The Basics of Macroeconomics

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Introductions

- ▶ My name: Jacob Adenbaum

- ▶ I will be the lecturer for the econ part of the course for the next 5 weeks

- ▶ My contact information is on the first slide

- ▶ I do research in Macro/Labour, broadly defined.

- ▶ Some things I am working on:

  - ▶ Task assignment within firms, and implications for aggregate productivity

  - ▶ Learning and human capital accumulation (in particular, how workers learn from their co-workers)

  - ▶ Wealth and Inequality (how credit constraints impact worker training, job search, and the corresponding impacts on inequality)

Textbook
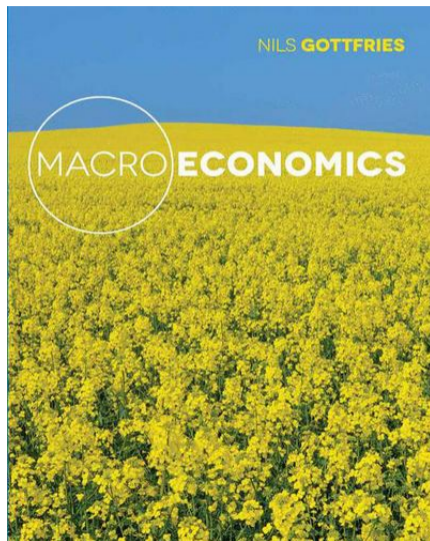
Other textbooks

I might use examples from other intermediate macroeconomic textbooks, such as:

- ▶ Macroeconomics, N.G. Mankiw
- ▶ Macroeconomics a European text, M. Burda and C. Wyplosz
- ▶ Macroeconomics, O.J. Blanchard
- ▶ Macroeconomics, C. Jones

Sometimes, if neither the book nor the lectures make sense for you regarding a certain topic, it can be helpful to read about it from another author's perspective.

Online resources

- Nils Gottfries Youtube channel

- Khan Academy

- Marginal Revolution University

- and many many more…

Outline for Block 1

We will, step-by-step, develop a model of aggregate supply and demand in a closed economy

- ▶ Chapter 1: Preliminaries

- ▶ Chapter 2: Aggregate supply

  - ▶ Firms, production, pricing

- ▶ Chapter 3: Aggregate demand

  - ▶ Investment

- ▶ Chapter 4: Aggregate demand

  - ▶ Consumption

Finally, we will put it all together and try to understand what determines the level and distribution of aggregate output.

Schedule for Block 1

Week	Lecture	Topic	Questions	Reading
1	M1	Math		
1	L1	Introduction	What is macro?	G1
1	L2		How do we measure things?	G1
2	M2	Math		
2	L3	Agg. supply	How much can firms produce?	G2
2	L4		Prices, distr. of income?	G2
3	M3	Math		
3	L5	Agg. demand 1	What is the real interest rate?	G3
3	L6	Investment	What is optimal investment?	G3
4	M4	Math		
4	L7	Agg. demand 2	What determines optimal	G4
4	L8	Consumption	consumption?	G4
5	M5	Math		
5	L9	Equilibrium	Putting it all together	G1-4
5	L10		Review	G1-4

Economics 2 – Block 2

Extend and apply the basic model to explain a variety of macroeconomic phenomena in the short run, long run and very long run:

- ▶ Chapter 5: Economic growth (very long run)

- ▶ Chapter 6: Unemployment (long run)
- ▶ Chapter 7: Money and inflation (long run)

- ▶ Chapter 8: Fluctuations in economic activity (short run)
- ▶ Chapter 9: Policy and economic fluctuations (short run)

Economics 2 - next year

Go even further extending and using the model to analyse questions related to:

▶ Part 3: Economic policy

    ▶ Explore long and short-run issues in monetary and fiscal policy

▶ Part 4: The open economy

    ▶ Explore the impact of openness and globalisation on macroeconomic activity and policy-making in the short and long run

▶ Part 5: Institutions and financial markets

    ▶ Explore the impact of institutions on policy-making and the linkages between financial markets and economic activity

Weekly schedule Block 1

- **Lectures** (week 1-5)
  - Lectures Monday and Thursday: Economics (with me)
  - Lecture Tuesday: Math (with Larkin Wurster)
  - Slides posted on Learn Sunday the week before

- **Tutorials** (week 2-5)
  - Tutorials Monday - Thursday
  - Material covers previous weeks' lectures
  - Questions released on Wednesday the week before
  - Uploading answers: due 5pm on Sunday prior to the relevant tutorial, regardless of the allocated tutorial timeslot
  - The answers do not need to be entirely complete or entirely correct, but there must be *an honest attempt* (equivalent of two pages of A4 handwritten or one page of A4 typed)

Assessment

Final grade calculated as a weighted average:

Component	Weight
Tutorials/Homework	10%
Group project (Semester 1)	5%
Essay (Semester 2)	10%
December exam	25%
Degree exam (pass required)	50%

Quizzes will not count as a form of assessment for the coursework mark, but are strongly advised for self-assessment.

