INSTRUCTOR'S MANUAL

Charles I. Jones

Macroeconomics

FIFTH EDITION

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Part 4   Applications and Microfoundations

CHAPTER 1 | Introduction to Macroeconomics

CHAPTER OVERVIEW

This is a conventional first chapter of a textbook: it defines macroeconomics, it mentions a few interesting topics, it explains what a model is, and it lays out the book's separation into sections on the long run, short run, applications, and microfoundations. It is quite a short chapter with few surprises, so rather than summarizing it, I will instead talk a little about what makes this book different and lay out a few different ways you can use it in your course.

WHAT MAKES THIS BOOK DIFFERENT

This book offers solid coverage of long-run growth—including endogenous growth—while simplifying the New Keynesian business cycle dramatically, and it does all this without any calculus. Author Charles (Chad) Jones shows how long-run macroeconomic growth models have evolved and how tweaking the assumptions of these models can lead to new and interesting insights and policy conclusions. Moreover, Chad is able to easily deduce a short-run model from the long-run model and thereby link short-run and long-run economic analyses. By streamlining the coverage while teaching surprisingly solid microfoundations, Chad's text gives you a solid chance to spend more time on intelligent, model-driven policy discussions about growth and business cycles.

HOW TO USE THIS TEXTBOOK

CONVENTIONAL ONE-SEMESTER CLASS

In this day and age of assessment, we are ever-conscious of what we teach, how we teach it, who our students are, what they learn, and how they learn. Most students who have recently had a principles course and who are comfortable with a little algebra should be able to handle Chapters 1 through 14 in a semester. How much time you spend on these chapters, whether you omit coverage of any of them, and the nature and skill level of your students will influence your coverage of the later chapters.

Moreover, if you want to leave room for a few supplementary articles, a nontechnical book, or a major empirical project or two, you might have to tread lightly over some of the math in the growth- and labor-market models, which are self-contained and don't directly come up again later in the semester. Advice on how to do this is given in later chapters of this manual.

This third and fourth editions of the book provide an innovative chapter on dynamic stochastic general equilibrium (DSGE) models. This chapter provides a bridge between long-run economic growth and short-run economic fluctuations, and it fits in nicely at the end of Part 3 of the textbook to remind us of the links between the long run and the short run. I'd recommend that you make time in the semester to include Chapter 15 as a capstone to a semester course.

ONE-QUARTER COURSE OR ONE-SEMESTER COURSE WITH MANY OUTSIDE READINGS AND PROJECTS

In this case the best choice would be Chapters 1–4 (the introduction through the basics of growth and productivity), 8–11, 15 (inflation, business cycles, and DGSE models), and two of the following: Chapters 5, 6.1–6.3, and 7, or 12–14, and Chapters 18–20.

TWO-QUARTER COURSE OR TWO-SEMESTER COURSE

In this case the best choice would be the entire book, spending one quarter or semester on long-run growth, labor mar-

kets, inflation, consumption, and investment (Chapters 1–8, 16, and 17) and one quarter or semester on short-run business cycles, the Great Recession, monetary policy, the Phillips curve, fiscal policy, the aggregate demand/aggregate supply model, DSGE models, international trade, exchange rates, and international finance (Chapters 9–15, 18–21), with enough time for a supplementary book each quarter as well as a few articles and data projects. This would be a great way to teach this course.

CHAPTERS THAT MAY BE OMITTED

I include this list because instructors often want to know if they can leave out a chapter without omitting facts or theories that come back in later chapters. These chapters each build on previous chapters, but none are directly used in later chapters.

- 6 Growth and Ideas (this is the last growth chapter)
- 7 The Labor Market, Wages, and Unemployment
- 15 DSGE Models: The Frontier of Business Cycle Research
- 16 Consumption
- 17 Investment
- 18 The Government and the Macroeconomy
- 19 International Trade
- 20 Exchange Rates and International Finance
- 21 Parting Thoughts

In particular, the international trade chapter (19) is independent of the foreign exchange chapter (20), so you can choose just one or the other depending on your needs.

For math-averse students, Chapter 5 (Solow) may be omitted if necessary, while key parts of Chapter 6 (Growth and Ideas) may be covered without difficulty (Sections 6.1 through 6.3). That means instructors can still teach the economics of ideas (a largely math-free topic) yet avoid the math of the Solow model.

HOW TO USE THIS INSTRUCTION MANUAL

Chad provides excellent summaries at the end of each chapter, and the student study guide performs much the same function. This instruction manual does something different: it is written to help you do a better job when teaching with this innovative textbook.

In this manual, we walk through each chapter from beginning to end, discussing how you might approach topics that students often find troublesome: for instance, the Solow steady-state model, making sense of the three ways to measure GDP, or what the Fisher equation really means.

Also, we sometimes recommend that you organize your lecture differently than the text does: some topics simply flow together particularly well when you're up there at the chalkboard. We always try to point out which topics you can safely gloss over or omit, and we often mention an illustration or two that might make your lectures a bit more relevant.

Every chapter in this manual also has a sample lecture, written on a topic that students typically have a tough time with. Finally, each chapter of this manual also contains a few case studies, often building on Chad's own case studies. In the case studies we provide some additional facts or theories that might help to flesh out a lecture or provoke classroom discussion. We hope you find this manual useful in getting the most out of Charles Jones's *Macroeconomics*.

