



## Session 10: Booms, Busts, and the IS curve

Chad Jones  
Stanford GSB

## Short Run Macro

In the second half of the course we are going to focus on short run macro:

- Booms and Recessions
- Inflation and expectations
- Monetary and fiscal policy
- Financial crises
- Exchange rates and international finance

*And how COVID-19 interacts with all of this*

## Outline for today's class: Booms, Busts, and the IS Curve

- The Short Run and the Long Run
- Short-Run Output
- Okun's Law
- How costly are recessions?
- Deriving the IS curve, the first building block of the SR Model
- Using the IS curve — many examples
- How effective is a fiscal stimulus?

## The Long Run and the Short Run

- Long-Run model: Potential Output, Long-Run Inflation
- Short-Run model: Current Output, Inflation

The Short-Run is the length of time over which these deviations occur – e.g. two to four years

## Trends and Fluctuations

$$\underbrace{\text{Current Output}}_{Y_t} = \underbrace{\text{Long Run Trend}}_{\bar{Y}_t} + \underbrace{\text{Short Run Fluctuations}}_{\tilde{Y}_t \text{ (as percent of } \bar{Y}_t \text{)}}$$

Define short run output  $\tilde{Y}_t$ :

$$\tilde{Y}_t = \frac{Y_t - \bar{Y}_t}{\bar{Y}_t}$$

What is the interpretation of  $\tilde{Y}_t$ ?

## Trends and Fluctuations

$$\underbrace{\text{Current Output}}_{Y_t} = \underbrace{\text{Long Run Trend}}_{\bar{Y}_t} + \underbrace{\text{Short Run Fluctuations}}_{\tilde{Y}_t \text{ (as percent of } \bar{Y}_t \text{)}}$$

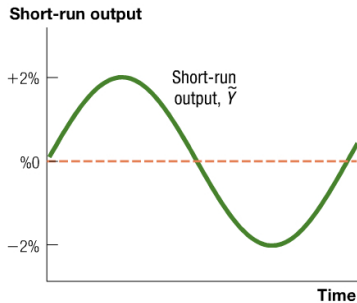
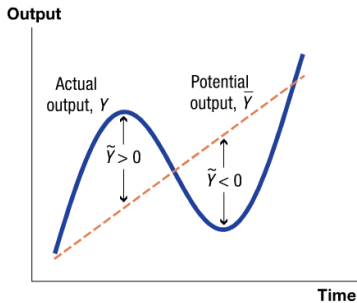
Define short run output  $\tilde{Y}_t$ :

$$\tilde{Y}_t = \frac{Y_t - \bar{Y}_t}{\bar{Y}_t}$$

What is the interpretation of  $\tilde{Y}_t$ ?

$\tilde{Y}_t$  is the percentage deviation from long run trend...

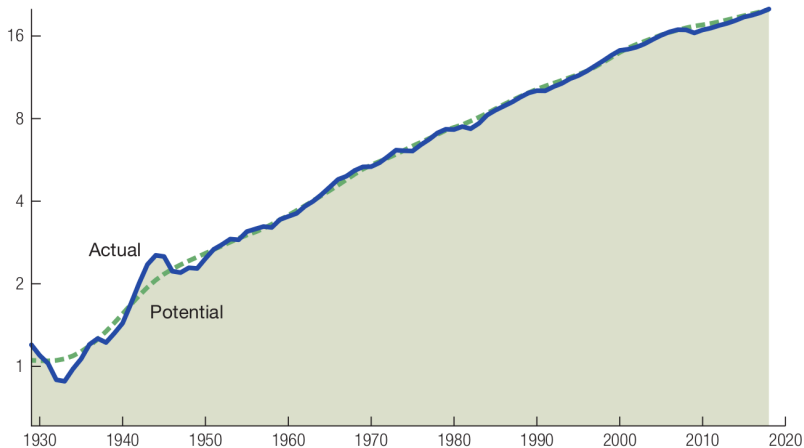
## Economic Fluctuations and Short-Run Output



- What is a recession?
- How can output be above potential?