Group project and optional reading group

Group project

- ▶ Will be released by Week 5
- ▶ Due Wednesday November 22 at 1pm (Week 10)
- ▶ Detailed guidelines will follow

Optional reading group

- ▶ Same format as in Econ1, Sean Brocklebank organiser
- ▶ You can earn bonus points with active participation
- ▶ You will receive email with further information

Course Email Policy

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What is macroeconomics?

As macroeconomists, we analyze aggregate phenomena such as aggregate output, inflation, unemployment, and growth.

We address questions such as:

- ▶ Why are livings standards higher in some countries than others?

- ▶ How can a Central Bank stabilize the economy?

- ▶ How do changing demographics affect the interest rate?

- ▶ Why has inequality increased over the past few decades?

- ▶ How do we design policy to combat climate change most effectively?

- ▶ How does covid-19 affect the economy, and vice versa?

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What is macroeconomics

In general: macroeconomists (often) address questions where the general equilibrium effects are important!

▶ Macroeconomists need to study problems where prices are not a given (general equilibrium)

Sometimes we say this means studying everything at once, rather than focusing on markets in isolation

▶ We have to consider the outcome of millions of decisions (aggregation)

▶ The decisions are often made over time (dynamics)

▶ We often have to distinguish between real and monetary phenomena

Can we use the same principles as microeconomists to answer these questions?

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Micro-founded macroeconomics

We develop models – simplified descriptions of the world – in which we make explicit assumptions about who takes decisions, how they behave, and how they interact.

Decisions	*Actors*
Production and price setting Wage setting Investment	Firm
Consumption/Saving	Consumer
Taxes and gov. expenditure Interest rate / money supply	Government Central Bank

The actors still behave according to the same logic as in micro! We "just" have to work out how they interact in general equilibrium...

We're going to be developing a model

▶ Over the course of the year, we are going to be developing a model of how the macroeconomy works

▶ An **economic model** is a set of assumptions about

  1. Who is acting
  2. What their choices are
  3. How those choices impact the world (technology)
  4. How they make decisions (i.e., what are their preferences)

▶ Once we've decided on what assumptions to make, we can think through the implications within the lens of the model and use it to make predictions about the world

▶ Some assumptions are relatively innocuous, and make for good models. Others are bad.

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How do we decide what assumptions to make?

▶ The world is massive and complex. The only "model" of the world that has no simplifying assumptions is a 1:1 copy

  ▶ For what I hope are obvious reasons, we can't work with that, so we *must* decide what to assume away

▶ In all scientific fields, there is a trade-off between **tractability** and **accuracy**

▶ Our job is to find a set of simplifying assumptions which make our theories tractable enough that we can analyze them and use them for predictions, without sacrificing too much accuracy

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Some "rather sweeping assumptions"

To be able to create a model with all these actors and decisions, we need to simplify.

In the context of this course, we will make some "rather sweeping assumptions":

▶ All households are identical

▶ All firms are identical

▶ Households and firms have simple objective functions that they want to maximize

Are these assumptions "realistic"? No.

Are they reasonable? For the questions we are asking in this course, they are reasonable!

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Obviously this assumption is not realistic.

But is it reasonable?

▶ If we want to study inequality?

▶ **No.** Then we need heterogeneous households to be able to say anything.

▶ If we want to study long-run growth or the natural rate of unemployment?

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We do not try to explain everything

Exogenous variables

- ▶ Variables we take as given
- ▶ Do not have to be constant over time, but we don't try to explain their variation
- ▶ Change in exogenous variable: shock

Endogenous variables

- ▶ Variables that are determined within the model
- ▶ These are the outcomes from our model that we are interested in

Which variables that should be exogenous and which should be endogenous depends on the question asked!

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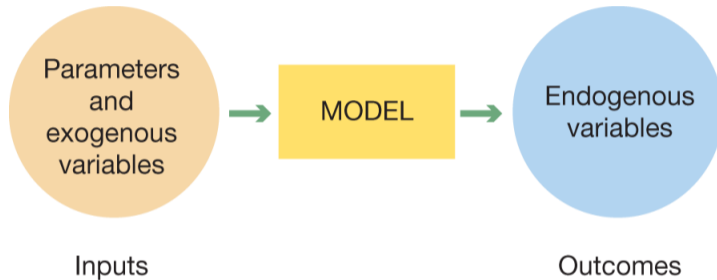
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Exogenous and endogenous variables

The art of modelling: knowing which variables we can and should assume to be exogenous for the question at hand.

