate, which CBO puts at 4.4% and the Fed at 4.2%.

• The Phillips curve trade-off holds only in the short run; once inflation is expected, it stops buying lower unemployment.

• The course’s reading: supply shocks lit the inflation of 2021-23, stimulus and tight labor markets fed it, and profits followed.

Module 13 Quiz

Check Your Understanding

1. Which measure of inflation does the Federal Reserve target at 2%?

A) The consumer price index excluding shelter, food, and energy
B) PCE inflation
C) The GDP price index, measured over five years
D) Wages, which it aims to raise 2% a year faster than prices

2. In the quantity equation M × V = P × Y, what does V stand for?

A) Value added
B) The volume of goods sold
C) Velocity, the number of times a dollar is spent on final goods and services in a year
D) Variable costs

3. Where was Argentina's monthly inflation in September 2026, against its peak of 25.5% in December 2023?

A) 20%
B) Below zero
C) Back above 30% a month after the stabilization collapsed under a run on the peso
D) 1.9%, or 33.4% over twelve months

4. What does the expectations-augmented Phillips curve of Friedman and Phelps say about the long run?

A) No lasting trade-off
B) A menu
C) That governments can permanently buy lower unemployment with a little more inflation
D) That unemployment and inflation always rise and fall together

5. What is the course's reading on what caused the 2021-23 inflation?

A) Supply shocks lit it, stimulus and tight labor markets fed it, and corporate pricing was a symptom
B) Stimulus alone
C) Supply chains alone
D) Corporate greed alone, since profits accounted for more than half of price growth in every year from 2021 to 2023, as every study agrees

Module 14 — Booms and Busts: Aggregate Demand and Supply

How Shocks Move a Whole Economy

Recommended Reading / Reference

Book: Barry Eichengreen, *Hall of Mirrors: The Great Depression, the Great Recession, and the Uses—and Misuses—of History* (2015), an economic historian's comparison of the two great slumps and the policies that met them

Reference: NBER Business Cycle Dating Committee, *US Business Cycle Expansions and Contractions*, the official chronology of American recessions

14a. The Business Cycle

Economies do not grow smoothly. Output rises in expansions and falls in contractions, and the worst contractions are called recessions. The popular rule that a recession means two quarters of falling real GDP is not the official one. In the United States, recessions are dated by a committee of the NBER, chaired since 2024 by Valerie Ramey, who succeeded Robert Hall after 46 years. It looks for a significant decline in economic activity, spread across the economy and lasting more than a few months, using jobs, real incomes, spending, and industrial production as well as GDP. It decides only in hindsight: it announced the end of the 2020 recession, in April 2020, on July 19, 2021.

Recession	Months	What drove it
November 1973 to March 1975	16	The Arab oil embargo, on top of rising inflation
January to July 1980	6	The second oil shock and the Fed's first attack on inflation
July 1981 to November 1982	16	The Fed's rate rises to break inflation
December 2007 to June 2009	18	The housing bust and the financial crisis
February to April 2020	2	The pandemic

NBER dates of five postwar recessions. None has been dated since April 2020.

14b. Aggregate Demand

To study the whole economy, economists use the same tools as for one market, applied to totals. Aggregate demand is the total spending on an economy's final goods and services at each level of prices: consumption, investment, government purchases, and net exports (Module 12). Drawn against the price level, it slopes downward, for three reasons. Higher prices shrink the real value of people's savings, so they spend less. They raise the demand for money, pushing up interest rates and discouraging borrowing. And they make a country's goods dearer abroad, cutting exports. Anything else that changes spending shifts the whole curve: confidence and wealth move consumption, interest rates and expectations move investment, budgets move government purchases and taxes, foreign growth and the exchange rate move net exports, and the central bank moves interest rates.

14c. Aggregate Supply, Short Run and Long

Aggregate supply is the total output firms will produce at each price level, and here time matters most. In the long run, output is set by the economy's workers, capital, and technology, its potential output, whatever the price level, so long-run aggregate supply is a vertical line (Module 18 asks what moves it). In the short run, many wages and prices are sticky, fixed by contracts and custom, so when prices in general rise, firms find it profitable to produce more, and short-run aggregate supply slopes upward. Over time, sticky wages and prices adjust, and the economy returns toward potential. How fast it does so on its own, and whether policy should hurry it, is the oldest argument in macroeconomics (Module 15).

14d. Demand Shocks and Supply Shocks

The model's most useful lesson is the difference between two kinds of shock. A demand shock moves output and prices in the same direction. A collapse in spending, as when a housing bubble bursts, cuts output and lowers inflation together, and a boom raises both. A central bank or government can then push back on both at once, by cutting rates or spending more in a slump.

A supply shock moves them in opposite directions. A jump in the price of oil raises costs across the economy, shifting short-run aggregate supply to the left, so prices rise while output falls, the combination called stagflation. Now policy faces a dilemma. Raising rates to fight inflation deepens the slump; cutting them to support output adds to inflation. The usual advice is to look through the first rise in prices, which will not repeat once the oil price stops rising, unless people begin to expect inflation to continue. That condition is why the central bank's credibility matters so much (Module 16).

14e. The Multiplier

A change in spending has effects larger than itself, because one person's spending is another's income. Economists call the share of an extra dollar of income that people spend the marginal propensity to consume (MPC). A dollar of new spending becomes a dollar of income, of which MPC is spent again, becoming someone else's income, and so on. The total adds up to $1 \div (1 - \text{MPC})$ dollars of spending for each dollar of the first round. With an MPC of 0.75, the multiplier is 4. The arithmetic works in reverse in a slump, as lost income cuts spending, which cuts income again.

Real multipliers are far smaller than this simple formula suggests. Each round leaks into taxes, imports, and saving; extra borrowing may raise interest rates and crowd out private spending; and a central bank that is aiming at inflation may raise rates to offset any boost. The estimates of Module 17 reflect those leaks.

14f. Stagflation in the 1970s

The 1970s gave the supply shock its textbook form. When Arab producers cut supplies and embargoed the United States in October 1973, the price of a barrel of oil rose from $2.90 to $11.65 by January 1974. The economy entered recession (14a), while consumer prices rose 12.3% in the year to December 1974, and unemployment reached 9.0% in May 1975. Iran's revolution brought a second shock: its output fell by 4.8 million barrels a day in 1979, 7% of the world's, and oil prices more than doubled from April 1979 to April 1980. Consumer prices rose 14.8% in the year to March 1980.

The Federal Reserve under Paul Volcker, chair from August 1979, decided that inflation would not fall until people stopped expecting it, and that only a determined squeeze would convince them. The federal funds

rate approached 20%, and two recessions followed (14a). Unemployment reached 10.8% in November and December 1982. Inflation fell from double digits to about 4% by 1983, and expectations with it. The lesson most economists drew was that letting inflation expectations rise in the first place had been the costly mistake.

14g. Two Recessions Driven by Demand

The two most recent recessions began on the demand side. In 2007-09, a collapse in house prices, which fell by roughly 30% from mid-2006 to mid-2009, set off defaults on mortgages, losses at banks, and a financial panic after Lehman Brothers failed in September 2008. Spending and lending collapsed. Real GDP fell 4.3% from the end of 2007 to mid-2009, employers cut about 9 million jobs from January 2008 to February 2010, and unemployment reached 10.0% in October 2009. The 2020 recession was both a supply and a demand shock, as the pandemic shut workplaces and kept customers home. Employers cut 22.4 million jobs in March and April 2020, unemployment reached 14.8% in April, and real GDP fell at an annual rate of 28.0% in the second quarter. It was the shortest recession on record (14a), cut short by vaccines, the reopening, and an enormous policy response (Module 17).

14h. Is 2026 a Replay of the 1970s? The Cases as Their Advocates Make Them

The case that it is: pessimists see the 1970s pattern returning. A war cut off much of the oil that passes through the Strait of Hormuz, about a fifth of the world's supply before the war, and the physical price soared (Module 4). Energy prices rose 20.4% in the year to September, consumer confidence fell to a record low of 44.8 on the University of Michigan's index in May, and the Fed began raising rates into the shock under a new chair and heavy political pressure (Module 16). Long-term interest rates rose (Module 16) with the government borrowing heavily (Module 17), and in March Moody's Analytics put the odds of a recession within a year at nearly 50%.

The case that it is not: optimists answer that the economy that met the 2026 shock is very different. It uses far less oil per dollar of output, so a price rise of the same real size costs less than half as large a share of income as in 1973. The United States now exports more petroleum than it imports, a net 2.85 million barrels a day in 2025 and about 4.2 million in the first eight months of 2026 (Energy Information Administration), so higher prices move income from American drivers to American producers rather than abroad. Core inflation stayed moderate (Module 13), the inflation investors expect over ten years was 2.35% on October 14, and pay was rising more slowly than prices, the opposite of a wage-price spiral. Real GDP grew strongly in the third quarter (Module 12).

