

# POPULATION, PARTICIPATION AND PRODUCTIVITY: HOW TO THINK ABOUT LONG-RUN ECONOMIC GROWTH

PRESENTATION TO THE INTERNATIONAL CONFERENCE OF  
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# A useful way of thinking about the sources of long-run economic growth

$$\begin{aligned} \text{GDP} &= \text{population} \times \frac{\text{employment}}{\text{population}} \times \frac{\text{hours worked}}{\text{employment}} \times \frac{\text{GDP}}{\text{hours worked}} \\ &= \text{population} \times \text{'employment rate'} \times \text{average hours worked} \times \text{labour productivity} \\ &= \text{population} \times \left\{ \frac{\text{labour force}}{\text{participation rate}^*} \times (1 - \text{unemployment rate}) \right\} \times \text{average hours worked} \times \text{labour productivity} \end{aligned}$$

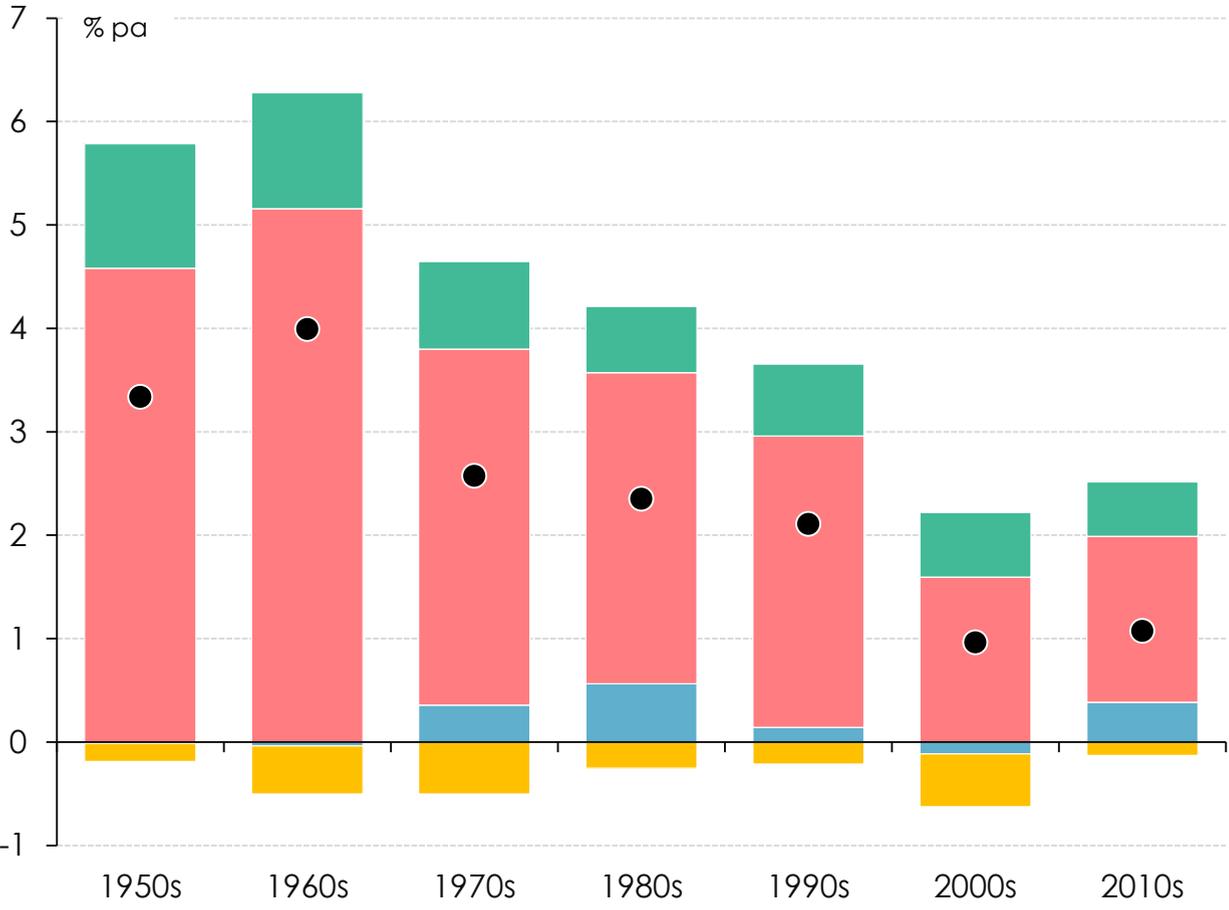
\* where the participation rate is the labour force as a pc of the total population, not just those aged 15+

$$\Delta \text{GDP} = \Delta \text{population} \times \Delta \text{'employment rate'} \times \Delta \text{average hours worked} \times \Delta \text{labour productivity}$$

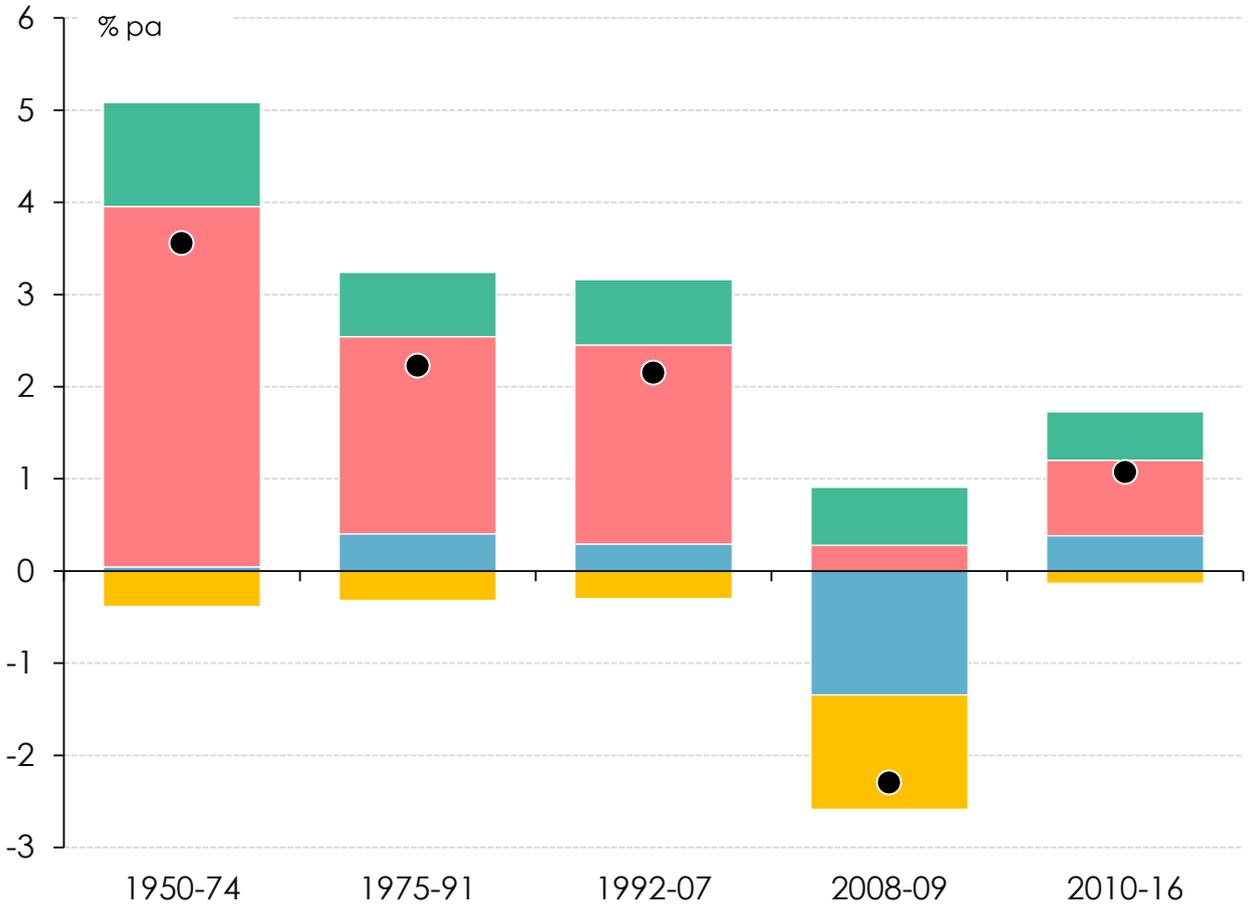
# Long-run slowdown in 'advanced' economies reflects slowing population, levelling out in employment participation and, especially, slower productivity

## Sources of real GDP growth in 'advanced' economies, 1950-2016

### By decade



### By major cyclical phases



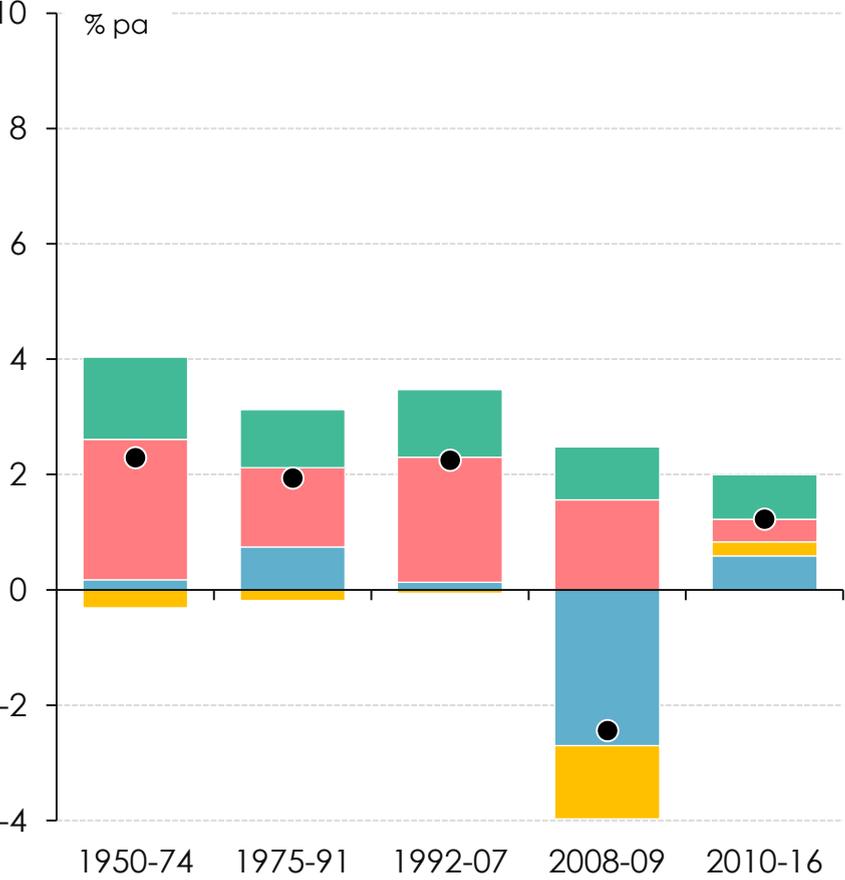
■ Employment-population ratio ■ Average hours worked ■ Labour productivity ■ Population ● Per capita GDP

Note: 'advanced' economies are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, Korea, Netherlands, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, Taiwan, United Kingdom and United States. These account for over 95% of the population and GDP of the 39 economies defined as 'advanced' by the IMF. Sources: The Conference Board, *Total Economy Database*, 17<sup>th</sup> May 2017; Corinna Economic Advisors.

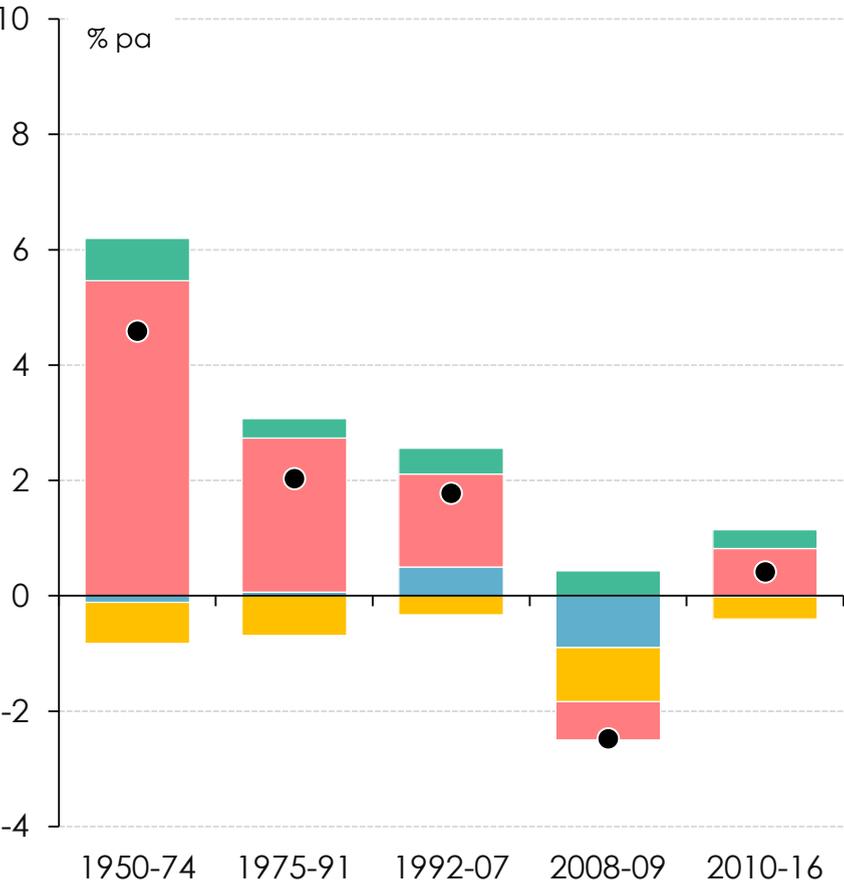
# Contribution of lower productivity growth and demographic change to slower economic growth particularly apparent in major economies

## Sources of real GDP growth in major 'advanced' economies, 1950-2016

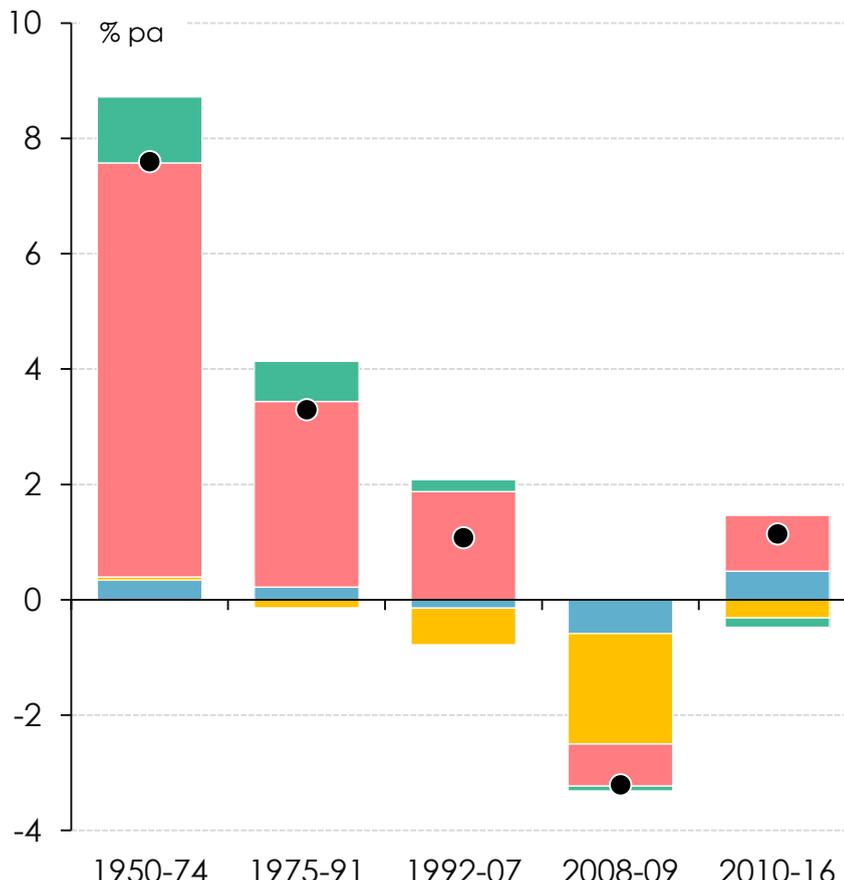
### United States



### Euro area



### Japan



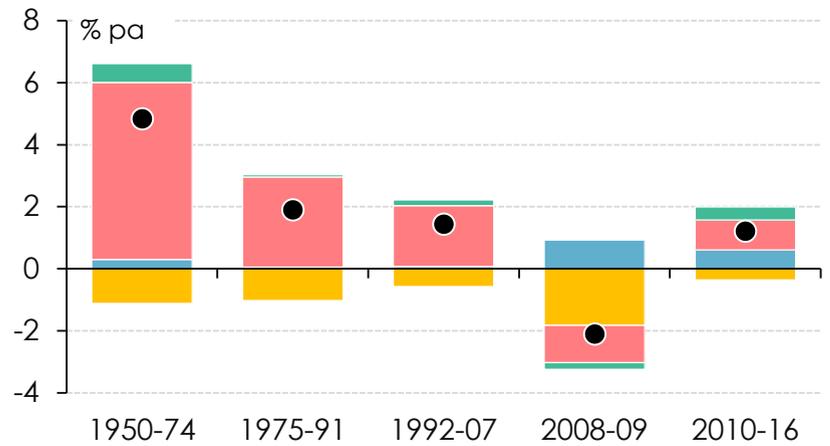
■ Employment-population ratio 
 ■ Average hours worked 
 ■ Labour productivity 
 ■ Population 
 ● Per capita GDP

Note: Euro area here excludes Cyprus, Estonia, Latvia, Lithuania, Luxembourg, Malta, Slovakia and Slovenia (for which data on hours worked, and output per hour worked, are not available for the entire time period shown here). Sources: The Conference Board, Total Economy Database 17th May 2017; Corinna Economic Advisors.