We use different models for different questions

Question: What is the short-run response of an exogenous shock to TFP (total factor productivity)?

We need a model where

- ▶ Potential output is exogenous
- ▶ Unemployment level is endogenous

Question: Why are some countries richer than others?

- ▶ Potential output must be endogenous!
- ▶ Natural resources might be exogenous

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Time frames in macroeconomics

Many macroeconomic phenomena have a time dimension – the underlying decision problem is *intertemporal* – so...

▶ Expectations about the future is important

  ▶ Examples: decisions about savings, investment, wage and debt contracts, all depend on what we expect to happen in the future

▶ It may take time to significantly affect certain stock variables, e.g., capital stock or technologies in use

▶ Prices for some goods may adjust slowly, which can explain why the aggregate price level is "sticky" (and same with wages)

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What is the correct way to model differences in output?

It depends on which time frame we are interested in!

- What causes year-to-year fluctuations (business cycles)?
    - We need to examine the short run
    - We assume that prices and wages adjust slowly (compared to our time frame)

- Why are some countries richer than others?
    - We need to examine the very long run
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Thinking critically about models

When using a model, you should ask yourself:

▶ What question is the model meant to answer?

▶ What assumptions are made?

▶ Which variables are endogenous, which are exogenous?

▶ Does the model provide intuitively reasonable answers? (phrased differently: can we understand the mechanisms at work?)

▶ Does it capture what is important for the question?

▶ How do the implications/predictions match the data?

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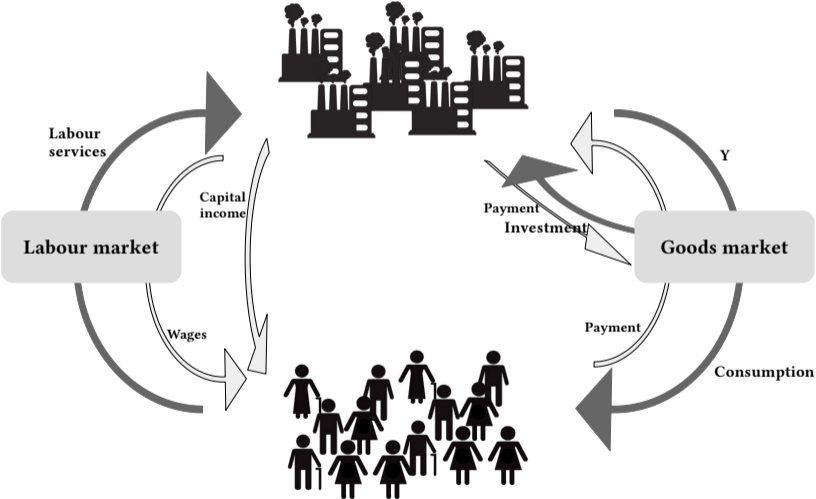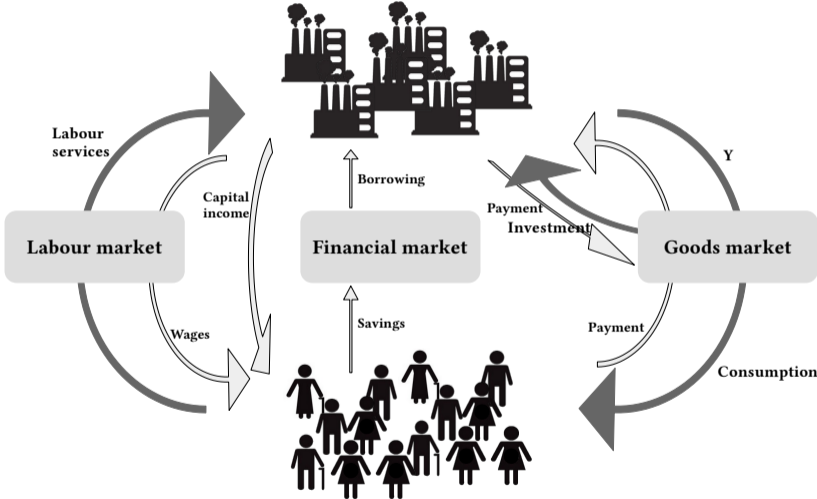# The model we will formulate over the next five weeks