## Actual and Potential Real GDP in the U.S.

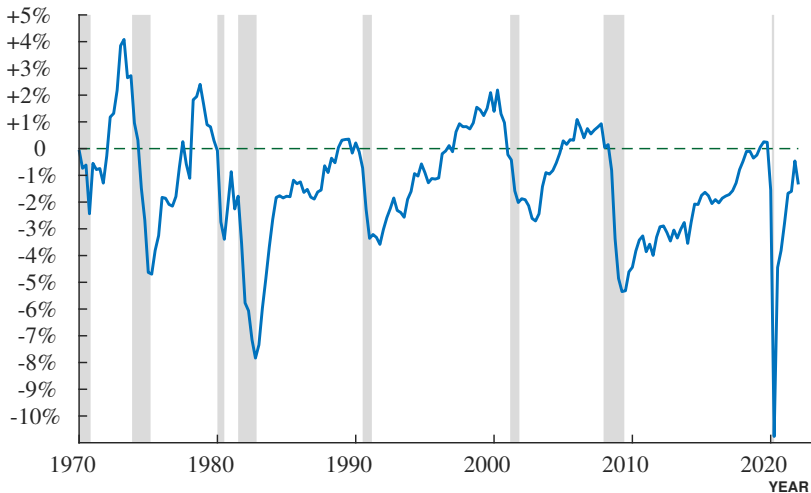
Trillions of chained  
2017 dollars, ratio scale