SAMPLE LECTURE: GIVING YOU ALL THE ANSWERS UP FRONT

Of great concern to the economics profession is the economic literacy of our students. In particular, do our students really own an understanding of the subject matter or do they simply borrow an understanding for the course? One of my teaching objectives is to ensure, as much as possible, that students own an understanding of economics. To that end, I begin the introductory class with a set of unfolding questions. I start with the most basic question, What is economics? The better students will respond with the textbook definition given in principles, which is fine. But then I ask the question, Would your brother or sister, friend or parent understand that answer? Most students respond by saying no. Loosely following the late, great Robert Heilbroner, I'll say that economics is the study of the economy (and I'll get a laugh) and students will relax. But then that compels the question, What is the economy? Then we go around on different definitions and work up to the point, again following Heilbroner, that the economy is a set of social institutions/relationships devised to produce and distribute goods and bads.

Next we pull that definition apart (to produce—to transform nature into something useful; to distribute—to decide who gets what; the goods and the bads—things that are literally good and/or bad). So the next question is, Why study economics? Because of the economic problem. What economic problem? Scarcity. What's scarcity? Not having enough resources or goods to meet needs and desires. What causes scarcity? Resource constraints inherent in nature and the process of social interaction that create wants and desires for goods. Again, via modified Heilbroner, I will ask, How does a society, regardless of space and time, confront scarcity? People must be induced to work more when they want to work less; people must be induced to consume less when they want to consume more; and technology (the art of production) must be modified/improved. What economic system does most of the world use today to confront scarcity? Students will say capitalism or markets. What are markets? Markets are the process whereby buyers and sell-

ers interact to determine prices and quantities. What two approaches do we have for studying markets? Microeconomics, the study of the individual parts of the economy, and macroeconomics, the study of the economy as a whole with emphasis on factors like economic growth, economic fluctuations, unemployment, inflation, and international economic relations.

Microeconomics is rooted in the writings of Adam Smith in his 1776 work, *An Inquiry into the Nature and Causes of the Wealth of Nations* (I like to say the full title as it sums up what most of economics is about). Smith showed that markets promote order and stability by allowing individuals to freely express self-interest there and that the expression of self-interest promotes the social good. (Most students will be familiar with the "invisible hand" but not familiar with its strong political implications.) Of course, if Smith is correct, then markets, as a set of institutions, become a set of goods that promote social welfare. Well, what about macroeconomics? Where did it come from? The origins of macroeconomics can be traced to the Great Depression, the writings of John Maynard Keynes, World War II, and the Employment Act of 1946. If anything, macroeconomics was the consequence of market failures, as evidenced by the Great Depression. To illustrate the market failures, Keynes invoked fallacies of composition in reasoning, such as the paradox of thrift (that wage deflation in isolation can stabilize a labor market but wage deflation in the economy as a whole will do little to reduce unemployment and may actually destabilize the economy). Keynes's ideas were too revolutionary to gain acceptance, but World War II taught my parents' generation that government coordination of the economy to ensure high levels of spending and the national defense of the United States ended the Great Depression. The World War II generation, wanting to eliminate future unemployment, had the Employment Act of 1946 passed. According to this legislation, government should pursue policies to promote maximum employment, production, and purchasing power. In addition, this legislation created the Council of Economic Advisors and the Joint Economic Committee to advise the president and Congress on the economy. Subsequently, macroeconomics, along with microeconomics, became part of every core economics curriculum. Although there is little disagreement as to how to teach microeconomics, tension remains as to how to teach macroeconomics. In particular, conflict occurs over whether to emphasize the long run or the short run. Chad's textbook gives you the flexibility of emphasizing either concept or both.

Today, the global economy has largely recovered from the Great Recession—the greatest recession since the Great Depression. During this recovery, it's clear that the emphasis in policy shifted to the short run, but long-run concerns remain. The U.S. unemployment rate rose from 4.6% in 2007 to 5.8% in 2008 and 9.6% in 2010 (the year after the Great Recession officially ended), and it declined to 7.4% in 2013, 4.9 in 2016, and 3.7% in August 2019. According to the NBER Business Cycle Dating Committee, the current economic expansion that began in July 2009 has now lasted over 120 months, putting it on track to be the longest expansion on record[1]. During this economic expansion we have seen the federal government's budget deficit fall and rise. In 2009, as the economy plunged, the federal government's budget deficit peaked at about $1.4 trillion and then fell to about $438 billion in 2015. Since 2015, the budget deficit has continued to increase, to about $780 billion in 2018, and was expected to be over $900 billion in 2019 and over $1 trillion per year thereafter[2]. In addition, the Federal Reserve Bank ended its quantitative easing programs and began to gradually raise the federal funds rate. The federal funds rate increased from about .16% in July 2009 to about .34% in January 2016 and peaked at about 2.4% in April 2019.

Facing increasing concerns about a slowdown in the economy (due to the effects of the trade war as well as the inherent nature of cycles), the Federal Reserve has recently moved to lower interest rates, with the federal funds rate targeted in a range between 1.75% and 2% as of September 2019. During this economic expansion, while unemployment has fallen to near historic lows, the United States continues to face some real challenges. For example, the average annual rate of growth in per capita real GDP during the current expansion has been anemic at about 1.4% [= (Per Capita Real GDP_{2018}/Per Capita Real GDP_{2009})$^{.10}$ − 1 = ($56,921 /$49,501)$^{.10}$ − 1]. As the baby boomers have retired, the labor force participation rates have fallen significantly, from about 66.9% in 2001 to around 63% in 2019. With the retirement of the baby boomers and the fall in the labor force participation rate, we have seen the social security system run deficits (spending down its accumulated surplus), which accelerates the rate at which the system will become insolvent, and, for the first time since the Affordable Care Act became law, the United States has seen an increase in the number of uninsured people. With this backdrop of increasing demand for social programs, slow growth in per capita income, high budget deficits, and low interest rates, concerns remain as to how much flexibility policy makers will have to address the next economic downturn. Ultimately, long-term solutions will be needed to address the changing demographics in the U.S. economy and the accompanying long-term changes. Chad, in this textbook, gives a clear and accessible analysis of both the long-term and short-term economic problems. In this course, we'll spend the first half of the semester talking about long-term issues: why some countries are richer than others, and why the average person today lives so much better than someone one or two hundred

