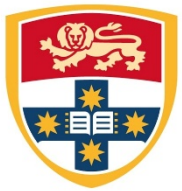

THE UNIVERSITY OF SYDNEY

ECON1002: Introductory Macroeconomics
Lecture 1: Output and Prices

6-8 March 2017

Dr Jordi Vidal-Robert
Lecturer | Assistant Professor
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Based on slides by Wills, Melatos and Bernanke, Olekalns and Frank

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I am from…

I am from…

Who to contact:

Tutorials

- I want to enrol in a different tutorial time for the semester:
  - Consult your personal timetable or contact the Student Centre.
- I will miss my tutorial and I want to catch up in a different tutorial that week:
  - Contact the tutors involved, or the Head Tutor, Dr Huy Vu: huy.vu@sydney.edu.au.
  - Bear in mind that we will be recording attendance at tutorials.

Who to contact:

Exams

- I cannot attend an exam for personal reasons/I want to sit my exam at a different time/I attended my exam but performed poorly because I didn't feel well:
  - You must formally apply for special consideration: http://sydney.edu.au/arts/current_students/special_consideration.shtml
- I'm not happy with my exam marks:
  - First, wait for the correct answers to be discussed in tutorials. If you think you have been marked incorrectly then,
  - Second, discuss your mark with your tutor.
  - Third, discuss your mark with the Head Tutor, Dr Huy Vu: huy.vu@sydney.edu.au.
  - Fourth, it is possible to formally appeal your marks here: http://sydney.edu.au/arts/current_students/appeal_academic_decision.shtml

Assessment

Assessment	Length	Weight	Time	Date
Mid Semester Exam - Multiple choice and short answer test	1hr	25%	6pm	Thu 27 Apr
Structured Research Essay - Short and long answer essay in lecture	1hr	25%	6pm	Tue 16 May
Final Exam - Multiple choice and short answer exam	2hr	50%	Scheduled	Exam period

What is economics?

Economics is the science of how people respond to incentives and make decisions about allocating scarce resources.

It helps us answer questions like:

- Why are some countries rich and some countries poor?
- What happened in 2008 to cause the worst recession since the 1930s?
- Why have income and wealth become more unequally distributed over the past few decades?
- How will population aging affect life in the coming decades?
- How will the workforce change with advances in robotics, automation, and artificial intelligence?

Microeconomics

- … studies decision-making by individual economic agents:
  - When does it make sense for one firm to merge with or take-over another?
  - How does a firm decide whether or not to enter a new market?
  - Should Australia join free trade agreements?
  - What is the likely impact of high petrol prices on an individual's car usage?

Macroeconomics

- … studies the aggregate impact of individual decisions:
  - What determines interest rates and exchange rates? How are they linked?
  - What determines a country's rate of economic growth and aggregate unemployment rate?
  - How will global warming (and government policy responses to this issue) impact on the Australian economy?
- ***Microeconomics*** provides a foundation for ***macroeconomics***.

Econometrics

- …provides the toolkit for testing micro- and macro-economic theories using data.
- It spends a lot of time disentangling correlation from causation
  - Do good institutions cause economic growth, or does economic growth create good institutions?

Why is this important now??

- Is Australia set for a financial crisis?
- How can we solve global warming?
- Should Trump close US borders?
- What role will China play in the world?
- How will AI and robotics affect our lives?
- How can we feed a growing world population?

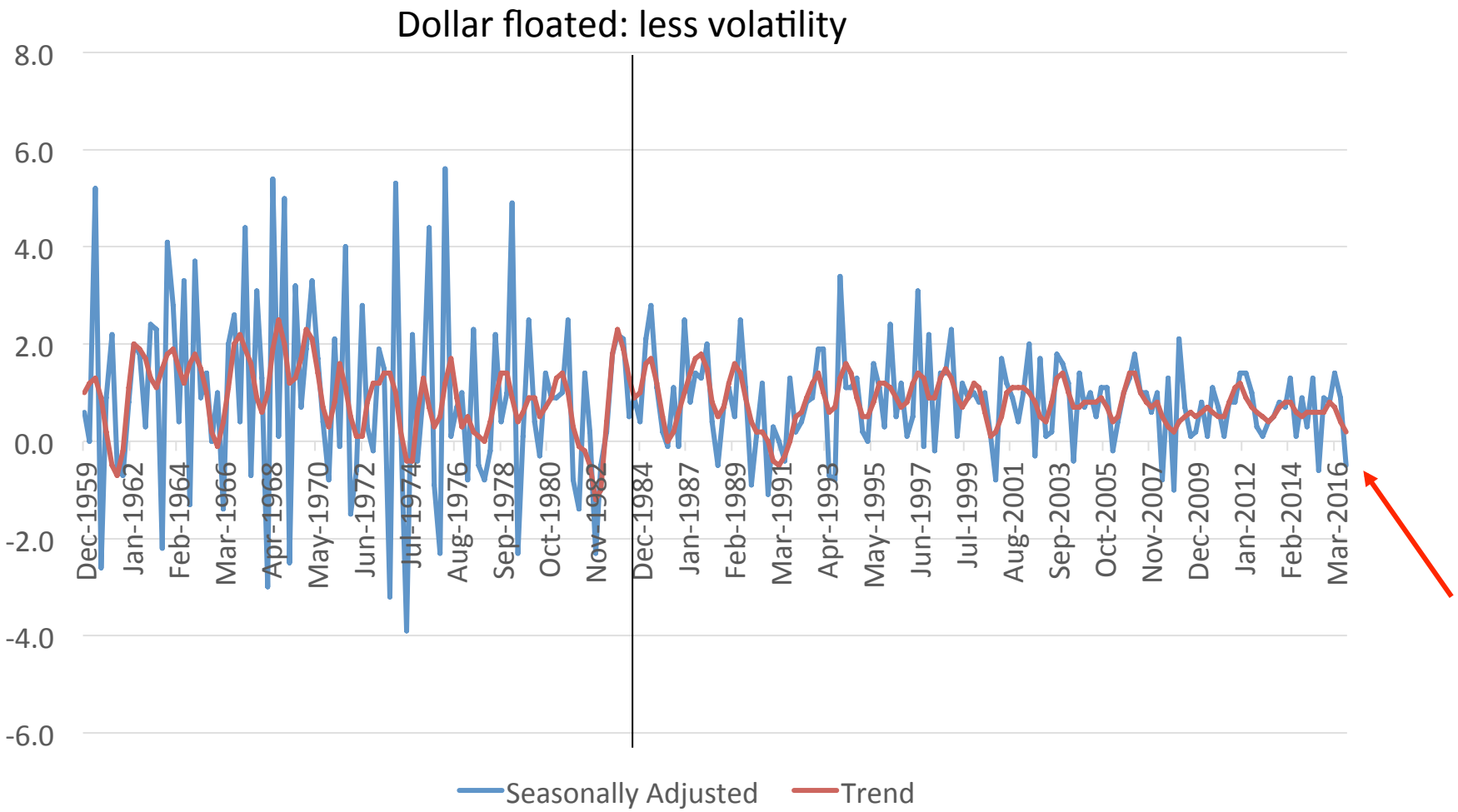
What you will learn in this course

- Measuring macro performance
  - Output
  - Prices
  - Savings and wealth
  - Unemployment
- Short-run macro: the business cycle
- Policy issues:
  - Fiscal policy
  - Monetary policy & the RBA
  - Aggregate demand and supply
- Economic growth
  - The role of saving
- Exchange rates & the balance of payments

Introduction

Last quarter Australia's GDP (seasonally adjusted) contracted for the second time since 2008.

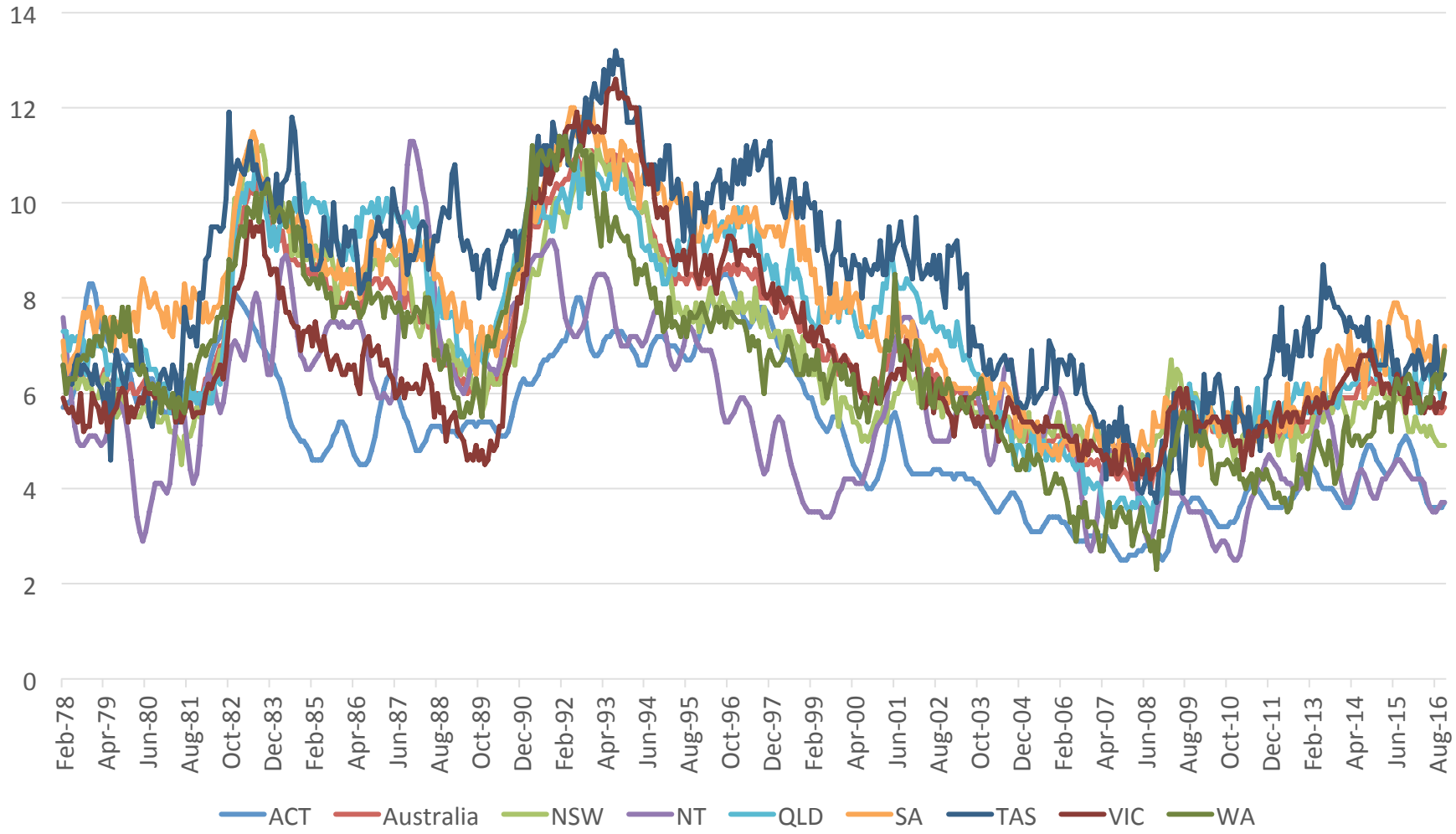
Real GDP growth (chain volume measure), seasonally adjusted and trend, %



Source: ABS

National unemployment has risen to 5.7%, and this masks quite a lot of regional inequality