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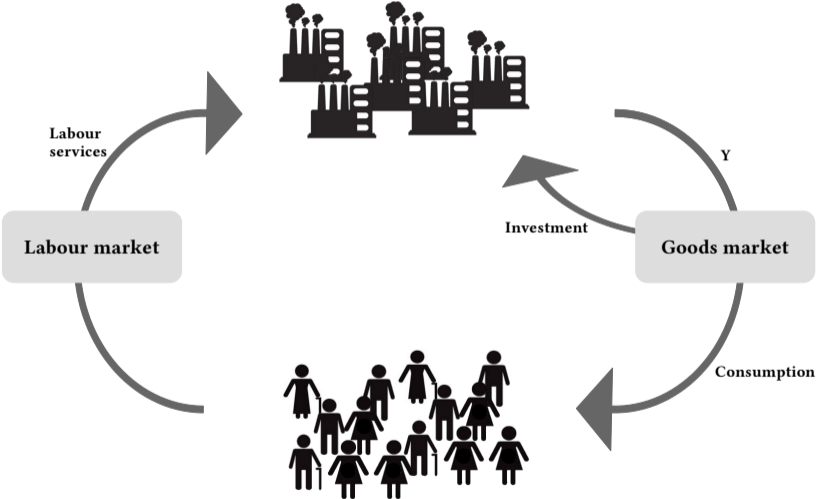
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Where does all of this fit in?

▶ The core model I've just described (and which forms the basis of the model we'll be developing all year) is a textbook macroeconomic model from the 1950s

Many of these ideas were first written down in the 1930s, and were formalized in the early post-war period by economists like John Hicks, Alvin Hansen, Paul Samuelson, Robert Mundell, Marcus Flemming, and many, many others.

▶ So why are we, in 2023, spending so much time learning economic models from the 1950s? Hasn't the field moved on?

  ▶ Short answer: it has.

  ▶ As we discussed, all models face a trade-off between tractability and accuracy

  ▶ The model(s) we'll be learning about this year have some well-known failure modes (which we'll discuss when we get to them) but fixing those problems introduces a *lot* of complexity

    You'll be learning more about some models that are more robust next year in topics in macro

  ▶ At the end of the day, a lot of the intuition in the more complicated models is pretty similar to what we'll be learning this year

  ▶ For many (but not all) economic questions, the old models are good enough

Where does all of this fit in?

▶ The core model I've just described (and which forms the basis of the model we'll be developing all year) is a textbook macroeconomic model from the 1950s

Many of these ideas were first written down in the 1930s, and were formalized in the early post-war period by economists like John Hicks, Alvin Hansen, Paul Samuelson, Robert Mundell, Marcus Flemming, and many, many others.

▶ So why are we, in 2023, spending so much time learning economic models from the 1950s? Hasn't the field moved on?

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Big Picture

The macroeconomy is made up by many agents: consumers, firms, policy makers…

We are interested in:

▶ how all the many agents act **(aggregation)**

▶ how markets behave over time **(dynamics)**

▶ how markets interact with each other **(general equilibrium)**

To analyze the economy and its agents, we use a model. The model helps us structure our thinking. We can use the model for, e.g., forecasting or policy analysis.

Next, we will talk about how we measure the variables that we analyse in our models. And then we will start building a model of the economy!

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Goal of macro measurement

▶ As economists, we're often interested in aggregate phenomena (output, unemployment, inflation)

▶ We want to develop a model of the economy and use it to evaluate the effects of different policies (counterfactual experiments)

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  ▶ What would be the impact on GDP and productivity if the UK had not exited the EU?

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National Accounts

- The national accounts are intended as a complete, consistent set of measures of the market-based economic activity of a nation, comparable across countries

- The national accounts include:
  - Flow measures (e.g., income or expenditure) over a particular period of time
  - Stock measures (e.g., of assets and liabilities) at the end of a period

- The development of a system of national income accounts was to a large extent a consequence of the Great Depression

Book-keeping for a nation

National accounts

We can think about the national accounts from three perspectives:

1. **Production side:** how much is produced and in which sector?

2. **Income side:** how is the income distributed between labour and capital income?

3. **User side:** What proportion of production is used for consumption, investment, and exports?

The production side

▶ The measure of aggregate production in a country's national accounts is known as Gross Domestic Product, or simply GDP

▶ However, we cannot simply add up the total value of goods/services sold in the economy as a measure of GDP

▶ Some intermediate goods are used as inputs in the production of other goods

▶ If we include the value of these intermediate goods in measuring total value of goods sold we will overestimate GDP

A closed economy producing whisky

A closed economy consists of the following three companies:

Farmer		Whisky distillery		Tesco	
Revenue	£100	Revenue	£220	Revenue	£300
Expenses	£80	Expenses	£170	Expenses	£290
Wages	*£80*	*Grain purch.*	*£100*	*Whisky purch.*	*£220*
		Wages	*£70*	*Wages*	*£70*
Profit	£20	Profit	£50	Profit	£10

The **production** side

Farmer		**Whisky distillery**		**Tesco**	
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▶ The sum of sales of all firms (100+220+300=620) is called output. However, this counts the grains three times! Not good.