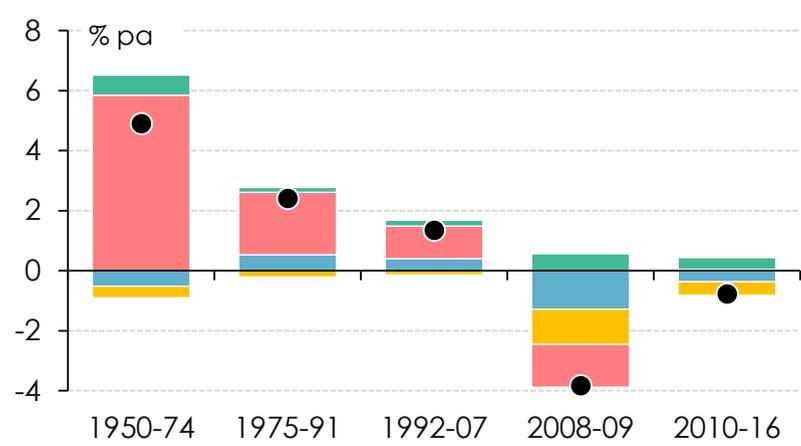
# Differences in productivity growth and employment participation explain most of the variations in economic growth within the euro area

## Sources of real GDP growth in selected euro area economies, 1950-2016

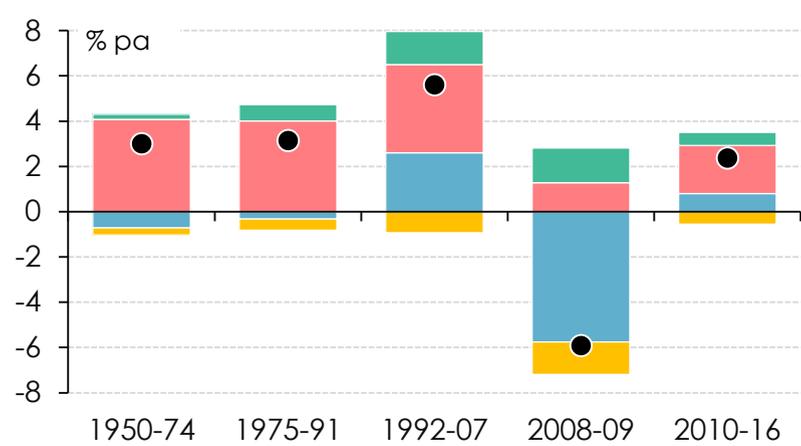
### Germany



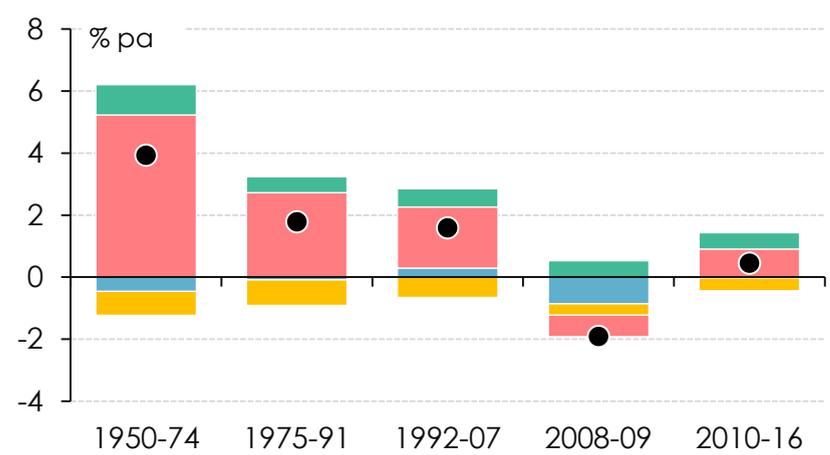
### Italy



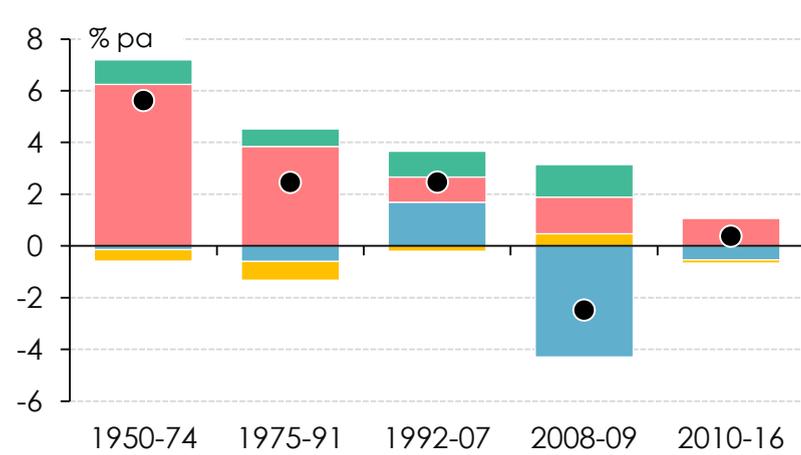
### Ireland



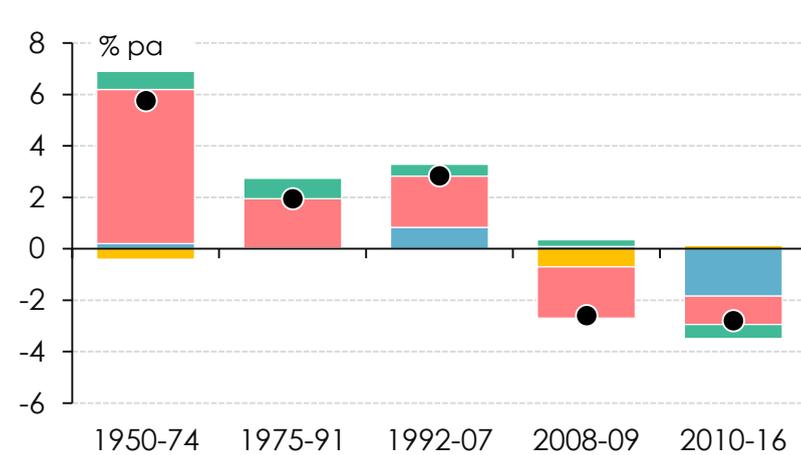
### France



### Spain



### Greece



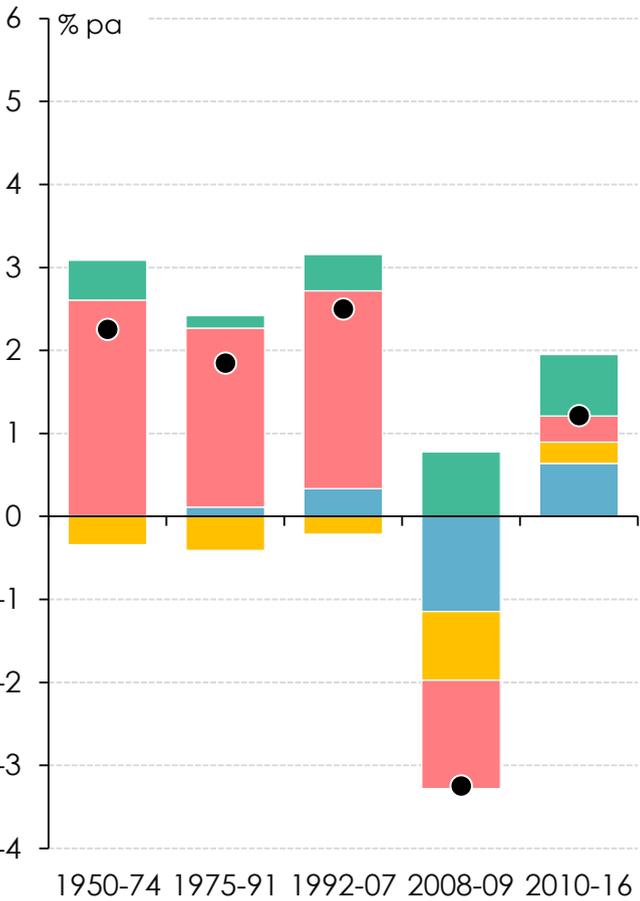
■ Employment-population ratio 
 ■ Average hours worked 
 ■ Labour productivity 
 ■ Population 
 ● Per capita GDP

Sources: The Conference Board, Total Economy Database, 17<sup>th</sup> May 2017; Corinna Economic Advisors.

# Faster productivity and population growth account for most of the superior economic performance of Britain's former colonies relative to the UK

## Sources of real GDP growth in 'Anglo' economies, 1950-2016

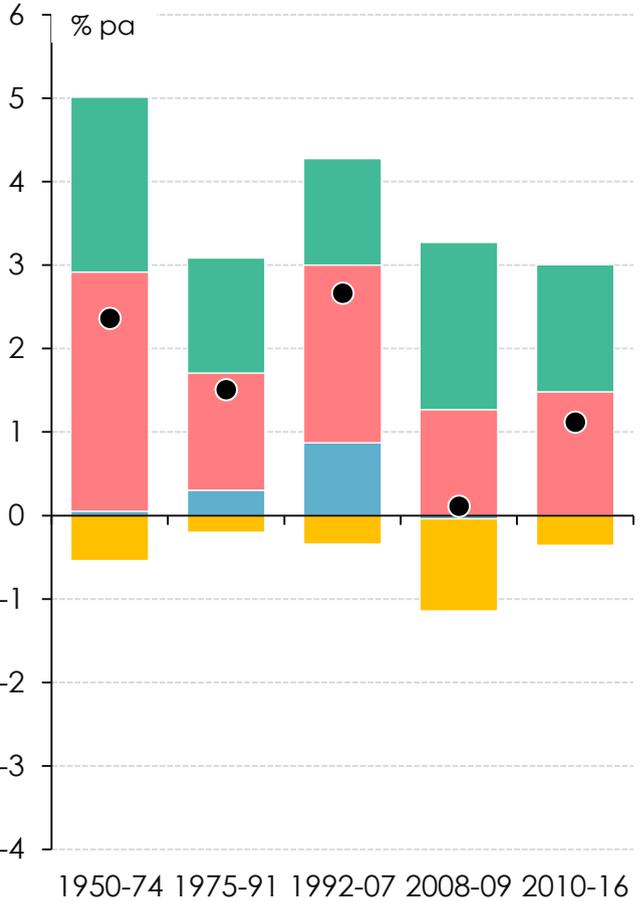
### United Kingdom



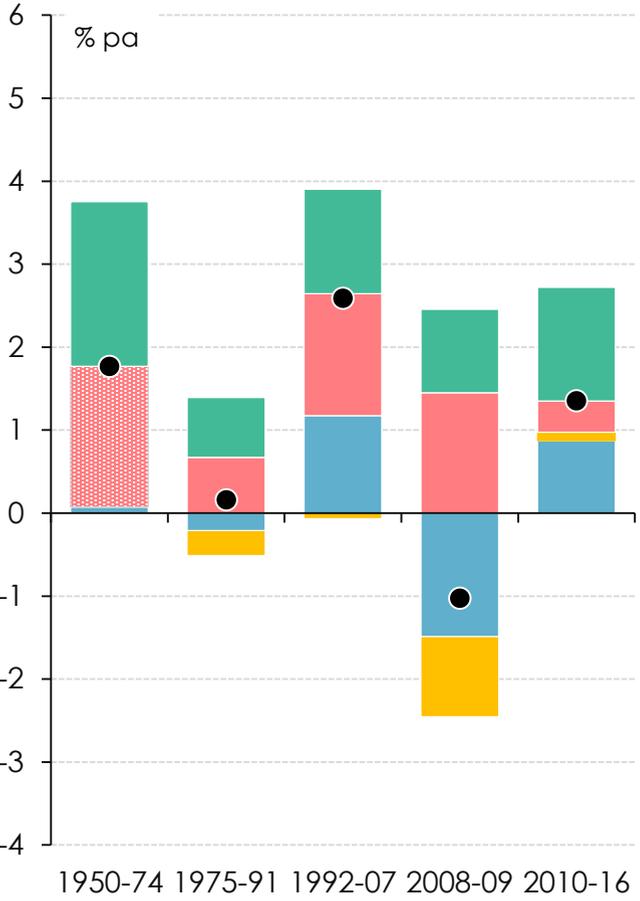
### Canada



### Australia



### New Zealand



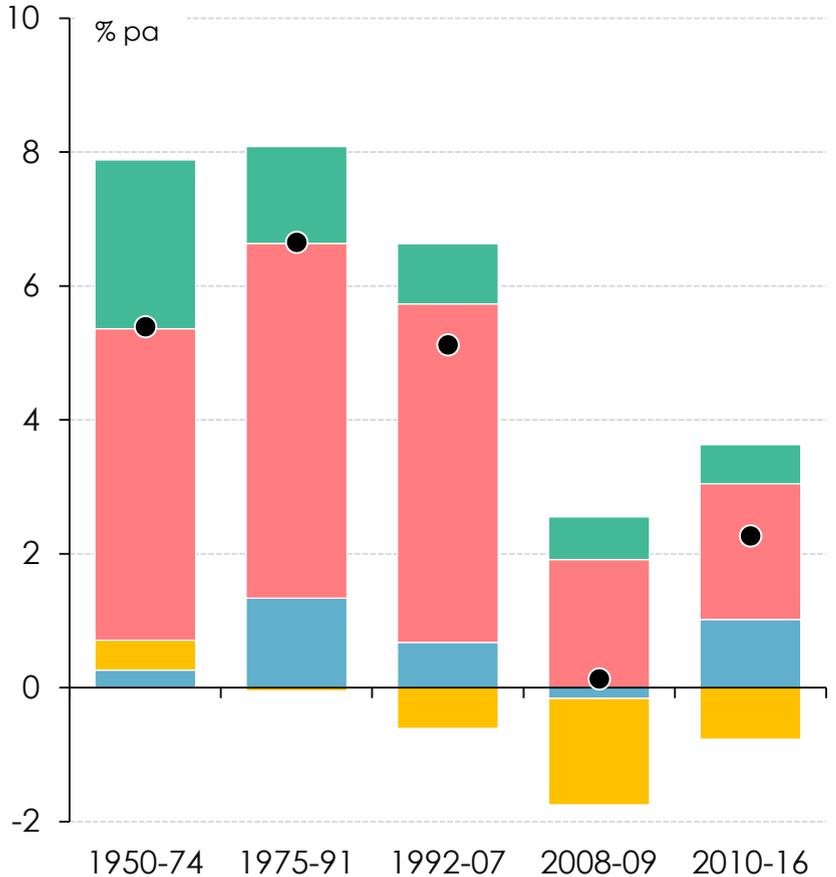
■ Employment-population ratio ■ Average hours worked ■ Labour productivity ■ Population ● Per capita GDP

Note: Labour productivity growth for New Zealand for the period 1950-74 is GDP per person employed, not per hour worked (due to the lack of data on hours worked prior to 1971). Sources: The Conference Board, Total Economy Database, 17th May 2017; Corinna Economic Advisors.

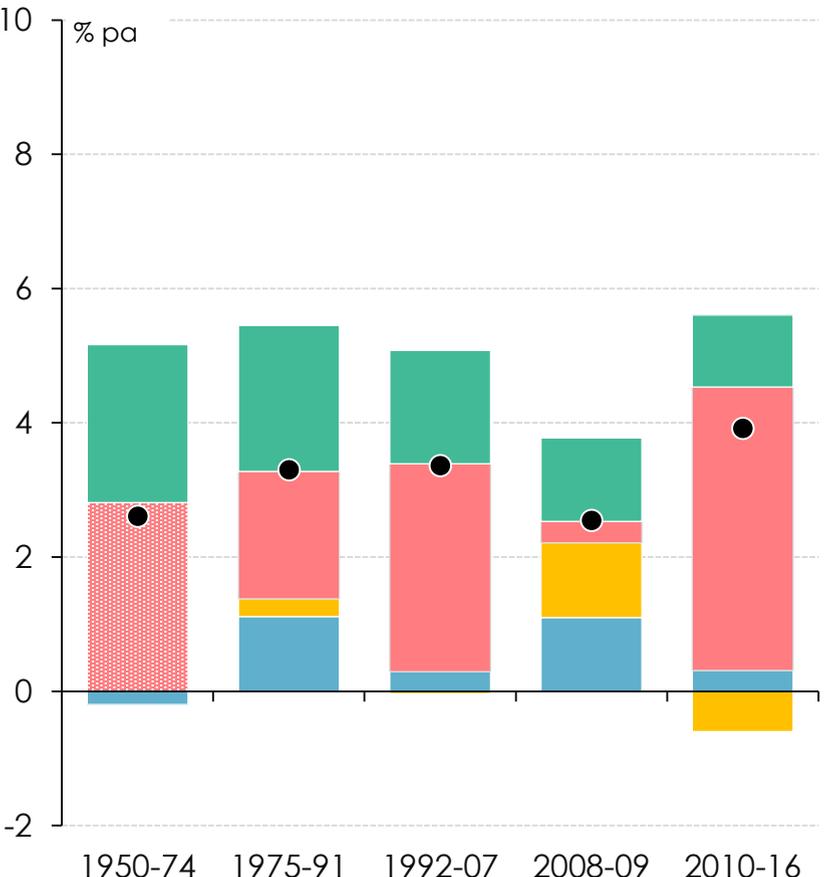
# Faster productivity growth the main reason for Asia out-performing Latin America – but productivity is now slowing in higher-income Asian economies

Sources of real GDP growth in selected groups of 'non-Western' economies, 1950-2016

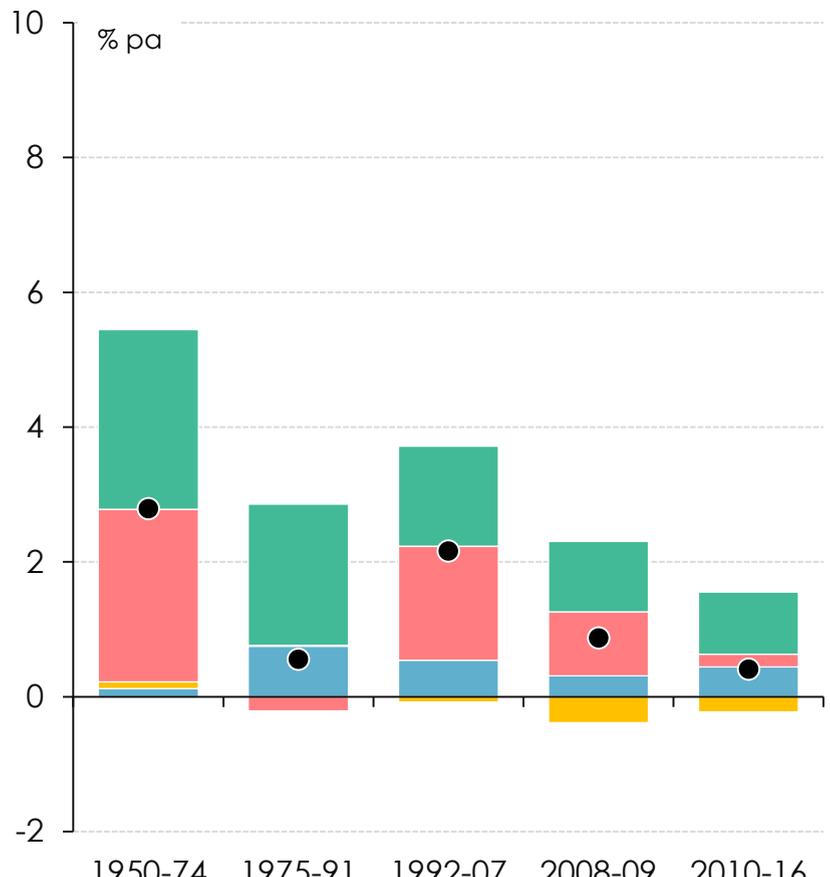
## Asian 'NIEs'