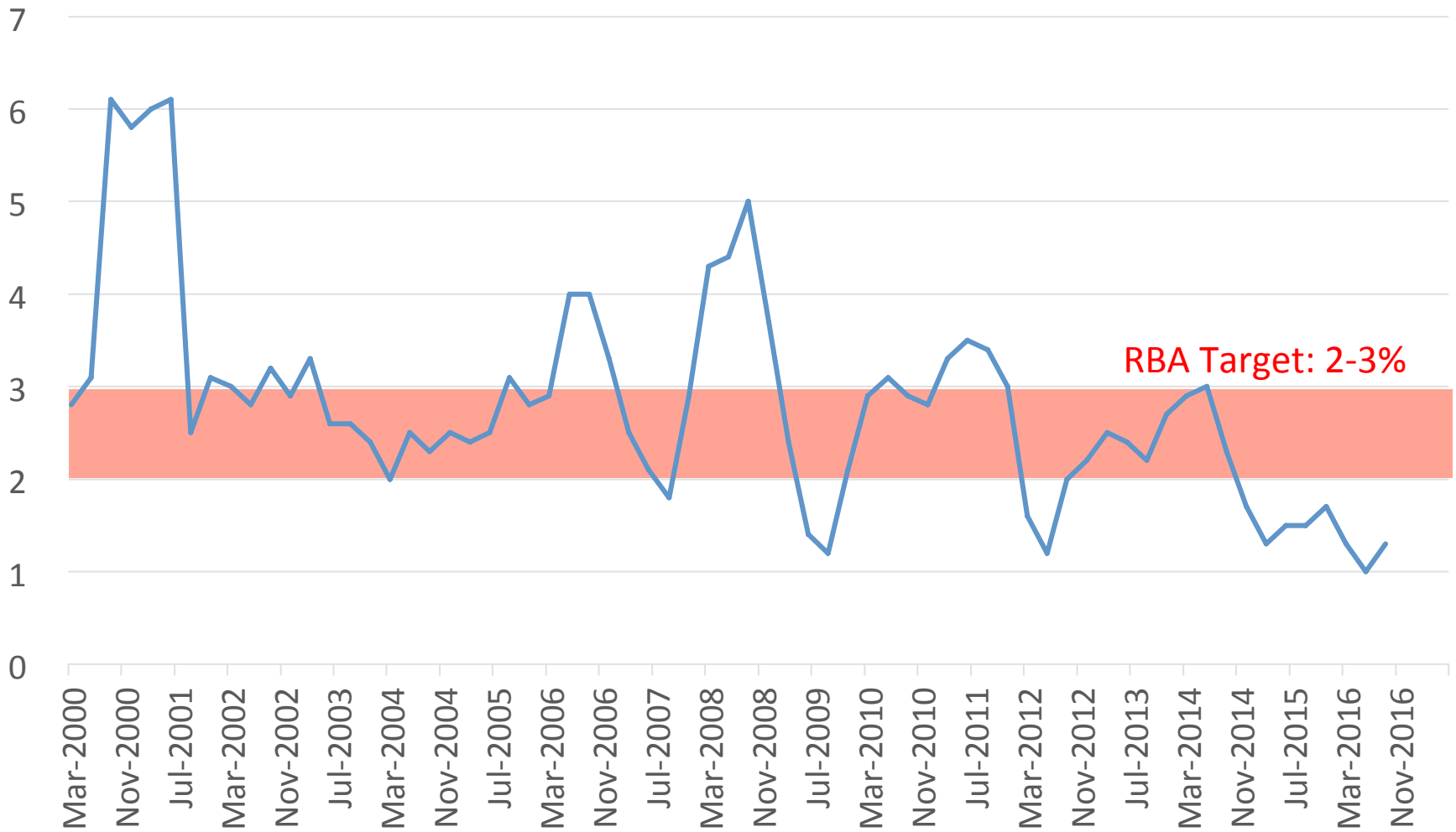
Unemployment rate, seasonally adjusted, %



Source: LMIP (SA4)

CPI Inflation is below target at 1.3%

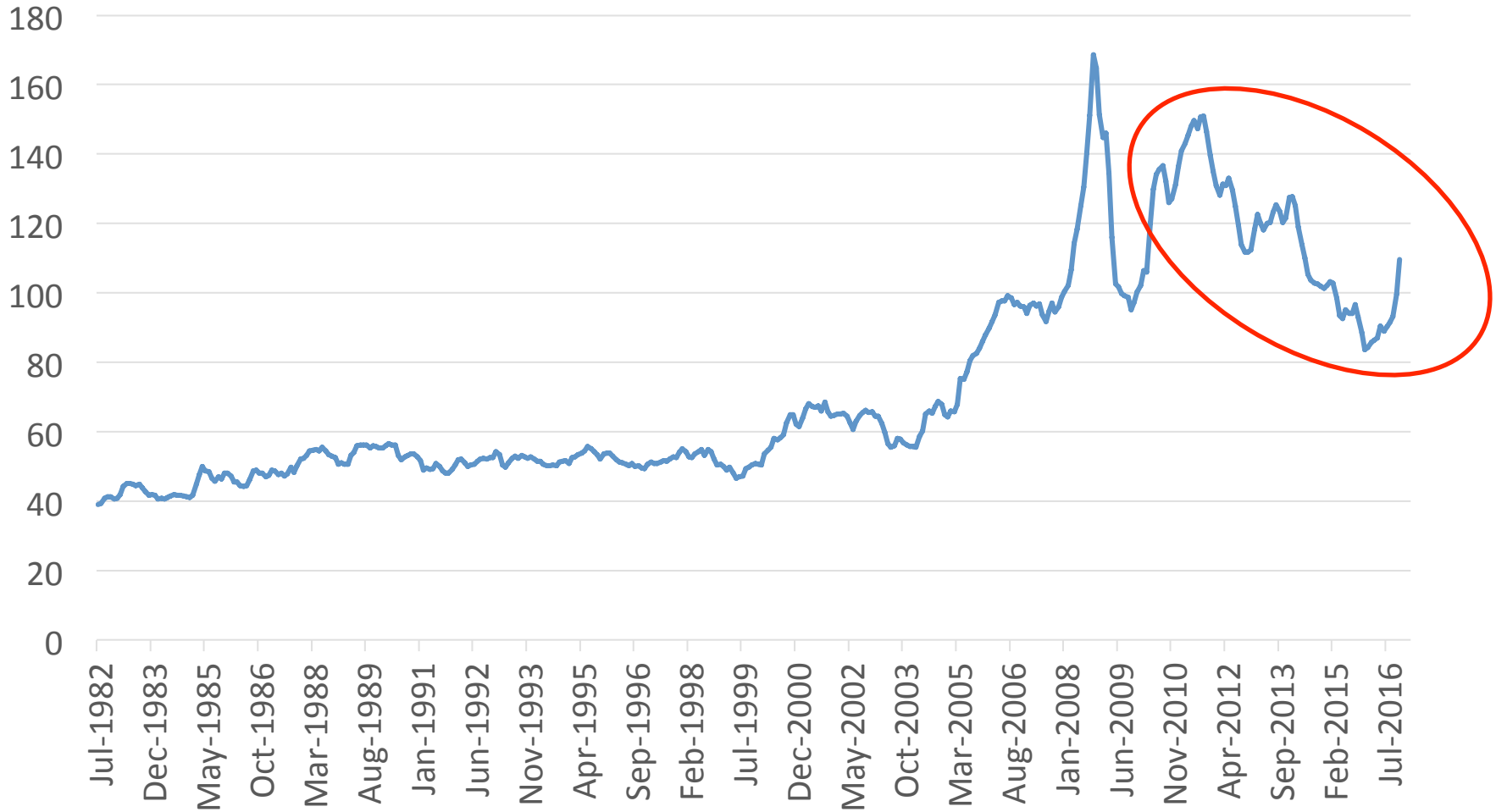
Australian annualized CPI inflation, %



Source: RBA

High commodity prices helped Australia avoid the 2008 GFC. Commodity prices started to fall in 2011 (though recently jumped)

Australian commodity price index, 2014/15=100



Source: RBA

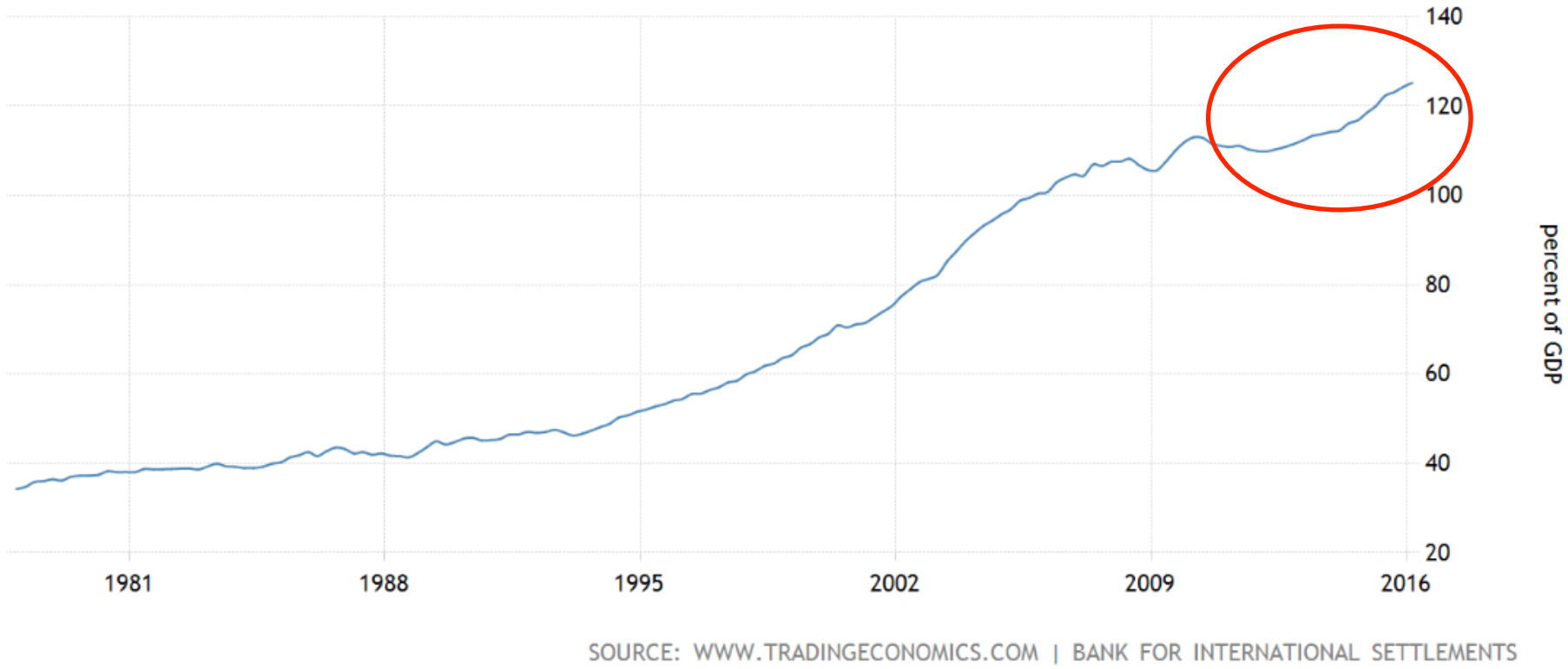
In response the RBA loosened interest rates, which has drawn construction workers from mines in the west to projects in the east

RBA cash rate, %

Source: RBA

Low interest rates encouraged borrowing, and Australian household debt is now 125% of GDP