▶ Instead, we calculate GDP as the sum of *value added* (= output - intermediate inputs):

Firm	Output - Intermediate Inputs	Value Added
Farmer:	100 - 0	= 100
Distillery:	220 - 100	= 120
Tesco:	300 - 220	= 80
GDP:	100 + 120 + 80	= 300

The **production** side

Farmer		Whisky distillery		Tesco	
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Tesco:	300 - 220	= 80
GDP:	**100 + 120 + 80**	**= 300**

The **income** side

Farmer		Whisky distillery		Tesco	
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How is the income in this economy distributed?

- 80 + 70 + 70 = 220 goes to workers as wages
- 20 + 50 + 10 = 80 goes to the owners of capital as profits
- **GDP: 220 + 80 = 300**
- This approach views GDP as the sum of all the sources of income earned in the economy

The **user** side

Farmer		Whisky distillery		Tesco	
Revenue	£100	Revenue	£220	Revenue	£300
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What proportion of production is used for consumption, investment and export?

▶ In this simple example we only have consumption (no investment or export)

▶ Because grain and bottles sold from the distillery are intermediate goods we only count the value of the whisky sold in Tesco, i..e., the *final consumption*, so **GDP is 300**

National accounts

▶ In our simple example we didn't have to think about the details.

▶ In practice national income accounting requires precise definitions:

  ▶ Market prices or basic prices? (diff: taxes less subsidies)

  ▶ Gross or net? (diff: depreciation)

  ▶ Domestic production or national income? (diff: net primary income)

  ▶ Primary income or disposable income? (diff: taxes and transfers)

▶ These concepts are distinct but related, and are useful for focussing on different aspects of economic activity.

▶ It is like learning a new language: part of it is just learning the vocabulary.

  Example: **GDP** = gross domestic product at market prices

  Now we understand what is meant by this statement!

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The production side of GDP in a few countries

In our stylized example, we had three "sectors". What does it look like in practice?

Country	Agriculture	Manufacturing	Services
Denmark	2	23	75
Sweden	1	24	74
UK	1	19	80
US	1	19	80

Table: Percent of GDP, 2022. Source: OECD.

- ▶ Most EU countries, UK, and the US all have similar structure
- ▶ Small share in agriculture, largest share in services
- ▶ Over time, the trend has been falling agricultural and manufacturing shares and increasing service sector

The income side of GDP

Country	GDP	Taxes less subsidies on products	Gross value added at basic prices	Compensation of empl.	
				Value	Percent
Denmark	2,205	288	1,917	1,132	59
Sweden	4,547	510	4,037	2,178	54
UK	2,055	255	1,800	971	54
US	19,552	780	18,772	10,420	56

Table: In national currencies, in billions, 2018. Source: OECD.

▶ Taxes (less subsidies) go straight to the government, so they cannot be distributed between labour and capital

▶ Thus, we are interested in how gross value added at *basic prices* is distributed, and therefore we deduct taxes

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▶ Compensation of employees makes up around 60 percent of gross value added at basic prices

▶ Correct for self-employed, and the share going to labour is approx. 2/3 (relatively stable over time)

▶ Rest is gross capital income: replacing depreciated capital, reinvesting in firms, interest payments, dividends.

The user side of GDP

In our stylized example we did not have any government, the firms did not need to invest, and we had no trade. Adding these components, we get:

$$Y + IM = C + I + C^G + I^G + X$$

Y	GDP	C	private consumption
IM	imports	I	private investment
		C^G	government consumption
		I^G	government investment
		X	exports

▶ On the left hand side, we have what is available: domestic production and imported goods/services

▶ On the right hand side, we have how the goods/services are used

▶ We can rewrite this as:

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with net exports $NX = X - IM$

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The user side of GDP in a few countries

Country	C	C^G	$I + I^G$	X	IM	NX
Denmark	46	25	21	55	48	7
Sweden	44	27	25	45	40	5
UK	61	22	17	28	28	0
US	67	15	21	10	13	-3

Table: Percent of GDP, 2020. Source: OECD.