What the evidence says: so far the data favor the optimists. Growth has been strong, core inflation has stayed near 2.5%, unemployment has held steady (Module 13), and the signals that usually precede a recession are quiet. The Sahm rule, which flags a recession when the three-month average unemployment rate rises half a point above its low of the past year, read zero in September, and the Conference Board's index of leading indicators was flat. The risks are the war and expectations: if control of the strait stays contested and energy prices stay high, expectations could drift, which is why some of the Fed's policymakers wanted another rate rise (Module 16).

The course's reading: 2026 is a supply shock with real costs, borne most by households that drive most and by countries that import energy, but it is not a replay. Lower oil dependence, America's oil exports, and anchored expectations have so far kept the 1970s mechanism, a wage-price spiral, from starting.

Worked example — Two Shocks Traced Through an Economy

The first is the demand shock of 2007-09. The house-price collapse and banking panic of 14g cut households' wealth, left many owing more than their homes were worth, and froze lending. Households and firms cut spending, layoffs followed, and lost incomes cut spending again, the multiplier in reverse. Aggregate demand shifted left, so output and inflation fell together, and policy could push back on both: the Fed cut its rate to near zero in December 2008 and began buying bonds, and Congress passed a large stimulus (Module 17). The second is the supply shock of 2026. The strait's closure, confirmed on March 2, cut traffic through it from 21.2 million barrels a day in 2025 to 4.9 million in the second quarter of 2026 (EIA). Crude prices soared (Module 4), and pump prices set seasonal records (Module 6). Headline inflation rose while core inflation held steady, and real pay fell (Module 13). Aggregate supply shifted left, raising prices; but output did not fall. Consumers kept spending despite their gloom, investment in equipment, much of it computers, kept rising, and American oil producers earned more. The Fed chose to lean against the price rise (Module 16), and borrowing costs rose: the 30-year mortgage rate reached 7.40% in October, and sales of existing homes ran at 3.99 million a year in September, near the lowest pace in three decades. The 1973 shock brought a recession within weeks; the 2026 shock, so far, has brought higher prices and higher rates without one.

Module 14 Key Points

Booms and Busts: Aggregate Demand and Supply

• A recession is a significant, widespread decline lasting months, dated by an NBER committee, not simply two falling quarters.

• Demand shocks move output and prices together; supply shocks move them apart, forcing a choice between jobs and prices.

• The simple multiplier is 1 ÷ (1 − MPC); real multipliers are smaller because of taxes, imports, saving, and central banks.

• The 1970s oil shocks brought inflation of 12.3% and 14.8%, and unemployment peaked at 10.8% in 1982 as Volcker broke inflation.

• In 2008-09 real GDP fell 4.3% and unemployment reached 10.0%; in April 2020 it reached 14.8%.

• The course’s reading: 2026 is a costly supply shock but no 1970s replay; lower oil dependence and anchored expectations have held.

Module 14 Quiz

Check Your Understanding

1. How does the NBER's committee define a recession?

A) Two consecutive quarters of falling real GDP, as it has since the committee was founded
B) Any quarter in which unemployment rises by half a point or more
C) A year in which real GDP per person falls below its previous peak
D) A significant, widespread decline lasting months

2. Why does an adverse supply shock create a dilemma for a central bank?

A) Because it lowers prices and output together
B) Because it raises prices while cutting output, so fighting inflation deepens the slump and supporting output raises inflation
C) Because it has no effect on prices
D) Because the law forbids rate changes after a shock

3. If households spend 75 cents of each extra dollar of income, what is the simple multiplier?

A) 0.75
B) 1.33, since $1 \div 0.75 = 1.33$, the inverse of the share spent
C) 4, since $1 \div (1 - 0.75) = 4$
D) 75, since each dollar is spent again 75 times as it passes from hand to hand

4. What happened to American unemployment at the worst of the 1981-82 recession?

A) It reached 6%
B) It fell
C) It reached 10.8%, in November and December 1982
D) It reached 25%, as high as in the Great Depression, before Volcker reversed course and cut rates

5. What is the course's reading on whether 2026 is a replay of the 1970s?

A) A costly supply shock, but no replay so far
B) Yes
C) Yes: a wage-price spiral began in the summer, as unions won raises that matched the rise in energy prices
D) No, because oil prices did not rise in 2026 by any measure

Module 15 — Why Economists Disagree: The Schools

Two Centuries of Argument, and What the Tests Showed

Recommended Reading / Reference

Book: Robert L. Heilbroner, *The Worldly Philosophers: The Lives, Times, and Ideas of the Great Economic Thinkers* (1953; seventh edition 1999), the classic short history of economic thought, from Smith to Keynes and Schumpeter

Reference: The Kent A. Clark Center for Global Markets at the University of Chicago Booth School of Business, whose polls of leading economists show where the profession agrees and where it splits

15a. Where the Schools Divide

Economists share most of the toolkit in Modules 1-11. A Keynesian and an Austrian draw the same supply and demand curves and agree that a rent ceiling causes a shortage. They part ways over the whole economy, on three questions. Does an economy that falls into a slump right itself, and how fast? What causes booms and busts in the first place? And what can central banks and governments do about them without making things worse?

A school of thought is a bundle of answers to those questions, built up by economists who saw the same events and drew the same lessons. The schools are easiest to understand in the order they arose, because each began as an answer to a crisis the one before it could not explain. The sections that follow trace that sequence, and 15i scores each school against the episodes that tested it.

15b. The Classical Economists and Marx

The classical economists, from Adam Smith's *The Wealth of Nations* (1776) to David Ricardo and John Stuart Mill, saw a market economy as self-correcting. Prices and wages adjust until what is offered for sale finds buyers. The French economist Jean-Baptiste Say gave his name to the idea behind it, Say's law: supply creates its own demand, because people produce in order to buy. A glut of one good was possible, but a general glut of everything at once was not, at least not for long.

Karl Marx accepted much of the classical machinery and turned it against the system. In *Capital* (1867) he argued that profit comes from paying workers less than the value they produce, that competition drives firms to replace workers with machines, and that capitalism lurches from crisis to crisis as profits fall and goods pile up unsold. Marx's predictions of collapse did not come true in the rich countries, and his theory of value lost out in the 1870s. Economists then explained prices by what the last unit is worth to buyers (the marginal reasoning of Module 1), and Alfred Marshall's *Principles of Economics* joined that idea to the costs of production in the supply and demand diagram of Module 3. Marxian economics survives in a few departments, and its questions about crises and inequality keep returning.

15c. Keynes and the Great Depression

The Depression broke the classical view. American output fell by about a quarter from 1929 to 1933, and about a quarter of the labor force was out of work in 1933. Wages and prices fell, as the classical theory said they should, but jobs did not come back. John Maynard Keynes, a Cambridge economist, explained why in *The General Theory of Employment, Interest and Money* (1936). Total spending, which Module 14 calls aggregate demand, can fall short of what the economy could produce and stay short. Wages resist cuts, and when they do fall, workers' incomes and spending fall with them. Business investment rides on confidence, which Keynes called "animal spirits." And when everyone tries to save more at once, spending and incomes fall, so total saving may not rise at all, the paradox of thrift.

Keynes's remedy was for government to fill the gap, by spending more or taxing less, and his followers built the multiplier of Module 14 into the case. After the Second World War, Paul Samuelson and others joined Keynes to the classical tradition in what was called the neoclassical synthesis: Keynes for the short run, when prices are sticky, and the classical economists for the long run. In the 1960s many Keynesians read the Phillips curve as a menu (Module 13).

15d. Hayek and the Austrians

Friedrich Hayek, Keynes's great opponent in the 1930s, came from the Austrian school founded by Carl Menger and carried on by Ludwig von Mises. The Austrians tell a different story of the cycle. A central bank that holds interest rates below what saving would set encourages borrowing for projects that only pay off at those rates, which they call malinvestment. When rates rise or the credit runs out, the projects fail, and the bust is the painful but necessary correction. Stimulus, on this view, only postpones it. Hayek also made the argument about knowledge in Module 3: no planner, and no central bank setting the price of money, can know what millions of people know. He shared the 1974 Nobel Prize in economics.

The Austrian school is a small presence in universities, centered on a few departments such as George Mason University's and on the Mises Institute. It is larger in public debate, among critics of central banks and admirers of gold. In November 2010 a group of economists, investors, and historians wrote to Fed Chair Ben Bernanke that his bond buying risked "currency debasement and inflation." American inflation then ran below the Fed's 2% target for most of the next decade.

15e. Friedman and the Monetarists

Milton Friedman of the University of Chicago led the counterattack on the Keynesians. In *A Monetary History of the United States, 1867-1960* (1963), Friedman and Anna Schwartz argued that the Federal Reserve turned a recession into the Depression by letting the money supply fall by about a third from 1929 to 1933. Money, not animal spirits, drove the worst swings. "Inflation is always and everywhere a monetary phenomenon," Friedman wrote, summing up the long-run link of the quantity equation (Module 13).