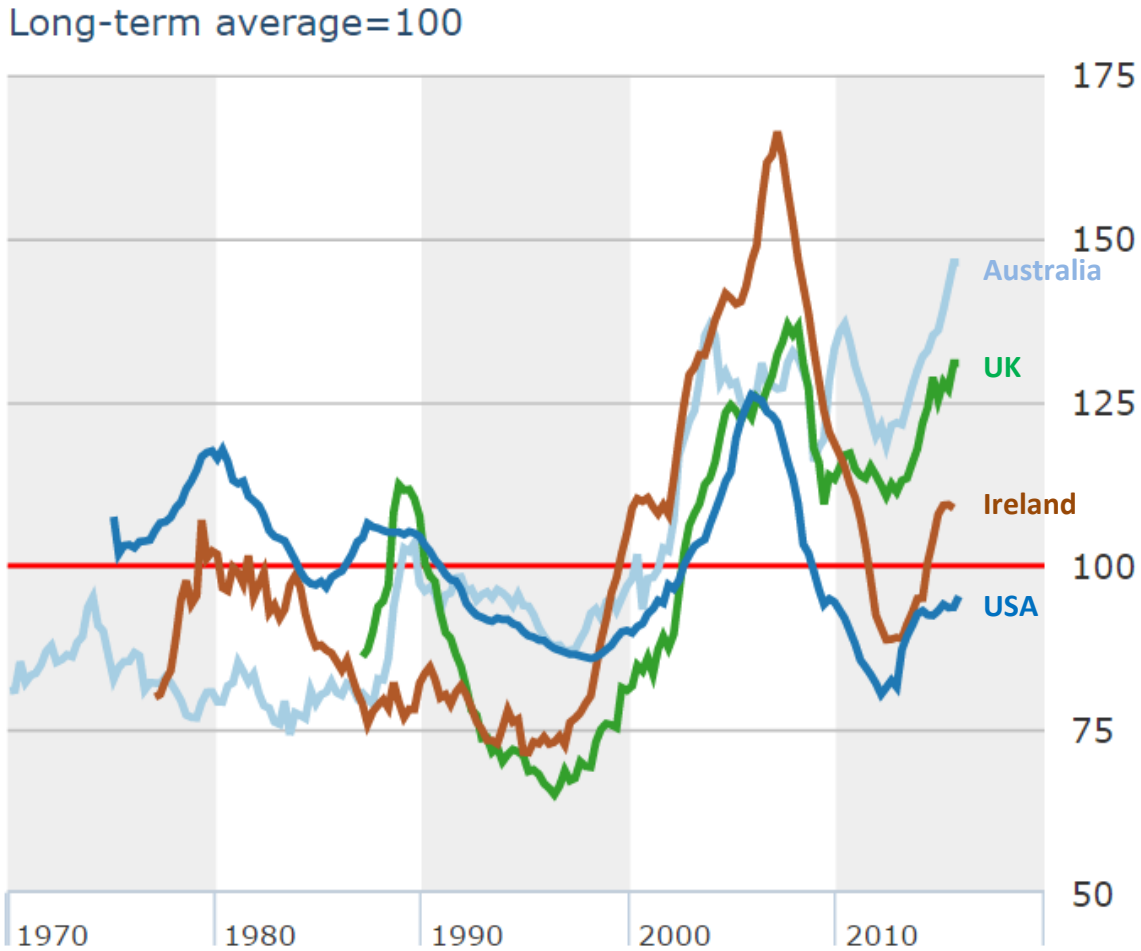
Australian household debt to GDP, %



Source: www.tradingeconomics.com

Much of this debt has been funneled into Australian housing, which is becoming unaffordable as a share of income

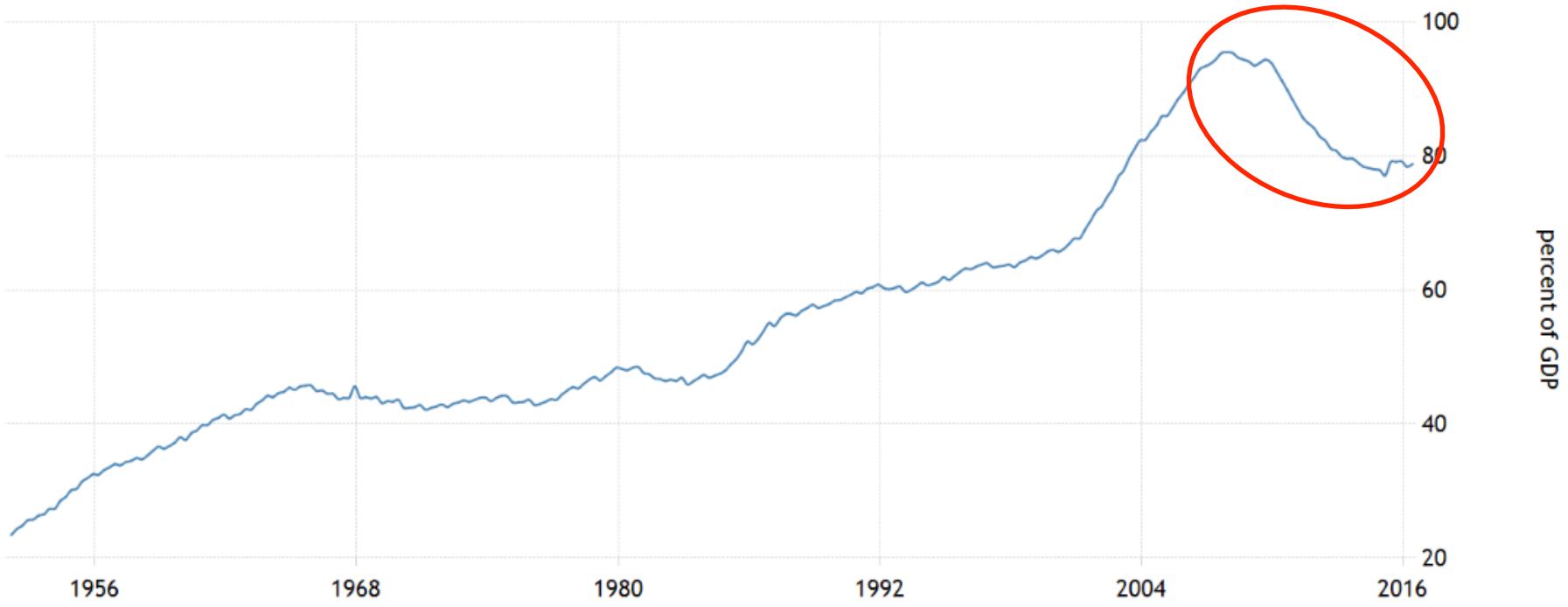
House prices against average income



Source: www.economist.com

In 2008 much of the world saw a recession, financial crisis, and a large "deleveraging" (paying back debt). Will it happen to Australia?

US household debt to GDP, %



Source: www.tradingeconomics.com

Chapter 1

Measuring macroeconomic performance: output and prices

Learning objectives

1.1 What does gross domestic product (GDP) mean

1.2 What are the three ways of measuring a country's GDP?

1.3 What is the distinction between nominal and real GDP?

1.4 What does the consumer price index (CPI) mean?

1.5 How is the CPI measured?

1.6 What is inflation and how is it measured?

1.7 What are the economic costs associated with inflation?

1.8 What is the relationship between rates of interest and the rate of inflation?

1.9 What is deflation and why is it regarded as a problem?

"Good" Economic Performance?

1. Rising living standards
   - Life expectancy, healthcare, education, infant mortality…
2. "Smoothing" the business cycle
   - Avoiding extremes of macroeconomic performance
3. Maintain the real value of the currency
   - Inflation alter the purchasing power of a dollar and creates costs to society
4. Sustainable levels of debt
   - The long-term debt cycle
5. Balance spending vs saving
   - Saving means postponing consumption today to provide more for the future
6. Full-employment
   - Regional unemployment in Australia

- What else?

Nominal GDP vs Nominal GNP

- GDP
  - Gross domestic product (GDP) is the **market value** of the **final goods and services** produced in a country during a given period
  - Short-run fluctuations in GDP are associated with the business
  - Long-run growth in GDP is associated with better living standards

- GNP
  - Gross national product (GNP) is the market value of the final goods and services produced by a country during a given period

“Produced in a country”: cars produced by Ford Australia count towards Australia’s GDP, but cars produced by Ford US don’t.

Australian-made cars are included in Australia’s GDP

American made cars are not

Let's start with Nominal GDP

Nominal Gross Domestic Product (Nominal GDP)

=

Real Gross Domestic Product (Real GDP)

X

GDP Deflator

The two most important measures in the economy are the quantity of goods and services produced, and the price they are sold for

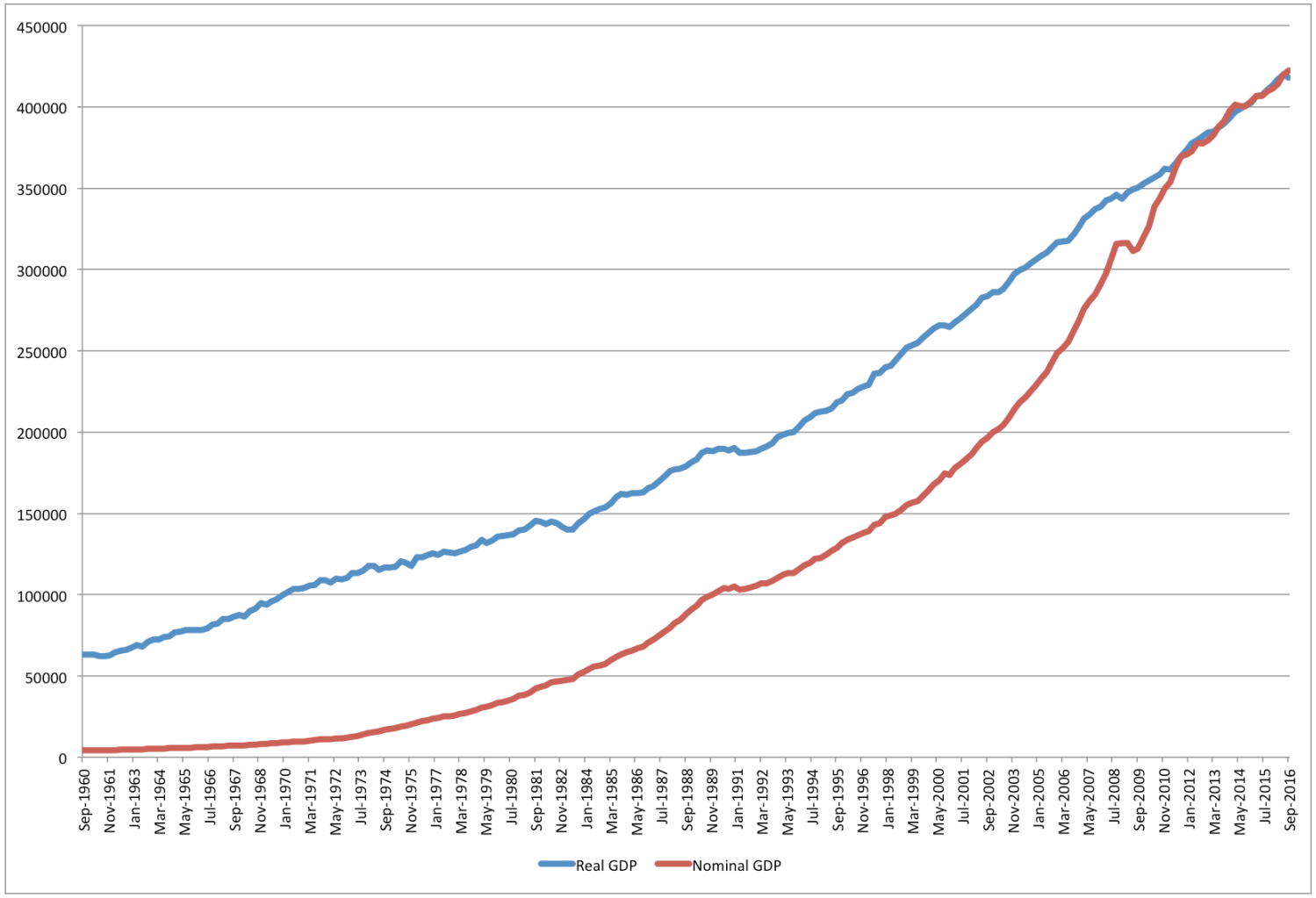
Nominal Gross Domestic Product (Nominal GDP) = Real Gross Domestic Product (Real GDP) X GDP Deflator

Quantities

Prices

Nominal GDP is the market value (at current prices) of the final goods and services produced in a country during a given period.