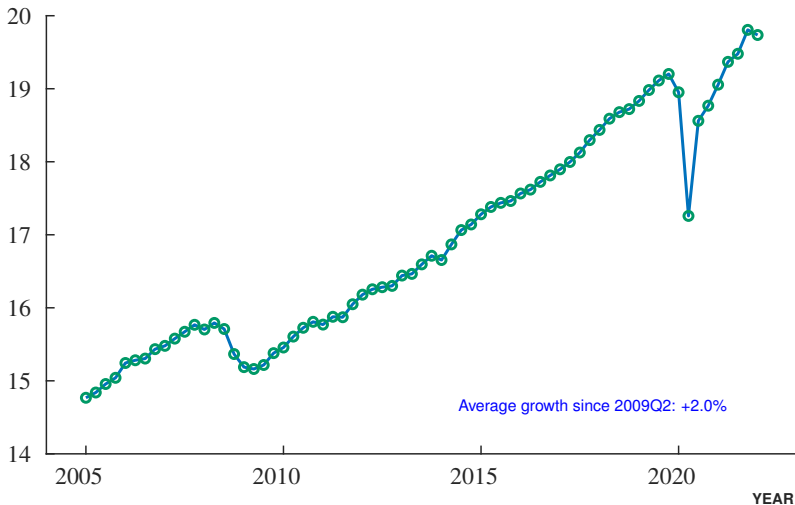
## U.S. Economic Fluctuations

SHORT-RUN OUTPUT,  $Y_{TILDE}$



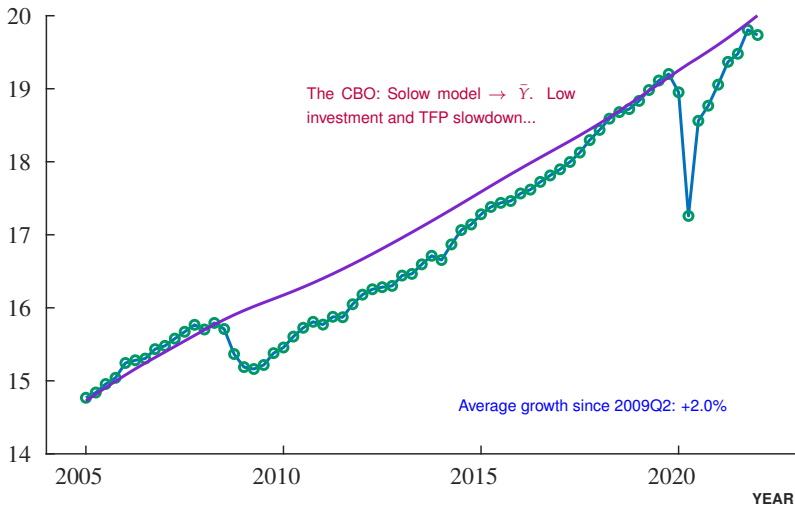
## U.S. Real GDP in Recent Years

TRILLIONS OF 2012 DOLLARS

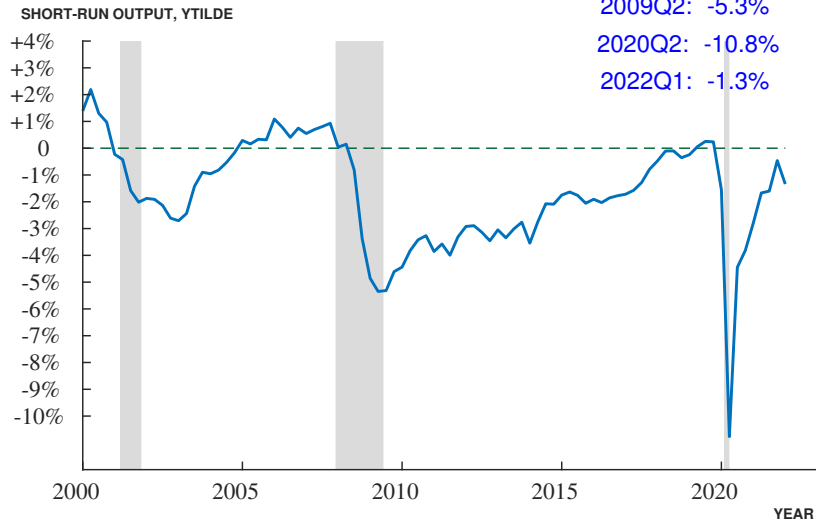


## U.S. Real GDP in Recent Years

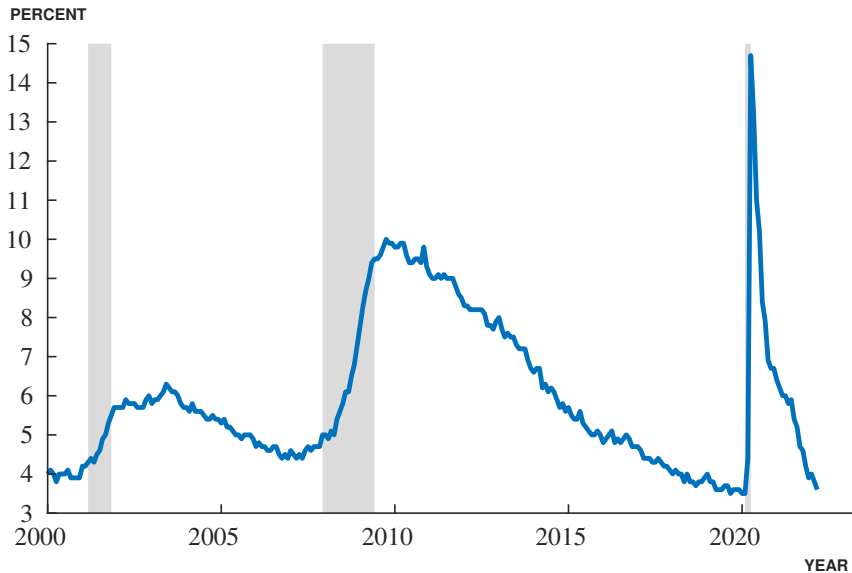
TRILLIONS OF 2012 DOLLARS



## Short-Run Output, $\tilde{Y}$ Recently



## U.S. Unemployment



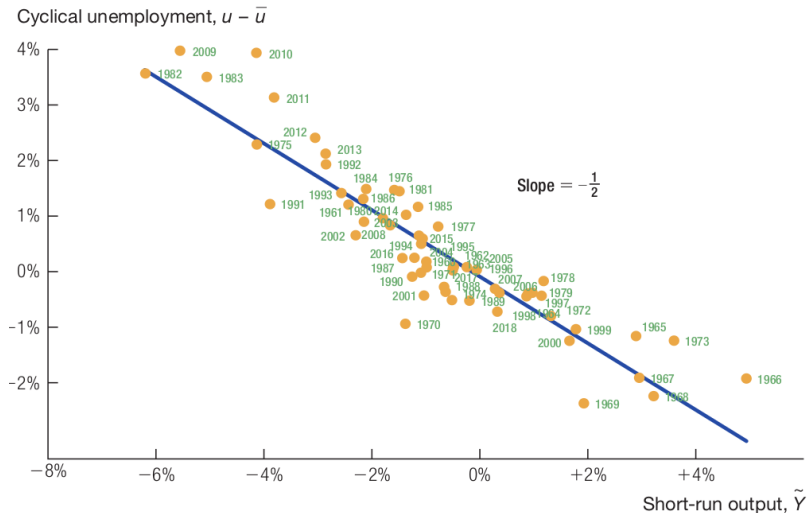
## Okun's Law

- In modeling booms and recessions, we could focus on either **short-run output** or **unemployment**.
  - Recession: Low short-run output and high unemployment
  - Boom: high short-run output and low unemployment
- **Okun's Law** is an empirical relationship that lets us go back and forth between these two

$$u - \bar{u} = -\frac{1}{2} \times \tilde{Y}$$

*Each percentage point of unemployment  
= 2 percentage point lower SR output*

## Okun's Law for the U.S. Economy



## Comparing Recessions

**TABLE 10.1**

### Changes in Key Macroeconomic Variables: Previous Recessions and the Great Recession

	Average of previous recessions since 1950	The Great Recession
GDP	−1.7%	−4.7%
Nonfarm employment	−2.5%	−6.3%
Unemployment rate	2.5	4.5
<i>Components of GDP</i>		
Consumption	0.4%	−3.4%
Investment	−14.4%	−34.0%
Government purchases	1.2%	5.5%
Exports	−1.5%	−10.3%
Imports	−4.2%	−18.7%