In his presidential address to the American Economic Association in December 1967, published in 1968, Friedman argued that the Phillips curve offered no lasting trade-off (Module 13), as Edmund Phelps did independently. The monetarists wanted rules rather than discretion: a central bank should let the money supply grow at a steady few percent a year and leave the economy alone. Friedman won the 1976 Nobel Prize and Phelps the 2006 prize. The money rule itself was dropped in the 1980s, when the link between money and spending broke down (Module 13).

15f. Rational Expectations and Real Business Cycles

Robert Lucas pushed Friedman's point further. If people form their expectations rationally, using everything they know, including how policy works, then only surprises can move output, and systematic policy cannot. The Lucas critique added that a model fitted to past behavior breaks down when policy changes, because people change their behavior too. Lucas won the 1995 Nobel Prize, and his methods, models built up from forward-looking households and firms, took over graduate macroeconomics.

Finn Kydland and Edward Prescott went further still. In their real business cycle model of 1982, recessions are the economy's efficient response to real shocks, such as a fall in productivity or a jump in the price of oil, and there is nothing for policy to fix. Their 1977 paper on time inconsistency, the gap between what a policymaker promises and what it later finds tempting to do, became the case for central-bank independence (Module 16). They shared the 2004 Nobel Prize.

15g. The New Keynesian Synthesis

By the 1990s the two camps had met in the middle. New Keynesian economists, among them John Taylor, Gregory Mankiw, and Olivier Blanchard, kept the rational expectations and forward-looking households of Lucas's models and added the sticky prices and wages of Module 14, so that money and demand matter in the short run but not the long. The prescription is an independent central bank that sets interest rates to keep inflation near a target and output near its potential, steering expectations as much as rates.

This is the mainstream, taught in the graduate textbooks and built into the dynamic stochastic general equilibrium (DSGE) models that most inflation-targeting central banks run. A 2025 survey of 22 such central banks by the Czech National Bank found that most use a DSGE model, though only two rely on it alone. The quarter century after 1984, when inflation and output both grew steadier, was called the Great Moderation, and the synthesis took much of the credit.

15h. After 2008

The financial crisis of 2008 revived economists the mainstream had set aside. Hyman Minsky, who died in 1996, had argued that stability breeds instability: in good times borrowers take on more debt against rising asset prices, until a fall in prices forces them to sell and the boom turns to bust. The mainstream models of 2007 had little room for banks, so economists rushed to add financial frictions to them. Ben Bernanke, Douglas Diamond, and Philip Dybvig won the 2022 Nobel Prize for work on why banks fail and why their failure deepens recessions.

Three newer currents followed. Lawrence Summers argued at the International Monetary Fund in November 2013 that rich economies faced secular stagnation, a chronic shortage of demand that kept growth slow even with interest rates near zero. Modern Monetary Theory (MMT), set out for general readers in Stephanie Kelton's *The Deficit Myth* (2020), holds that a government that issues its own currency cannot run out of money, so that inflation, not solvency, limits its spending, and taxes are the tool for restraining inflation. And behavioral economics (Module 10) brought psychology into the models, honored by the Nobel Prizes of Robert Shiller in 2013 and Richard Thaler in 2017.

15i. The Tests

Economists cannot run experiments on whole economies, so the big episodes serve instead. Each one favored some schools and embarrassed others.

Episode	What happened	Favored	Embarrassed
Depression, 1929-33	Output and prices fell, but jobs did not return (15c)	Keynes; later Friedman and Schwartz's account of money	Classical self-correction
Stagflation, 1970s	High inflation and high unemployment together	Friedman and Phelps's natural rate; rational expectations	The Phillips curve as a menu
Volcker's disinflation, 1979-82	Tight money ended high inflation at the cost of two recessions	Monetarists on the power of money	The hope that disinflation could be painless
Great Moderation, 1984-2007	Steadier inflation and output	Inflation targeting and the New Keynesians	Few, until 2008
Financial crisis, 2008-09	A banking panic and the deepest recession since the 1930s	Minsky; Keynesians on stimulus	Models without banks
Bond buying, 2009-19	Central banks bought trillions of dollars of bonds; inflation stayed low	Secular stagnation	Austrian and monetarist warnings of high inflation
Inflation, 2021-23	The highest inflation in four decades, then a fall without a recession	Those who warned of overheating; then the New Keynesian stress on expectations	Relaxed views of deficits, MMT's among them; forecasts that inflation would be brief

The course's scoring. The 2021-23 inflation's causes are argued in Module 13, and the oil shock of 2026 is still under way (Module 14).

15j. How Much Each School Is Used Today

The New Keynesian framework, extended since 2008 to include banks, borrowing limits, and households that differ in income and wealth, is what central banks use and graduate students learn. The monetarists' and the rational-expectations economists' main ideas live on inside it: the natural rate, forward-looking expectations, and the case for an independent central bank. Behavioral economics has been absorbed in the same way.

The heterodox schools, Austrian, Marxian, post-Keynesian (Minsky's tradition), and Modern Monetary Theory, are small minorities among academic economists. When the Clark Center put two of Modern Monetary Theory's propositions to its panel of leading economists in March 2019, not one agreed with either. The heterodox schools have more influence outside universities, in politics, finance, and public argument, than within them.

15k. Does Economics Need a New Paradigm After 2008 and 2021? The Cases as Their Advocates Make Them

The case that it does: critics from the heterodox schools, joined by some insiders, say the mainstream failed its two biggest tests of the century. Its models missed the financial crisis because they left out banks and debt, and missed the inflation of 2021 because they assumed expectations would stay anchored. Paul Romer, a Nobel laureate, called modern macroeconomics a retreat from evidence in "The Trouble with Macroeconomics" (2016). Blanchard himself asked in 2016 whether DSGE models had a future. A profession this uniform, the critics conclude, needs competition from outside.

The case that it does not: defenders reply that the mainstream did what a science should and absorbed its failures. Banks, borrowing limits, and unequal households are now in the models. The policies that ended the 2008 panic and brought a fast recovery after 2020, from bond buying to large relief payments, came out of mainstream thinking. The immaculate disinflation of 2023-24 (Module 13) matched its stress on expectations. And no rival school, they point out, has a better record of prediction.

What the evidence says: forecasting is the weak spot for everyone. A study by Zidong An, João Tovar Jalles, and Prakash Loungani for the International Monetary Fund (2018) found that of 153 recessions in 63 countries from 1992 to 2014, only five had been predicted by the consensus of forecasters by April of the year before. Many forecasters expected an American recession in 2023, and none came. Explanation is stronger than prediction: the mainstream's account of why inflation rose and then fell has held up better than its forecasts did. The heterodox schools' best ideas, Minsky's above all, entered the mainstream rather than replacing it.

The course's reading: the mainstream adapted rather than failed, and it has no rival with a better record, but forecasting recessions remains its weakest skill. The useful habit for a reader is to ask which school's mechanism best fits the shock at hand.

Worked example — One Shock, Six Prescriptions

The shock is the oil price rise of 2026 (Module 14), which lifted headline inflation above core inflation (Module 13). A real business cycle economist sees a real shock that lowers what the economy can produce: prices should adjust, and policy has nothing to fix. A Keynesian worries about spending: if unemployment rises, help households directly, and let the central bank look through a price rise it did not cause. A monetarist wants steady money growth, neither feeding the rise nor fighting it hard, and watches for wages chasing prices. A New Keynesian asks whether long-run inflation expectations stay anchored. Judging by the ten-year breakeven rate (Module 14), mostly yes, so the first-round rise can be looked through, though a small rate rise can signal resolve. An Austrian says rates were too low for years, so a rise is overdue and the correction should be allowed. A Modern Monetary theorist calls it a supply problem, to be met with targeted measures on energy rather than higher interest rates. The Fed raised rates once and then held, with a minority wanting another rise (Module 16). That is the New Keynesian answer with a monetarist's caution, leaning further toward resolve than the textbook's advice to look through a supply shock.

Module 15 Key Points

Why Economists Disagree: The Schools

• Economists share the micro toolkit; the schools divide over whether economies right themselves and what policy can do.

• Keynes argued demand can fall short and stay short; Friedman answered that money and expectations limit what policy can do.

• Rational expectations made models forward-looking; the New Keynesian synthesis added sticky prices back and now runs central banks.

• The 1970s embarrassed the Phillips curve as a menu, 2008 models without banks, and 2021-23 relaxed views of deficits.

• Austrian, Marxian, and Modern Monetary Theory views remain small minorities; no economist polled in 2019 agreed with two MMT claims.

• The course’s reading: the mainstream adapted rather than failed, but forecasting recessions remains its weakest skill.