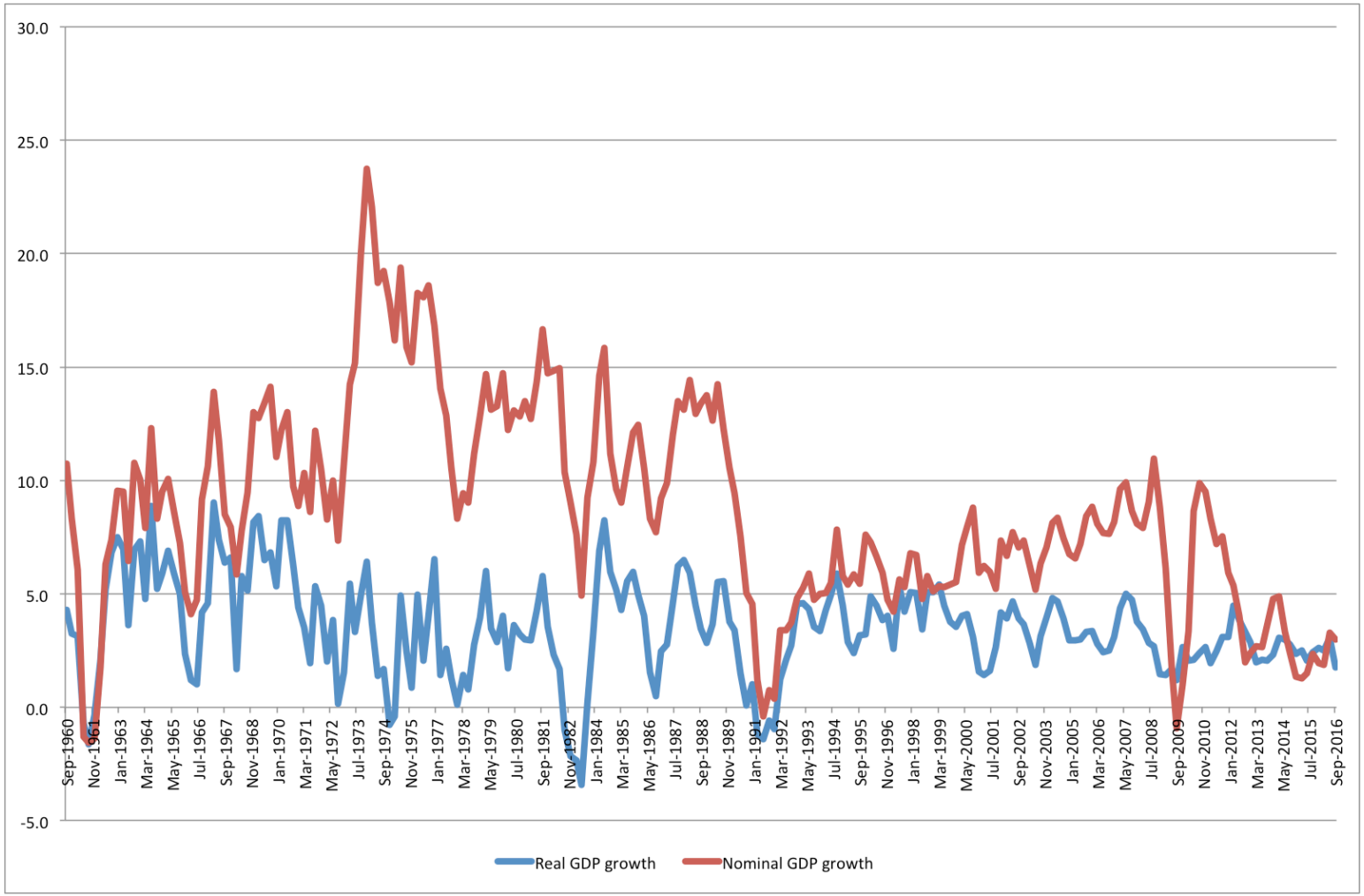
Nominal and Real (2015) GDP, quarterly, million $



Source: RBA, ABS

The difference in the growth of nominal and real GDP is due to inflation

Nominal and Real (2015) GDP growth, quarterly, %



Source: RBA

"Market value" is the quantity traded times the price it is traded for.

Market goods and services

- Included in GDP at market value
- Public goods are included at their cost of provision
- Examples include:
  - Goods: food, TVs, cars, new houses, iron ore.
  - Services: restaurant meals, education, accounting, law enforcement

Non-market goods and services

- Not included in GDP
- Examples include:
  - Non-market goods: forest growth, natural resource depletion
  - Unpaid services: eg volunteering, housework (within a family)

See detail on next page

Higher female participation in the labor force has made a significant contribution to GDP growth over the 20th century

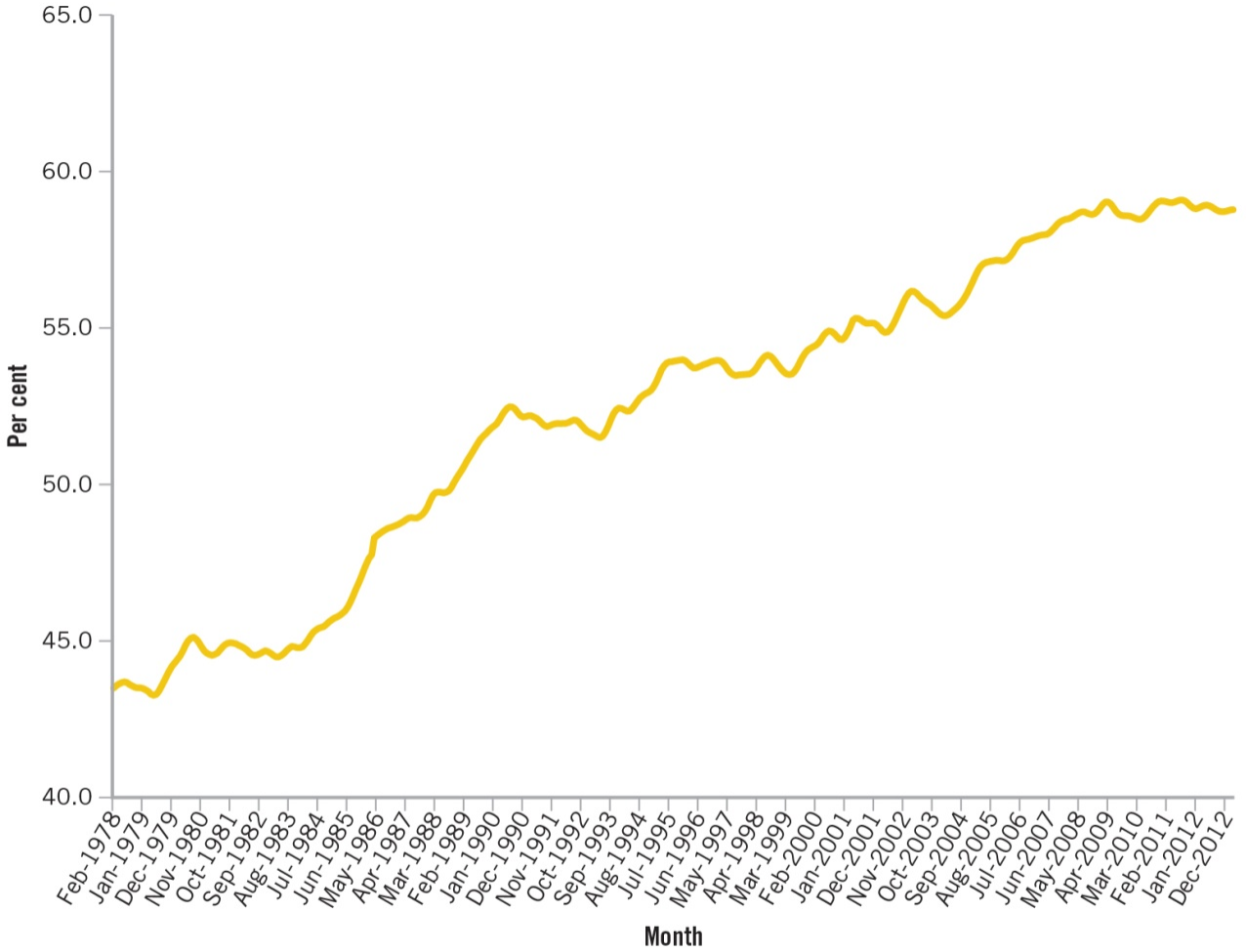


Figure 1.2 **Female labour force participation, Australia** The proportion of Australian women working outside the home has steadily increased.

Source: Australian Bureau of Statistics (2013), *Labour Force, Australia*, January, Cat. No. 6202.0, Table 01, Labour force status by sex—trend

"Final goods and services" is the ultimate good sold in Australia after all the production processes have taken place

Example: Iron Ore

Iron ore is dug up in Western Australia:

Case 1:

The ore is sold to a steel manufacturer in China:

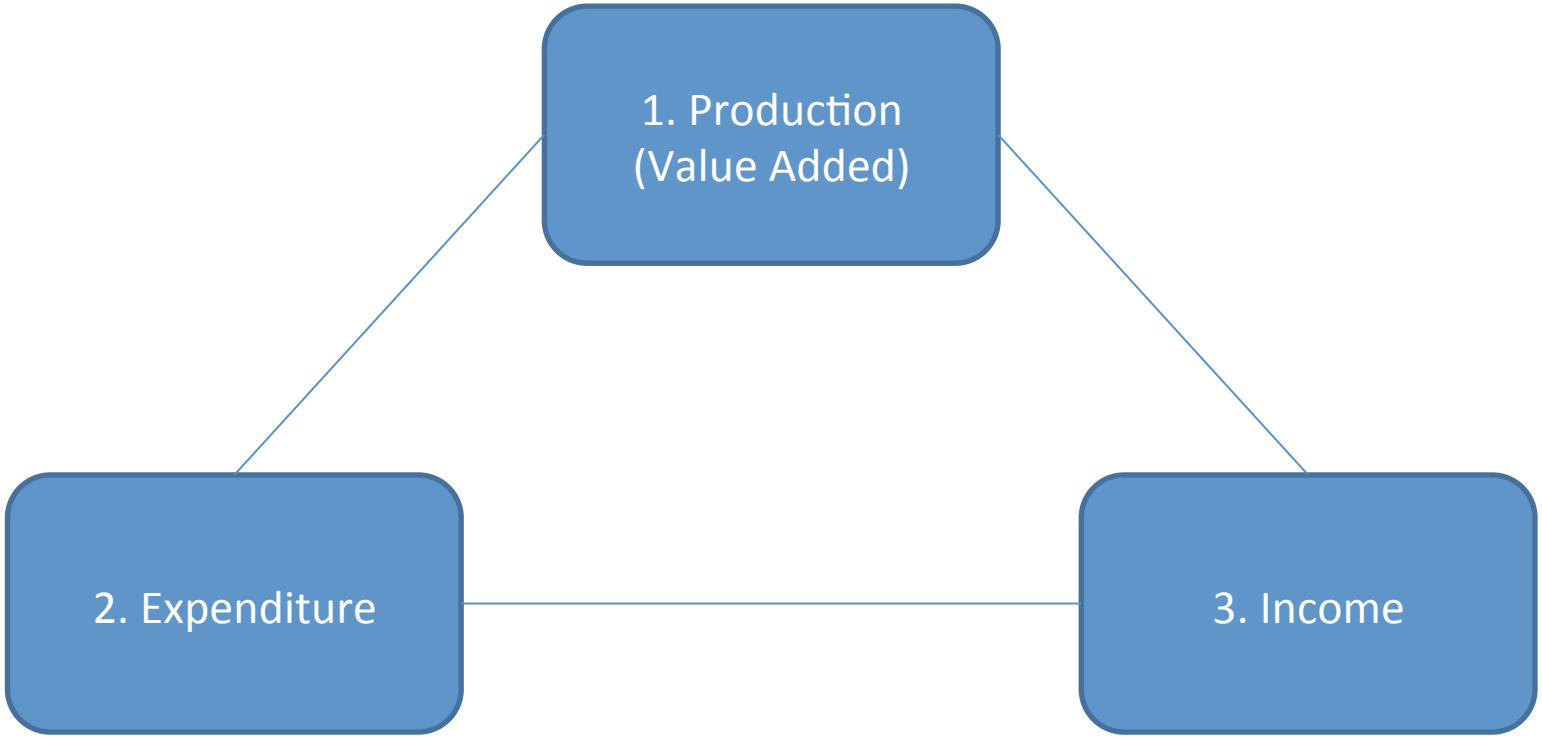
- The value of the iron ore is included in Australia's GDP

Case 2:

The ore is sold to a steel manufacturer in Australia, and eventually made into a bicycle in Australia:

- The value of the bicycle (final good) is included in Australia's GDP
- This includes the value of all the inputs (intermediate goods), including the iron ore, steel, rubber, labour, and shop space.
- If the market value of the intermediate goods was included there would be "double counting"

GDP can be calculated in three ways: using production, expenditure and income, which should all produce the same result.