▶ The US has a high fraction of private cons., and low fraction of government cons., (compared to the Scandinavian countries)

▶ This is mainly due to differences in financing of certain services

　▶ US: large share of education and health care privately financed

　▶ Scandinavian countries: large share of education and health care is government financed

▶ Thus, these differences do not necessarily indicate any difference in the nature of the services

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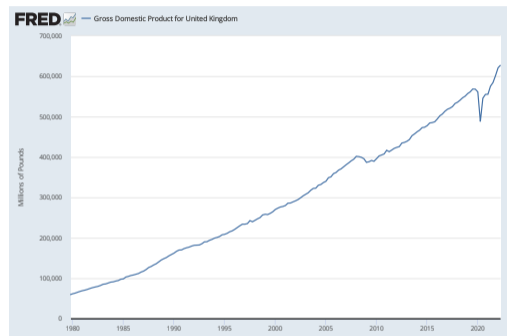▶ Thus, these differences do not necessarily indicate any difference in the nature of the services

Nominal GDP United Kingdom

- ▶ UK *quarterly* GDP was around £568 billion in the end of 2019, vs £62 billion in 1980Q1

- ▶ Has the UK economic activity really increased 9-fold since 1980?

- ▶ Not really. Much of the increase reflects an increase in prices rather than an increase in the quantities involved

- ▶ This is reflected in the difference between *nominal* and *real* GDP

- ▶ **Nominal GDP:** the sum of quantities of final goods multiplied by their current price. So an increase in nominal GDP may reflect:
  - ▶ Increases in the quantities of goods produced
  - ▶ Increases in the prices of goods

Figure: Source: https://fred.stlouisfed.org/

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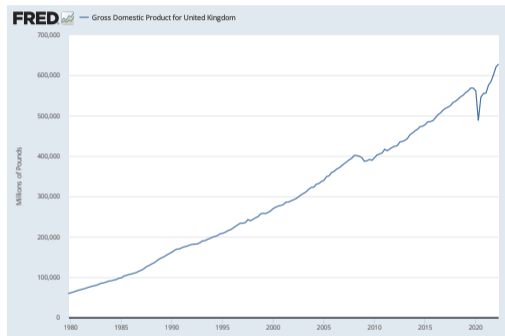   ▶ Increases in the prices of goods

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Nominal vs. real GDP

▶ **Real GDP** is constructed as the sum of the quantity of final goods times constant (rather than current) prices

▶ The idea is to eliminate the effect of increasing prices on our GDP measure

Year	Quantity of whisky	Price of whisky	Nominal GDP	Real GDP in 2019 prices
2018	10	£20	£200	£240
2019	12	£24	£288	£288
2020	13	£26	£338	£312

▶ Nominal GDP increased by 69% between 2018 and 2020

▶ Real GDP increased by 30%

▶ This looks like it should be easy: just read it off the first column

▶ Real GDP is just the quantity of whisky produced, and nominal GDP is just the price times the quantity.

▶ But what happens when we have more than one good...?

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Real GDP with Two Goods

▶ Suppose we have two goods: A_t and B_t, with corresponding prices p_t^A and p_t^B for each.

$$\text{Nominal GDP}_t = p_t^A A_t + p_t^B B_t$$

▶ We want to know: what would nominal GDP have been in year $t + 1$ if the prices had remained unchanged?

$$\text{Real GDP}_{t+1} = P_t^A A_{t+1} + P_t^B B_{t+1}$$

Note that we need a reference year for the prices: this is the year when nominal GDP is equal to GDP.

▶ To get the real growth rate of GDP, we divide the two:

$$g_t = \frac{\text{Real GDP}_{t+1}}{\text{Real GDP}_t} - 1 = \frac{\text{Real GDP}_{t+1}}{\text{Nominal GDP}_t} - 1 = \frac{P_t^A A_{t+1} + P_t^B B_{t+1}}{P_t^A A_t + P_t^B B_t} - 1$$

As you can see, **the prices don't cancel out**

▶ In the case with just one good, real GDP growth is just:

$$g_t = \frac{P_t^A A_{t+1}}{P_t^A A_t} - 1 = \frac{A_{t+1}}{A_t} - 1$$

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▶ To get the real growth rate of GDP, we divide the two:

$$g_t = \frac{\text{Real GDP}_{t+1}}{\text{Real GDP}_t} - 1 = \frac{\text{Real GDP}_{t+1}}{\text{Nominal GDP}_t} - 1 = \frac{P_t^A A_{t+1} + P_t^B B_{t+1}}{P_t^A A_t + P_t^B B_t} - 1$$

As you can see, **the prices don't cancel out**

▶ In the case with just one good, real GDP growth is just:

$$g_t = \frac{P_t^A A_{t+1}}{P_t^A A_t} - 1 = \frac{A_{t+1}}{A_t} - 1$$

which is what we saw before

Real GDP with Two Goods

▶ Suppose we have two goods: A_t and B_t, with corresponding prices p_t^A and p_t^B for each.