## ASEAN 5



## Latin America 5

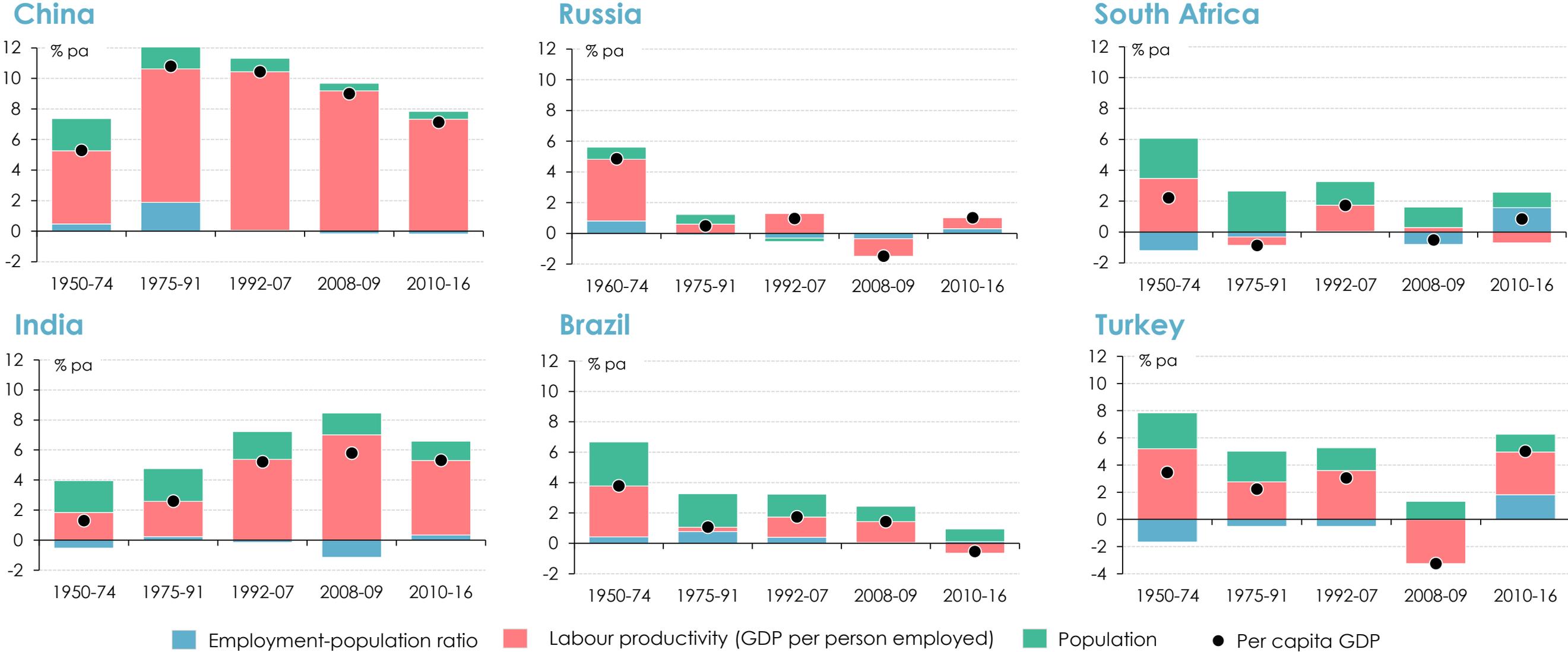


■ Employment-population ratio 
 ■ Average hours worked 
 ■ Labour productivity 
 ■ Population 
 ● Per capita GDP

Note: Asian 'NIEs' ('newly industrializing economies') are Korea, Taiwan, Hong Kong & Singapore. ASEAN 5 are Indonesia, Malaysia, Philippines, Thailand & Vietnam (note data on hours worked not available for these countries prior to 1970 so productivity growth measure shown for 195-74 is GDP per person employed). 'Latin America 5' are Argentina, Brazil, Chile, Mexico and Peru. Sources: The Conference Board, Total Economy Database, 17<sup>th</sup> May 2017; Corinna Economic Advisors.

# China's productivity performance since the late 1970s has been astounding – can other big 'emerging' markets emulate it as China's demography bites?

## Sources of real GDP growth in major 'emerging' economies, 1950-2016

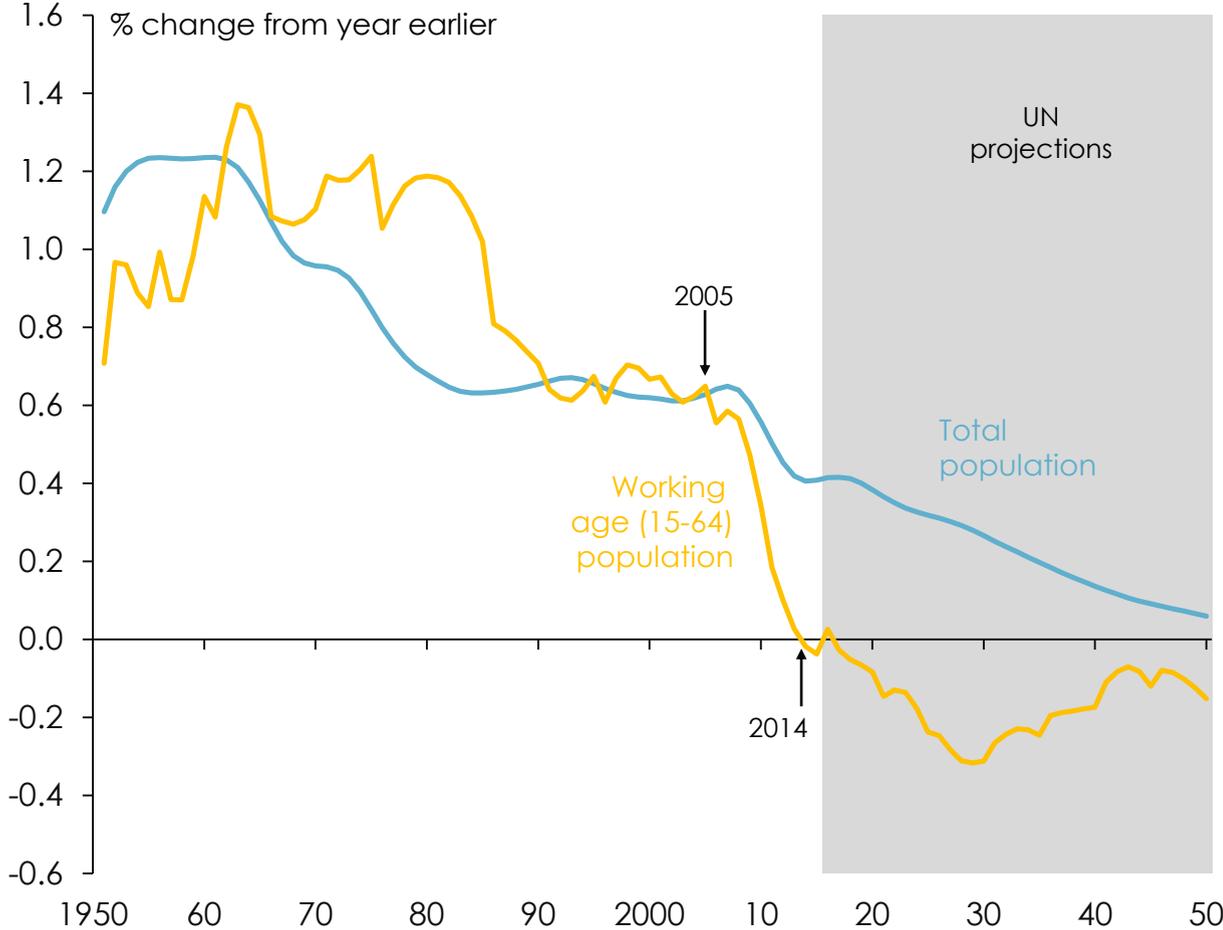


Note: GDP estimates not available for Russia before 1960. Sources: The Conference Board, Total Economy Database, 17th May 2017; Corinna Economic Advisors.

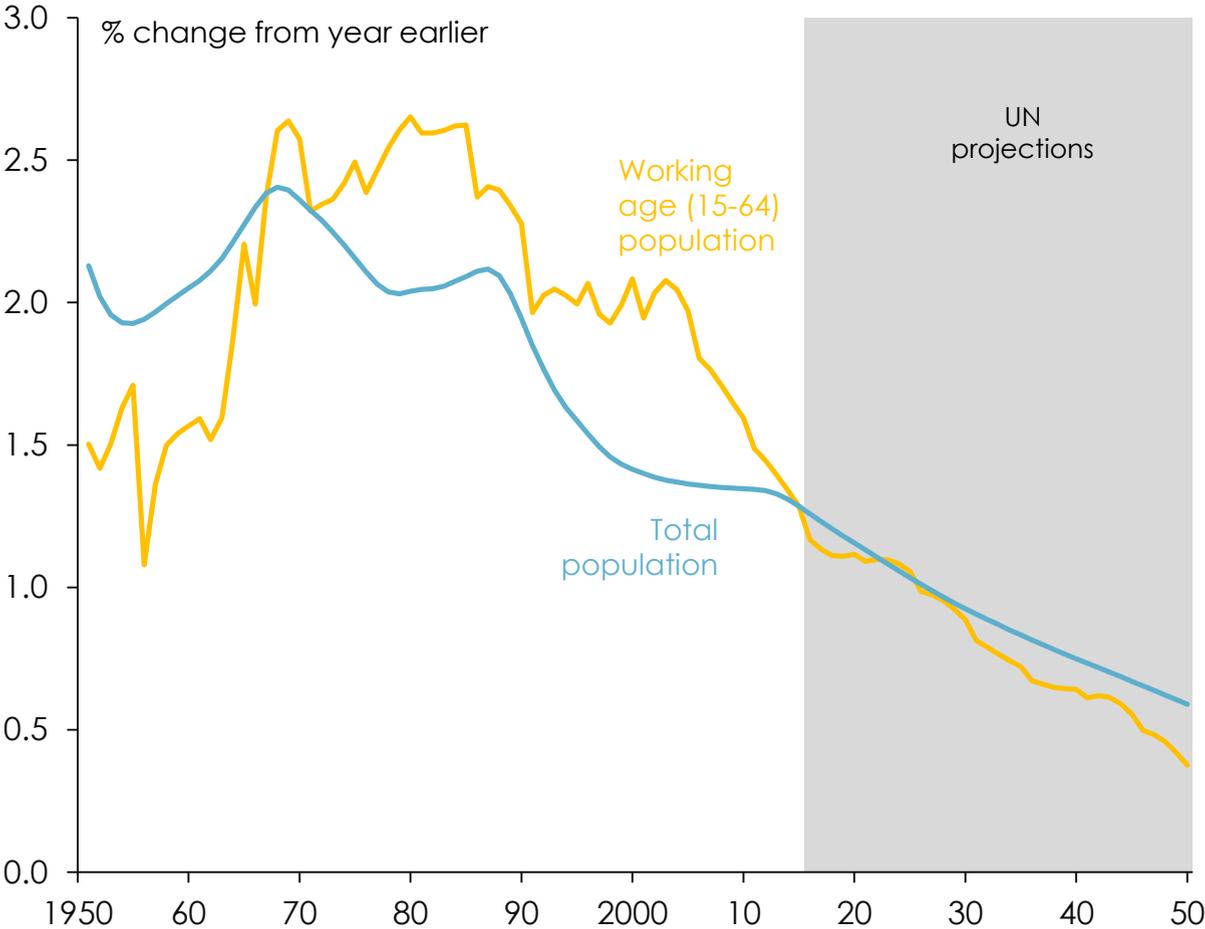
# The growth rate of 'advanced' economies' working-age populations has slowed sharply since just before the financial crisis

## Total vs 'working age' (15-64) populations in 'advanced' and 'emerging' economies, 1950-2050

### 'Advanced' economies



### 'Emerging and developing' economies

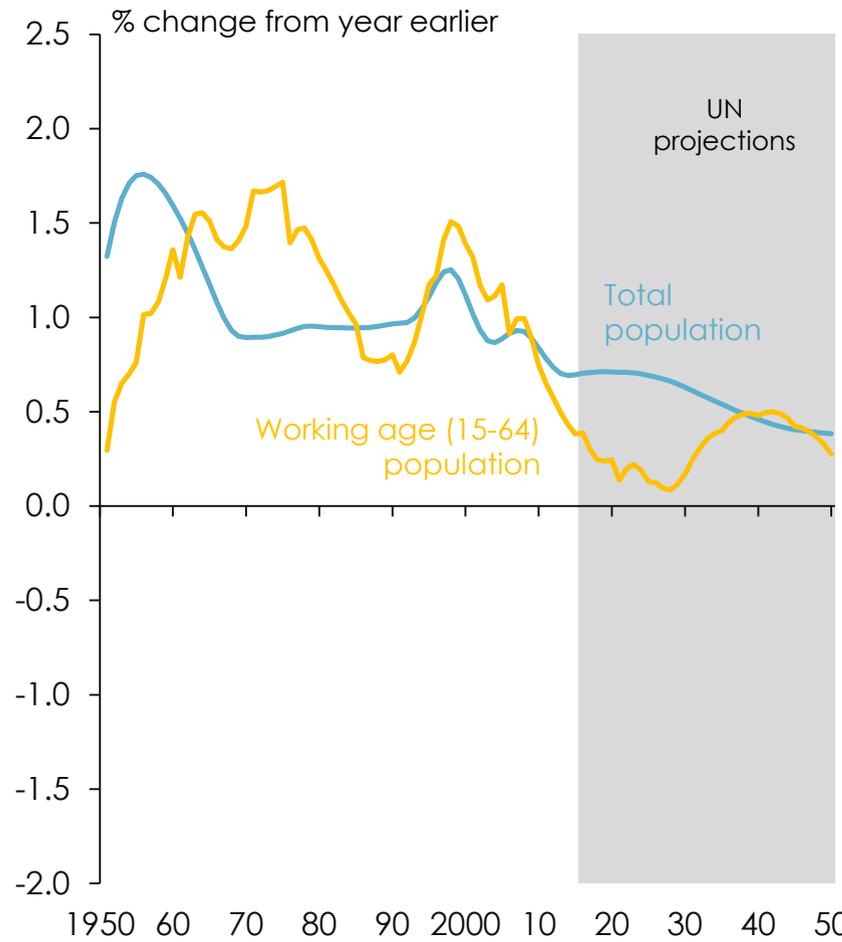


Note: 'Advanced' economies are as defined by the IMF in its *World Economic Outlook* (ie, Australia, Canada, Czech Republic, Denmark, the 19 members of the euro area, Hong Kong, Israel, Japan, Korea, Macao, New Zealand, Norway, Puerto Rico, San Marino, Singapore, Sweden, Switzerland, Taiwan, United Kingdom and United States).  
Sources: United Nations Department of Economic and Social Affairs Population Division, *World Population Prospects 2017*, 21<sup>st</sup> June 2017; Corinna Economic Advisors.