These three methods are all the same because everything that is produced (1.) must be bought by someone (2. - including inventories which are bought by the producer), which generates income for the seller (3.).

It is difficult to measure GDP

- Prices change
- Multi-stage production
- Multinational production
- Informal economy + public goods

The Production method involves adding up the value added (revenue-costs) by each firm along the production chain

A loaf of bread is sold in Australia for $2.00:

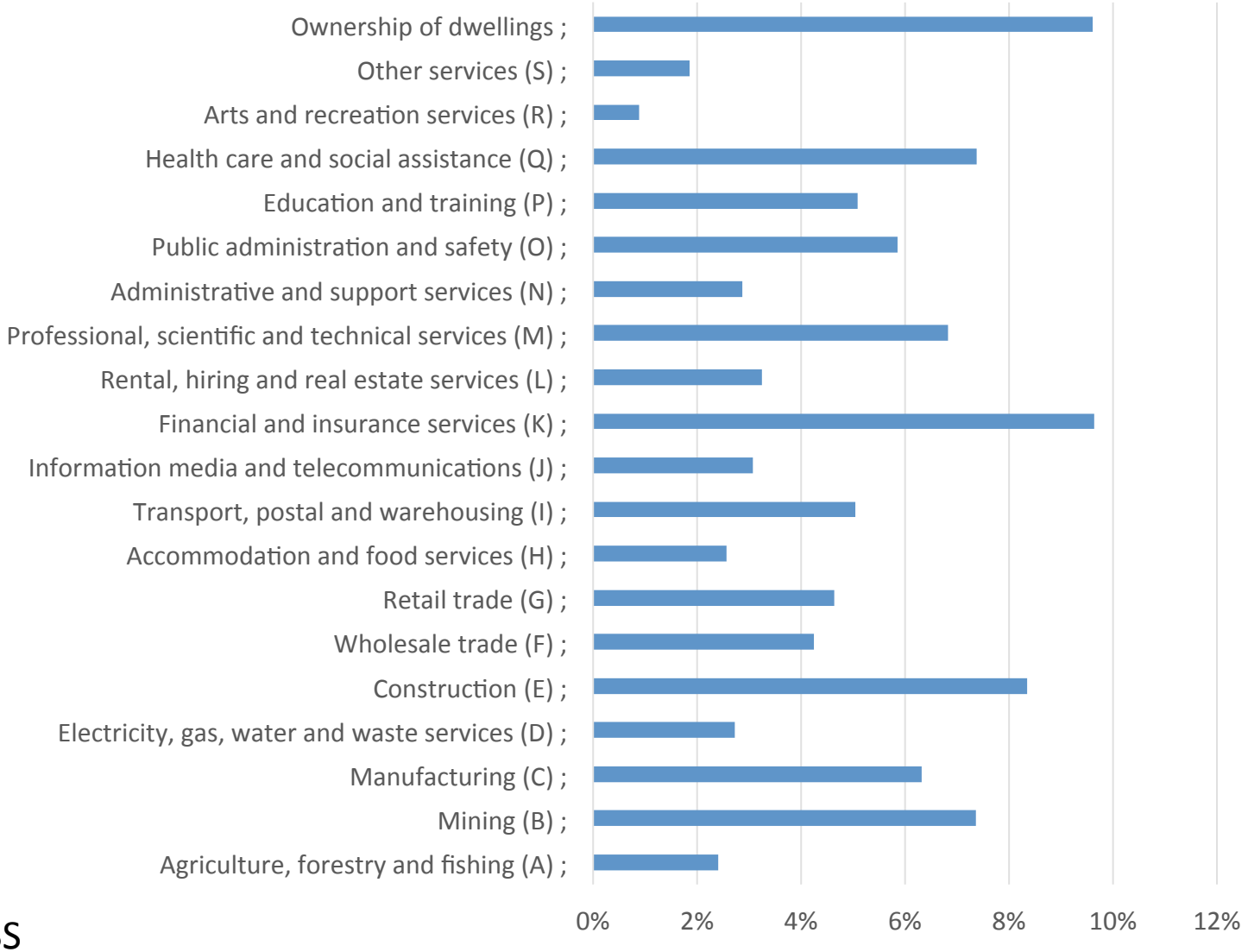
TABLE 1.1 Value added in bread production

COMPANY	REVENUES	–	COST OF PURCHASED INPUTS	=	VALUE ADDED
ABC Grain	$0.50		$0.00		$0.50
General Flour	$1.20		$0.50		$0.70
Hot 'n' Fresh	$2.00		$1.20		$0.80
Total					**$2.00**

- The farmer (ABC Grain) uses land, capital (tractors) and labour to add value by growing the original grain and shipping it to market
- The processor (General Flour) uses capital (a mill) and labour (millers) to add value to the grain, turning it into flour
- The baker (Hot 'n' Fresh) uses capital (oven) and labour to add value to the flour, baking it into bread which is finally sold to the consumer.

~75% of the Australian economy is services, 10% is (imputed) housing, 7% mining, 6% manufacturing and 2% agriculture

Australian value-added by sector, Sep 2016, % of gross value-added



Source: ABS

The Expenditure Method adds up everything spent by final consumers in the economy

The GDP Identity

$$Y = C + I + G + NX$$

GDP	*Household consumption*	*Investment*	*Government spending (C_G +I_G)*	*Net Exports (Exports – Imports)*

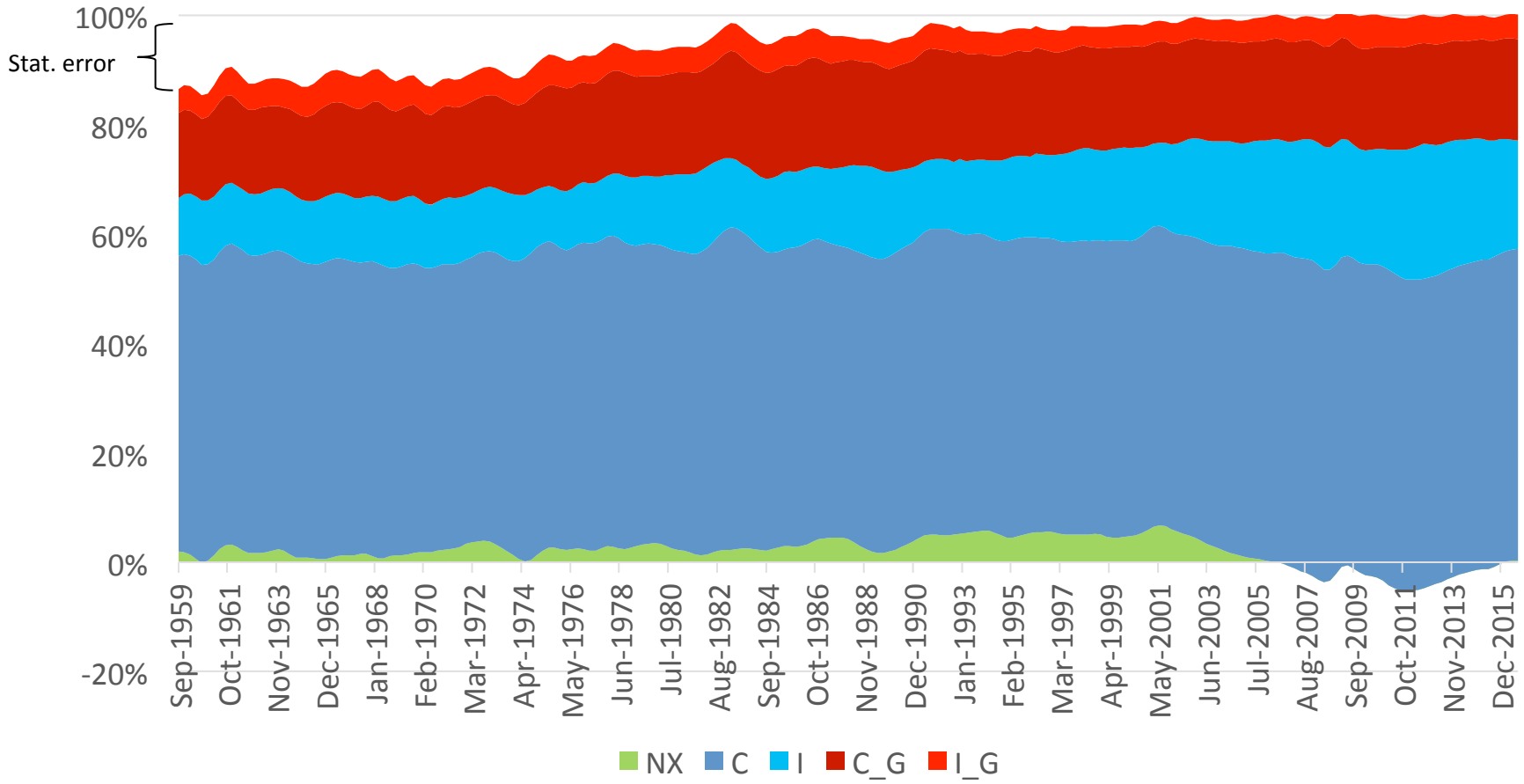
Everything that is produced in Australia must be:

- [C] Consumed by households (e.g. food, clothes, consumer goods, haircuts)
- [I] Invested in capital (added to a stock, like inventories, or building a house)
- [G] Consumed or invested by government (e.g. law enforcement, social security, new train lines)
- [NX] Exported abroad, minus any imports (e.g. iron ore, education, tourism).

As such, GDP can also be measured as the sum of 'expenditure' on domestic production by households, all firms, government and foreigners.

The public sector accounts for ~1/4 of the Australian economy. While exports are ~20%, net exports fluctuate between ±5%.

Australian GDP expenditure, %



Source: ABS

The Income Method traces who earns the income from the sale of all goods and services in the economy

When a good or service is sold, the revenues from the sale are distributed to the workers and the owners of the capital involved in the production.

GDP also equals labour income plus capital income from the production.

- Labour income is wages, salaries and self-employed income.
- Capital income includes payments to physical capital, intangible capital and profits.