$$\text{Nominal GDP}_t = p_t^A A_t + p_t^B B_t$$

▶ We want to know: what would nominal GDP have been in year $t+1$ if the prices had remained unchanged?

$$\text{Real GDP}_{t+1} = P_t^A A_{t+1} + P_t^B B_{t+1}$$

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Nominal vs. real GDP United Kingdom

Figure: Source: https://fred.stlouisfed.org/
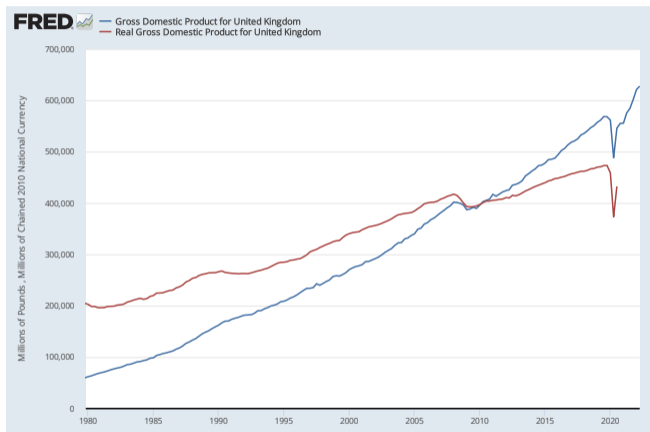
► Real GDP in Q1 1980 was £203 billion, *measured in 2010 national currency*

► Real GDP in Q4 2019 was £473 billion, *measured in 2010 national currency*

► Thus, the growth in real terms has been 2.3-fold

► This can be translated into an annual growth rate of approximately 2.2%

Real annual GDP growth United Kingdom

- ▶ Macroeconomists often look at fluctuations

- ▶ Growth rate of GDP:
$$\frac{Y_t - Y_{t-1}}{Y_{t-1}} = \frac{Y_t}{Y_{t-1}} - 1$$

- ▶ Can be measured monthly, quarterly, annual…

Figure: Source: https://fred.stlouisfed.org/

How do we measure inflation?

Inflation: change in the price level.

How do we measure the price level in the economy?

▶ One measure is the GDP deflator, let's call it P_t:

$$P_t = \frac{\text{Nominal GDP (in time t)}}{\text{Real GDP (in time t)}}$$

▶ If nominal GDP increases relative to real GDP, it must be due to price increase

▶ Then inflation is $\pi_{t+1} = \frac{P_{t+1} - P_t}{P_t} = \frac{P_{t+1}}{P_t} - 1$

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How do we measure inflation?

- ▶ Another common measure of the price level is the *consumer price index*, CPI
- ▶ *"How much more we must pay in order to consume the same consumption basket as the previous year?"*
- ▶ Assume we have two goods in our consumption basket: A and B
- ▶ How much do we have to pay in time t:

$$P_t^A C_t^A + P_t^B C_t^B$$

- ▶ Inflation is then defined as:

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How do we measure inflation?

- **GDP deflator:** Using the price level of all goods and services produced in the country

- **CPI:** using the price level of all goods and services consumed in the country
    - Excludes investment goods
    - Excludes government consumption
    - Excludes exports
    - Includes imports

- In practice, in most countries these two measures are very close
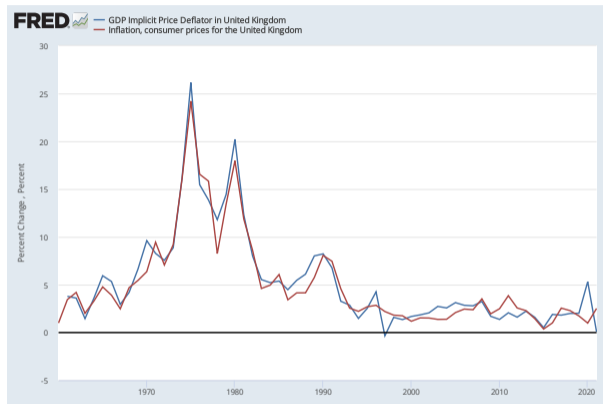
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Is GDP really the best measure?

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▶ GDP is a measure of market activity, goods and services that are not traded on markets are therefore not counted:

  1. Household production

  2. Leisure

  3. Illegal and underground production

  4. Impact of economic "bads"

▶ So GDP may be an imperfect indicator of economic activity

▶ Cross-country comparisons may be confounded if the extent of non-market activity differ across countries

▶ It doesn't measure what we are ultimately interested in: welfare!