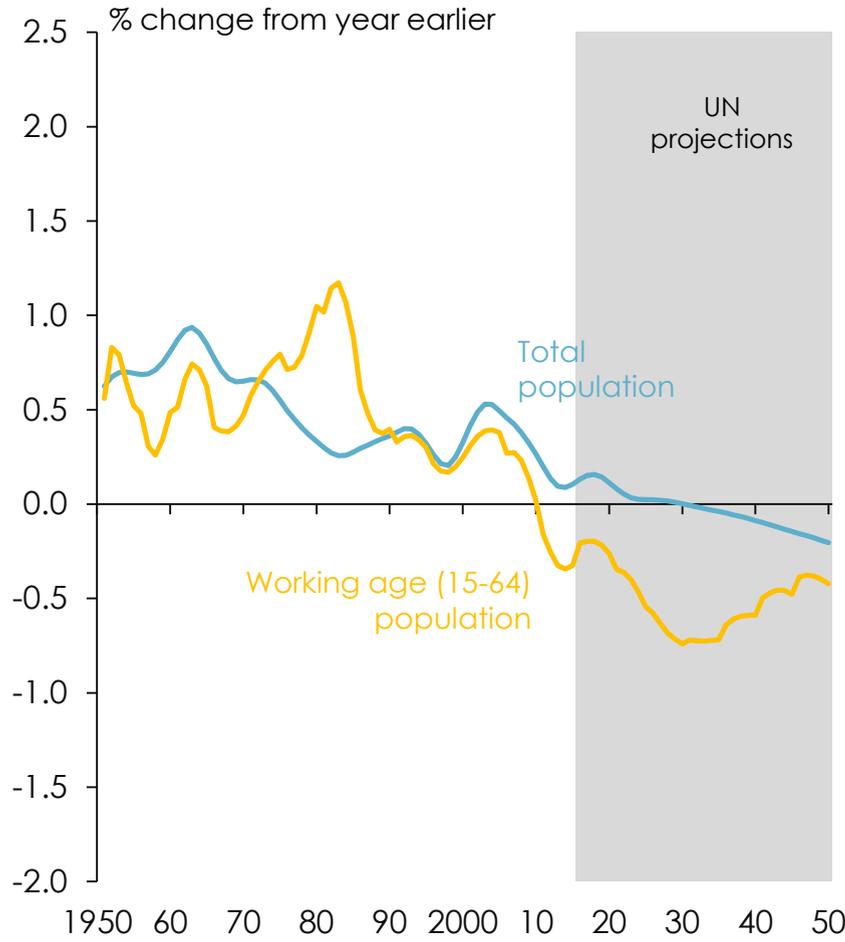
# The working age populations of the euro area and Japan are already declining, while in the US working age population growth has slowed sharply

## Total vs 'working age' (15-64) populations in major 'advanced' economies, 1950-2050

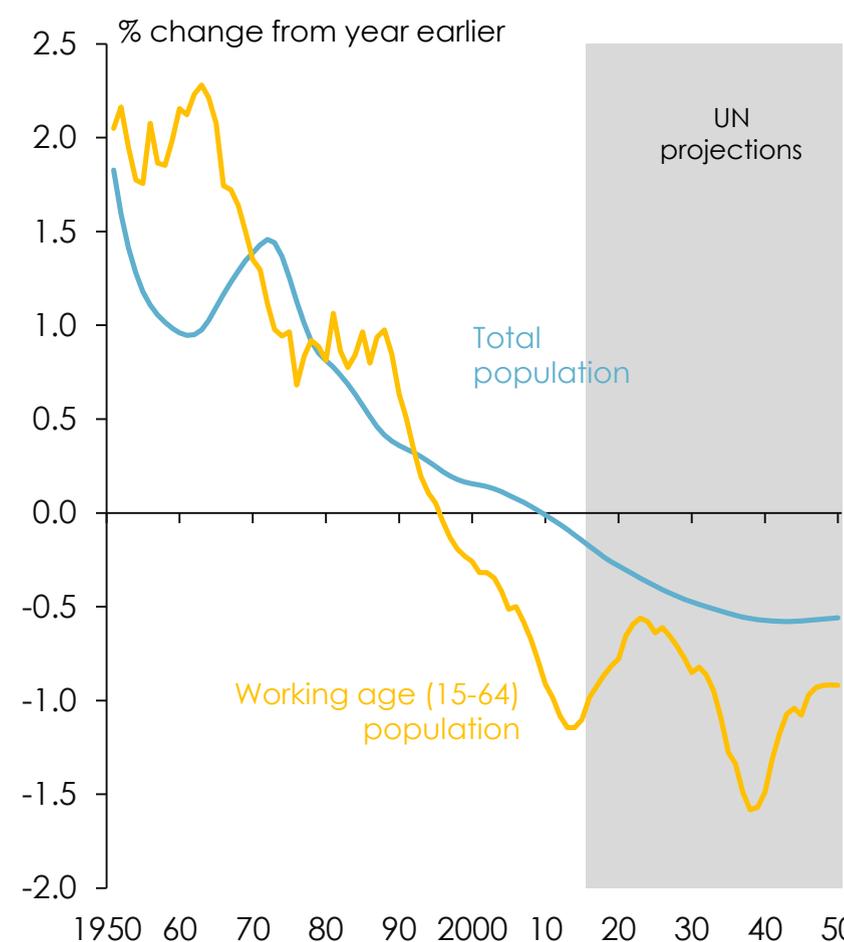
### United States



### Euro area



### Japan

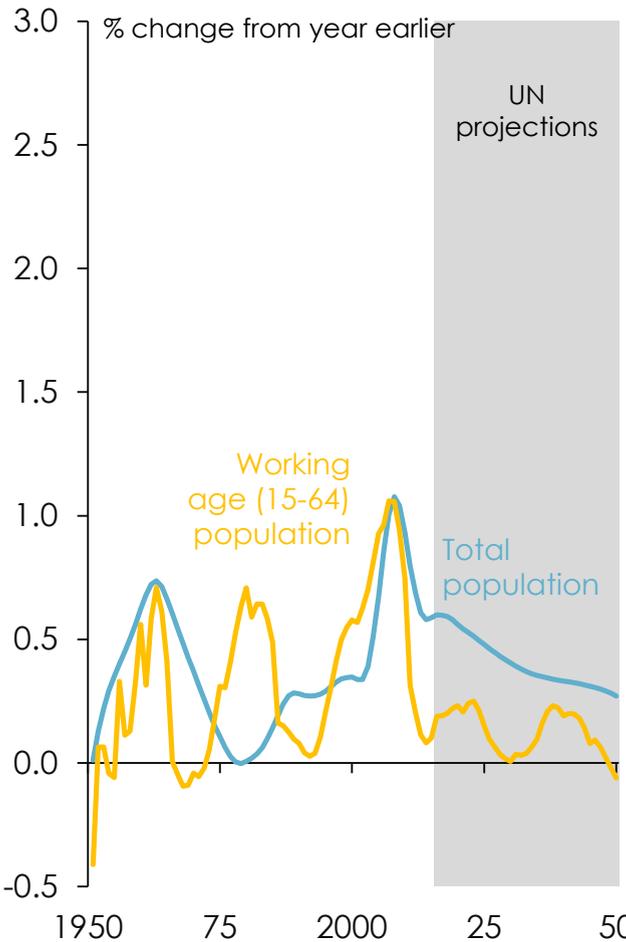


Sources: United Nations Department of Economic and Social Affairs Population Division, *World Population Prospects 2017*, 21<sup>st</sup> June 2017; Corinna Economic Advisors.

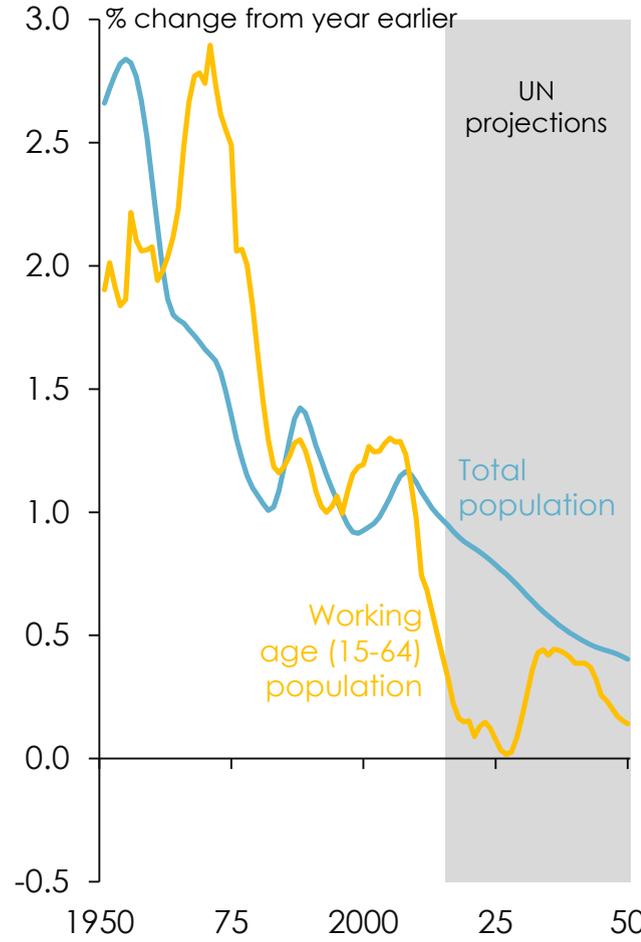
# 'Anglo' countries' immigration programs are mitigating the impact of population ageing – although 'Brexit' may remove that effect for the UK

## Total vs 'working age' populations in 'Anglo' countries, 1950-2050

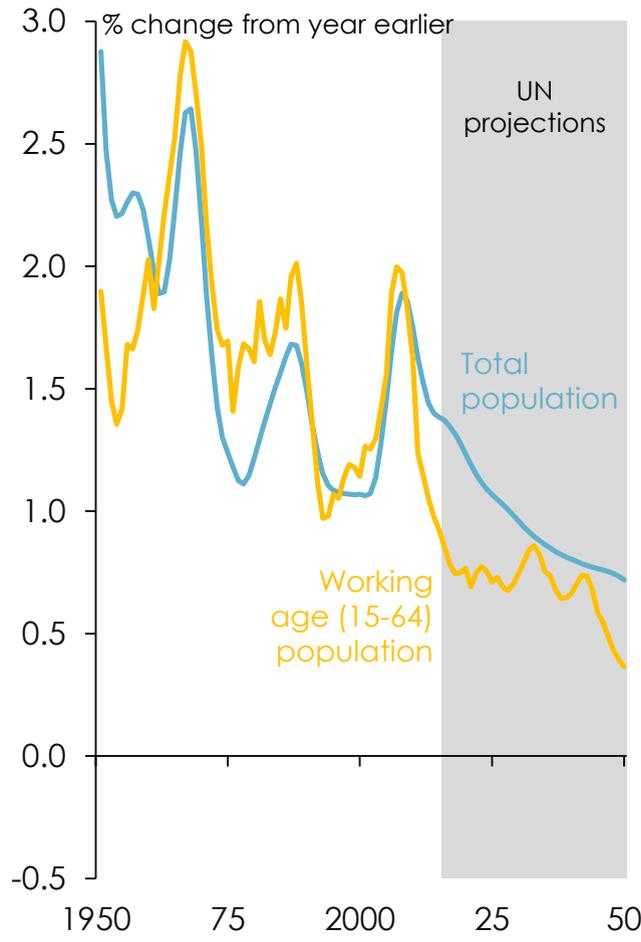
United Kingdom



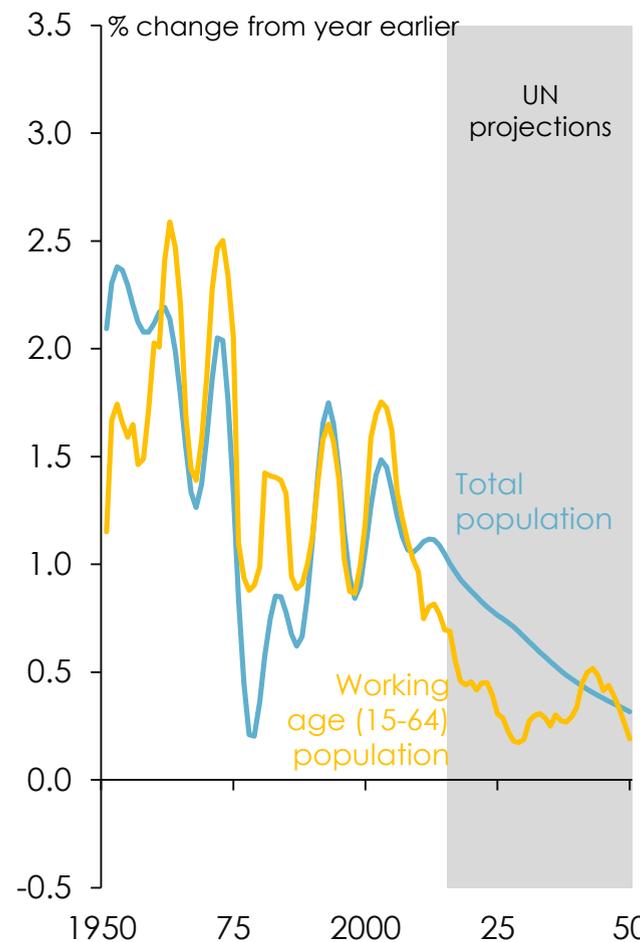
Canada



Australia



New Zealand

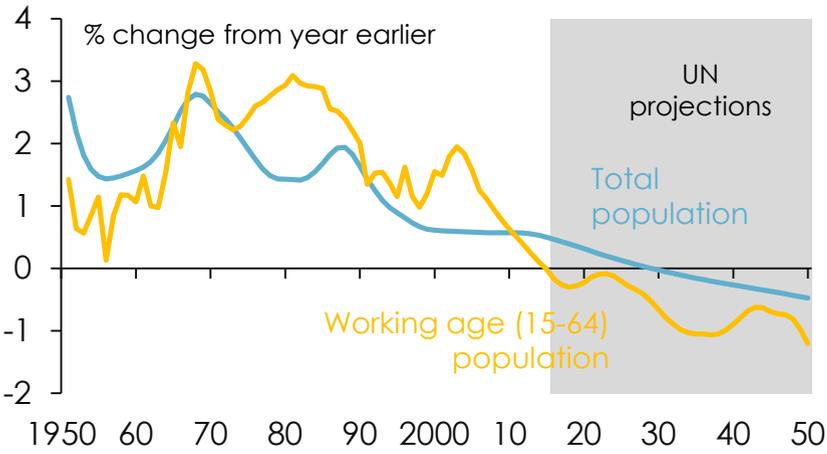


Sources: United Nations Department of Economic and Social Affairs Population Division, *World Population Prospects 2017*, 21<sup>st</sup> June 2017; Corinna Economic Advisors.

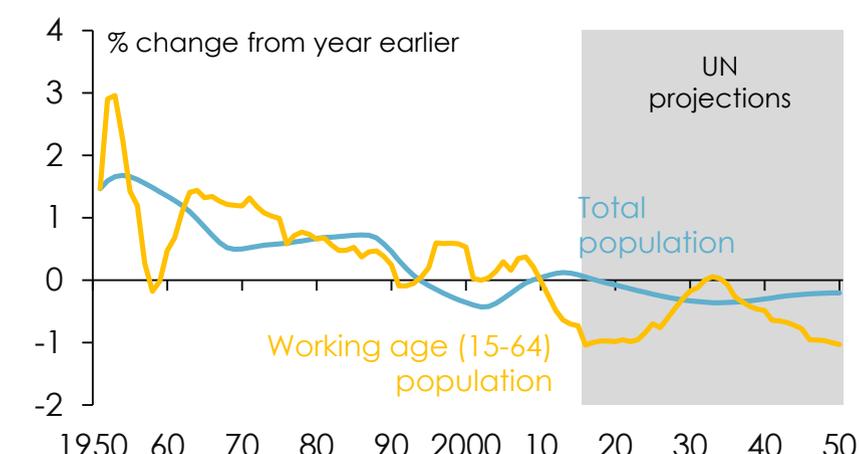
# Demography is a huge challenge for China and Russia – but an advantage for other major ‘emerging’ economies