The Income Method traces who earns the income from the sale of all goods and services in the economy

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Hot 'n' Fresh	$2.00		$1.20		$0.80
Total					**$2.00**

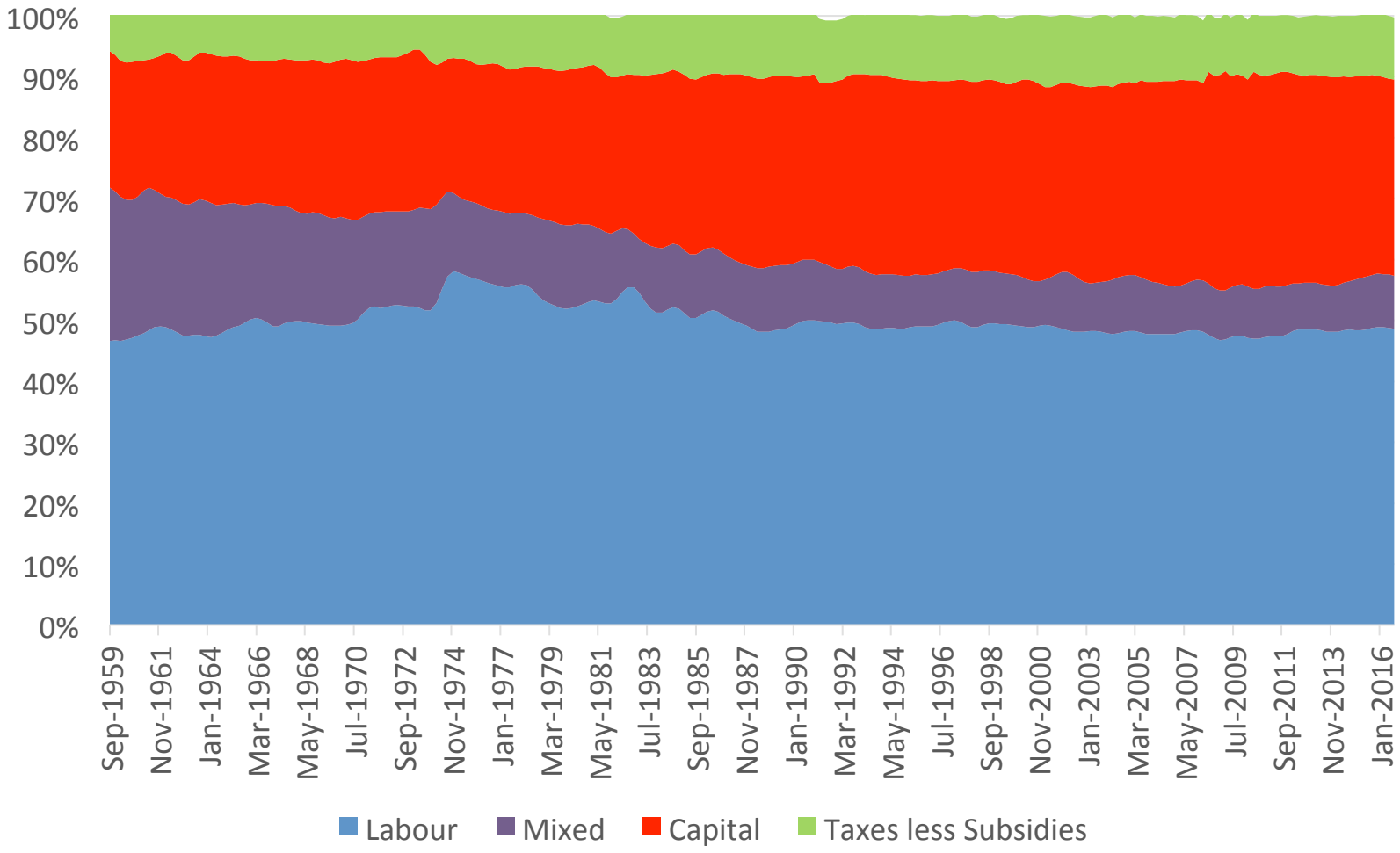
- The $0.50 earned by ABC Grain may go to:
  - Rent to tractor owner ($0.20), Rent/Profit to landowner ($0.20), Wages to farmer ($0.10)
- The $0.70 earned by General Flour may go to:
  - Rent/Profit to mill owner ($0.50), Wages to millers ($0.20)
- The $0.80 earned by Hot 'n' Fresh may go to:
  - Rent to store owner ($0.10), repaying loans for oven ($0.20), wages for baker ($0.30), profits for franchisee ($0.10)

There is therefore a circular flow of income between households and firms. The former supply labour to, and buys goods from, the latter.

Figure 1.3 **The circular flow of income** The circular flow of income in a two-sector economy traces the flows of income, expenditure and production of resources between households and firms.

The share of Australian income going to capital has risen from ~20% to ~35% over the past 50 years, which is a driver of inequality

Australian factor income as a share of GDP, %



Source: ABS

The two most important measures in the economy are the quantity of goods and services produced, and the price they are sold for

Real Gross Domestic Product (Real GDP)

Nominal Gross Domestic Product (Nominal GDP) = X

GDP Deflator

Nominal GDP measures the value of output in current prices, Real GDP measures it in constant prices

Nominal GDP: Current Prices

- Current prices are the price each year
- Prices change from one year to another (inflation). It can mislead when comparing GDP over time
- Nominal GDP can rise simply due to a higher general price level rather than the production level

Real GDP: Constant Prices

- Constant prices are calculated using a fixed reference year
- Macroeconomists are more interested in changes to the production level over time.
  - Efficient allocation of scarce factors of production
- Real GDP rises when quantities rise or when higher valued items are being produced
- This can also be complicated because the things produced and consumed vary between years
  - e.g. If 2005 is the reference year it won't include iPhones.

Real GDP vs Nominal GDP: an example

TABLE 1.4 Prices and quantities in 2007 and 2013

	QUANTITY OF PIZZAS	PRICE OF PIZZAS	QUANTITY OF PASTA	PRICE OF PASTA	NOMINAL GDP
2007	10	$10	15	$5	$175
2013	20	$12	30	$6	$420

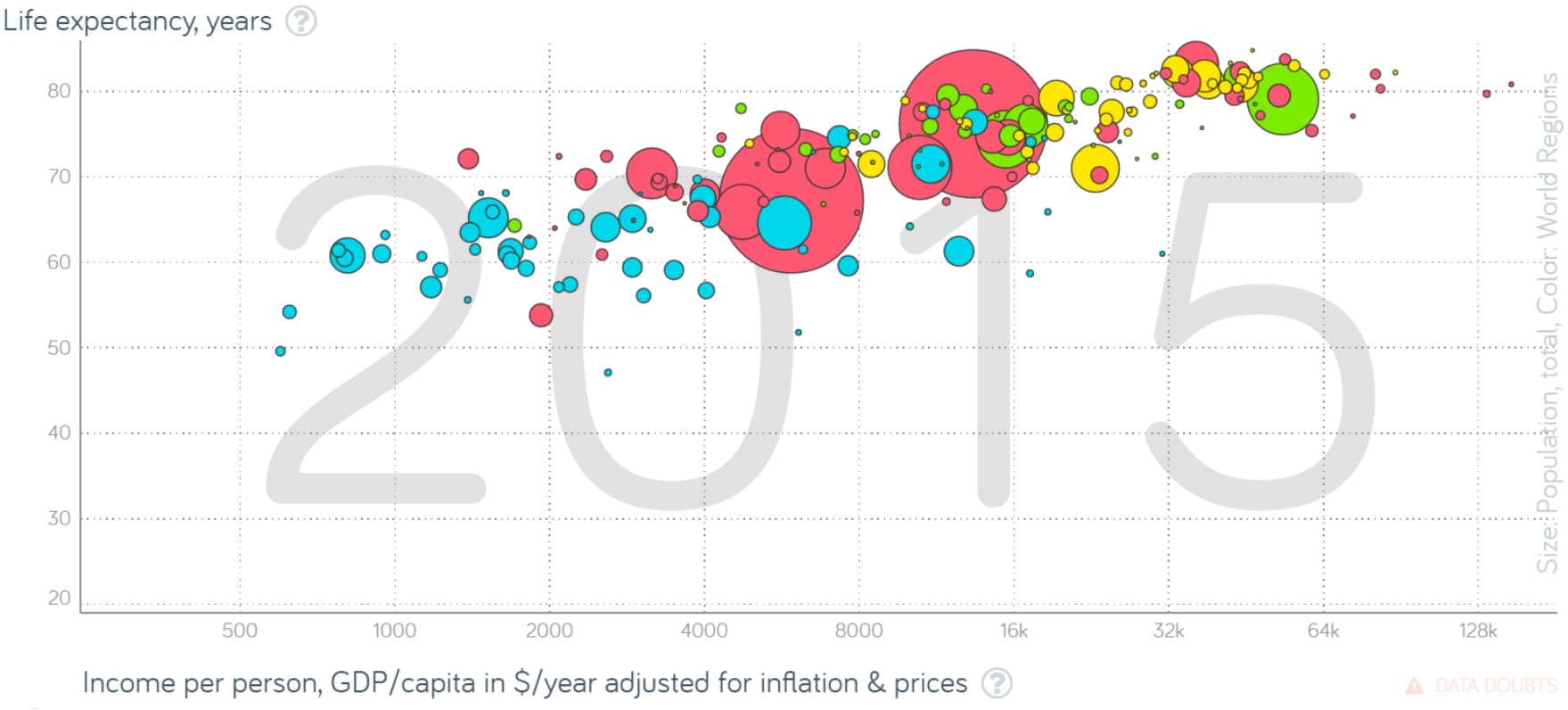
GDP is not a perfect measure of economic wellbeing, but it has many advantages

Advantages and disadvantages of GDP as a measure of economic wellbeing

Advantages	Disadvantages
• Relatively easier to measure than other things (though not easy) • Correlated with rising living standards • Can afford more leisure, healthcare, art, etc. with higher income	Excludes: • Leisure time • Non-market economic activities • Environmental quality and resource depletion • Quality of life • Poverty and economic inequality

GDP is positively correlated with life expectancy

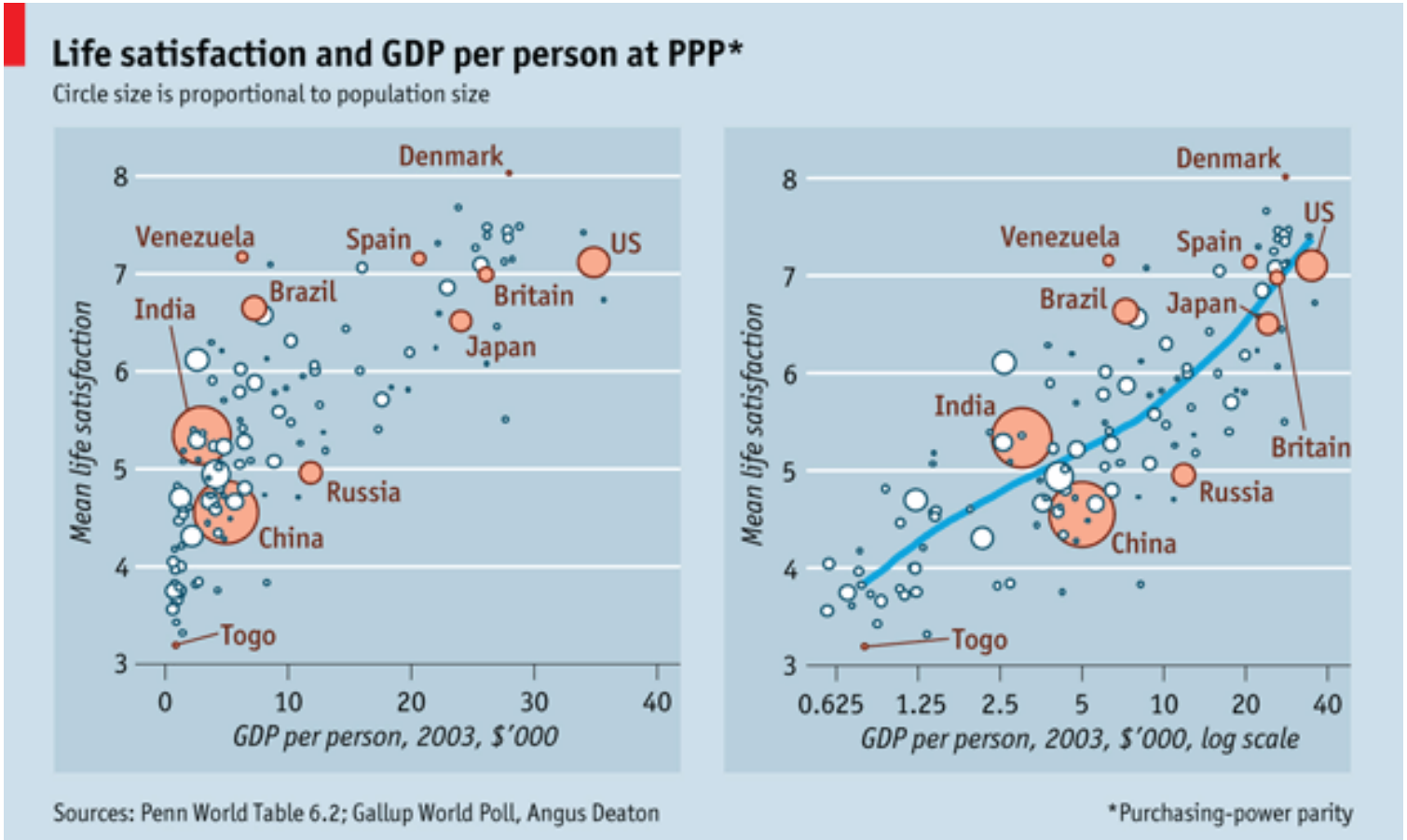
Life expectancy vs GDP/capita, 2015



Correlation vs causation: Does GDP cause longer life expectancy, or vice versa?