# Overview of the Short-Run Model

## Questions our Short-Run Model Addresses

- Why does actual GDP differ from potential?
- Why do recessions follow peaks in the inflation rate?
- What is the role for monetary and fiscal policy in smoothing economic fluctuations?
- How do economic fluctuations in one country spill over to affect other countries?
- How do we understand current events in the macroeconomy?

## Three Premises of the Short-Run Model

- ① The economy is constantly being hit by **shocks**
- ② Monetary policy affects the real economy in the short run
  - The Classical Dichotomy fails in the short run
- ③ There is a dynamic tradeoff between output and inflation in the short run
  - If monetary policy can affect output, why wouldn't the government keep output as high as possible?

## Two sentence summary of the Short-Run Model?

- A booming economy leads the inflation rate to increase, and a slumping economy leads inflation to decline.
- The government (via the central bank and its fiscal authority) can influence output in the short run.

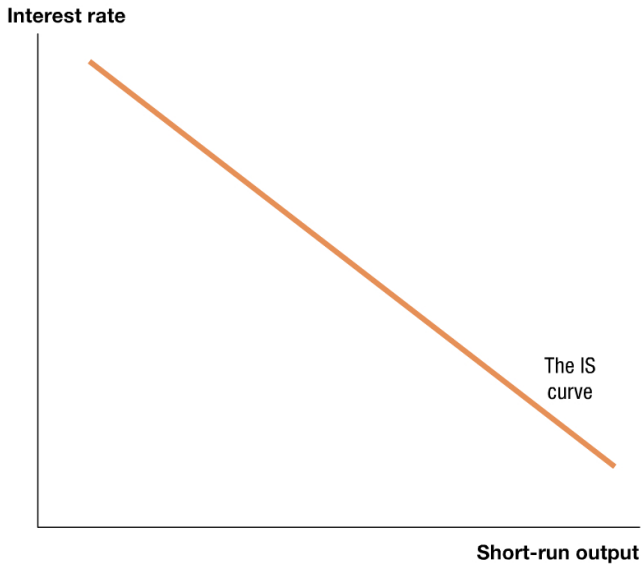
## Three Building Blocks of the Short-Run Model

- 1 **The IS Curve:** Short-run output depends on the real interest rate.
- 2 **The MP Curve:** The central bank sets the real interest rate.
- 3 **The Phillips Curve:** Inflation rises if the economy is booming, and falls if the economy is slumping.