## Total vs ‘working age’ populations in major ‘emerging’ economies, 1950-2050

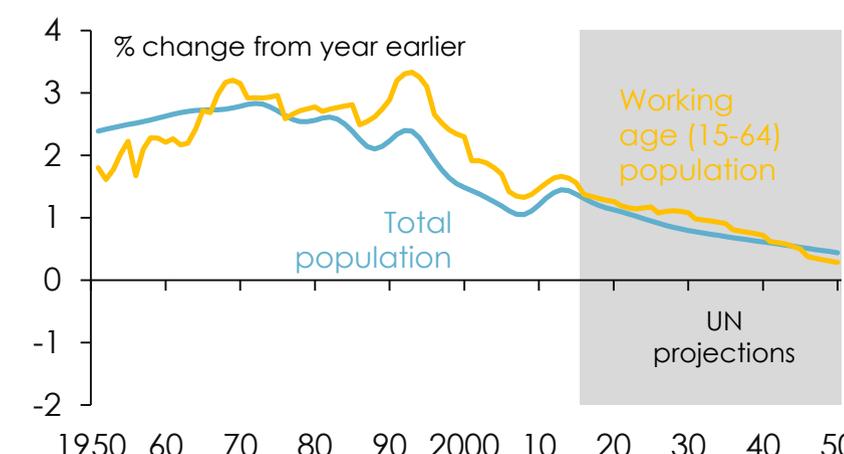
### China



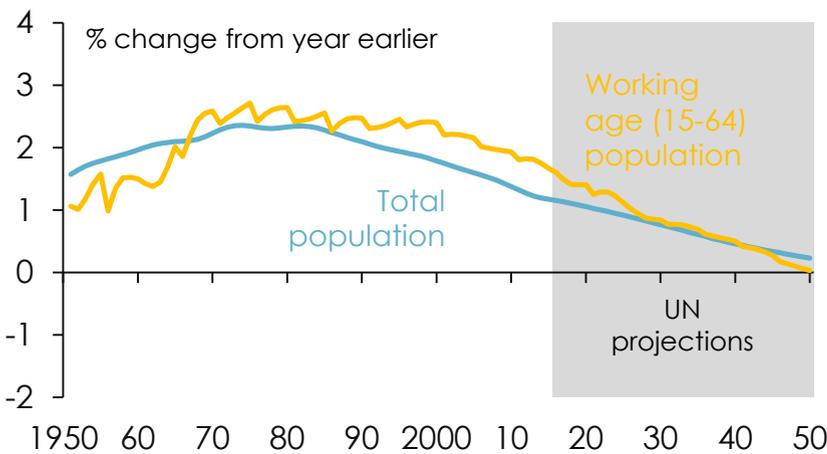
### Russia



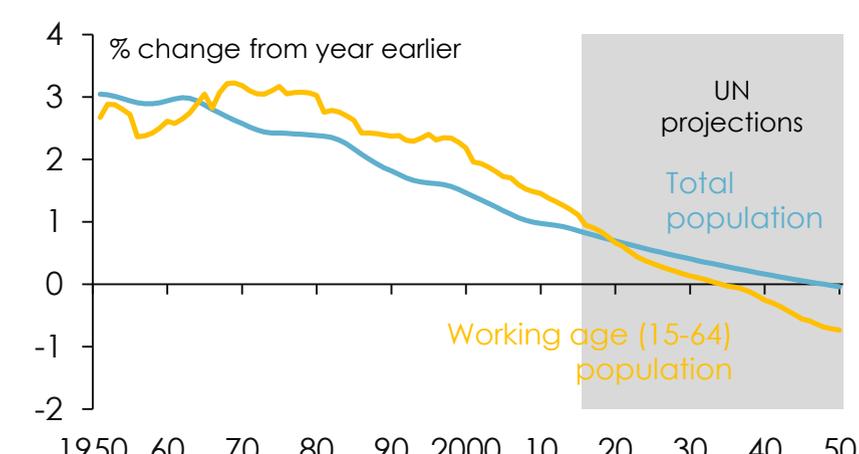
### South Africa



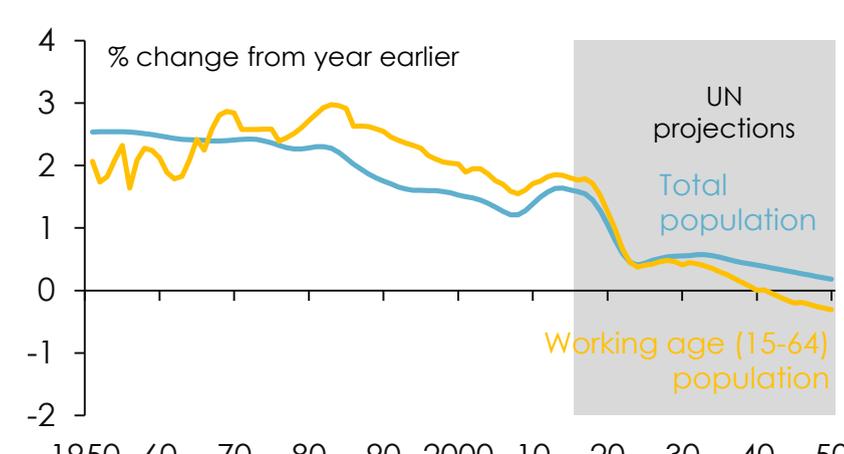
### India



### Brazil



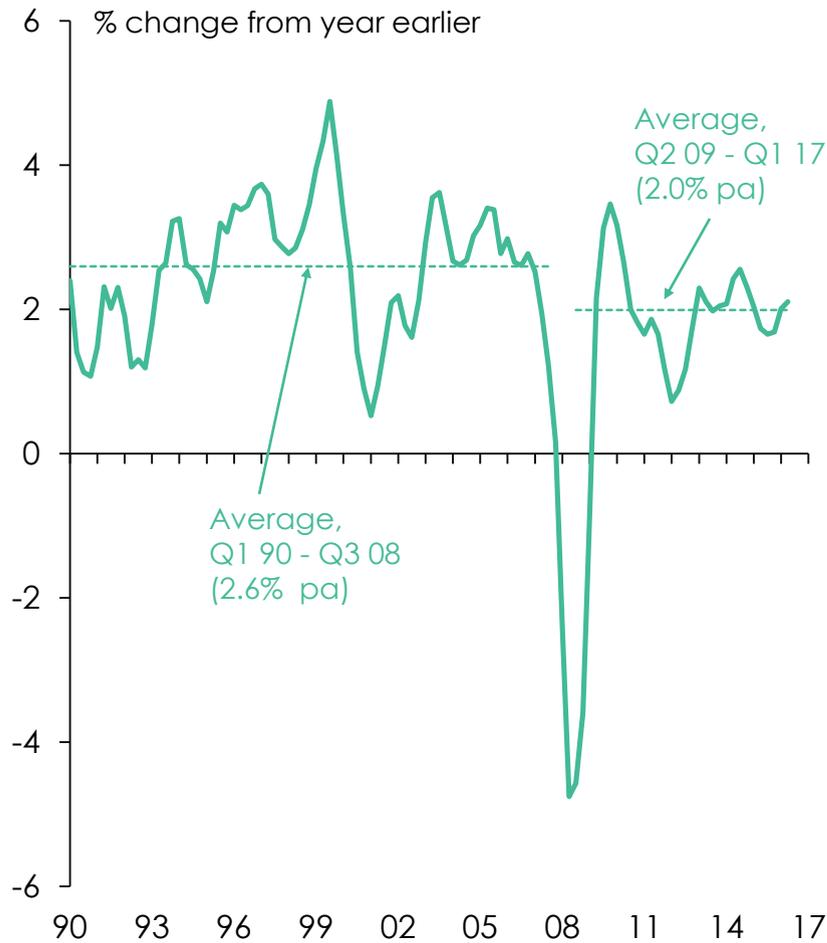
### Turkey



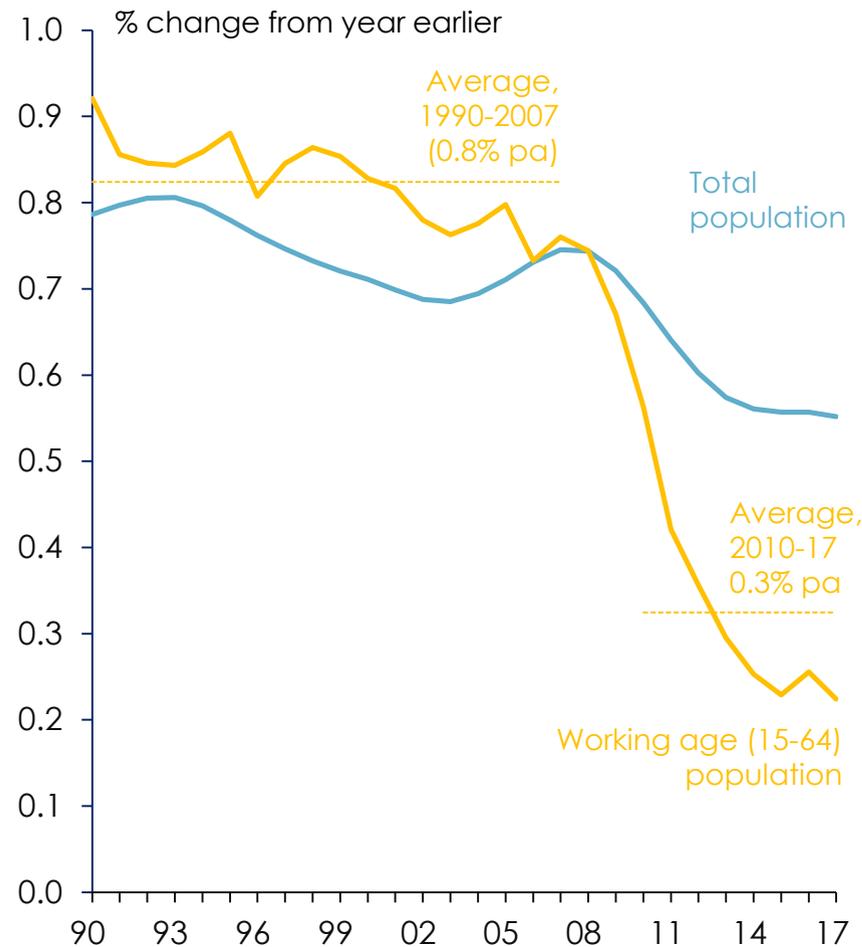
Sources: United Nations Department of Economic and Social Affairs Population Division, *World Population Prospects 2017*, 21<sup>st</sup> June 2017; Corinna Economic Advisors.

# Slower working-age population growth largely explains why OECD unemployment has fallen so quickly despite 'below-trend' GDP growth

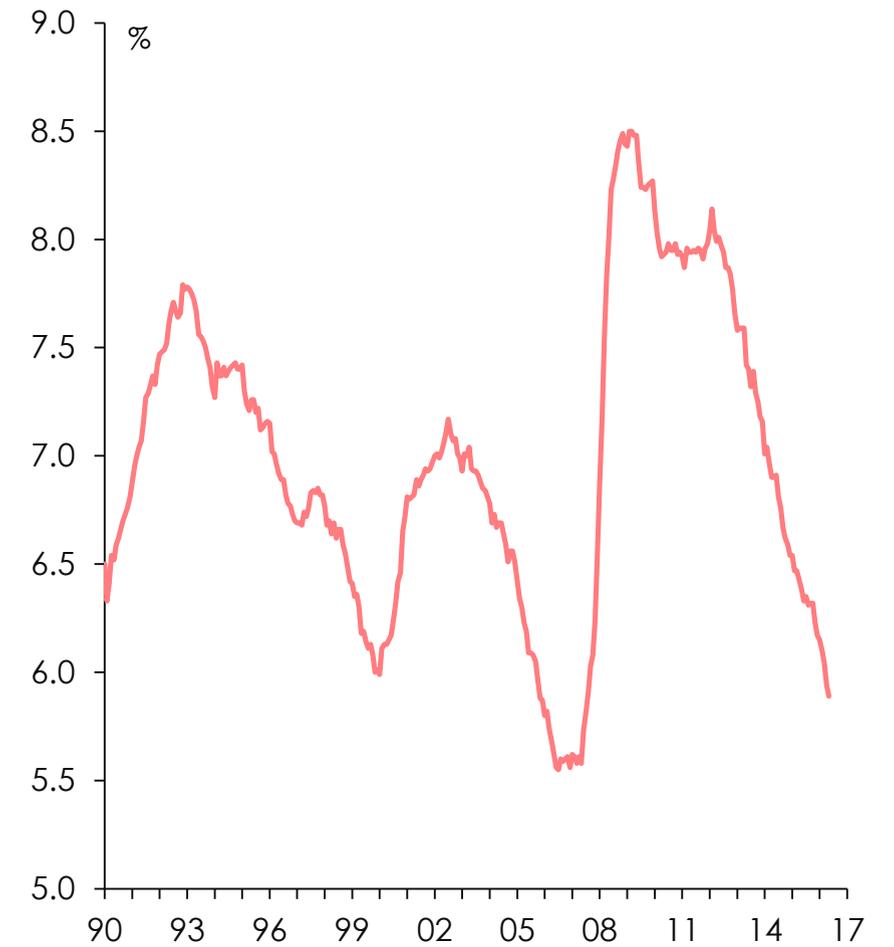
## OECD area real GDP growth



## OECD area population growth



## OECD area unemployment rate

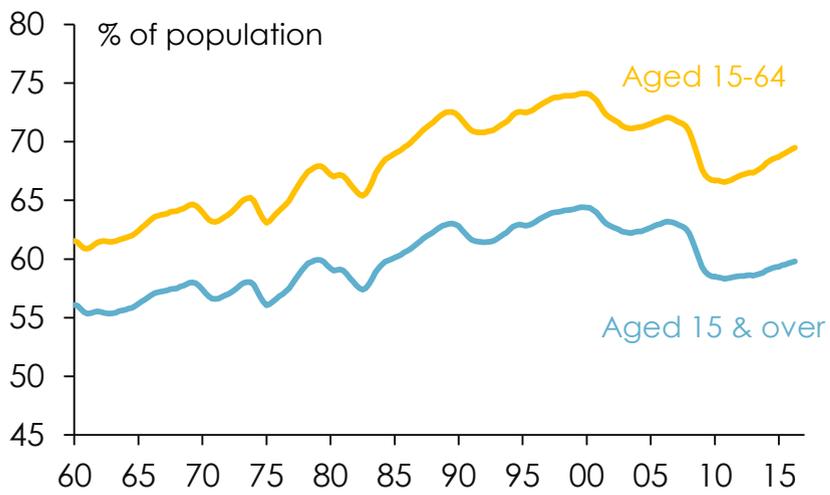


Note: The OECD (Organization for Economic Co-operation & Development) comprises the economies classified as 'advanced' by the IMF, excluding Hong Kong, Lithuania, Macao, Puerto Rico, San Marino, Singapore, Taiwan, plus Chile, Hungary, Mexico, Poland and Turkey.  
 Sources: OECD, *Main Economic Indicators*; UN DESA, *World Population Prospects 2017*; Corinna Economic Advisors.

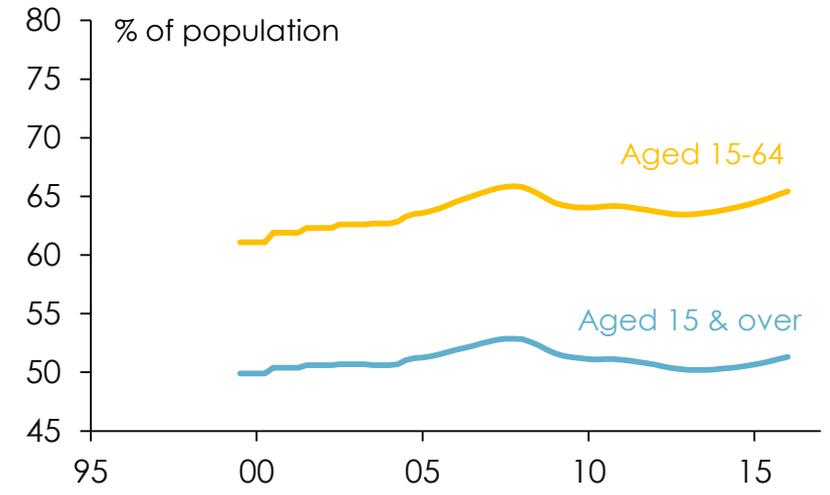
# However this means in, some 'advanced' economies, the scope for further growth in employment is more limited than generally recognized

## Employment as a pc of 'working age' populations in selected 'advanced' economies

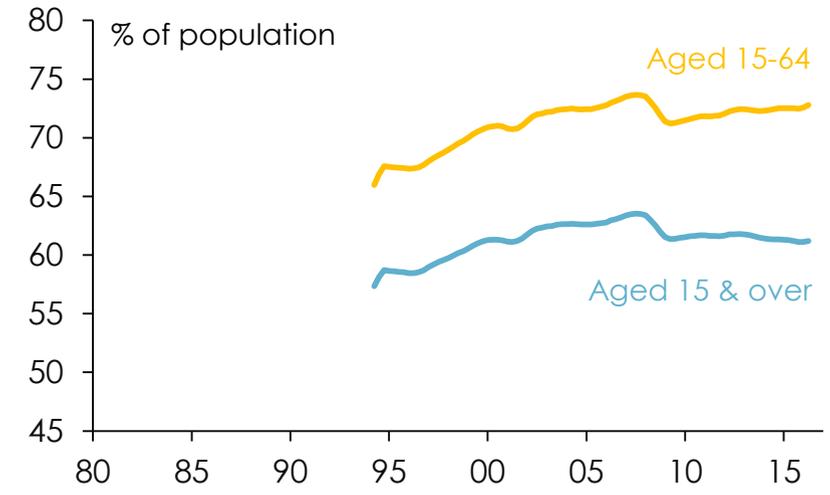
United States



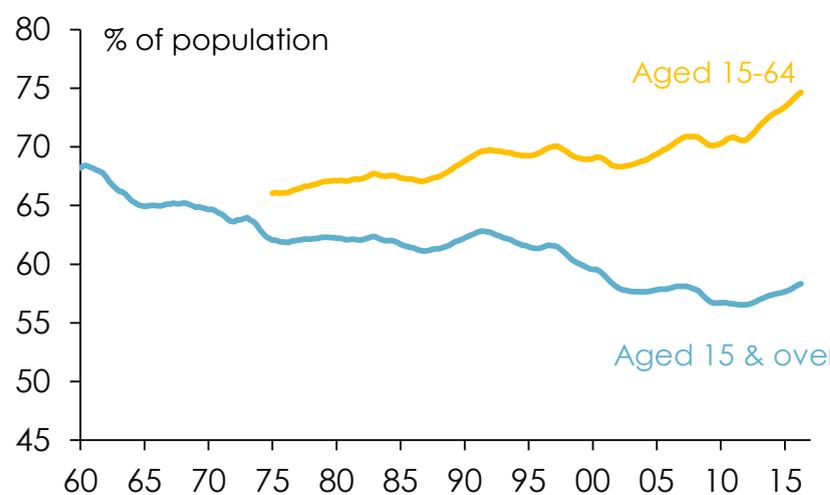
Euro area



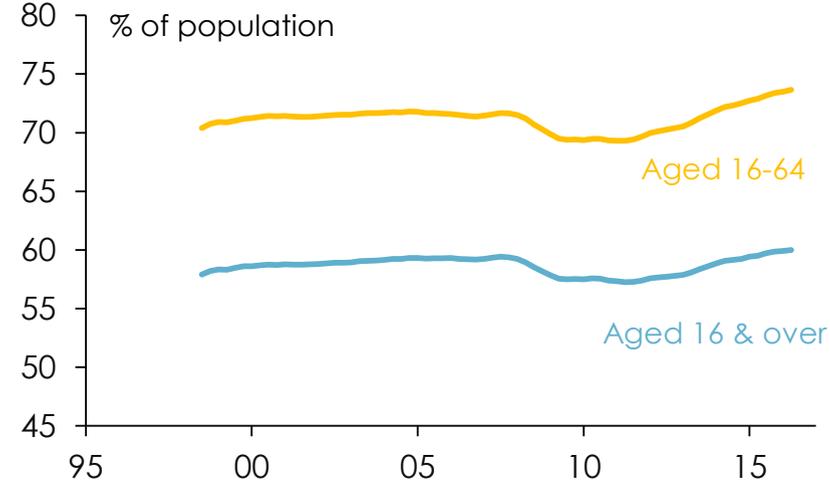
Canada



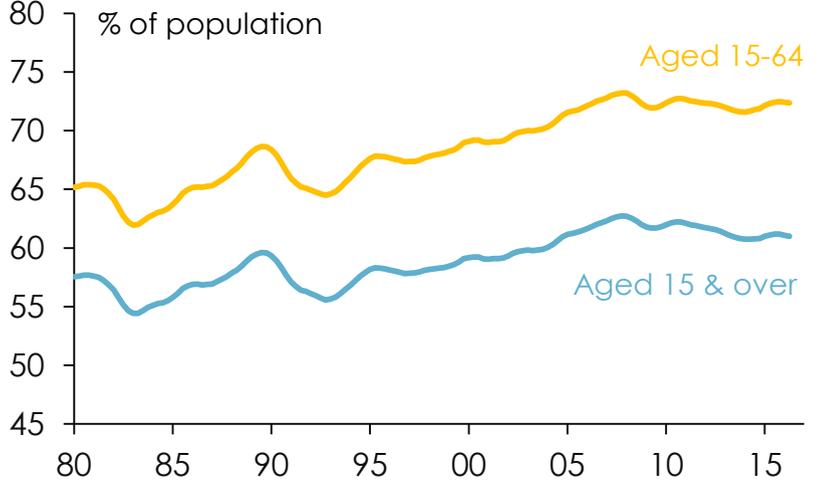
Japan



United Kingdom



Australia

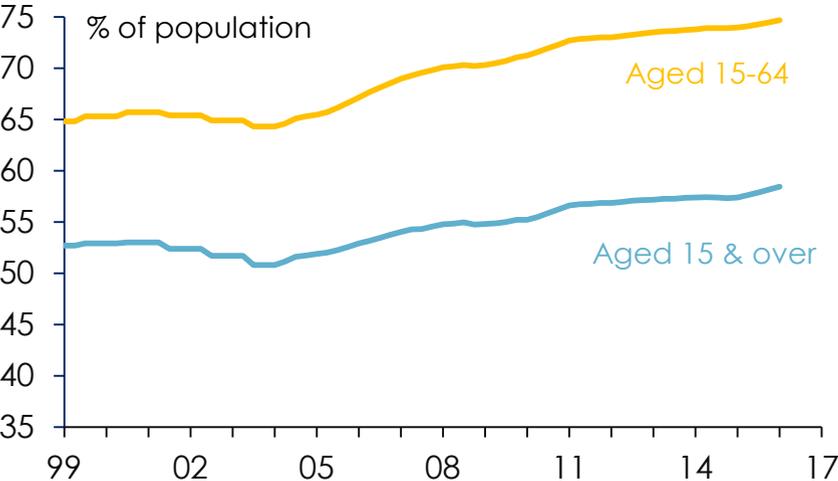


Note: Series expressed as four-quarter moving averages of not-seasonally-adjusted data. Source: OECD, Main Economic Indicators; Thomson Reuters Datastream.