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Developments in National Accounting

- ▶ Environmental accounting
  - ▶ Attempts to include the value of environmental assets in national accounts
- ▶ Generational accounting
  - ▶ Attempts to measure the intergenerational redistribution implicit in the tax burden of different generations as a result of e.g. social insurance

Complementing measures that takes GDP as (one of many) inputs

- ▶ HDI, Human Development Index
  - ▶ Composite index consisting of GNI, life expectancy, and educational level, used by, e.g., UNDP
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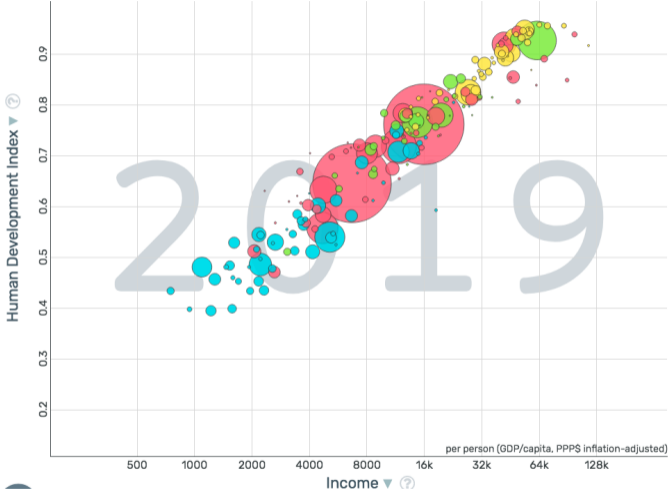
High correlation between GDP and HDI

Figure: Source: https://www.gapminder.org

…and between GDP and, e.g., child mortality

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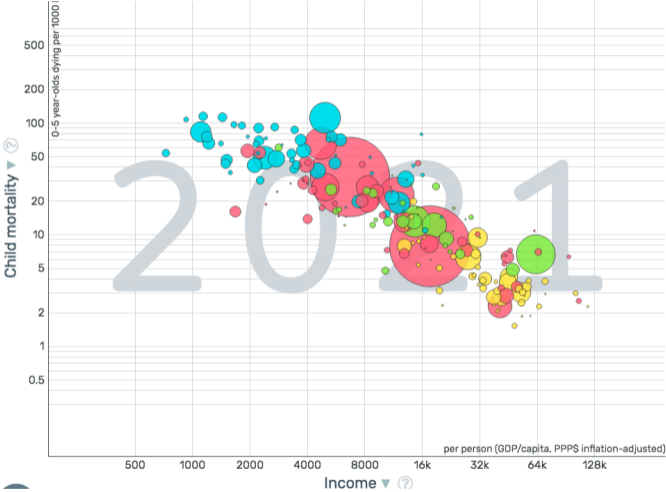
. . . and between GDP and life satisfaction

Figure 10.2

Life satisfaction and income per person

Source: Betsey Stevenson and Justin Wolfers, Wharton School at the University of Pennsylvania.
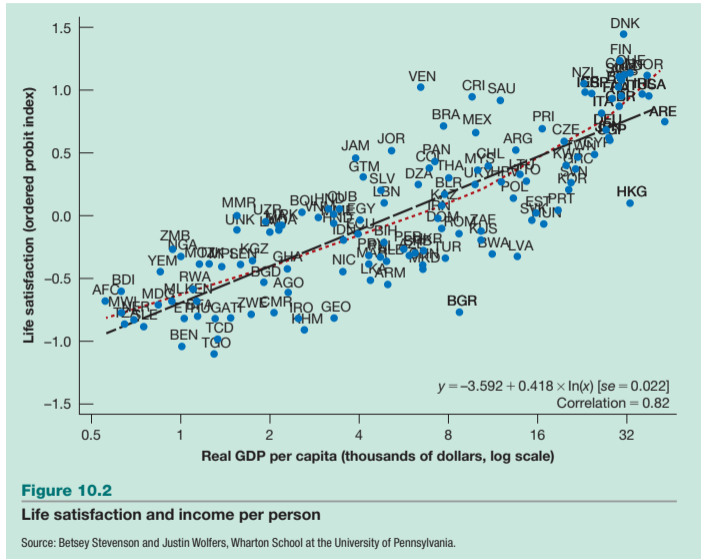
Figure: Source: Blanchard (2017), Global Edition

Concluding remarks

▶ We've sketched out what macroeconomics is, and discussed why we need to build models of the macroeconomy

▶ We gave an overview of the basic structure of the model we're going to be developing, and argued that the first step to building a scientific model is to be able to measure the economy that we're modeling

▶ To that end, we have discussed how the national accounts work, and how they can be viewed as book-keeping for a nation

▶ We discussed the difference between real and nominal values, and how inflation is measured

▶ ...and finally, we briefly discussed some conceptual problems with GDP

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