Module 15 Quiz

Check Your Understanding

1. What did Say’s law, as the classical economists used it, hold?

A) That governments must spend to keep demand up in slumps
B) That supply creates its own demand
C) That the money supply alone sets prices and output over every horizon
D) That wages settle at the cost of a worker’s subsistence

2. What did Friedman and Schwartz conclude about the Great Depression?

A) That excessive government spending caused it
B) That tariffs alone caused it
C) That it was an efficient response to a fall in productivity
D) That the Federal Reserve let the money supply fall by about a third, turning a recession into a depression

3. Which idea is most associated with Robert Lucas?

A) Animal spirits drive investment and the cycle
B) Rational expectations
C) Central-bank credit causes booms that must end in busts
D) A government that issues its own currency cannot run out of money

4. What does Modern Monetary Theory say limits the spending of a government that borrows in its own currency?

A) The bond market’s appetite, which sets a hard ceiling on its debt
B) Its gold reserves
C) A legal debt limit that only the legislature can raise
D) Inflation, not solvency

5. What is the course’s reading on whether economics needs a new paradigm?

A) Yes: the mainstream failed in 2008 and should give way to MMT
B) No: its models predicted every recession since 1990
C) No: the mainstream adapted, though forecasting recessions remains its weakest skill
D) Yes, since every school failed the tests of 2021-23 equally and none of them can be trusted any longer

Module 16 — Money, Banks, and the Central Bank

What Monetary Policy Can and Cannot Do

Recommended Reading / Reference

Book: Ben S. Bernanke, *21st Century Monetary Policy: The Federal Reserve from the Great Inflation to COVID-19* (2022), the modern toolkit explained by a former chair of the Fed

Reference: The FOMC's statement of October 28, 2026 and its Summary of Economic Projections of September 16, 2026, on the Federal Reserve's website

16a. What Money Is

Money is whatever people accept in payment. It does three jobs: it is a medium of exchange, so that a plumber need not find a baker who wants plumbing; a unit of account, in which prices are quoted; and a store of value, though an imperfect one when prices rise. For most of history money was a commodity, such as gold or silver, valued for itself. Modern money is fiat money, valuable because a government declares it legal tender, accepts it for taxes, and limits its supply. Economists count it in layers. The narrowest measure (M1) is currency and checking deposits; the broader one (M2), whose size Module 13 gives, adds savings deposits, small time deposits, and retail money-market funds.

16b. How Banks Create Money

Most money is not currency but bank deposits, and banks create most of it. When a bank makes a loan, it does not hand over other customers' savings; it credits the borrower's account with a new deposit, which the borrower can spend. That deposit is new money. Repaying a loan destroys money in the same way. Banks' ability to lend is limited not by a fixed multiple of their reserves, as older textbooks taught, but by the capital regulators require them to hold against losses, by the need to keep enough cash and safe assets to meet withdrawals, by the demand for loans from creditworthy borrowers, and by the interest rate the central bank sets. The Fed has required banks to hold no minimum reserves at all since March 2020.

Because banks lend out long-term what depositors can withdraw at once, they are open to runs, in which depositors rush to withdraw before the bank fails. Deposit insurance, which covers $250,000 per depositor at each insured bank, and the central bank's role as lender of last resort exist to prevent them. When Silicon Valley Bank failed in March 2023, the government guaranteed even its uninsured deposits to stop a wider run.

16c. The Central Bank's Tools

The Federal Reserve's main tool is the federal funds rate, the rate at which banks lend reserves to each other overnight. Its policy committee, the FOMC, sets a target range, 3.75-4.00% since its latest rise (16g), and steers the market rate into it with rates it controls directly. It pays 3.90% on the reserves banks hold with it, it lends to banks at 4.00% through its discount window, and it offers 3.75% to money-market funds and others through overnight reverse repurchase agreements. No bank will lend reserves for much less than it can earn at the Fed, so these rates bracket the market rate. With about $3 trillion of reserves in the system, the Fed controls rates this way rather than by adjusting the quantity of reserves day to day.

When its rate reaches zero, a central bank can buy bonds to push down longer-term rates, which is called quantitative easing. The Fed's holdings grew to about $9 trillion by 2022 through such purchases, and it then let them shrink, quantitative tightening, until December 1, 2025; its balance sheet stood at $6.75 trillion on October 22, 2026. Central banks also try to steer expectations by saying what they plan to do, called forward guidance. Kevin Warsh, Fed chair since May 22, 2026, dropped the practice of signaling future moves.

16d. How a Rate Change Reaches the Economy

A higher policy rate works through several channels. It raises the cost of borrowing for homes, cars, and business investment, so people borrow and spend less. It lowers the prices of stocks, bonds, and houses, whose value is the present value of future payments (Module 11), so households feel poorer and spend less. It strengthens the dollar, as foreign savers seek higher returns, making exports dearer and imports cheaper. And it shapes expectations: a central bank seen as determined to hold inflation down makes workers and firms less likely to build higher inflation into wages and prices. Friedman described the lags as long and variable: a change in rates affects spending most after about a year, and inflation after one to two years, so a central bank must act on forecasts rather than on today's data.

16e. The Taylor Rule

In 1993 John Taylor of Stanford proposed a simple formula that described the Fed's decisions surprisingly well. Write i for the policy rate, r* for the neutral real interest rate (the rate after inflation that neither speeds nor slows the economy), π for inflation over the past year, π* for the inflation target, and gap for the output gap, the percentage by which real GDP is above or below potential output. Then $i = r^* + \pi + 0.5 \times (\pi - \pi^*) + 0.5 \times \text{gap}$. The rule raises the policy rate by one and a half points for each point of extra inflation, so that the real rate rises and restrains spending, and by half a point for each point that output exceeds its potential. Where the output gap is not measured directly, it is often estimated as twice the amount by which unemployment falls short of its natural rate.

16f. What Monetary Policy Cannot Do

Monetary policy can steer spending and inflation, but not much else. It cannot raise the economy's long-run growth, which depends on workers, capital, and technology (Module 18): in the long run, money is neutral. It loses power when its rate reaches zero, as from 2008 to 2015 and from 2020 to 2022. It faces the dilemma of a supply shock (Module 14). And it does not set long-term interest rates, which depend on investors' expectations of future rates and the extra return they demand for the risk of holding long bonds, the term premium. In the autumn of 2026 the ten-year Treasury yield was above 5% while the Fed's rate was below 4%, partly because investors worried about deficits and inflation. A government with a very large debt may also lean on its central bank to hold rates down, which economists call fiscal dominance.

16g. Independence and the Rulings of 2026

Most rich countries leave monetary policy to central banks that elected governments cannot easily direct. The case rests on the time-inconsistency problem (Module 15): a government facing an election is tempted to engineer a boom and pay for it later with inflation, so a central bank's promise of low inflation is believed only if the bank is shielded from that temptation. Alberto Alesina and Lawrence Summers compared 16 rich countries and found that more independent central banks delivered lower and steadier inflation with no loss

of growth (1993). The reverse case is Turkey, where President Recep Tayyip Erdoğan pressed the central bank to cut rates as inflation rose; consumer prices were 85.5% higher in October 2022 than a year earlier.

American independence was tested in 2025-26. In August 2025 the President announced that he was removing Governor Lisa Cook, citing allegations about her mortgages. On June 29, 2026, in *Trump v. Cook*, the Supreme Court ruled 5-4 that governors of the Fed may be removed only for cause, and refused to let the removal take effect. Warsh was nominated on January 30, 2026 and confirmed by the Senate 54-45 on May 13, the narrowest margin for a Fed chair on record; his term as chair runs to May 2030, while Jerome Powell, his predecessor, remains a governor. Under Warsh the committee raised its rate by a quarter point on September 16, 12-0, its first rise since July 2023, and held it on October 28 by 10-2, with Cook and Beth Hammack, president of the Federal Reserve Bank of Cleveland, voting for another rise.

16h. Rules or Discretion, and How Independent? The Cases as Their Advocates Make Them

The case for rules: Taylor and others in Friedman's tradition argue that a central bank should follow a published rule, or at least explain any departure from one. Rules make policy predictable, protect central bankers from political pressure, and prevent the drift that let inflation rise in the 1970s and again in 2021, when a Taylor rule called for raising rates months before the Fed did.

The case for discretion: Bernanke and others reply that no formula foresees a financial panic, a pandemic, or an oil war, and that the inputs to any rule, the neutral rate and the output gap above all, cannot be observed and must be estimated. Central banks already practice what Bernanke calls constrained discretion: a fixed inflation target, with judgment about how to reach it.

The case against independence: critics on the left and the right argue that unelected officials make choices with large effects on jobs, wealth, and government borrowing, and should answer more directly to voters. They point to the Fed's late start against inflation in 2021, and the administration argued that the Fed was slow to cut rates in 2024-25.