1. https://www.nber.org/cycles/cyclesmain.html
2. https://www.cbo.gov/publication/54918

years ago. A generation ago, such topics would barely have been mentioned, but with the rise of globalization, the spread of markets around the world, and a new concern about prospects for global growth, a new emphasis in economics has emerged.

In the second half of the semester, we'll talk about short-term issues: economic busts and booms, which economists often call the "business cycle" or "economic fluctuations." The book's goal is to provide a framework for understanding the nature, causes, and solutions to both short-run and long-run fluctuations. A generation ago, the business cycle section would have been almost the whole course. Back then, many macroeconomists thought they could control the overall level of GDP on a year-to-year basis. That's certainly what the textbooks taught back then. In those days, we spent the semester talking about how to control the demand for goods and services in the economy. Back then, we thought we actually *could* control things. Today's macroeconomics is largely about teaching macroeconomists—myself and my colleagues—to be humble. We'll learn that the Federal Reserve can have an impact on the average rate of inflation. There are increases in the overall price level, but at the same time we'll see that the Federal Reserve has a limited impact on reducing the average rate of unemployment: the fraction of workers who can't find jobs. (The Federal Reserve might be able to temporarily reduce the unemployment rate below some "natural" rate, but it would subsequently risk high inflation without any long-run reduction in the unemployment rate.)

One point to take away from the semester is this: the Federal Reserve might be able to smooth out the bumps on the road—with the emphasis on "might"—but it can't make the trip go any faster. For the average American to have a better standard of living in the long run, we'll have to focus on something other than interest-rate policy. That's why we'll spend quite a bit of time in the first half of the semester on the "supply side" of the economy: the supply of people willing to work; the supply of machines, equipment, and natural resources; and the supply of useful, practical ideas. Economists tend to think that if you have a good supply of those four things—people, machines, natural resources, and ideas—then in a market economy, those "inputs" will usually get combined to create "outputs" that we really want, like cars, movies, doctor's appointments, books, vacations, and food. By spending time in the first half of the semester talking about the supply side, the hope is that when you're voting or when you're serving in government, you'll remember that how well people live doesn't depend on whether there's a *demand* for goods: as you learned when studying economic principles or by talking with your friends, people's demands are basically unlimited. The key problem of economics is scarcity: and the miracle of long-term economic growth is that most of the things people want become a little bit less scarce each year.

SAMPLE LECTURE: MODELS AND THEIR SOLUTIONS

In Section 1.2, Chad outlines the four-step approach that unifies macroeconomics: document the facts, develop a model, compare the predictions of the model with the original facts, and use the model to make additional predictions. Students in intermediate theory still may be a little uncertain and ill at ease when developing models. One possible way to make students comfortable in the process of developing models is to remind them that the central point of their study in principles was the supply-and-demand (market) model. A quick review of that supply-and-demand model goes a long way in clearing up the vocabulary used throughout much of the text (and economics in general). For example, describing the market model as a process whereby buyers and sellers interact to determine price and quantity provides a structural model in which the behavior of buyers is modeled as a demand equation, the behavior of the sellers is modeled as a supply equation, and the model is solved by specifying an equilibrium equation, namely, in general functional form (an idea that is good to introduce early on): where demand is $Q_d = Qd(P, NPDs)$; where supply is $Qs = Qs(P, NPDs)$, where the NPDs = the relevant nonprice determinants of demand or supply (an example or two of the respective NPDs quickly refreshes students' memories); and where equilibrium is $Q_d = Q_s$. After specifying the model, remind students that the model must be signed: putting a negative sign, "–," under P in the demand equation and a positive sign, "+," under P in the supply equation, and explaining in the process what the signs mean.

A simple graph illustrates the equilibrium solution: the equilibrium price and quantity are shown as endogenous variables and the NPDs are the exogenous variables that determine equilibrium levels. As a further example, you might consider moving the market analysis into specific functional form: where $Q_d = a - bP$ and $Q_s = \alpha + \beta P$; where the NPDs are reflected in the slope and intercept parameters; and where the equilibrium price is $P^* = (a - \alpha)/(b + \beta)$ and the equilibrium quantities are $Q_d^* = a - bP^*$ and $Qs^* = \alpha + \beta P^*$. Students quickly learn that much of what they were doing in principles is nicely summarized in Figure 1.6: the parameters/exogenous variables determine the solutions to the endogenous variables and the equilibrium price and quantities, and tweaking those parameters/exogenous variables modifies the solutions to the models.

CASE STUDY: HOW MUCH WOULD YOU PAY TO GET RID OF RECESSIONS?

Given that the U.S. economy has just emerged from the so-called Great Recession and is perhaps teetering on the brink of another recession, Nobel Prize winner Robert Lucas's

question, How much would you pay to get rid of recessions? remains apropos. Lucas's answer to this question was: not much.