## The IS Curve

## The IS Curve



## Basic questions

- What is the IS curve?
- Why does it slope downward?



## What two equations are fundamental to the IS curve?

$$Y_t = C_t + I_t + G_t + NX_t$$

$$\frac{I_t}{\bar{Y}_t} = \bar{a}_i - \bar{b}(R_t - \bar{r})$$

For the other components of GDP:

$$\frac{C_t}{\bar{Y}_t} = \bar{a}_c \quad \frac{G_t}{\bar{Y}_t} = \bar{a}_g \quad \frac{NX_t}{\bar{Y}_t} = \bar{a}_{nx}$$

## What two equations are fundamental to the IS curve?

$$Y_t = C_t + I_t + G_t + NX_t$$

$$\frac{I_t}{\bar{Y}_t} = \bar{a}_i - \bar{b}(R_t - \bar{r})$$

Firms have a menu of investment projects with different returns.  
As  $R$  rises, fewer of these projects are worth undertaking.

For the other components of GDP:

$$\frac{C_t}{\bar{Y}_t} = \bar{a}_c \quad \frac{G_t}{\bar{Y}_t} = \bar{a}_g \quad \frac{NX_t}{\bar{Y}_t} = \bar{a}_{nx}$$

## The IS Curve in Equation Form

$$\tilde{Y}_t = \bar{a} - \bar{b}(R_t - \bar{r})$$

- $\tilde{Y}$  Short-run output
- $\bar{a}$  Aggregate demand shock (zero normally)
- $R_t$  The real interest rate (financial markets)
- $\bar{r}$  The marginal product of capital
- $\bar{b}$  The sensitivity of investment to interest rates

$$\bar{a} = \bar{a}_c + \bar{a}_i + \bar{a}_g + \bar{a}_{nx} - 1$$

## Why is it called the “IS curve”?

- Investment equals Saving
- Return to the National Income Identity:

$$Y = C + I + G + EX - IM$$

- Rearrange the terms to get

$$Y - C - G + (IM - EX) = I$$

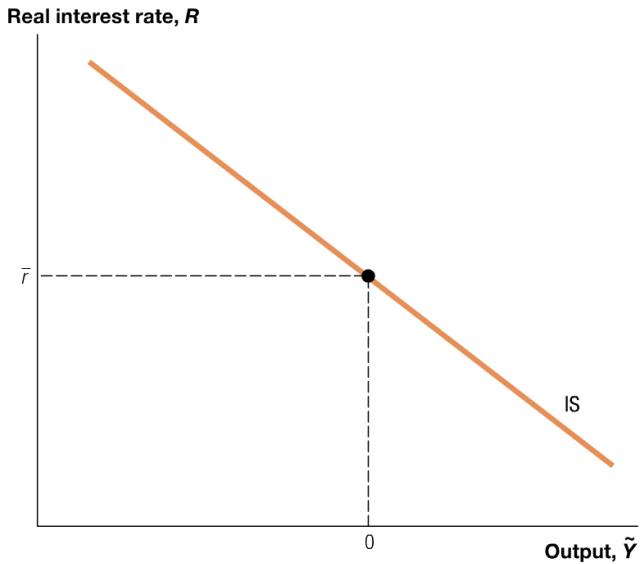
- Add and subtract taxes

$$\underbrace{(Y - T - C)}_{\text{Private Saving}} + \underbrace{(T - G)}_{\text{Gov't Saving}} + \underbrace{(IM - EX)}_{\text{Foreign saving}} = I$$