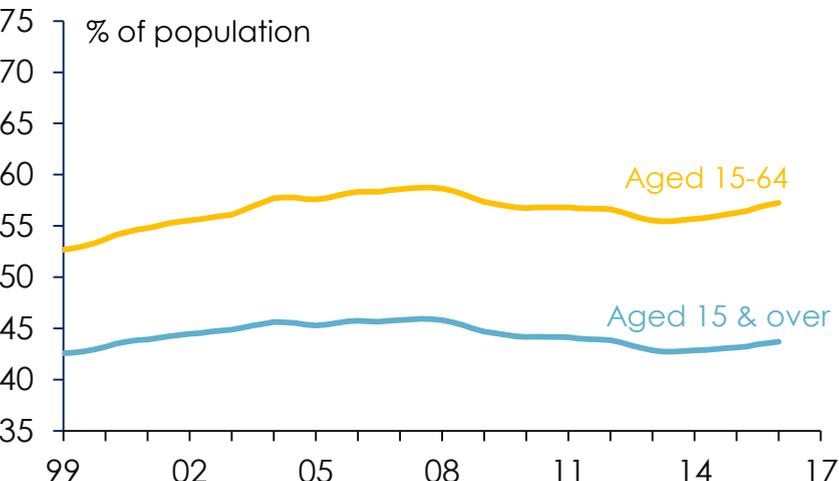
# There is considerable scope – at least in theory – for lifting employment participation in many euro area member countries

## Employment as a pc of 'working age' populations in selected euro area economies

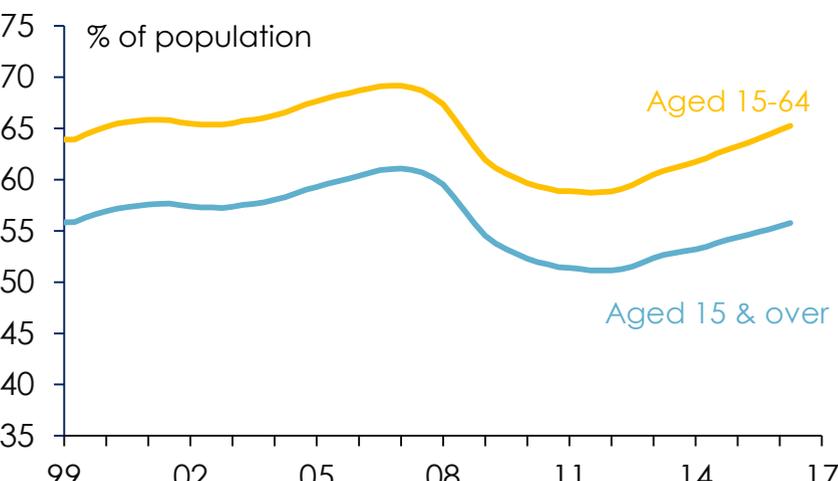
### Germany



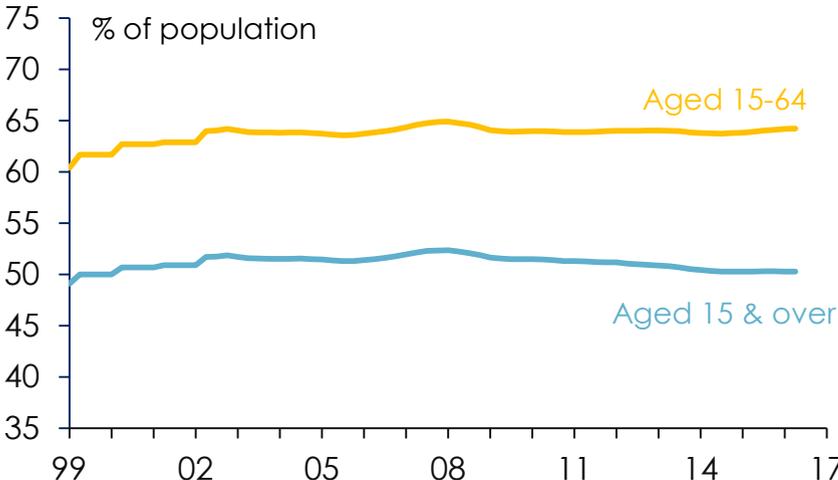
### Italy



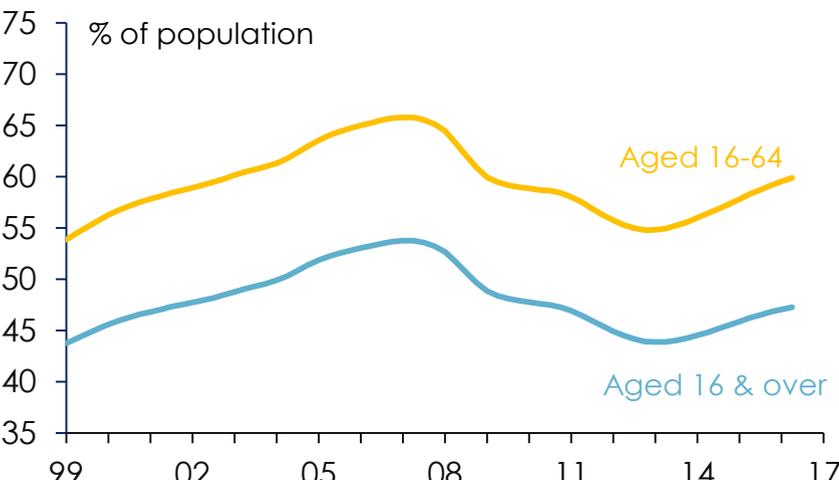
### Ireland



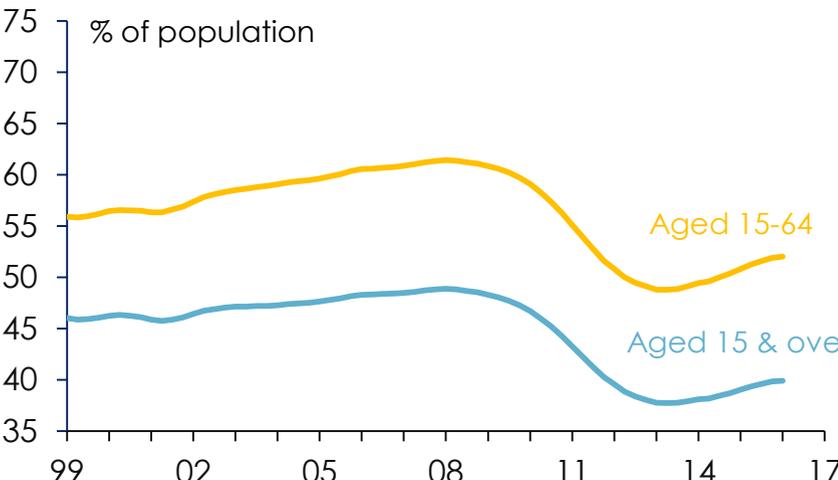
### France



### Spain



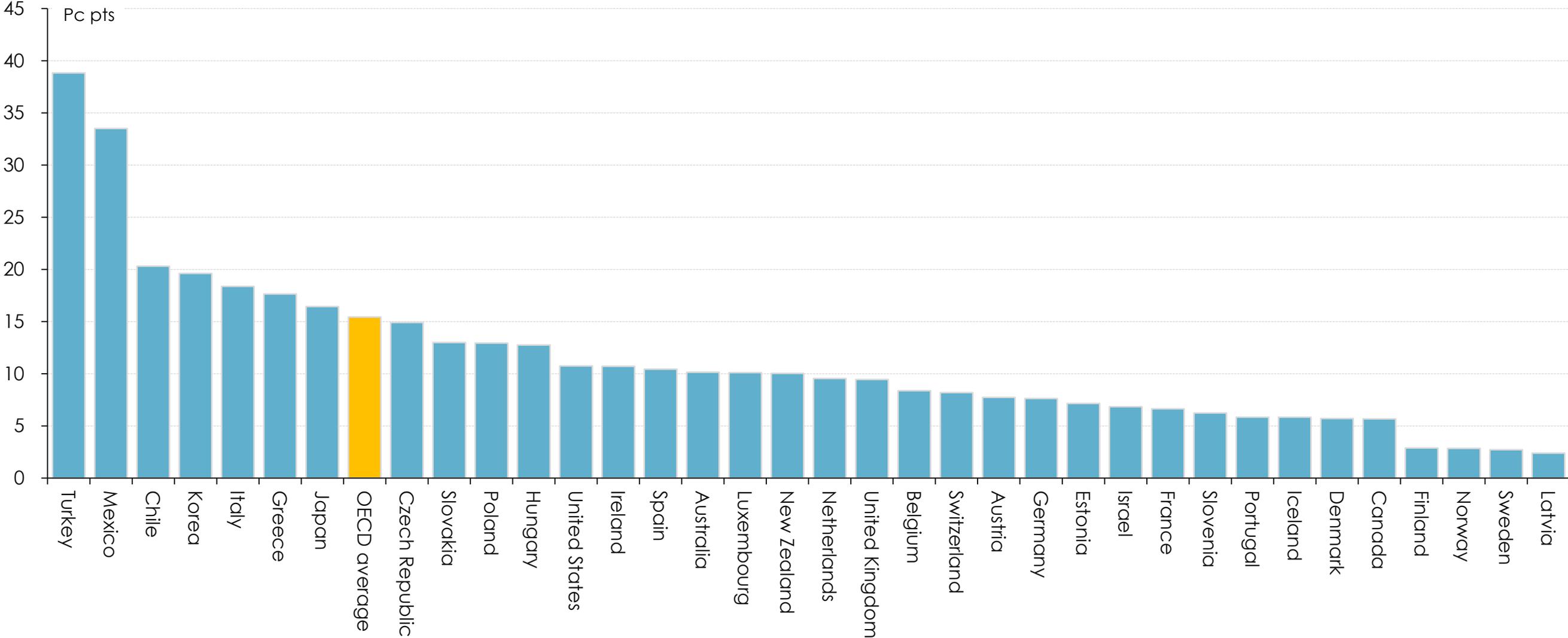
### Greece



Note: Series expressed as four-quarter moving averages of not-seasonally-adjusted data. Source: OECD, Main Economic Indicators; Thomson Reuters Datastream.

# Many OECD countries have considerable scope to lift female employment participation rates

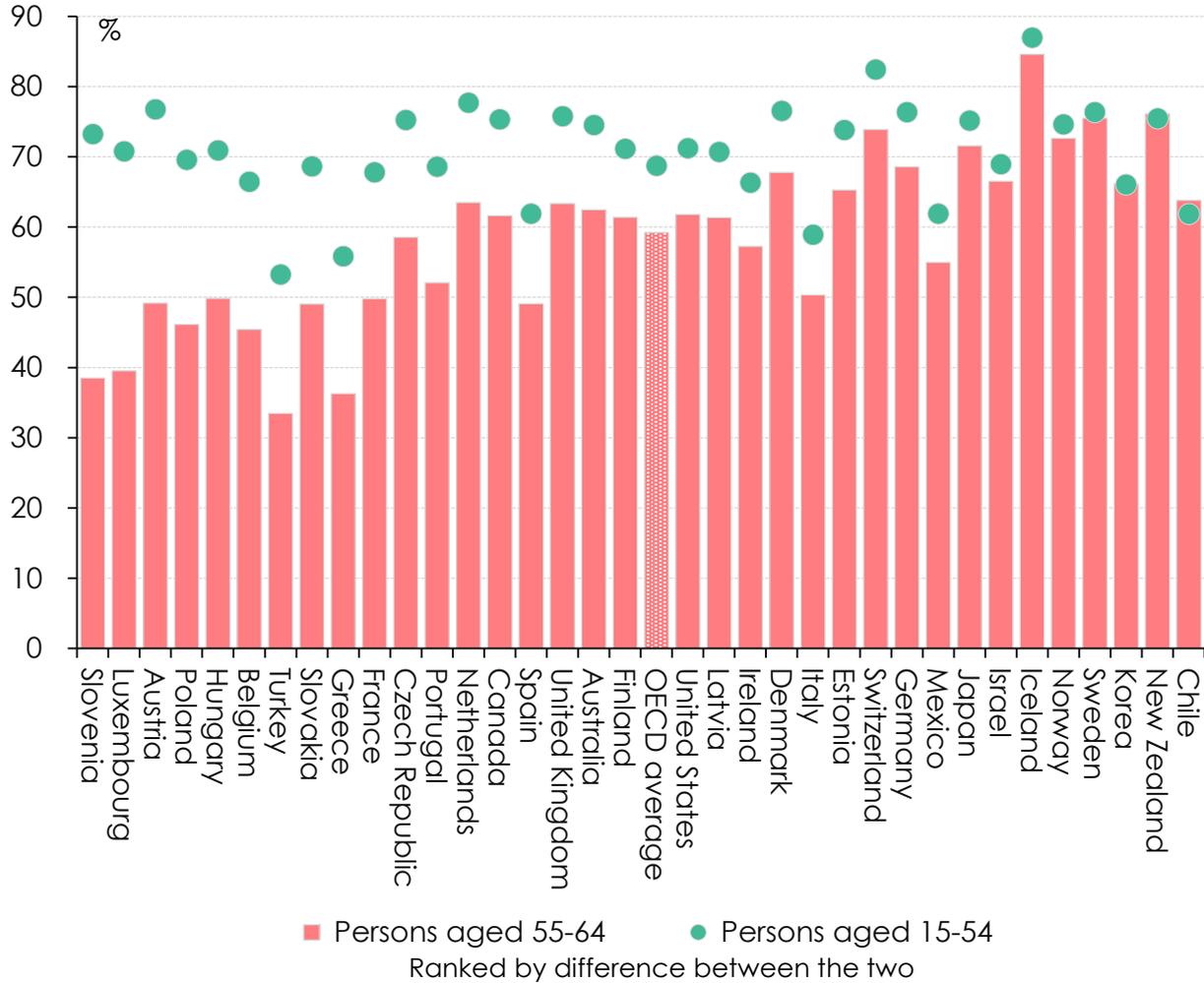
## 'Gender gap' in 15-64yo employment rates, OECD countries, 2016



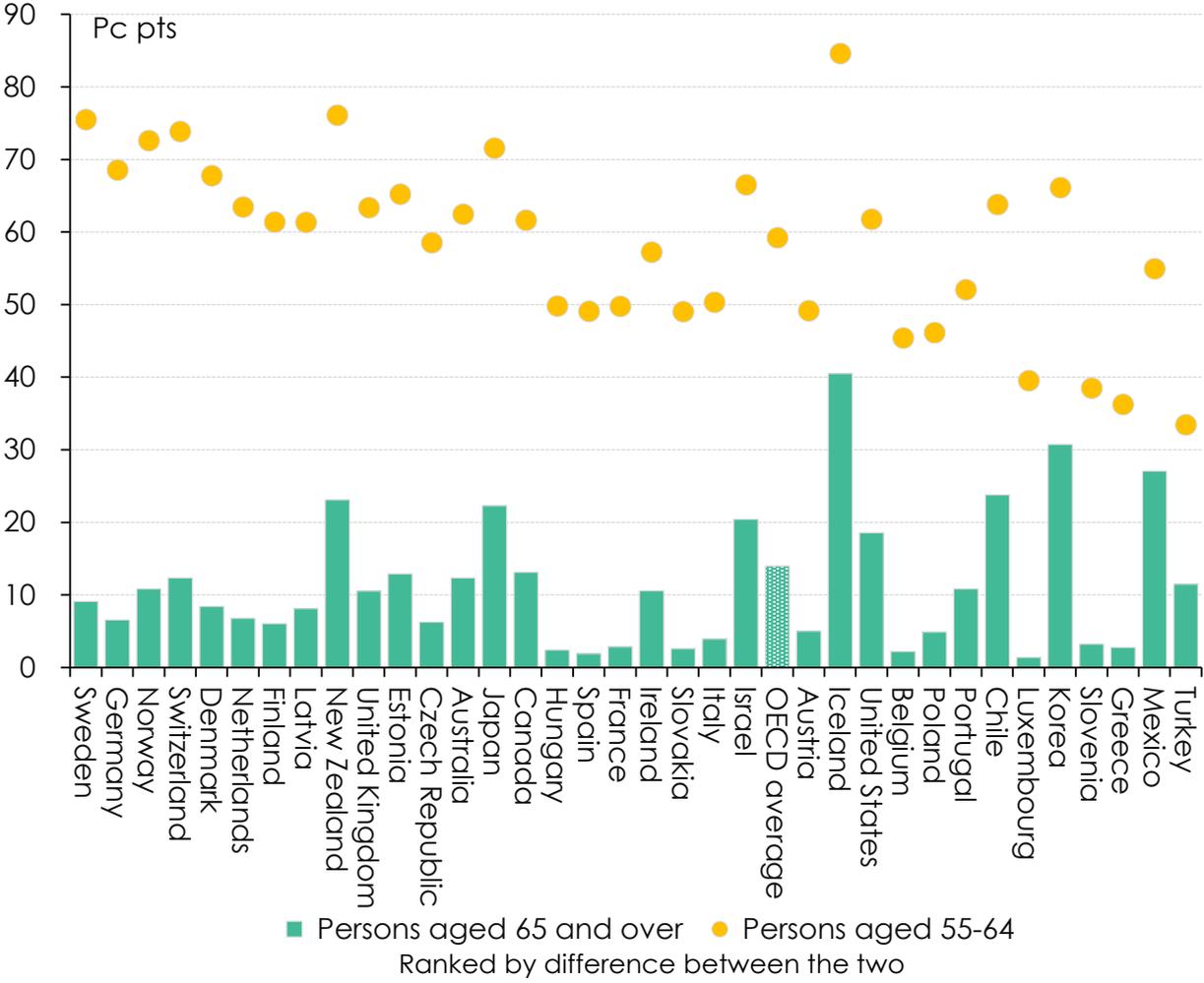
Note: Chart shows the difference in employment-population ratios between men and women aged 15-64. Source: OECD.Stat, Main Economic Indicators.