As is well described in "After the Blowup" by John Cassidy (*The New Yorker*, January 11, 2010), Lucas won the Nobel Prize, in part, for reinventing the notion that markets are self-regulating. So Lucas's answer is not surprising. Lucas noticed that consumer spending—the part of our income we use to buy happiness—doesn't really change that much for the average person from year to year. It only fluctuates from year to year by about 1.5% (an aside: that's the standard deviation of real consumption) for the average person. There's a strong annual upward trend of about 2%, but around that trend there's a small wiggle, averaging about 1.5% per year.

So how much would you, personally, be willing to pay for an insurance policy that promised that you'd never have to risk those 1.5% up-and-down shocks to your consumer spending? Lucas ran some estimates and found that the average person would be willing to pay about 0.06% per year for an insurance policy like that. For a person earning $50,000 per year, it would cost $30 per year to guarantee a steady growth in your standard of living. Even when taking into account that it's hard to buy goods when you lose your job—you just might not be able to borrow the money to put food on the table—he found that in the United States, unemployment insurance benefits are usually good enough that the average person still wouldn't want to pay a lot for insurance to get rid of the consumption risk. This suggests that modern unemployment insurance is pretty good insurance already.

Quite possibly, the average poor person in the United States would pay more than $30 per year for that kind of insurance policy. For poorer people, every dollar counts more. But Lucas was trying to come up with an *average* estimate of how much the *typical* American would pay to get rid of business cycles. And he just couldn't find a way to make that number look big.

Economists David Romer and Lawrence Ball[3] think that Lucas is missing the point entirely. They think that the big cost of economic fluctuations isn't the fact that you can't go to restaurants as often during a recession; it's that you might not have a job. They've run some estimates based on what they think the average person is like and found that economic fluctuations have a much higher cost than Lucas believes. They agree that the average person doesn't get hit hard on the consuming side during a recession, but they think that people really don't like going in and out of the workforce. They found that people would rather work a steady 40-hour week than work 45 hours most of the time with some random lay-

offs thrown in. And of course, surveys and common sense do show that people hate being out of work.

Over the course of 50 years the economics profession has gone from the notion that business cycles could be tamed (Samuelson and the Keynesians) to the ideas of Lucas and others that markets are self-regulating and that government intervention has ill or nil effects. In light of current events, you will be challenged throughout this course with questions regarding what should be done to end recessions and reduce unemployment. For a nice review of the current debate, see the aforementioned Cassidy article.

CASE STUDY: THE OECD REPORT ON INCOME INEQUALITY AND ECONOMIC GROWTH

Chad, in Section 1.1, examines some of the big questions in macroeconomics. Some students might be wondering where income inequality fits into macroeconomics, as in recent years the issue of income inequality has risen to the forefront of both political and economic discussions. A good primer on this topic can be found in a report published by the Organisation for Economic Co-operation and Development (OECD) in December 2015, *Income Inequality: The Gap between Rich and Poor*[4]. In Section 4.1 of the report, a summary of what economists "think about inequality is provided." First, the Kuznets hypothesis is discussed. Economic growth, through industrialization and the development specializations, raises living standards above the subsistence levels and generates ever-widening gaps in the income distribution, which are then moderated by redistributive fiscal policies. With economic development, over time, inequality is expected to rise and then fall. However, in looking back over the last 100 years or so, as economies have developed, inequality has fallen and then increased.

Second, in attempting to provide a link between economic growth and inequality, a "complex and dynamic" relationship is considered that depends on (where Sara Voitchovsky's insights are mentioned) how different income groups behave and how different income groups interact. For example, inequality affects how the poor invest in education, how the middle class demands goods and services, and how the rich save, invest, and alter the direction of public investment or services. Inequality also affects the way groups interact by altering trust (which impacts transaction costs), social capital (creating insider and outsider networks), social unrest (increasing governance costs), and volatility (generating sudden policy shifts). In short, the report hedges on the issue of income equality, arguing that inequality is the byproduct of an incentive-driven process that stimulates growth while

3. Laurence Ball and David Romer, "Real Rigidities and the Non-Neutrality of Money," *Review of Economic Studies*, vol. 57, no. 2 (April 1990), pp. 183–203.

4. http://www.oecd.org/social/income-inequality-9789264246010-en.htm)

Table 1. PER CAPITA REAL GDP GROWTH RATES AND INCOME INEQUALITY: EASTERN EUROPEAN EU COUNTRIES

Country	Per Capita Real GDP Growth Rate (2018)	Ratio of the Share of Income of the Top Quintile to the Bottom Quintile (2017)
Czech Republic	5.14%	3.4
Estonia	5.83%	5.4
Slovak Republic	6.16%	9.4
Croatia	6.44%	5.0
Hungary	6.62%	4.3
Poland	6.76%	4.6
Bulgaria	6.79%	8.2
Slovenia	6.84%	4.3
Latvia	6.99%	6.3
Romania	7.00%	6.5
Lithuania	7.42%	7.3

Data sources: Eurostat and author's calculations.