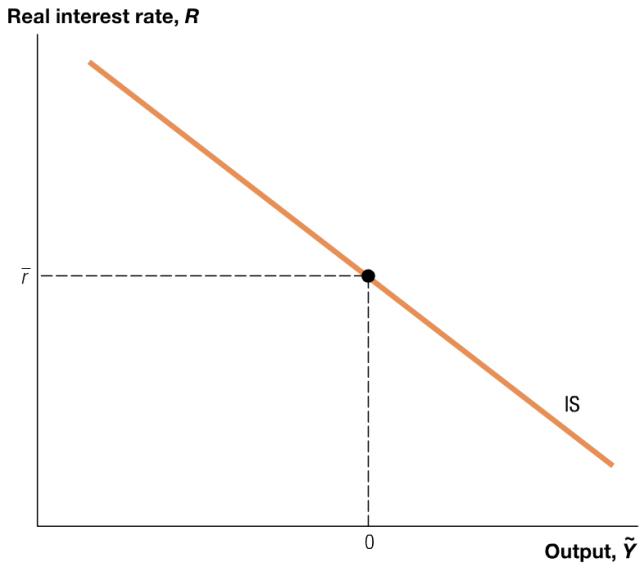


## Using the IS Curve

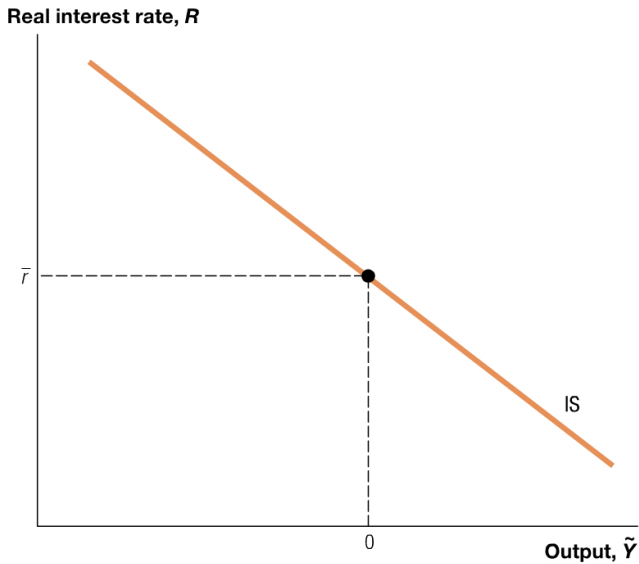
## The IS Curve



## What happens if the Fed raises the interest rate?

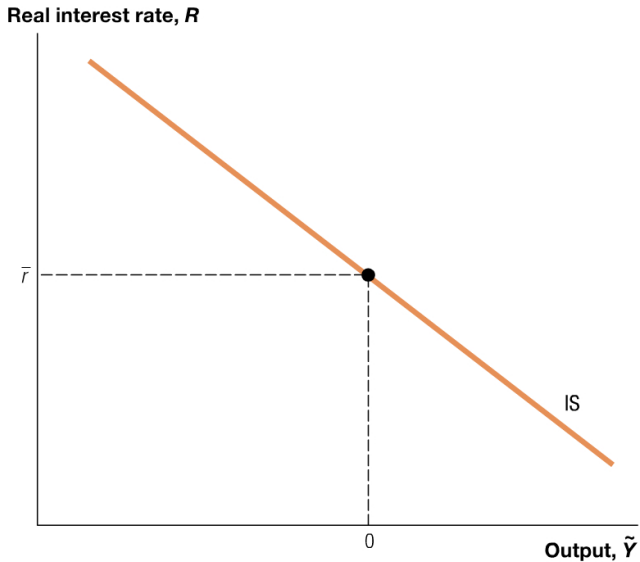


## What if IT improvements $\Rightarrow$ investment boom?

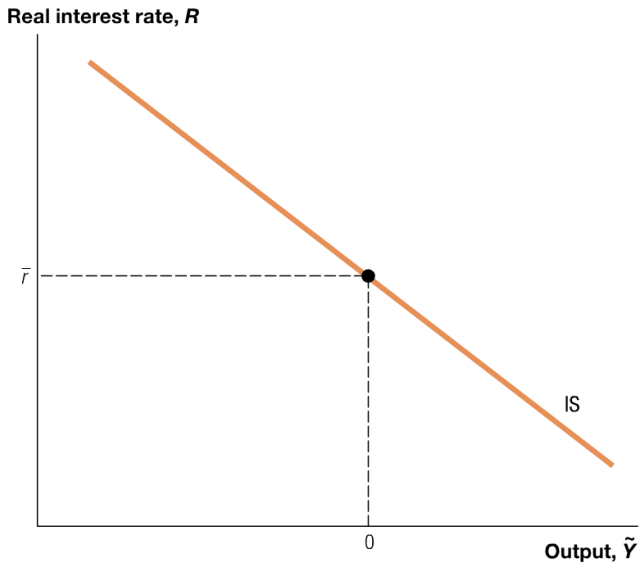




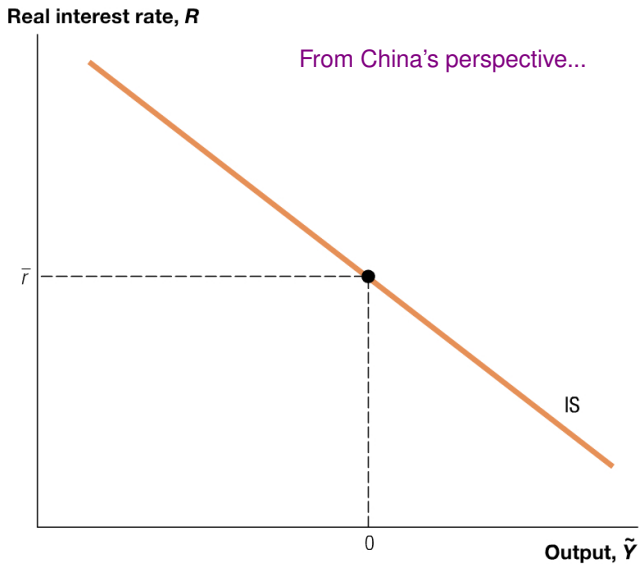
## What about the COVID-19 crisis?



## CARES Act response to the COVID-19 crisis?



## How did the 2008 U.S. financial crisis spillover into China?





# Microfoundations

## The Permanent Income Hypothesis for Consumption

- Milton Friedman and Franco Modigliani, two Nobel Prize winners
- Consumption depends mostly on expected average income in the future (“permanent income”)
  - Why? People prefer to **smooth** their consumption because of diminishing marginal utility.