What the evidence says: across countries, independence goes with lower inflation and no cost in growth, and Turkey shows what political control can do. Rules would have tightened sooner in 2021 but would have struggled in 2008 and 2020. The worked example shows how much any rule's prescription depends on its inputs.

The course's reading: independence under a clear inflation target has the best record. Pure rules are too rigid for crises, so the best practice is constrained discretion: publish what a rule would prescribe, and explain departures from it.

Worked example — The Taylor Rule at October 2026 Numbers

Start with the neutral real rate. The median member of the FOMC put the long-run federal funds rate at 3.2% in September 2026; subtracting the 2% inflation target gives an implied neutral real rate of 1.2%. For the output gap, CBO's natural rate and September's unemployment rate (Module 13) give a gap of about 2 × (4.4 − 4.2), or 0.4%. Using headline PCE inflation of 3.6% in September, the rule prescribes 1.2 + 3.6 + 0.5 × (3.6 − 2) + 0.5 × 0.4 = 5.8%. Using core PCE inflation of 3.1%, which leaves out the oil shock's direct effect, it prescribes 1.2 + 3.1 + 0.5 × 1.1 + 0.2 = 5.05%, about 5.1%. With the FOMC's own natural rate (Module 13) there is no gap, and the prescriptions fall to 5.6% and about 4.9%. If the neutral real rate were 0.5% rather than 1.2%, the core prescription would fall to about 4.4%. And using core PCE prices' annual rate in the third quarter, 2.5%, it would be about 4.2% even with the higher neutral rate. Against the midpoint of the target range, 3.875%, every version says policy was loose, by as little as 0.3 points or as much as 1.9. The gap shows why the dissenters wanted a rise, and why the majority, saying it wanted more information before moving again, did not.

Module 16 Key Points

Money, Banks, and the Central Bank

• Banks create most money by lending: a new loan makes a new deposit, limited by capital, liquidity, and demand.

• The Fed sets a target range for its policy rate, 3.75-4.00% since September 2026, and pays 3.90% on reserves.

• Rate changes reach spending through borrowing costs, asset prices, the dollar, and expectations, with long and variable lags.

• The Taylor rule raises rates 1.5 points for each point of extra inflation; October 2026’s numbers gave 4.2-5.8%, above the Fed’s rate.

• The Supreme Court ruled 5-4 on June 29, 2026 that Fed governors can be removed only for cause.

• The course’s reading: independence under a clear inflation target works best, with departures from a rule explained.

Module 16 Quiz

Check Your Understanding

1. How do commercial banks create money?

A) When a bank makes a loan, it credits the borrower's account with a new deposit, which is money
B) By printing currency
C) By selling gold to the Fed
D) Only by lending out deposits they already hold

2. What did the Supreme Court decide in Trump v. Cook on June 29, 2026?

A) That the Fed must cut rates
B) That the President may fire any governor
C) By 5-4, that Fed governors may be removed only for cause
D) That the Fed's chair must be confirmed again by the Senate every two years, starting with Chair Warsh

3. What does the Taylor rule prescribe when inflation rises one point above target, other things equal?

A) No change
B) Raising the rate 1.5 points
C) Cutting the rate half a point to support output, since inflation hurts spending
D) Raising the rate exactly one point, matching inflation

4. What did the FOMC decide on October 28, 2026?

A) It held at 3.75-4.00%
B) It cut its rate by half a point to cushion the oil shock
C) It raised its rate a quarter point for the second meeting in a row
D) It ended its target for inflation and adopted a target for the money supply

5. What is the course's reading on rules, discretion, and independence?

A) Fixed rules, always
B) Political control
C) Independence without any target
D) Independence under a clear inflation target works best, with a rule's prescription published and departures from it explained

Module 17 — Budgets, Deficits, and Debt

What Government Budgets Can and Cannot Do

Recommended Reading / Reference

Book: Olivier Blanchard, *Fiscal Policy under Low Interest Rates* (2023), a former chief economist of the International Monetary Fund on when public debt is cheap and when it becomes dangerous, free to read online from its publisher

Reference: CBO, *The Budget and Economic Outlook: 2026 to 2036* (February 11, 2026), its long-term outlook (March 2026), and its *Monthly Budget Review* for fiscal 2026 (October 8, 2026)

17a. Deficits and Debt in 2026

Fiscal policy is the government's budget used as a tool: what it spends on goods and services, what it pays out in transfers such as Social Security and unemployment benefits, and what it collects in taxes. The deficit is the gap in one year between spending and revenue; the debt is the total of past deficits not yet repaid. In the fiscal year that ended on September 30, 2026, the federal government took in $5.40 trillion, 16.8% of GDP, and spent $7.40 trillion, 23.0%. The deficit was $1.99 trillion, 6.2% of GDP, a figure more typical of a recession than of an economy with unemployment near 4%.

Interest is the fastest-growing part of the bill. Net interest on the public debt was $1.14 trillion in fiscal 2026, more than the Defense Department's $916 billion. Leave interest out and the government still spent about $850 billion more than it collected, a primary deficit of 2.6% of GDP. The debt held by the public, what the government owes to investors at home and abroad rather than to its own trust funds, was $32.48 trillion on October 13, about 100% of GDP. Counting what it owes its own trust funds, the gross debt passed $40 trillion on August 18.

17b. Automatic Stabilizers and Chosen Stimulus

Part of fiscal policy runs itself. When the economy weakens, income tax receipts fall faster than incomes, because tax rates rise with income, and spending on unemployment insurance, food aid, and Medicaid rises as more people qualify. These automatic stabilizers put money in households' hands in a slump and take it out in a boom, without anyone passing a law.

The rest is chosen. Congress passed about $800 billion of stimulus in February 2009 and close to $6 trillion of relief in 2020-21: about $4 trillion in 2020, led by the Coronavirus Aid, Relief, and Economic Security (CARES) Act of March and about $900 billion more in December, and the $1.9 trillion American Rescue Plan of March 2021. Chosen stimulus comes with lags. A slump must be recognized, a law argued over and passed, and money spent, and by then the economy may have recovered on its own. That is one reason many economists prefer to leave stabilization to the central bank (Module 16), which can move in a day.

17c. What a Dollar of Stimulus Buys

The multiplier of Module 14 says that a dollar of government spending can raise output by more than a dollar, as the money is spent again. Measuring it is hard, because governments spend more in slumps, which makes spending look ineffective. Studies get around this with spending that rose for reasons unrelated to the economy, such as military buildups. Valerie Ramey surveyed the evidence in the *Journal of*

Economic Perspectives (2019) and put most estimates of the spending multiplier between 0.6 and 1. Studies of tax changes made for reasons unrelated to the economy find larger effects: a tax rise equal to 1% of GDP cuts output by 2% to 3%.

Policy	Output per dollar of cost (low and high estimates)
Federal purchases of goods and services	$0.50 to $2.50
Transfers to states for infrastructure	$0.40 to $2.20
Transfers to individuals, such as unemployment benefits	$0.40 to $2.10
Two-year tax cuts for lower- and middle-income people	$0.30 to $1.50
One-year tax cut for higher-income people	$0.10 to $0.60
Tax breaks for corporate cash flow	$0 to $0.40

CBO’s ranges, from its report on the 2009 stimulus (February 21, 2014). Money that goes to people likely to spend it does more than money that goes to people likely to save it.

Multipliers are not constants. They are largest in deep slumps, when idle workers and machines can be put to use and the central bank has cut its rate to zero and will not raise it. They are smallest near capacity, when the central bank offsets extra spending (Module 14), as the Fed was doing in 2026.

17d. Crowding Out and Ricardian Equivalence

Government borrowing competes with businesses and households for the economy’s saving. If saving does not rise to meet it, interest rates rise and some private investment does not happen, which is called crowding out. It matters most when the economy is at full employment, and least in a slump, when saving piles up unused.

Robert Barro made a sharper argument in 1974. If people see that a tax cut paid for with borrowing means higher taxes later, they will save the tax cut to pay them, and spending will not change. James Buchanan named the idea Ricardian equivalence in 1976, after David Ricardo, who had raised it in 1820 and doubted that people behave that way. The evidence is against the strong form. When the government mailed out rebates in 2008, Jonathan Parker and his colleagues found that households spent a large share within months, much of it on cars (*American Economic Review*, 2013). People without savings to fall back on spend most of what they get, whatever their taxes may be in the future.

17e. The Arithmetic of Debt

What matters for a country’s debt is its size against the economy that must carry it. The debt ratio changes each year by a simple rule. Let d be the debt as a share of GDP, r the average interest rate the government pays on it, g the growth rate of nominal GDP (output in current dollars, including inflation), and p the primary deficit as a share of GDP. Then the debt ratio rises each year by about $(r - g) \times d + p$.