Table 2. PER CAPITA REAL GDP GROWTH RATES AND INCOME INEQUALITY: THE REST OF THE EU COUNTRIES

Country	Per Capita Real GDP Growth Rate (2018)	Ratio of the Share of Income of the Top Quintile to the Bottom Quintile (2017)
France	3.73%	4.5
Denmark	3.74%	4.1
Germany	3.94%	6.6
Luxembourg	4.45%	5.0
Netherlands	4.59%	4.0
Austria	4.62%	4.3
Malta	4.63%	4.2
Greece	4.68%	6.1
Spain	4.74%	3.4
Finland	4.84%	3.5
Portugal	4.86%	5.7
Cyprus	5.21%	4.6
Ireland	6.13%	4.6

Data sources: Eurostat and author's calculations.

recognizing that the rising income inequality can generate underinvestment in education and skills, as, for example, evidenced by the decline in numeracy skills of low-income people as income inequality increases. The OECD suggests that the solution to the dual problem of growth and income inequality is a radical rethinking of the educational process: providing more equal and meaningful educational opportunity to the poor.

CASE STUDY: INCOME INEQUALITY IN THE EUROPEAN UNION AND ECONOMIC GROWTH

Following the OECD report on income inequality (described in the previous paragraphs), we can use a popular measure of income inequality that was reported by Eurostat[5] to take a snapshot of income inequality in the European Union (EU) and per capita GDP growth rates. The Eurostat measure of income inequality is the ratio of the income share of the top quintile to the income share of the bottom quintile. Table 1 reports the per capita GDP growth rate and the quintile ratios for the Eastern European countries of the EU. Table 2 reports the same data for rest of the European countries.

For the Eastern European members, we can see, that with the exception of the Slovak Republic and Bulgaria, the three countries with the highest growth rates have the highest degrees of income inequality. For example, Lithuania has a per capita real GDP growth rate of just over 7.4% and the top quintile share of income is over seven times greater than the income share of the bottom quintile. For the rest of Europe, Germany and Greece have the

highest degree of income inequality; Greece's growth rate reflects its recovery from the debt crisis. In Eastern Europe, the Czech Republic reports a low degree of income inequality and is on par with Spain and Finland. Clearly, the relationship between income inequality and growth is hard to decipher from a "snapshot," but we do see some evidence, as stated by the Kuznets hypothesis, of industrialization leading to income inequality.

REVIEW QUESTIONS

1–3. Based on personal preference.

4. Ingredients: Inputs, the model itself, and outputs. We can call these "exogenous variables," "equations or words," and "endogenous variables," respectively. The best short summary of the power of models is Robert Lucas's 1988 speech, "What Economists Do," which is available widely on the Web. This is possibly his best line: "I'm not sure whether you will take this as a confession or a boast, but we are basically storytellers, creators of make-believe economic systems." Lucas explains that if you want to be a matter-of-fact person who understands how the world works, you actually need to be creative and imaginative.

EXERCISES

1, 2. Based on personal preference.

3. **(a)** From www.stanford.edu/~chadj/snapshots.pdf:

Ethiopia: 2.9%
India: 11.8%
Mexico: 31.7%
Japan: 73.7%

5. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Income_poverty_statistics

(b) Botswana's per capita growth rate between 1960 and 2017 was about 5.5%. China's per capita growth rate was somewhere around 3.9%.

(c) Population as of 2017, biggest to smallest: United States (324.5 million), Indonesia (264.0 million), Brazil (209.3 million), Nigeria (190.9 million), Bangladesh (164.7 million), Russia (144.0 million).

(d) Government purchases are likely to be larger in poor countries, while investment expenditures are likely to be higher in rich countries. Using the UN Human Development Report to compare the five most highly developed countries with the five least developed countries reveals:

THE FIVE HIGHEST HUMAN DEVELOPMENT COUNTRIES

Country (2017)	I/Y (percent)	G/Y (percent)	Exchange Rate
Norway	28.5	5.8	8.27
Switzerland	27	7.23	0.985
Australia	24.4	15.8	1.3
Ireland	28.4	8.3	0.89
Germany	19.8	15.7	0.89

THE FIVE LOWEST HUMAN DEVELOPMENT COUNTRIES

Country (2017)	I/Y (percent)	G/Y (percent)	Exchange Rate
Niger	25.7	18.1	582.07
Central Africa Republic	10.3	11.2	582.07
South Sudan	30.4	10.6	6.68
Chad	11	6.7	582.07
Burundi	6.14	31.96	1729.05

Source: UNHDR 2018.

(e) While there are many exceptions, it appears that money in poorer countries has less value per unit compared to money in richer countries (see the exchange rate data provided previously, in part **d**). This is largely because some poor countries have a history of high inflation, so that one unit of their currency becomes worth very little compared to the dollar. High inflation is rare in rich countries and much more common in poor countries.

4. Based on personal preference.

5. This is a worked exercise. Please see the text for the solution.

6. (a) $\bar{a}$ tells us how the quantity of labor supplied responds to wages. Informally, it tells us how sensitive workers are to wages when deciding how much to work.

(b) This is the same as in **5**: quantity of labor supplied, quantity of labor demanded, equilibrium labor supply, and the wage. (Of course, you could simply collapse this to equilibrium labor supply and equilibrium wage without losing much of interest.)

(c) $w^* = \dfrac{\left(\bar{f} - \bar{\ell}\right)}{\left(1 + \bar{a}\right)}$

$L^* = \left(\bar{f} - w^*\right)$

This might be a good time to review the importance of the associative rule: students often forget about the importance of parentheses when doing algebra.

(d) If $\bar{\ell}$ increases, the wage falls and the equilibrium quantity of labor increases. This is just what we expect: the supply of labor increased exogenously, and workers were willing to work the same number of hours at a lower wage. In equilibrium, firms decide to hire more workers at a new, lower wage.

(e) This is an increase in demand: the quantity and wage of labor will both rise in equilibrium. The wage rises a bit, to which workers respond by supplying more labor.