  - Example: Suppose you win a lottery that — 5 years from now — pays you \$10 million. What happens to your consumption today?
- Empirically, the permanent income hypothesis has some merit, but current income also seems to matter more than this theory would suggest. Why?

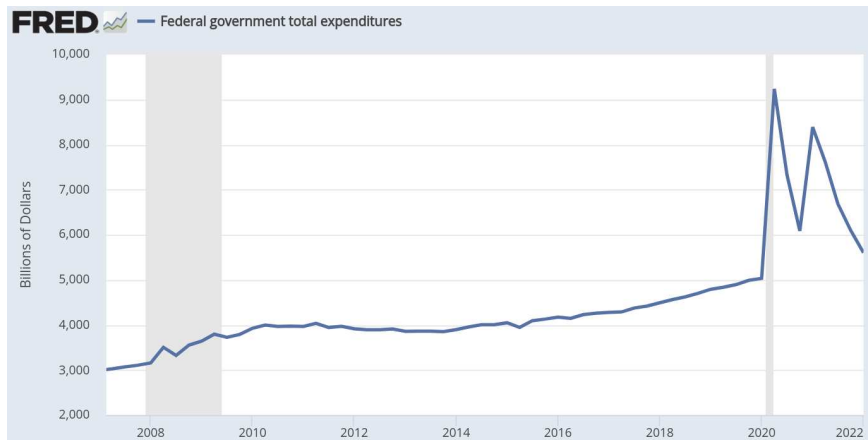
## Fiscal Stimulus and Austerity

- Does an increase in  $G_t$  stimulate the economy?

## Fiscal Stimulus and Austerity

- Does an increase in  $G_t$  stimulate the economy?
- Probably yes, but not by as much as you might think in normal times
  - **No free lunch**: An increase in  $G$  today must be paid for with taxes
  - Either today or in the future
- **Ricardian equivalence**: it doesn't matter how we finance  $G_t$
- Monetary offset
- Empirical evidence is hard to come by
  - No “parallel universe machine”
  - Multipliers are likely positive but less than one — e.g. 0.8