The term $(r - g) \times d$ is the heart of it. When the interest rate is below the growth rate, the economy outgrows the interest, and the debt ratio can hold steady or fall even with a modest primary deficit. When the interest rate is above the growth rate, the ratio rises even if the government balances its budget before interest, and the higher the debt, the faster the rise. The average interest rate on the government’s marketable debt was 3.53% on September 30, 2026, below the annual rate at which nominal GDP grew in the third quarter (Module 12). But a third of the debt matures within a year, its average maturity is under six years, and every

dollar refinanced now pays today's higher rates. CBO's long-term outlook (March 2026) has the debt reaching 175% of GDP in 2056, with net interest at 6.9% of GDP.

17f. Who Holds the Debt

Foreign investors held $9.25 trillion of American government debt in July 2026, about 28.5% of the debt held by the public. Japan, with $1,068 billion, and Britain, with $1,010 billion, were the largest holders in August, and China's holdings had fallen to $591 billion, the least since 2008. The rest is held at home, by the Fed, banks, money-market and mutual funds, pension funds, insurers, and individuals. The legal limit on federal borrowing, raised by the 2025 budget law, stands at $41.104 trillion; the Treasury, led by Secretary Scott Bessent, is expected to reach it in about May 2027 and to run out of room to keep paying its bills some months later, on one independent estimate (Module 19).

17g. How Much Debt Is Too Much? The Cases as Their Advocates Make Them

The case for alarm: deficit hawks, CBO's projections, and the International Monetary Fund point to interest that now exceeds defense spending and is projected to keep climbing. The IMF's *Fiscal Monitor* of October 14, 2026 warned that a declining premium for the safety of American bonds leaves markets open to a sharp repricing. Moody's took away the last top credit rating the United States held in May 2025, and the ten-year yield in the autumn of 2026 reached a level last seen in 2007 (Module 16). Rich countries can be punished fast: British bond yields leapt in September 2022 after a budget of unfunded tax cuts, and the Bank of England had to step in within days. France's ten-year yield passed 5% on October 21-22, 2026, its highest since 2002.

The case for calm: others, Blanchard prominent among them in his 2019 presidential address to the American Economic Association, argue that when interest rates are below growth rates, debt has little lasting cost, and that cutting it in a hurry can do more harm than carrying it. The United States borrows in its own currency, the dollar is the world's reserve currency, and Japan has carried gross debt above 200% of GDP for years without a crisis. Modern Monetary Theory goes further, holding that only inflation limits a government that issues its own currency (Module 15).

What the evidence says: no reliable threshold exists. The best-known one, Carmen Reinhart and Kenneth Rogoff's finding that growth slows sharply once debt passes 90% of GDP (2010), shrank when other economists found a spreadsheet error and other problems in the work (2013). What the evidence does show is that the American interest rate has been climbing toward the growth rate. The average rate on the debt is still below nominal growth, but nominal growth is high partly because of inflation, which flatters the debt ratio, and new long-term borrowing costs well above the average rate. On CBO's measure of net interest, the government paid $352 billion in fiscal 2021 and $970 billion in 2025, nearly three times as much, money that would otherwise have gone elsewhere.

The course's reading: no fixed line marks too much debt, and a sudden American crisis is unlikely. The real danger is slower: interest that crowds out other spending and leaves less room to fight the next recession, as the economy moves from a world where debt paid for itself to one where it must be paid for.

Worked example — The Debt Ratio's Path at Today's Numbers

Start from 17a's debt ratio (d = 1.00), 17e's average interest rate (r = 0.0353), 17a's primary deficit (p = 0.026), and nominal growth of an illustrative 4% a year (g = 0.04), about 2% real growth plus 2% inflation. Then the ratio rises each year by (0.0353 − 0.04) × 1.00 + 0.026, or about 2.1 percentage points: growth outruns interest by a little, but the primary deficit adds more. Over ten years, at that pace, the debt reaches about 121% of GDP. Now suppose the whole debt comes to cost 5% (r = 0.05) as it is refinanced. The yearly rise becomes (0.05 − 0.04) × 1.00 + 0.026, or 3.6 points, and the ratio reaches about 137% in ten years. To hold the ratio steady, the primary deficit would have to shrink to 0.47% of GDP at the current interest rate, a cut of about 2.1% of GDP, or roughly $700 billion a year. At 5% interest the budget before interest would need a surplus of 1% of GDP, a swing of 3.6% of GDP, about $1.2 trillion a year. The arithmetic shows why the interest rate, not just the deficit, sets the path of the debt.

Module 17 Key Points

Budgets, Deficits, and Debt

• The 2026 deficit was $1.99 trillion, 6.2% of GDP, and interest of $1.14 trillion exceeded defense spending.

• Automatic stabilizers cushion slumps without new laws; chosen stimulus, close to $6 trillion in 2020-21, comes with lags.

• Spending multipliers run mostly 0.6 to 1, larger in deep slumps and smaller when the central bank leans against them.

• The debt ratio rises each year by the gap between interest and growth times the debt, plus the primary deficit.

• At 2026’s numbers the debt ratio climbs about two points a year; with the debt costing 5%, closer to four.

• The course’s reading: no fixed threshold exists, but rising interest is crowding out other spending and room to fight recessions.

Module 17 Quiz

Check Your Understanding

1. What are automatic stabilizers?

A) Rules that require a balanced budget
B) Fed rate cuts that follow the unemployment rate
C) Taxes and benefits that cushion a slump without new laws, such as unemployment insurance
D) Spending programs that Congress must vote to renew each year, so that they can be cut quickly whenever the economy overheats

2. What range does Valerie Ramey's survey give for government spending multipliers?

A) Mostly 0.6 to 1
B) Always above 3, so stimulus pays for itself
C) Zero in every study, since private spending falls dollar for dollar
D) Negative, because spending always raises interest rates by more than it adds

3. What does Ricardian equivalence predict about a tax cut paid for by borrowing?

A) That it doubles consumer spending
B) That people save it to pay future taxes
C) That it raises interest rates by exactly the amount of the cut
D) That it lowers the debt by spurring enough growth to pay for itself

4. In the arithmetic of debt, what can happen to the debt ratio when the interest rate on the debt is below the growth rate of nominal GDP?

A) It must rise
B) It is unaffected by either rate
C) It falls only if the budget is in overall surplus
D) It can hold steady or fall even with a modest primary deficit, because the economy outgrows the interest

5. What is the course's reading on how much debt is too much?

A) Any debt above 90% of GDP sets off a crisis, as Reinhart and Rogoff showed
B) No fixed line; interest crowds out other uses
C) A country that issues its own currency can never borrow too much
D) Debt is harmless as long as foreigners hold less than a third of it

Module 18 — Long-Run Growth

Why Some Economies Grow Rich

Recommended Reading / Reference

Book: Robert J. Gordon, *The Rise and Fall of American Growth: The U.S. Standard of Living since the Civil War* (2016), a history of the inventions that transformed American life and an argument that their like may not return

Reference: BLS, *Total Factor Productivity* release (March 19, 2026) and the quarterly *Productivity and Costs* releases, which divide productivity growth among its sources

18a. The Power of Compounding

Over a year, the difference between 1% and 2% growth is barely noticeable. Over a lifetime it decides whether children live much better than their parents or only a little. Growth compounds, as interest does, and a handy approximation shows how fast: an amount growing at g% a year doubles in about 70 ÷ g years, the rule of 70. At 1% a year, income per person doubles in about 70 years; at 2%, in 35; at 7%, the pace China sustained for decades, in about 10.

18b. The Long Record

For most of history, living standards barely grew. Output rose with population, but output per person crept up so slowly that a farmer of 1700 lived much like one of 1300. Then, starting in Britain around 1800, growth took off, and it has continued for two centuries. On the estimates of the Maddison Project, a database of historical incomes kept at the University of Groningen, world GDP per person rose about fourteenfold from 1820 to 2020. Plotted over the long run, the line runs flat for millennia and then turns sharply upward, the shape economists call a hockey stick.

The takeoff was uneven, so countries that grew first grew far richer, a gap historians call the great divergence. Since 1950, some poor countries have closed much of it. South Korea and Ghana were about equally poor in 1960, with GDP per person of about $1,038 and $1,101 in constant dollars (World Bank). By 2024 South Korea’s had risen about 36-fold, to $37,048, and Ghana’s had roughly doubled, to $2,173. Explaining that difference is the central question of growth economics.

18c. Where Growth Comes From

Output per hour of work, labor productivity, rises for three reasons. Workers can have more capital to work with: machines, buildings, vehicles, and software. They can have more skills, the human capital of Module 11. And the economy can combine its workers and capital more efficiently, through better technology and organization, which economists measure as total factor productivity (TFP): the growth left over after counting the growth of the inputs. Dividing growth among these sources is called growth accounting. BLS found that labor productivity in private businesses outside farming grew 2.2% in 2025, of which about 0.8 points came from TFP, about 0.9 from more capital per hour worked, and about 0.4 from a more skilled and experienced workforce (the shares are rounded).