Source: http://www.gapminder.org/tools/#_chart-type=bubbles

GDP is positively correlated with happiness



Source: The Economist

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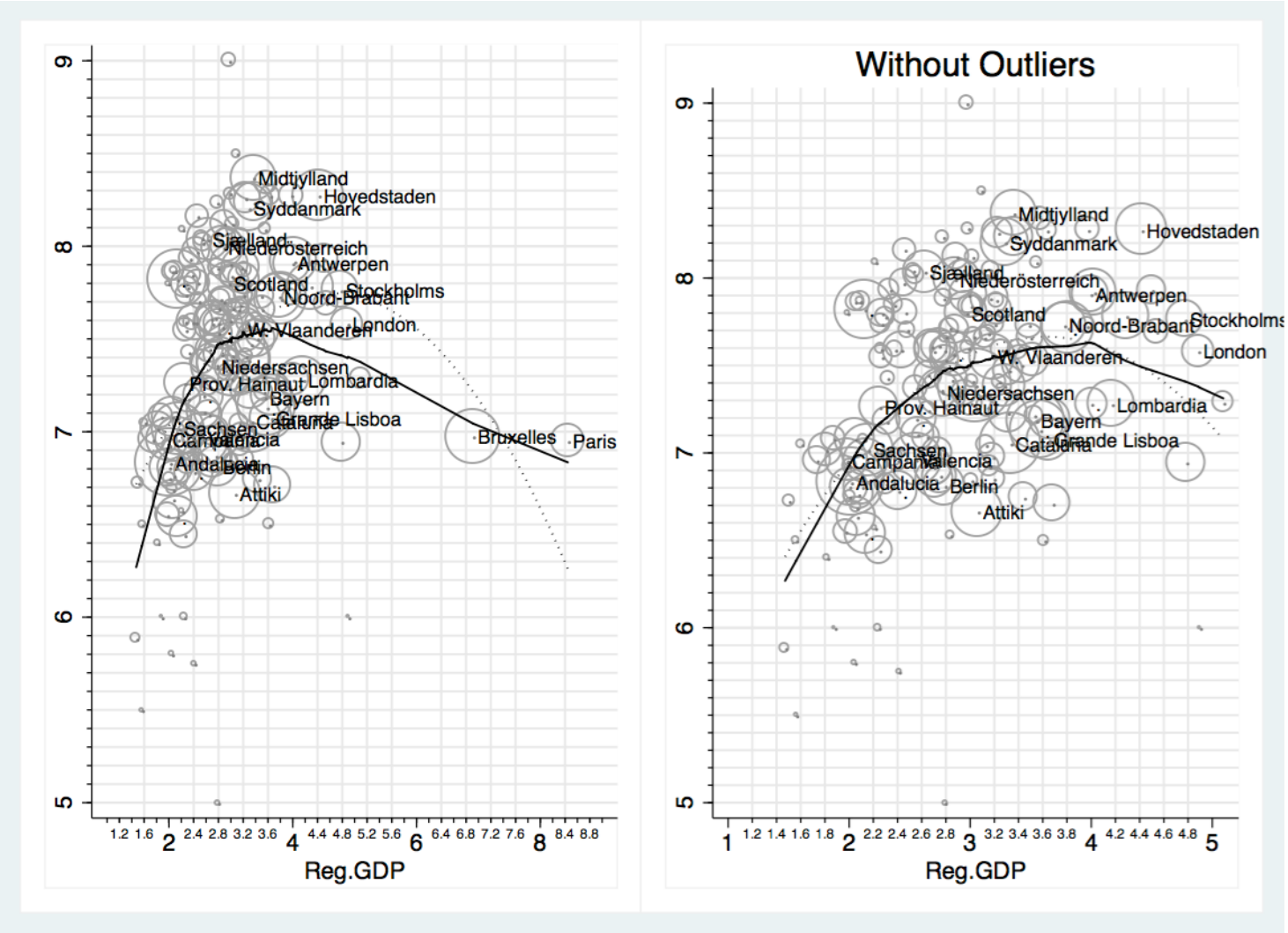
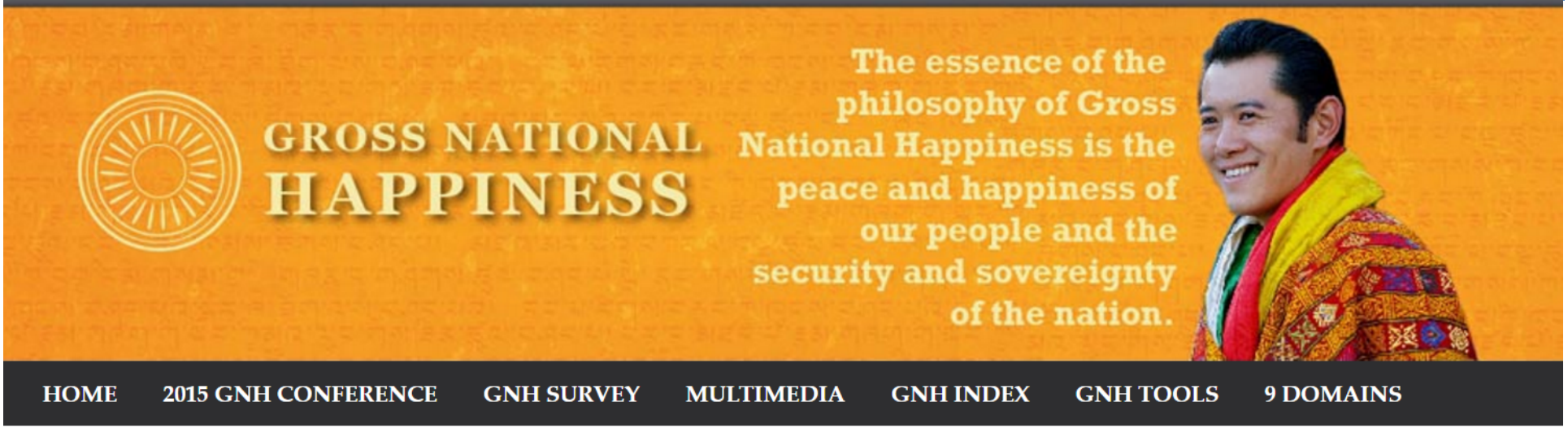


Source: http://voxeu.org/article/gdp-and-life-satisfaction-new-evidence

Bhutan's "Gross National Happiness" index has received global attention, including from the UN --- World Happiness Report



HAPPY NEW YEAR!

SEARCH

LATEST NEWS

PROVISIONAL FINDINGS OF 2015 GNH SURVEY

SUMMARY OF 2015 GNH SURVEY FINDINGS

FOCUS GROUP DISCUSSION ON GNH

MEETING OF PRACTITIONERS AND

The two most important measures in the economy are the quantity of goods and services produced, and the price they are sold for

Real Gross Domestic Product (Real GDP)

Nominal Gross Domestic Product (Nominal GDP) = X

GDP Deflator

There are a variety of ways to measure the price level, including the GDP deflator, and the Consumer Price Index

GDP Deflator

$$\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

- Price of the basket of goods included in GDP (i.e. produced in Australia), relative to the price in a base year

Consumer Price Index

- Price of the basket of goods consumed by Australian households (i.e. produced in Australia and abroad), relative to the cost of that basket in a base year
- Measures average cost of living, so is more of a focus for policymakers than the GDP deflator
- $\text{Inflation}_t = CPI_t - CPI_{t-1} = \Delta CPI_t$

Example: CPI is the price of a constant basket of goods and services consumed in a given year

The CPI measures the cost in a certain period of a standard basket of goods and services relative to the cost of the same basket in the base year.

The CPI provides an objective measure of: average price level and inflation.

TABLE 1.7 Cost of reproducing the 2008 (base-year) basket of goods and services in year 2013

ITEM	COST (IN 2008)	COST (IN 2013)
Rent, two-bedroom apartment	$500	$630
Hamburgers (60 at $2.50 each)	$120	$150
Movie tickets (10 at $7.00 each)	$60	$70
Total expenditure	$680	$850

$$\text{CPI} = \frac{\text{Cost of base-year consumption basket of goods and services in current year}}{\text{Cost of base-year consumption basket of goods and services in base year}}$$

$$\text{CPI in year 2013} = \frac{\$850}{\$680} = 1.25$$

- Includes foreign-produced components (e.g. imported hamburger buns/films)

Inflation is the rate of change of the price level.

- The CPI is used to calculate the rate of inflation. This is the percentage change in the CPI over the specified time period.

$$\text{Inflation}_{\text{Dec2016}} = \frac{\text{CPI}_{\text{Dec2016}} - \text{CPI}_{\text{Dec2015}}}{\text{CPI}_{\text{Dec2015}}} \text{ X } 100$$

- Inflation is an average measure. If some prices rise and others fall then inflation may be zero.

- "Headline inflation" includes food and energy prices, reflecting the cost of living for the average consumer
  - However, food and energy prices are volatile

- "Core inflation" excludes food and energy prices

Example: Adjusting for inflation makes prices comparable over time, with reference to the average cost of living

TABLE 1.8 Comparing the real values of a family's income in 2010 and 2013

YEAR	NOMINAL FAMILY INCOME	CPI	REAL FAMILY INCOME = NOMINAL FAMILY INCOME/CPI
2010	$40 000	1.00	$40 000/1.00 = $40 000
2013	$44 000	1.25	$44 000/1.25 = $35 200

It can be difficult to measure inflation because of the quality adjustment and substitution biases