7. (a) Q^D = demand for computers = $F(P, \bar{X})$
$\bar{X}$ is exogenous and captures consumers' understanding of how to use computers.

Q^S = supply of computers = $G(P, \bar{Y})$
$\bar{Y}$ is exogenous and captures the manufacturing skill of the computer industry.

In equilibrium, $Q^S = Q^D = Q^*$, so this model is really three equations and three variables (unknowns, Q^S, Q^D, and P). If the demand and supply functions are straight lines, then there must be a unique solution.

(b) Q^D = demand for classical music = $F(P, \bar{X})$
$\bar{X}$ is exogenous and captures consumers' interest in classical music.

Q^S = supply of classical music = $G(P, \bar{Y})$
$\bar{Y}$ is exogenous and captures the technology for recovering and cleaning up old classical music recordings.

(c) Q^D = demand for dollars = $F(P, \bar{X})$
$\bar{X}$ is exogenous and captures the domestic and foreign beliefs about the relative safety of the dollar versus the yen, the euro, and the pound.

Q^S = supply of dollars = $G(P, \bar{Y})$
$\bar{Y}$ is exogenous, and captures the Federal Reserve's supply of currency.

CHAPTER 2 | Measuring the Macroeconomy

CHAPTER OVERVIEW

By and large, this is a conventional "What is gross domestic product (GDP)?" chapter. Jones runs through the production, expenditure, and income approaches and emphasizes that the labor share in the United States is roughly constant (a point well worth emphasizing, since it helps justify the Cobb-Douglas production function that plays a major role later).

There's a particularly clear discussion of how to compare GDP numbers across countries; even if you don't plan on covering international topics in your course, this is probably worth discussing, since cross-country GDP comparisons are so central to the economic growth chapters (and many students have an intuition that prices differ across countries).

Interest rates and the unemployment rate are deferred to later chapters, so you can focus your energies on an intellectual triumph that we economists usually take for granted: the definition of GDP.

2.1 Introduction

Chad starts off by emphasizing just how hard it is to measure "an economy." What should we include? What should we leave out? How can we add up things that are wildly dissimilar—automobile production and grocery store employment and resales of homes and on and on—into one number that tells us what is happening?

Simon Kuznets found a reasonable way to do this, and he was awarded the 1971 Nobel Prize in economics largely for creating the definition of GDP that we use today. Economists and citizens take GDP for granted: but it really is one of the great intellectual contributions to economics. What did we ever do without it? Bad macro policy: that's what we did without it. Throughout this chapter, you may want to look for ways to emphasize how many *bad* ways there are to count economic activity: this lets students know that you're not just belaboring the obvious. In addition, you may want to emphasize that the system of national accounts constitutes a set of accounting identities: statements that are true by definition. These definitions are important in framing questions and finding answers. For example, if we define "spending" as $C + I + G + NX$, then we will ask how C, I, G, and NX changed to cause spending to change. In contrast, if we define "spending" as the money supply times velocity ($M \times V$), then we will ask how the money supply and velocity changed to cause spending to change. Definitions are an essential part of economic theory. The national accounts provide ample definitions for asking questions.

A useful analogy comes from medicine. How can you tell whether a human being is healthy? Doctors have settled on a few key variables for summing up human health: body temperature, blood pressure, heart rate, and breathing rate. The first two of the vital signs, in particular, could be measured in a number of ways—so doctors had to settle on the one best way to measure body temperature and blood pressure. Over the centuries, many different "vital signs" were put forward as being the key to measuring health, but only these four passed the test. Even today, many doctors push to include a fifth or sixth vital sign—oxygen levels in the blood, pupil size, emotional distress, pain—but the profession as a whole resists these efforts.

So too with GDP: we're always tinkering with ways to improve the GDP measure. We remind students of its limitations: we look at other numbers as well, but we keep coming back to GDP because it seems to be one of the vital signs of the nation's economic health. GDP is also the most complicated vital sign to explain—not unlike blood pressure in that regard—so we spend a whole chapter explaining it.

2.2 Measuring the State of the Economy

Let's start with Chad's phrasing of the definition of GDP: "Gross domestic product is defined as the *market value* of the *final* goods and *services produced* in an economy over a certain period." The words of this definition that can be emphasized are "market value," "final," "produced," and "services."

By emphasizing "market value," we stress that GDP is valued in some currency, such as dollars, and that unalike quantities of goods cannot be added up to measure the nation's output.

By highlighting "final" I emphasize that one key to accurately measuring GDP is to *avoid double counting*. I like to use examples in which common sense conflicts with Kuznets' GDP measure, as in the following sample lecture.

By highlighting "produced" I emphasize that GDP doesn't include sales of used items (such as homes and cars) or purely financial transactions (such as buying stocks or moving money between bank accounts). Moreover, GDP is a flow. A flow represents an economic variable that is measured through time; for example, how much income was earned or spent last week. In contrast, economic variables measured at a point in time are called stocks. These variables are found in our balance sheets (our statements of assets, liabilities, and net worth). How much money you hold is a question about an economic stock.

By highlighting "services" I emphasize that a large part of economic activity in the United States isn't about making things: it's about providing valuable services. If we leave out the ambiguous "housing services" part of GDP, the remaining service items—transportation, medical care, tourism, and "other"—add up to about $3.5 trillion, about one-fourth of our $13 trillion U.S. economy. Consumer services represent the largest category of consumer spending in the United States, about two-thirds of total consumer spending. In short, consumer services are almost half (around 47%) of GDP.