18d. The Solow Model and Catch-Up

Robert Solow showed in 1956 why capital alone cannot sustain growth. Capital has diminishing returns (Module 7). So an economy that keeps investing gets less extra output from each new machine, and growth from capital alone slows toward zero. In the long run, only better technology keeps output per person rising. The model has a hopeful corollary. Where capital is scarce, each new machine adds a great deal, so poor countries that save, invest, and adopt existing technology can grow faster than rich ones and catch up, as South Korea, Taiwan, and later China did. The catch is the condition: catch-up happens only where the other ingredients of growth are present, which is why many poor countries have not caught up at all.

18e. Ideas and Institutions

If technology drives long-run growth, what drives technology? Paul Romer answered in 1990 that ideas are different from other goods: they are non-rival (Module 9), so a formula, a design, or a piece of software can be used by everyone at once without being used up. An economy that invests in research and education can keep raising productivity indefinitely, and policies that reward discovery, through patents, research funding, and open trade in ideas, raise its growth rate. Romer shared the 2018 Nobel Prize.

Ideas and capital flow only where it is safe to use them. Daron Acemoglu, Simon Johnson, and James Robinson won the 2024 Nobel Prize “for studies of how institutions are formed and affect prosperity.” They distinguish inclusive institutions, which protect property, enforce contracts impartially, and constrain rulers, from extractive ones, built to let a narrow elite take what others produce. The two Koreas are their starkest example: one people and one culture, divided in 1945, with incomes now worlds apart. Geography, culture, and history matter too, and economists still argue over the weights.

18f. America’s Productivity Eras

American productivity has grown in long waves. It grew fast in the quarter century after the Second World War, as electricity, the car, and the interstate highways spread through the economy. It slowed sharply after 1973, for reasons still debated. It revived from the mid-1990s, as businesses learned to use computers and the internet, and slowed again in the mid-2000s, despite the smartphone. Since 2019 it has picked up again.

Period	Labor productivity growth, average per year
1948-1973	2.8%
1973-1979	1.2%
1979-1990	1.5%
1990-2000	2.2%
2000-2007	2.6%
2007-2019	1.5%
2019-2025	2.2%

Output per hour in the nonfarm business sector, from the BLS index, annual averages. Growth in 2025 alone was 2.1%; 18c uses BLS’s measure for private nonfarm businesses.

18g. Will AI Raise Productivity Growth Much? The Cases as Their Advocates Make Them

The case that it will: optimists see artificial intelligence as a general-purpose technology like electricity, able to raise productivity across the economy. Economists at Goldman Sachs estimated in 2023 that generative AI could raise world GDP by 7% over a decade and add about 1.5 points a year to American productivity growth. The firm-level evidence is striking: when a large company gave its customer-support agents an AI assistant, they resolved 15% more problems an hour on average, with the largest gains among the least experienced (Erik Brynjolfsson, Danielle Li, and Lindsey Raymond, *Quarterly Journal of Economics*, 2025). A survey by the Federal Reserve Bank of St. Louis found that workers using generative AI saved 5.4% of their hours, which its authors translated into about 1.1% higher productivity across the economy. And businesses are investing on a historic scale: in July 2026 the four largest American technology companies guided toward $720 billion to $745 billion of capital spending for the year.

The case that it will not, or not soon: skeptics expect far less. Acemoglu estimated that AI would raise total factor productivity by no more than 0.66% over ten years in all, since it will transform only some tasks and those slowly (2024). The Penn Wharton Budget Model projected that AI would raise the level of productivity and GDP by 1.5% by 2035 and about 3% by 2055, adding at most 0.2 points to growth in any year. Robert Solow remarked in 1987 that “you can see the computer age everywhere but in the productivity statistics,” and adoption has been gradual: about 18% to 20% of American firms reported using AI in some business function in early 2026 (Census Bureau). In a survey of about 6,000 executives published by the Federal Reserve Bank of Atlanta in March 2026, more than 80% said AI had not yet affected their productivity or employment.

What the evidence says: productivity growth since 2019 has been faster than in 2007-19, but researchers have found no measurable effect of AI across the whole economy yet. Gains appear in particular tasks and firms, and one study of about 750 chief financial officers found that they reported AI gains of 1.8% in 2025 while their revenue and staffing implied about 0.6%. Past general-purpose technologies took decades to show up in the statistics, because firms had to reorganize around them first, a pattern Brynjolfsson and colleagues call the productivity J-curve.

The course’s reading: AI will likely raise productivity growth, but by tenths of a point a year over the next decade rather than full points, with large gains in particular tasks showing first.

Worked example — What 1% Against 2% Means Over a Working Life

Give income per person an index of 100 today and follow it over a 40-year working life. At 1% growth a year it reaches about 149 (100×1.01^{40}), at 2% about 221, and at 3% about 326. The gap between 1% and 2%, which no one would notice in a single year, is the gap between a life in which income rises by half and one in which it more than doubles. America’s own record shows the stakes. At the 2007-19 pace (18f), productivity grows about 81% over 40 years; at the 1948-73 pace, it triples. On the skeptics’ estimate, AI at most lifts the 2007-19 pace to 1.7% (18g), raising the 40-year gain from about 81% to about 96%; on Goldman Sachs’ estimate it matches the postwar boom. For South Korea, growth averaging close to 6% a year turned an income like Ghana’s into one like Western Europe’s within a single lifetime.

Module 18 Key Points

Long-Run Growth

• At 2% growth a year income doubles in about 35 years, at 1% in 70: small differences in growth compound into large ones.

• World GDP per person rose about fourteenfold from 1820 to 2020; South Korea’s rose about 36-fold from 1960 to 2024.

• Growth comes from more capital, more skills, and better technology and organization, measured as total factor productivity.

• Solow’s diminishing returns permit catch-up; Romer’s ideas and inclusive institutions explain why growth can last.

• American productivity grew 2.8% a year in 1948-73, 1.5% in 2007-19, and 2.2% in 2019-25.

• The course’s reading: AI will likely add tenths of a point a year to productivity growth, not full points.

Module 18 Quiz

Check Your Understanding

1. By the rule of 70, how long does it take income to double at 2% growth a year?

A) 70 years
B) About 140 years, since growth slows as income rises
C) About 35 years
D) About 20 years, since compounding speeds the doubling as the economy grows larger

2. What does total factor productivity measure?

A) Hours worked
B) The number of factories
C) Output per worker
D) How efficiently an economy combines its workers and capital, the part of growth not explained by more inputs

3. Why can poor countries with little capital grow faster, in the Solow model?

A) Capital has diminishing returns, so each machine adds more where machines are scarce
B) They have more people
C) Their governments spend more
D) Because rich countries are required by trade agreements to transfer their technology and capital to poorer ones at no cost

4. What did the 2024 Nobel Prize in economics honor?

A) Research on banks and financial crises
B) Behavioral economics
C) The analysis of how auctions and matching markets can be designed to work better
D) How institutions shape prosperity

5. What is the course's reading on whether AI will raise productivity growth much?

A) Likely by tenths of a point a year over the next decade rather than full points, with large gains in particular tasks showing first
B) By 5 points a year
C) Not at all
D) Only in manufacturing

Module 19 — Where Things Stand, and What to Watch

The Argument, the Contradictions, and the Dates Ahead

Recommended Reading / Reference

Book: Diane Coyle, *Cogs and Monsters: What Economics Is, and What It Should Be* (2021), an economist's account of what the discipline does well and where it must change

Reference: The release calendars of BEA and BLS and the Federal Reserve's calendar of FOMC meetings, which date most of the events below

19a. The Argument on One Page

Economics is a way of reasoning about choices when resources are scarce. Its first tools are simple: the cost of anything is what you give up for it; good decisions are made at the margin; and people respond to incentives, often in ways no one intended (Module 1). Specialization and trade make people richer, though not every person (Module 2). Prices form where supply meets demand and carry what millions of people know (Module 3); how strongly people respond to them decides who bears a tax and how far a price must move (Module 4). Under competition, with every cost counted and both sides informed, markets make the gains from trade as large as they can be (Module 5).

Much of economics is the study of what happens when those conditions fail. Governments that set prices cause shortages and surpluses (Module 6). Firms with market power charge too much and sell too little (Module 8). Costs that fall on others are overproduced and public goods underproduced (Module 9). Markets with one better-informed side can unravel, and real people do not always choose as the models assume (Module 10). Each failure has remedies, from taxes on harm to antitrust to insurance mandates, and each remedy has costs of its own. How income is divided among labor, capital, and land follows from the same tools (Module 11).

The whole economy is measured imperfectly (Module 12). Inflation and unemployment trade off only in the short run, and only while expectations hold (Module 13). Shocks to demand move output and prices together; shocks to supply move them apart (Module 14). The schools of thought divide chiefly over how fast an economy rights itself and what policy can do about it (Module 15). Central banks and budgets can steer demand but not supply, and debt holds steady without a primary surplus only while growth outpaces interest (Modules 16 and 17). Over the long run, living standards depend on productivity, ideas, and institutions (Module 18). Through it all, economists agree far more on how things work than on how much, or on what should be done.