1. Quality-adjustment bias

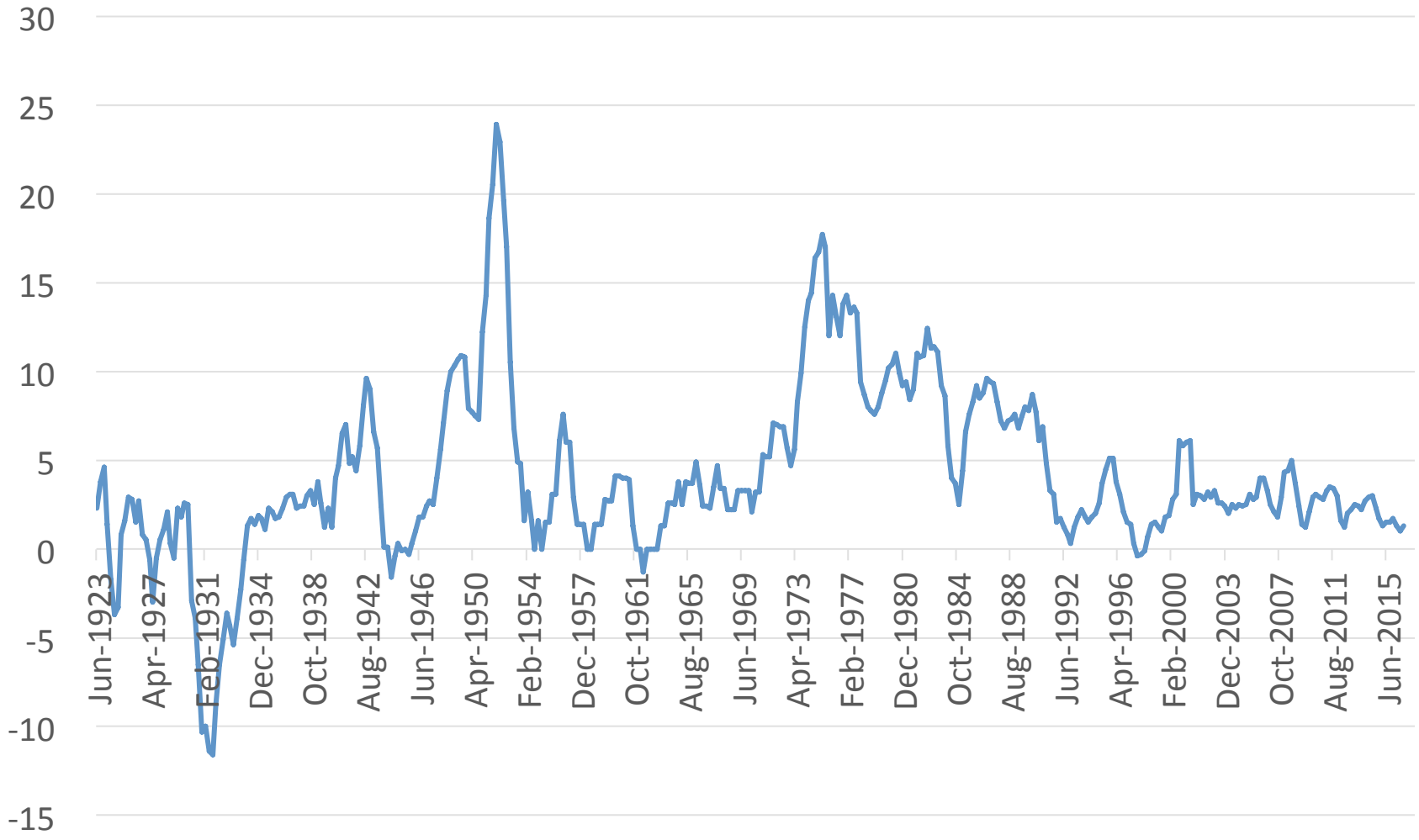
- Inflation can be overstated because quality improvements over time in goods and services are difficult to adjust for (e.g. iPhone vs Nokia 3310)

2. Substitution bias

- The basket of goods and services is fixed, but higher prices in one good leads consumers to substitute cheaper goods.

Australia's inflation has come under control since the 1980, after the dollar was floated (1983) and the RBA started inflation-targeting (1993)

Australian annualized CPI inflation, %



Source: RBA

It is important to adjust for CPI inflation when looking at wages, to give a better idea of what those wages can buy.

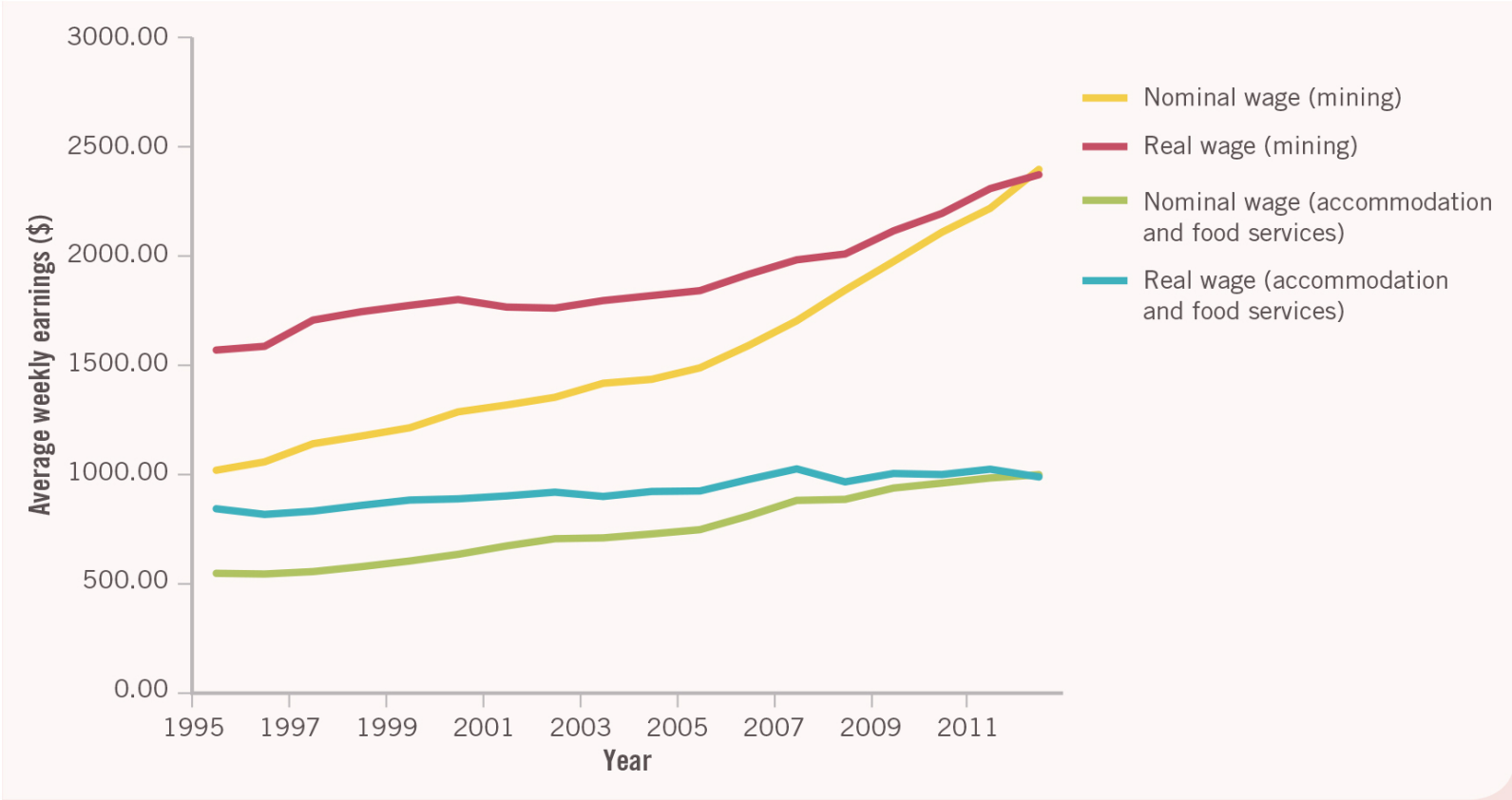


Figure 1.5 **Nominal and real earnings for mining and accommodation/food service workers, 1995–2012**

Source: Authors' calculations using Australian Bureau of Statistics, *Average Weekly Earnings, Australia*, Cat. No. 6302.0; and Australian Bureau of Statistics, *Consumer Price Index, Australia*, Cat. No. 6401.0

Some inflation is helpful, but high inflation can be very costly

Low inflation can be helpful

- Helps adjust relative prices if there is "downward price (or wage) rigidity"
- Allows steady, stable economic growth
- Lets the government collect "seignorage tax": printing money to finance spending, causing inflation which devalues existing currency (esp. developing countries)

High inflation is very costly

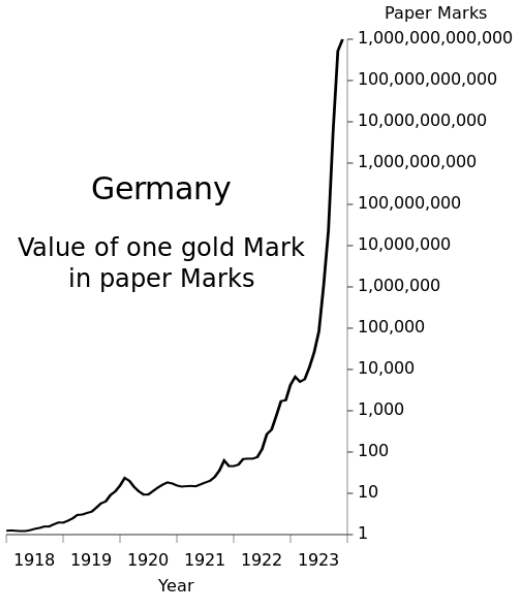
- Distorts relative prices: if some prices change faster than others
- Distorts taxation: "tax bracket creep" as nominal wages rise
- Introduces noise: firms don't know whether high prices are due to demand or inflation
- Redistributes wealth: borrowers benefit at expense of savers. Encourages speculation
- Creates shoe-leather costs: consumers hold less cash on hand (changing with technology)
- Creates menu costs: expensive to continually change listed prices (changing with technology)

In an extreme case, hyperinflation occurs when inflation expectations become "unanchored": spiraling out of control

Examples of hyperinflation episodes

Germany (Weimar Republic): 1921-1924

- Germany incurred heavy costs during WWI
- The Treaty of Versailles (1919) exacerbated the problem, by forcing the Germans to pay reparations to the Allies
- Reparations were paid with foreign currency, which were bought with mass-printed paper marks
- Inflation rose to ~30,000% in Nov 1923
- Stabilized by introducing new bank and currency - confidence



Source: Wikimedia commons

Zimbabwe: 2000-2015

- Became independent in 1980
- Robert Mugabe began land redistribution in 1998, disrupting food production and creating unemployment
- To meet government expenditure printed new notes
- Inflation peaked at ~79.6 billion percent in Nov 2008
- Stabilized by abandoning currency and moving to US Dollar.

Inflation and Interest Rates are linked by the Fisher equation

The Fisher Equation

Exact: $(1 + i) = (1 + r)(1 + \pi)$

Approximate: $i \approx r + \pi$

i = nominal interest rate, r = real interest rate, π = inflation

- π directly affects i
- π may also indirectly affect i because the RBA will change r to slow inflation
- The real interest rate is the compensation someone earns from lending money (or delaying consumption from today to tomorrow).
- For a given i, high π reduces the real interest rate. This redistributes wealth from lenders to borrowers.

Example: Inflation reduces the real return on a one year loan.

Assume the nominal interest rate is 10% per annum so the borrower will repay the lender $110 at the end of the year.

Assume that price of bread at the beginning of the loan is $1 per loaf. Then the lender is aiming to give up the equivalent of 100 loaves of bread now, so as to receive more in the future.

The real interest rate is the real increase in purchasing power the lender gains.

Inflation rate	Price of bread at end of year	Purchasing power of repayment	Real interest rate
6%	$1.06	110/1.06 = 104 loaves	4%
10%	$1.10	110/1.10 = 100 loaves	0%
2%	$1.02	110/1.02 = 108 loaves	8%

Deflation can lead to higher real interest rates if the nominal interest rate hits the zero lower bound

The Fisher Equation: $i \approx r + \pi$

- Deflation is when the average price level (CPI) falls ($\pi<0$).
  - Typically due to slowing aggregate demand
- Nominal interest rates must be $i>0$ (the "Zero Lower Bound (ZLB)")
  - Otherwise would just hide cash under a pillow
  - This is relevant now: ECB: 0%, UK, 0.25%, USA: 0.75%, AUS: 1.5%
- If deflations happens at the ZLB there can be a spiral, as it will cause r to rise, discouraging investment.

Summary

- GDP is the market value of final goods and services produced within a country during a given period of time.
- GDP can be measured by the expenditure, income and value-added methods.
- GDP is not the same as economic wellbeing as many things are excluded from the measurement.
- Living standards are positively correlated with real GDP per capita.
- The CPI measures the cost in that period of a standard basket of goods and services relative to the cost of the same basket in the base year.
- Inflation is the rate of change in CPI between two periods.
- High and persisted inflation can be extremely costly to the society.
- Real interest rates reflect the true cost of borrowing.