PRODUCTION = EXPENDITURE = INCOME

A clear example about Homer and Marge running a farm makes the point that if you measure correctly, there are three equivalent ways to measure GDP. You can remind students that this is the same "circular flow" idea they saw back in Principles courses: you can take the economy's pulse when products flow to final users, when revenue flows to firms, or when income flows to the firm's workers, owners, and lenders.

It may be worth emphasizing that Chad's "profits" are what Principles texts often call "accounting profits." They're different from "economic profits," which don't come into play at all when measuring GDP (recall that the difference between accounting and economic profits is the opportunity cost of the entrepreneur's time and the investor's capital).

It's worth remembering that GDP is, by and large, an accounting measure, using accounting intuition.

Students are often confused by the rhetoric of macroeconomists. A case in point arises here. Macroeconomists often use the terms *real income, output*, and *GDP* interchangeably. Since the value of output, as realized through sales, is distributed in the form of various incomes, *real income, output*, and *GDP* are identical.

THE EXPENDITURE APPROACH TO GDP

Here we run through *C*, *I*, *G*, and *NX* just as in Principles. Fortunately, Chad places less emphasis on the minutiae of the four categories and instead focuses on how these shares have changed over time: and by emphasizing time series, he gives the students stylized facts for macroeconomic theory to explain.

In one case he begins a theoretical explanation immediately. He draws attention to the rise in the U.S. consumption share, noting that it could reflect the fact that in recent decades it's become easier for average consumers to borrow. Alternatively, the rise in today's consumption share could reflect an expected rise in future income.

A few points might be worth noting:

- It's always worth emphasizing the difference between government purchases (measured in GDP) and government spending (which is what the media cares about and what matters for many fiscal policy questions but is not a formal category of GDP). As Chad notes, social security, Medicare, and interest on the debt are not included in *G*. They are transfer payments, and in practice most social security and all Medicare payments are used to purchase *C*, consumer goods and services.
- It's worth noting that the composition of spending is sensitive to where the economy is during the business cycle. During the current downturn in the economy, we see investment's share of GDP falling as consumption and government purchases' shares are increasing.

It's also worth emphasizing what *NX* really does: it makes sure we count everything exactly once. For example, *C* contains all *purchases* of consumer goods within the United States, not all *production* of consumer goods within the United States. Therefore, some of the *C* in GDP is really produced in Germany or China or Canada: and if our final measure of GDP is really going to measure U.S. *production*, we have to subtract that to make sure it doesn't show up in our final number.

As a result, when an American buys a $400 Chinese TV from the local appliance store, it shows up twice on the right-hand side of the national income identity: as +$400 in *C*, and again as −$200 in *NX*. That's how we make sure that the portion of the TVs produced abroad doesn't show up in U.S. gross *domestic* product.

The surprise is that *C*, *I*, *G*, and *NX* all reflect *purchases* by different groups, but they are defined in such a way that they sum up to U.S. *production*.

THE INCOME APPROACH TO GDP

This section gives just enough information for students to learn that the labor share is fairly stable across time within the United States. The only point I might emphasize is that the two forms of business income (net operating surplus and depreciation) are actually one item: income going to owners of capital, which we might call "gross operating surplus of business." The "depreciation" item is imputed (that is, scientifically made up) based on assumptions about the decay of the U.S. capital stock.

And just why is there an item called "indirect business taxes" if so many other forms of taxes—income and payroll taxes, in particular—don't show up here? The easy answer is probably the right one: it's because the creators of the national accounts are following accounting methods. In accounting terms, the answer to "Who pays a sales-type tax?" is empirically ambiguous: in the typical case, the customer "pays" the tax, since it's added onto the bill, but in reality, the business owner sends the proceeds on to the government. By lumping these ambiguous taxes together, we reduce the ambiguity of the other income categories.

THE PRODUCTION APPROACH TO GDP

Once again, this gives you another chance to emphasize the importance of counting everything exactly once. In the production method, you have only two choices:

1. Either only measure *final goods and services* or

2. Only measure the *value added at each stage of production* as a good moves from firm to firm to final purchaser

Why bother with choice (2)? For an economist (or businessperson) trying to figure out which industries are most productive, it is useful to know which industries add the most value to their inputs. In Chad's example, you could use the value-added method to answer the question, "Where does most of a car's value come from—the raw materials or the assembly of those materials?" In the diamond jewelry industry, the answer might be quite different (if the "raw" material is cut diamonds).

I often emphasize that when measuring the size of a local economy, common sense and economic sense are likely to conflict. Common sense says, "Measure the size of the local economy by adding up the sales of all the local businesses." But that would include massive double counting: just think of all the products that are sold from one local business to the next before they reach their final user (farm products are a good example, as is anything made locally and then sold in a local store).

Economic sense says something different: "Measure the size of the local economy by summing up the *value added* by each local business." To do that, you need to know the cost of each company's outputs and inputs, and then just sum all the values of the outputs while subtracting the sum of all the values of the inputs.

WHAT IS INCLUDED IN GDP AND WHAT IS NOT?

Of course, we have to explain the limitations of GDP: Chad's discussion differs from many by pointing to recent research showing that health matters more than is measured in GDP, while environmental degradation likely matters very little. In addition, you might emphasize the importance of leisure as a good that is excluded from GDP.