19b. Five Contradictions

1. Strong numbers, gloomy people. In the third quarter of 2026 real GDP grew strongly and unemployment held steady, yet consumer confidence sat near its record low (Modules 12-14). The averages hide how the oil shock fell. Households that drive most saw their prices rise much faster than the average and their real pay fall (Module 13), and higher mortgage rates (Module 14) shut many out of buying homes. A strong economy and a strained household budget are both true at once.

2. A supply shock met with a rate rise. The textbook says a central bank should look through the first rise in prices from a supply shock (Module 14), yet the Fed raised its rate, and some members wanted to raise it again (Module 16). The reason is history: a central bank that misjudged inflation as brief in 2021 cannot simply assume that expectations will stay anchored. Its credibility, not the model, set the choice.

3. Consensus ignored. Economists are nearly unanimous that rent control shrinks the housing it covers and that broad tariffs make the country imposing them poorer (Modules 2 and 6). Yet New York froze stabilized rents, and the tariffs the Supreme Court struck down were replaced under other laws within days. The gap is not mainly about facts. As with subsidies (Module 5), these policies' costs are spread thinly and arrive late, while their benefits are concentrated and visible, and voters weigh fairness and security differently from economists.

4. Rising productivity, falling share. Labor's share of income fell to a record low (Module 11), while productivity grew faster than in the decade before the pandemic (Module 18) and markups and stock prices stood high (Module 8). If the gains from productivity keep flowing to capital and to the dominant firms, the arrival of AI will sharpen the question of who benefits from growth rather than answer it.

5. Inflation flatters the debt. Rising prices squeeze households (Module 13), but they lift nominal GDP faster than the average interest rate on the government's debt, slowing the rise of the debt ratio (Module 17). The government gains from the very inflation the Fed is fighting, which is why economists worry that a heavily indebted government may lean on its central bank (Module 16).

19c. What to Watch

When	What	Why it matters
October 29-30, 2026	The Bank of Japan's meeting	Whether the last major central bank to leave negative rates raises again, with the yen weak, which moves long-term rates everywhere (Module 16)
November 3, 2026	The midterm elections	Control of Congress decides the stopgap's replacement, the path to the debt limit, and whether tariffs gain the backing of law (Modules 2 and 17)
November 5	Productivity and labor's share for the third quarter (BLS)	Whether productivity growth stays above 2% and labor's share recovers from its low (Modules 11 and 18)
November 6	The October jobs report	Whether job growth stays near the low pace that now holds unemployment steady (Module 13)
November 10	The October consumer price index	Whether energy prices ease, and which year-on-year rates can be published (Modules 12 and 13)
November 25	The second estimate of third-quarter GDP	Whether growth that leaned on stockbuilding holds up in revision (Module 12)
November 29	OPEC+ ministers meet, the first time without the UAE	Whether a cartel that lost a member with spare capacity can hold its quotas (Module 8)
December 8-9	The FOMC, with new projections	Whether the committee raises its rate again or the dissents fade (Module 16)
December 11	The stopgap funding the government ends	A shutdown would halt data collection again, as in 2025 (Modules 12 and 17)
January 1, 2027	73 state and local minimum-wage increases take effect, among them Washington's, to $17.73, and Seattle's (Module 6)	New natural experiments in the minimum-wage debate (Module 6)

When	What	Why it matters
January 10, 2027	The US-China trade truce expires	Tariff levels and the shift of imports among suppliers (Modules 2, 4, and 12)
February 1, 2027	Importers to the EU begin buying certificates for the carbon in their goods	The first border price on carbon starts to bite (Module 9)
February 5, 2027	The January jobs report, with the final benchmark revision	How much job growth in 2025-26 is revised away (Module 12)
Early 2027	CBO’s next budget outlook	The first baseline to count 2026’s higher interest rates and faster nominal growth (Module 17)
March 29, 2027	The FTC’s trial against Amazon begins	The next test of antitrust against a platform (Module 8)
June 2027	New York’s Rent Guidelines Board votes on leases from October 2027	Whether the freeze continues, and what landlords do in the meantime (Module 6)
About February 2028	The Treasury runs out of room under the debt limit, on one estimate	The next fight over borrowing, at higher interest rates (Module 17)

Dates as announced by October 29, 2026; CBO’s outlook and the debt-limit date are estimates. Two cases have no date: the appeal over New York’s congestion charge (Module 9) and the remedies against Live Nation (Module 8).

19d. The Last Word

The tools of this course are few and old. Opportunity cost, marginal thinking, supply and demand, elasticity, incentives, and the arithmetic of compounding were all known a century ago. What makes economics hard is not the tools but their application, because the world never holds other things equal and people never stop responding. The year 2026 put nearly every tool to work at once: a bird flu and a cocoa blight showed prices doing their job, a war showed what inelastic supply does, New York showed the trade-offs of setting prices, and the Fed showed how much a central bank’s past shapes its present.

A reader who follows the economy from here will do better with a few habits than with any forecast. Ask what people give up, and what they will do differently once the rules change. Ask who really bears a cost, whatever the law says. Ask whether a shock hit demand or supply, and whether a measure is real or nominal, average or typical. And ask what evidence would change your mind. Economists do not agree on everything, but they agree on these questions, and asking them is most of the economic way of thinking.

Module 19 Key Points

Where Things Stand, and What to Watch

• Economics reasons about choices under scarcity; prices coordinate them, and markets maximize gains when their conditions hold.

• Where those conditions fail, remedies exist, from taxes on harm to antitrust, and each carries costs of its own.

• In 2026 growth was strong and unemployment low while confidence sat near record lows, because prices hit drivers hardest.

• Near-consensus against rent control and tariffs met a rent freeze and new tariffs: their costs are diffuse, their benefits visible.

• Watch the FOMC on December 8-9, the stopgap’s end on December 11, and the US-China truce on January 10, 2027.

Module 19 Quiz

Check Your Understanding

1. Which contradiction does the module draw from the 2026 figures on growth and confidence?

A) Growth collapsed while confidence soared on hopes of lower interest rates
B) Strong growth, gloomy consumers
C) Unemployment rose to 8% while consumers spent as if in a boom
D) Both growth and confidence fell to records, as in every past oil shock

2. Why, on the module's reading, did the Fed raise rates into a supply shock that the textbook says to look through?

A) Because the law required it
B) To weaken the dollar
C) Because after 2021 it could not assume expectations would stay anchored
D) Because the oil shock had ended by September and the economy was overheating from a surge in government spending

3. How does inflation affect the government's debt ratio, according to the module?

A) It flatters it, because rising prices lift nominal GDP faster than the average interest rate on the debt, so the ratio grows more slowly
B) It has no effect
C) It doubles it
D) It raises it, since all the debt is indexed

4. When does the US-China trade truce expire, as of October 2026?

A) It expired in 2025
B) January 10, 2027
C) Never
D) On November 3, 2026, the day of the midterm elections, unless Congress extends it

5. What habit does the course's last word recommend to a reader of economic news?

A) Trust forecasts
B) Ignore incentives
C) Believe whichever school of thought sounds most confident, since all of them are equally likely to be right about every question
D) Ask what people give up, how they will respond, and who bears the cost

Answer Sheet

Answers to every module's Check Your Understanding quiz.

Module	Answers
Module 1 Quiz	1. A 2. D 3. C 4. B 5. B
Module 2 Quiz	1. A 2. C 3. D 4. C 5. A
Module 3 Quiz	1. D 2. B 3. C 4. D 5. A
Module 4 Quiz	1. B 2. D 3. B 4. A 5. C
Module 5 Quiz	1. D 2. B 3. C 4. A 5. A
Module 6 Quiz	1. B 2. D 3. C 4. B 5. C
Module 7 Quiz	1. A 2. D 3. C 4. B 5. D
Module 8 Quiz	1. A 2. D 3. A 4. B 5. C
Module 9 Quiz	1. B 2. C 3. A 4. D 5. B
Module 10 Quiz	1. C 2. D 3. A 4. C 5. D
Module 11 Quiz	1. A 2. B 3. A 4. B 5. C
Module 12 Quiz	1. D 2. A 3. D 4. C 5. B
Module 13 Quiz	1. B 2. C 3. D 4. A 5. A
Module 14 Quiz	1. D 2. B 3. C 4. C 5. A
Module 15 Quiz	1. B 2. D 3. B 4. D 5. C
Module 16 Quiz	1. A 2. C 3. B 4. A 5. D
Module 17 Quiz	1. C 2. A 3. B 4. D 5. B
Module 18 Quiz	1. C 2. D 3. A 4. D 5. A
Module 19 Quiz	1. B 2. C 3. A 4. B 5. D