# Some OECD countries could also potentially lift overall employment rates by reducing barriers or disincentives to employment of older people

## Employment rates of 55-64 year olds compared with 15-54 year olds, 2016



## Employment rates of persons aged 65 and over compared with 55-64 year olds, 2016

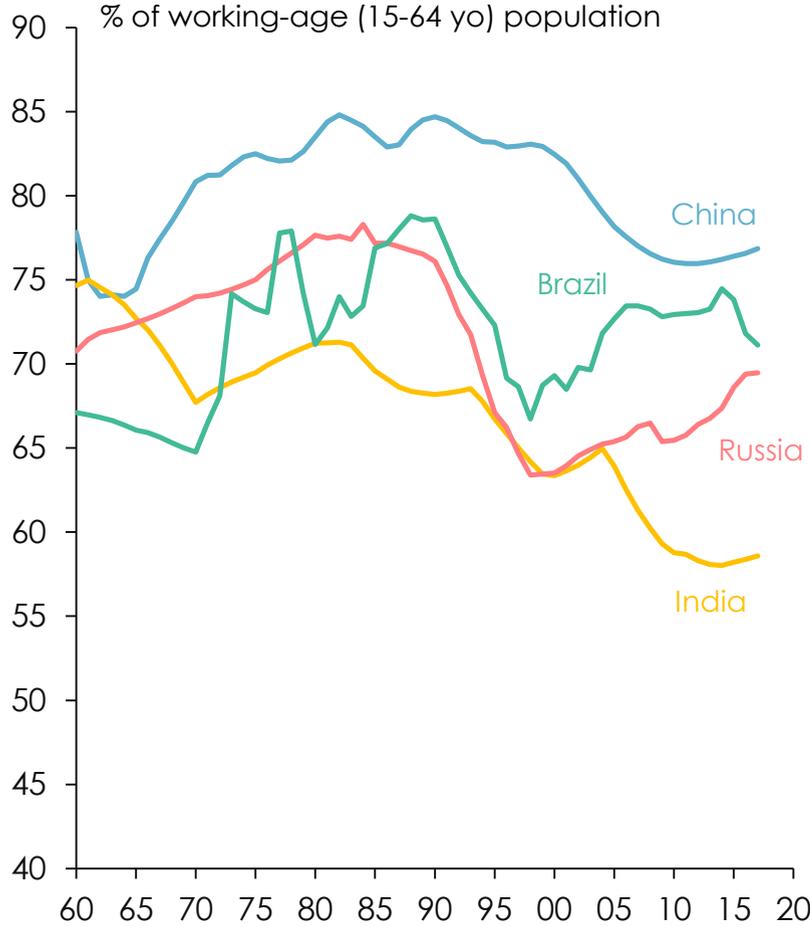


Source: OECD.Stat, Main Economic Indicators.

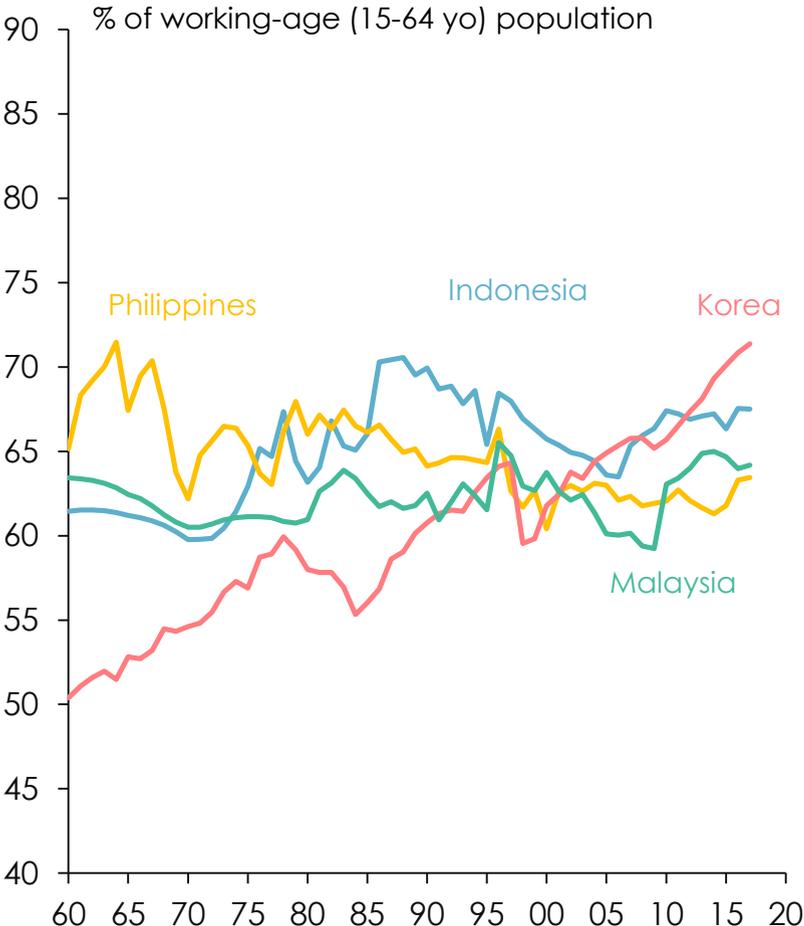
# China's 'employment rate' is declining (from a relatively high level); most other emerging economies have scope to lift participation in employment

## Employment as a pc of 15-64yo populations in selected 'emerging' economies, 1960-2016

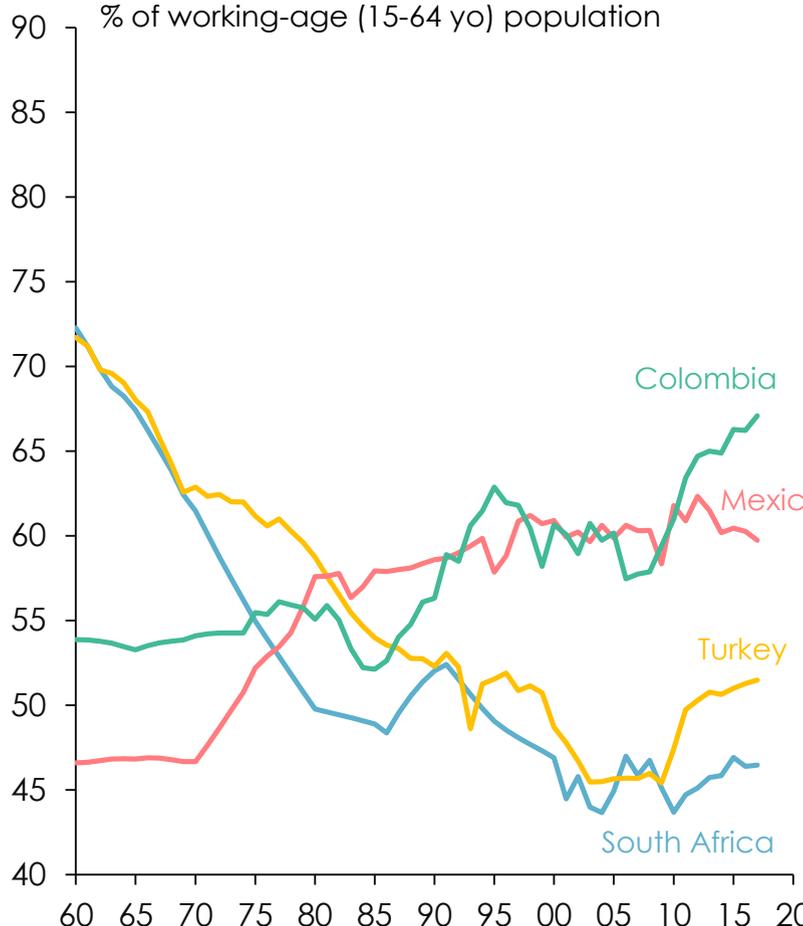
### BRICs



### Other Asian economies



### Other 'emerging' economies

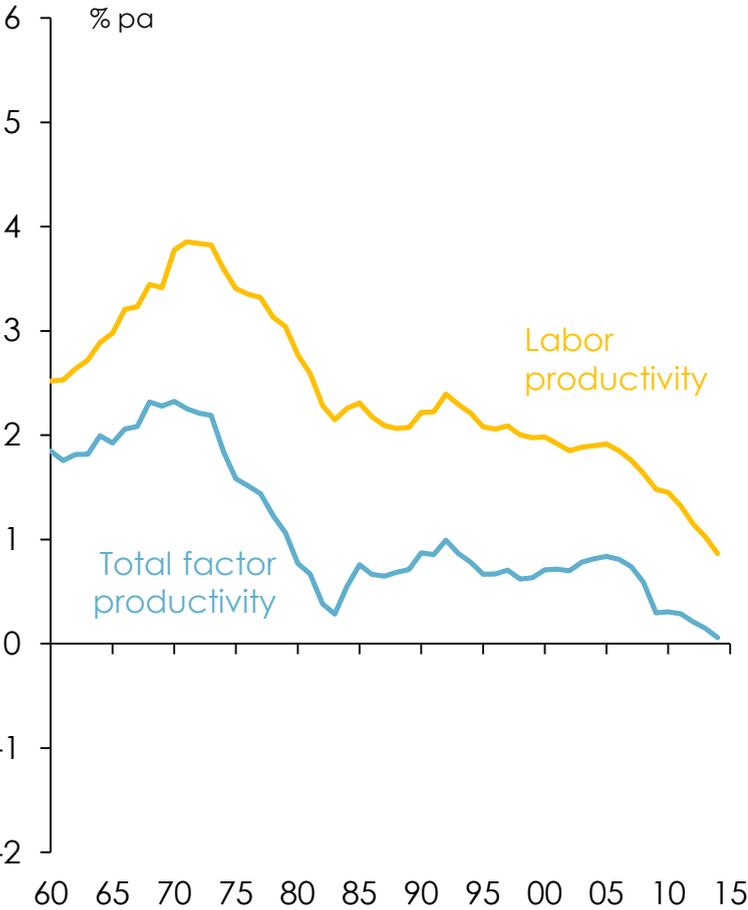


Note: 'Employment' includes people of all ages (including those aged 65 and over), so the 'employment rate' may be overstated to a small extent in countries where a relatively large number of people work past the age of 64. Sources: The Conference Board, *Total Economy Database*, May 2017; United Nations Department of Economic and Social Affairs Population Division, *World Population Prospects 2017*, June 2017; Corinna Economic Advisors.

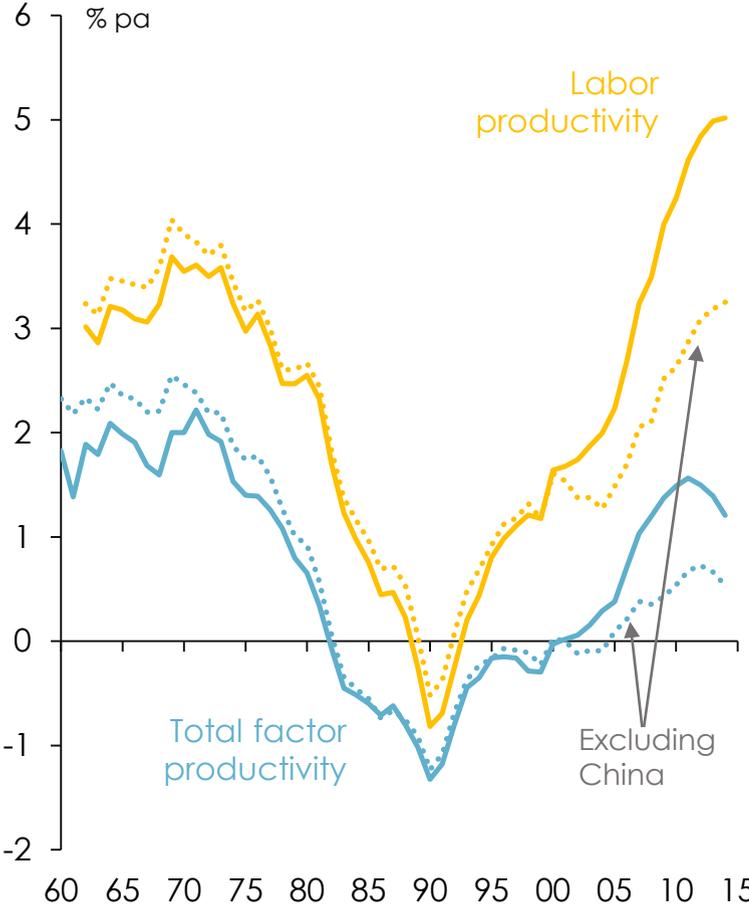
# Labour productivity growth has been slowing for some time in 'advanced' economies – and TFP growth has slowed everywhere since the financial crisis

## Labour and total factor productivity growth rates over rolling 10-year periods

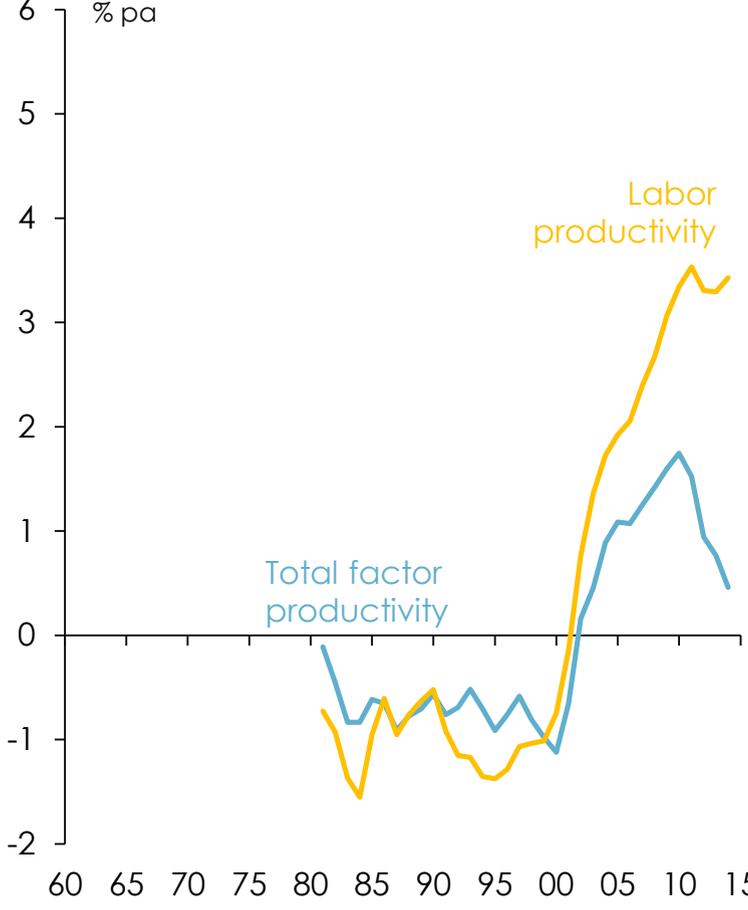
### 'Advanced' economies



### 'Emerging market' economies



### Low-income countries

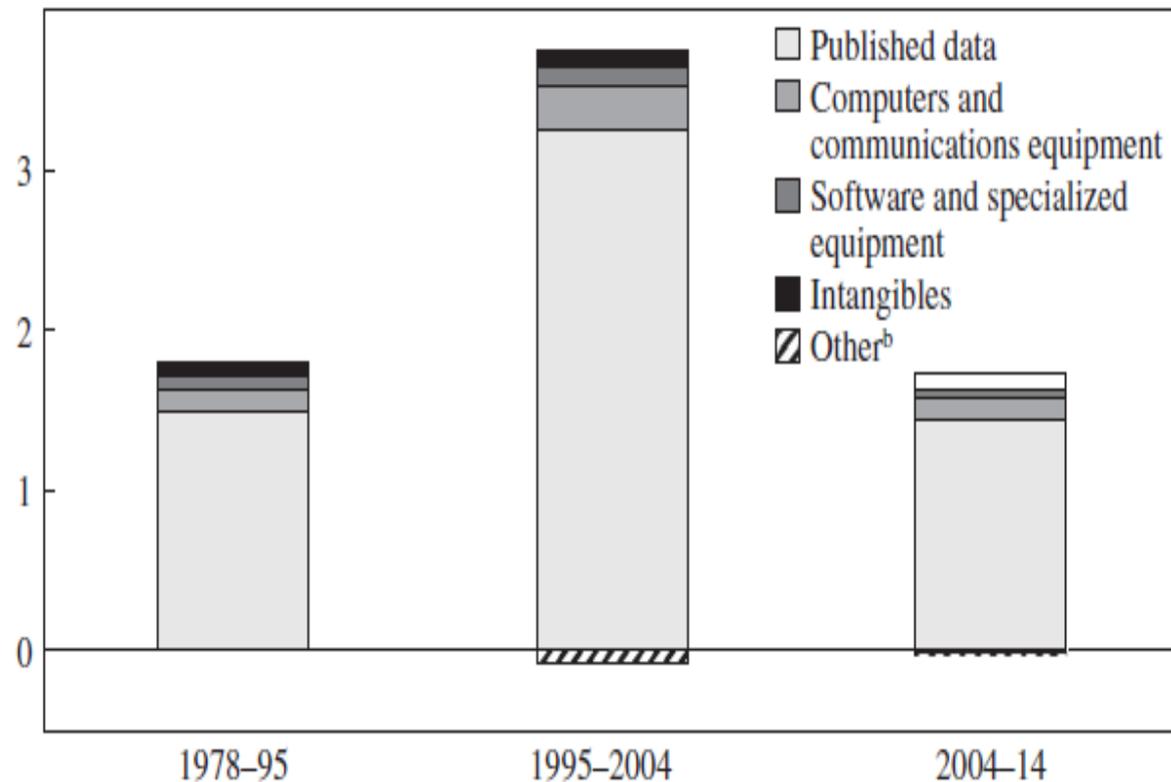


Note: Series shown are PPP GDP weighted averages of largest 20 economies in each country group. Source: Gustavo Adler et al., *Gone with the Headwinds: Global Productivity*, IMF Staff Discussion Note 17/04, April 2017.

# The productivity slowdown in 'advanced' economies isn't due to mis-measurement of the effects of innovations in IT and other areas

## Published and adjusted data on US labour productivity

Percentage points



- ❑ There's little doubt that the deflators used in the estimation of real GDP fail to capture the full extent of price declines for ICT equipment
- ❑ Byrne et al (2016) find that the measurement errors in ICT equipment deflators and software are larger for the period 2004-14 than for 1995-2004, but that the weight of those deflators in GDP has declined because ICT equipment production has moved offshore
- ❑ Hence mismeasurement of these prices has resulted in understatement of US labour productivity growth by 0.24 pc pts pa in 2004-14, as against 0.38pc pts pa in 1995-2004
- ❑ Including similar adjustments for mis-measurement of internet access and e-commerce, 'fracking' unmeasured investment in intangibles, and input price declines from 'off-shoring', Byrne et al estimate the total understatement of labour productivity growth to have been 0.37 pc pts pa in 2004-14, compared with 0.41 pc pts pa in 1995-2004

Source: David Byrne, John Fernald & Marshall Reinsdorf, 'Does the United States Have a Productivity Slowdown or a Measurement Problem', *Brookings Papers on Economic Activity*, Spring 2016, pp. 109-157.