In this fifth edition of the textbook, Chad provides a case study in which a nation's welfare is linked to consumption (government and personal) per person, life expectancy, leisure, and consumption inequality. The resulting measure of welfare is contrasted to relative per capita GDP. When comparing the welfare measures across countries, two important results emerge. First, relative to the United States, in developed countries like those of northern Europe, welfare rises in comparison to per capita GDP because of: (1) more government consumption, (2) more leisure, (3) higher life expectancy, and (4) less consumption inequality. Second, in poorer countries, relative welfare decreases in comparison to relative per capita GDP for the opposite reasons. Chad's case study complements and provides results similar to the United Nations Development Programme's Human Development Index[1].

2.3 Measuring Changes over Time

Now we get to the distinction between nominal and real GDP. In Section 2.3.1, Jones runs through a simple apples-and-computers example, yielding what you really need to cover: Nominal GDP and Real GDP.

In Sections 2.3.2, 2.3.3, and 2.3.5, he runs through the various types of price indexes: Laspeyres, Paasche, and chain-weighted. If you want to avoid these price-index details, that's easy: just cover 2.3.1 to teach the old standby of "Real GDP in Year x Prices." Then use the basic equation at the beginning of 2.3.1 (nominal GDP = real GDP × price level) to back out the price level.

From there, proceed directly to 2.3.4 and to the definition of inflation, which is probably what you care about anyway. Chain weighting doesn't ever come up again aside from a parenthetical reference between equations 2.3 and 2.4.

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1. http://hdr.undp.org/en/statistics/hdi

Chad's coverage of the three types of price indexes is quite clear and brief, so if you do want to cover it, it shouldn't take more than half an hour in class.

2.4 Comparing Economic Performance across Countries

Students often have a strong intuition that prices vary across countries, and since cross-country GDP comparisons will play a major role in the next four chapters, it may be worthwhile to spend a little time on this section. There is one particular point that I would expand on a bit with most students, and that is the meaning of the final equation in this section:

$$\text{real Chinese GDP in U.S. prices} = \left(\frac{\text{U.S. price level}}{\text{Chinese price level}} \right) \times \text{Chinese nominal GDP}$$

The easiest way to make sense of this equation is to first convert Chinese nominal GDP from yuan into dollars. Students can then see, given the exchange rate, how much those many trillion yuan are worth in dollars. Then you can point out that goods cost less in China than in the United States, and therefore those dollars purchase more goods in China than they would have purchased in the United States. If those dollars purchase more goods, real GDP in China is increased. This real Chinese GDP in U.S. dollars can then simply be found by dividing China's nominal dollar GDP by the ratio of the Chinese price level to the U.S. price level (multiplying nominal dollar GDP by the ratio of the U.S. price level to the Chinese price level). The key takeaway here should be that if prices are "lower" in China than in the United States, then Chinese real GDP is higher than Chinese nominal GDP.

Compare actual, uncorrected, right-off-the-website U.S. prices (in dollars) for certain goods and services to actual, uncorrected, right-off-the-website Chinese prices (in yuan) for the same goods and services. Convert those yuan prices into dollars at the actual, uncorrected nominal dollar/yuan exchange rate, and you've got a commonsense measure of where prices are lower. Add in a big budget and dozens of well-meaning bureaucrats, and you've got the United Nations International Comparisons Program.

If goods and services cost less in China than in the United States (in fact they do, after you convert yuan into dollars), then that means the price level is lower in China than in the United States. So while China's nominal GDP may look relatively small at $5.8 trillion (when converted into dollars), when adjusting for relative prices, the Chinese real GDP is relatively large at $10.8 trillion.

Figuring out *why* the same goods and services are more or less expensive in some countries than in others is a task usually left to international economics, so I won't attempt even a quick explanation here. Chad closes this section (and

for practical purposes, the chapter) by noting that the same goods and services are often cheaper in the poorest countries: haircuts are a classic example. Also, the *Economist*'s Big Mac Index is always worth a mention, since students can grasp that idea quickly.

Thus, while on paper the world's wealthiest countries may appear 100 times richer than the world's poorest countries, the actual difference is closer to 30 times richer. That is still a massive difference that demands explanation: and that is the topic of the next few chapters.

2.5 Concluding Thoughts

Just as a reminder, there are two popular topics that Chad (mercifully) leaves out of this chapter in order to get us away from the economic anatomy and toward the economic models that are our field's strength. These are the Consumer Price Index and how price indexes measure quality changes. Chad provides coverage of the former later on in Chapter 8, while this manual provides some coverage on quality changes when discussing that chapter.

You may want to mention these topics in class at some point, to let the students know you'll come back to them:

- The Consumer Price Index (CPI) "basket" method is different from the other price indexes covered in this chapter. (The CPI is used to index tax brackets and social security payments, so it has policy relevance.)
- It's difficult to measure changes in quality over time (which is key in a new-economy world). The Census Bureau's hedonic price indexes for computers and Alan Greenspan's speech on the falling real price of cataract surgery come to mind.

Finally, students might be interested to know that national accounts provide a wealth of useful definitions that can be used as a starting point for analyzing important questions such as what causes the national budget deficit and what role the national budget deficit plays in affecting national savings and gross savings.

SAMPLE LECTURE: PRODUCTION, EXPENDITURE, AND INCOME IN A TRUCK ECONOMY

In this lecture, you can tie together all three GDP measurement methods in a simple economy with one output good. Since I find that most misunderstandings and most of the insights in national income accounting come from the production/value-added method, we'll use Chad's example of steel being used to make trucks. Let's consider the economy of Pickupia. The only two companies in Pickupia produce steel (SteelCo) and trucks (TruckCo).