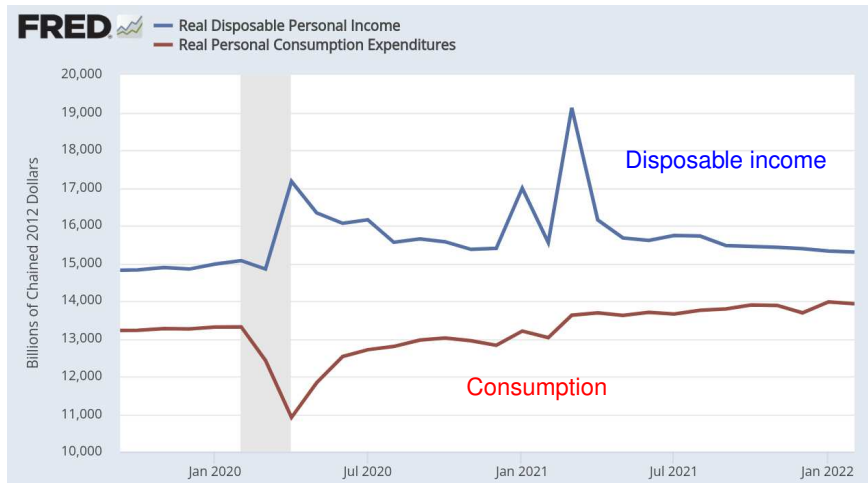
## Government Spending and COVID-19



↑G : Payments to poor/middle income households, extended unemployment insurance

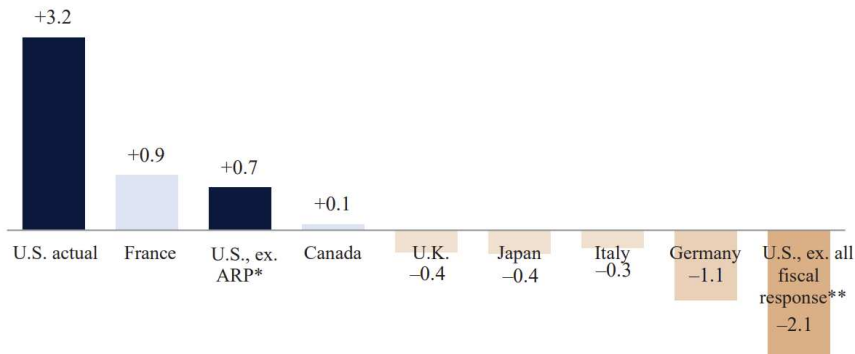


## Consumption and Disposable Personal Income



## Real GDP 2021:Q4 vs. Before the Pandemic

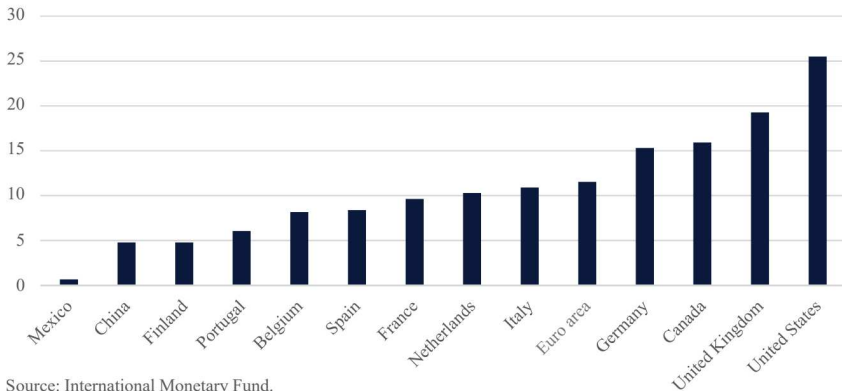
*Percentage of 2019:Q4 level*



Economic Report of the President, 2022, Figure 2.4

## Discretionary Fiscal Response, 2020:Q1–2021:Q3

*Percentage of 2020 GDP*



Source: International Monetary Fund.

Economic Report of the President, 2022, Figure 3.4

## Questions for Review

- How do the Short-Run Model and the Long-Run Model (Solow+Romer) fit together?
- What is potential output? What is short-run output? How are they related to actual output?
- What is Okun's Law and why is it useful?
- What is the IS curve, and why does it slope downward?
- What causes a movement along the IS curve?
- What causes the IS curve to shift?
- Why is it called the "IS curve"?