# Plausible explanations for the slowdown in productivity growth

## ❑ **Slowing rate of growth of human capital accumulation**

- primarily an issue in 'advanced' economies
- may be exacerbated by population ageing

## ❑ **Slowing pace of innovation at the 'technological frontier'**

- in both ICT and non-ICT sectors
- apparent before the financial crisis but may have been exacerbated by persistent weakness in business investment since the crisis

## ❑ **Mis-allocation of capital during the pre-crisis credit boom, and also after the crisis**

## ❑ **Slower diffusion of productivity enhancements from 'frontier' to laggard firms and sectors**

- may be a result of increasing industry concentration and loss of business dynamism

## ❑ **Inadequate public investment in infrastructure**

- failure to maintain capacity of transport, energy, health and social infrastructure, etc., to cope with growth in population and economic activity leading to congestion, delay, waste of time and other resources all detracting from productivity

## ❑ **Slower growth in world trade**

- diminished impetus to pursuit of higher productivity from foreign competition

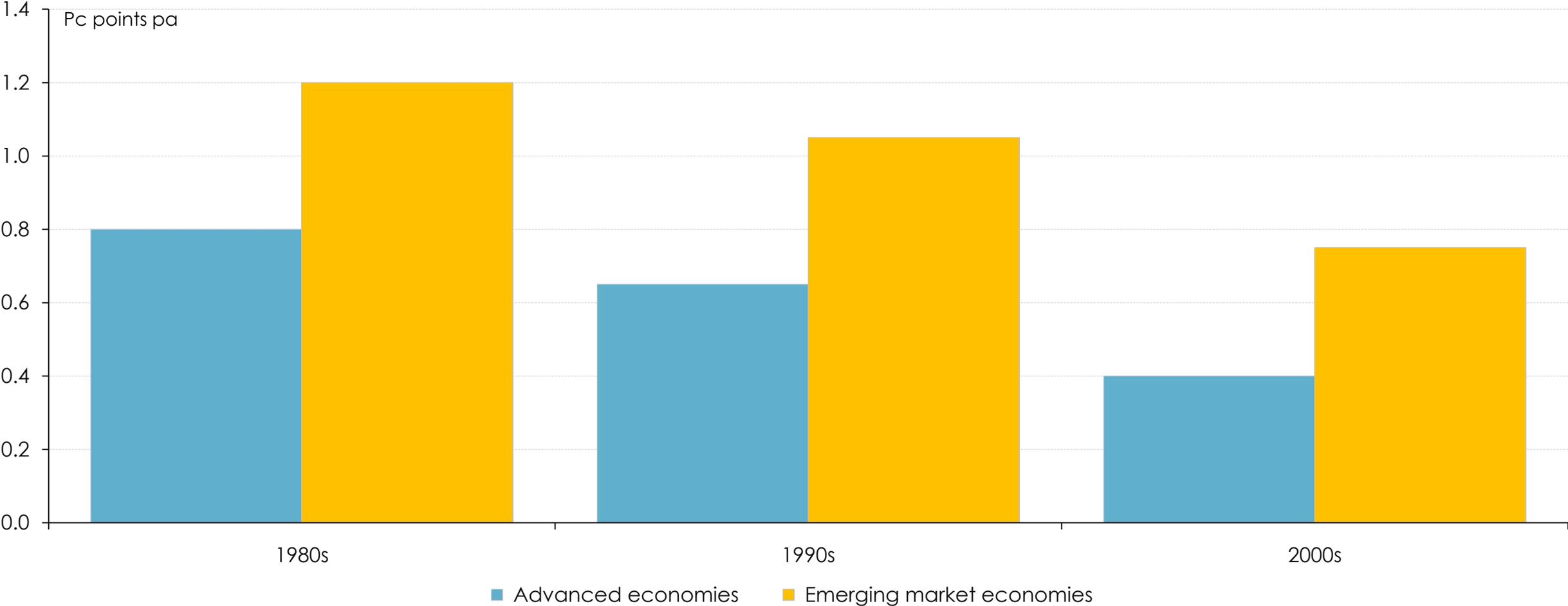
## ❑ **Fading structural reform efforts**

## ❑ **The quest for 'security'**

- diversion of labour and capital to activities that don't add to GDP, and which consume time that might otherwise have been more productively used – for limited gains in terms of 'security'

# The contribution of human capital to labour productivity growth has been declining

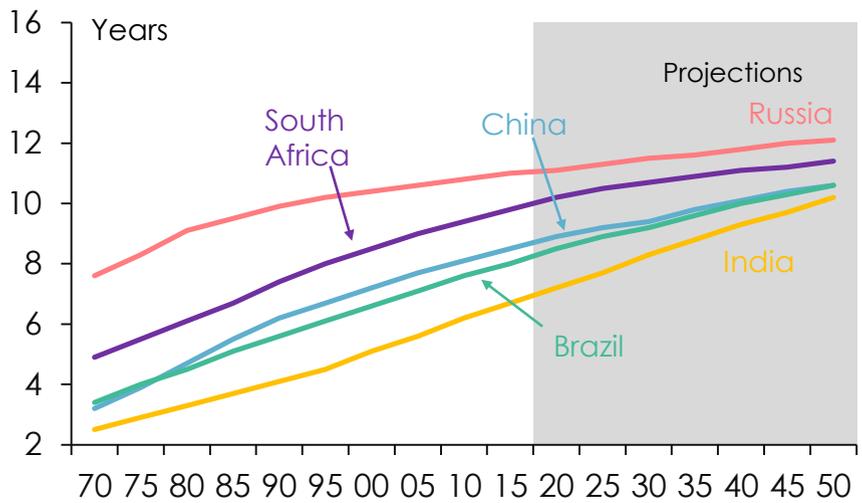
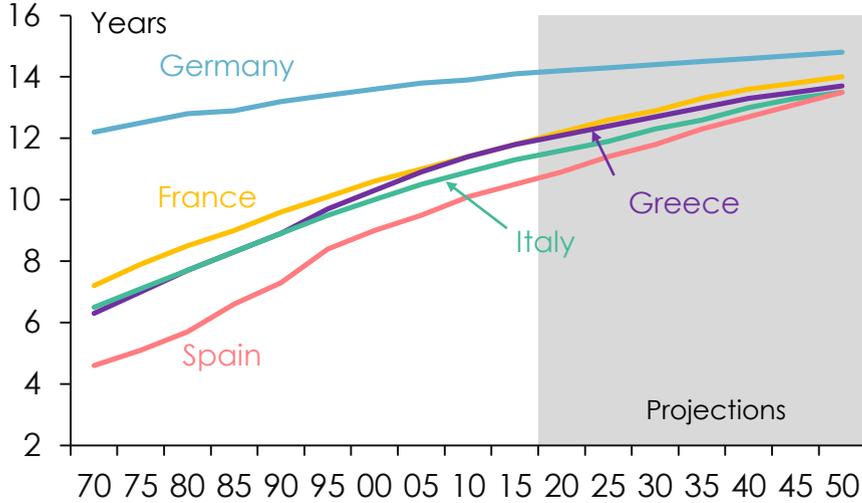
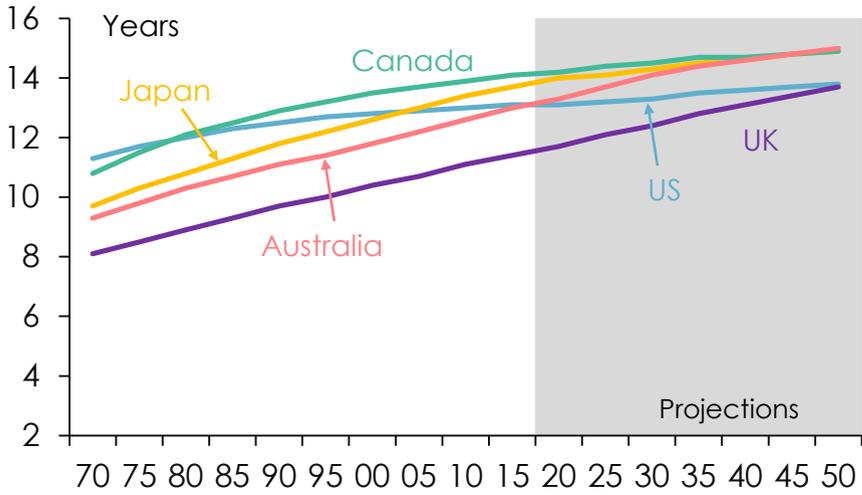
## Contribution of human capital to labour productivity growth



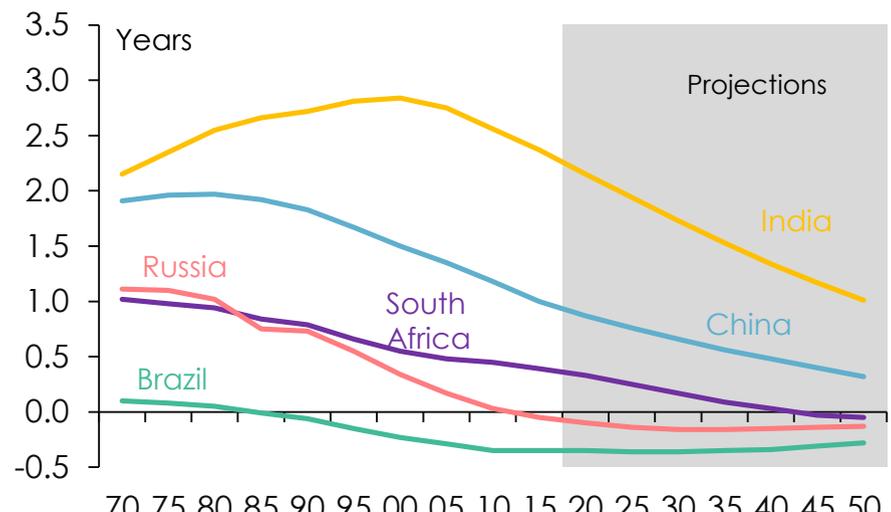
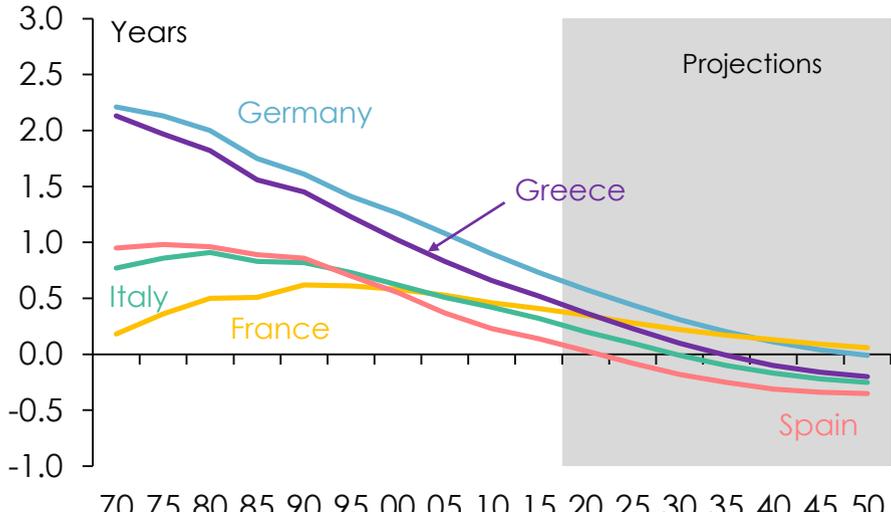
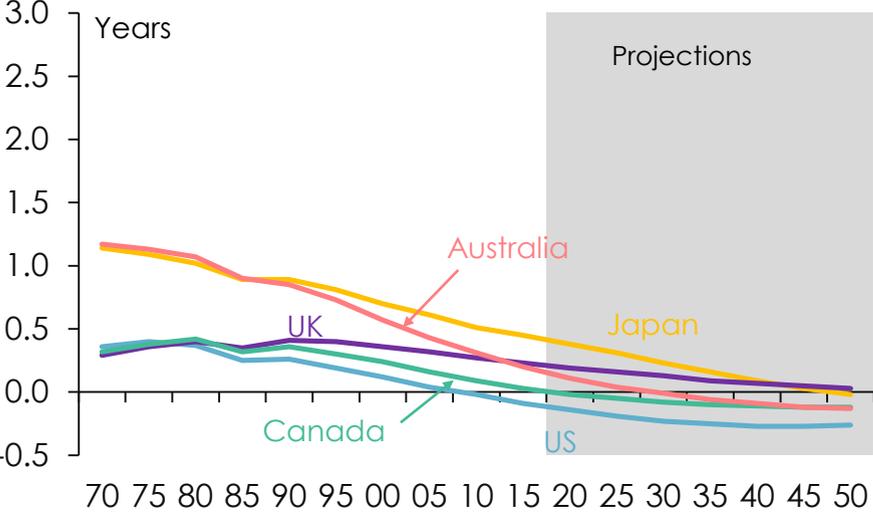
Note: 'Advanced' economies comprise Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Slovakia, Slovenia, Spain, Switzerland, United Kingdom and United States; 'emerging market' economies comprise Argentina, Brazil, Chile, China, Hungary, India, Indonesia, Mexico, Poland, Saudi Arabia, South Africa and Turkey.  
Sources: Christian Morrison & Fabrice Murtin, 'The Kuznets Curve of Human Capital Inequality: 1870-2010', *Journal of Economic Inequality*, Volume 11, No. 3, September 2013, pp. 283-301; Gustavo Adler et al., *Gone with the Headwinds: Global Productivity*, IMF Staff Discussion Note 17/04, April 2017.

# There's now less scope for raising the quality of human capital in advanced economies – but still considerable potential in most emerging economies

## Mean years of schooling – population aged 20-64



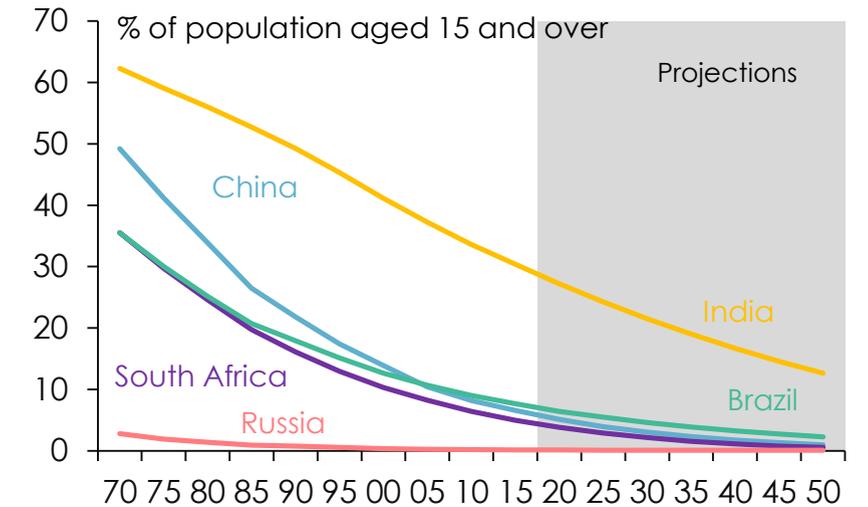
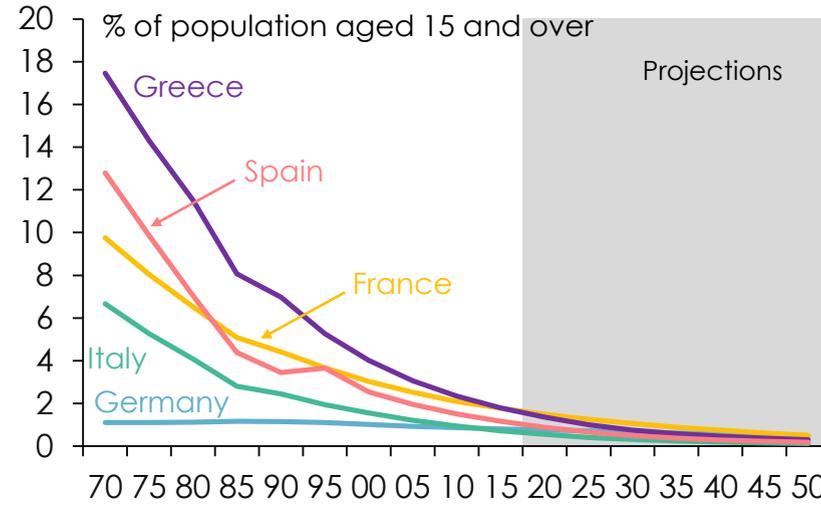
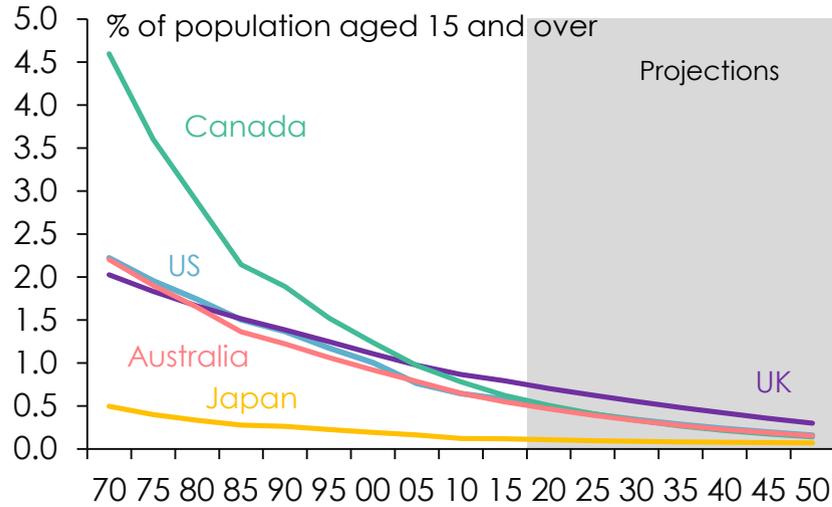
## 'Gender gap' between male and female mean years of schooling – population aged 25-64



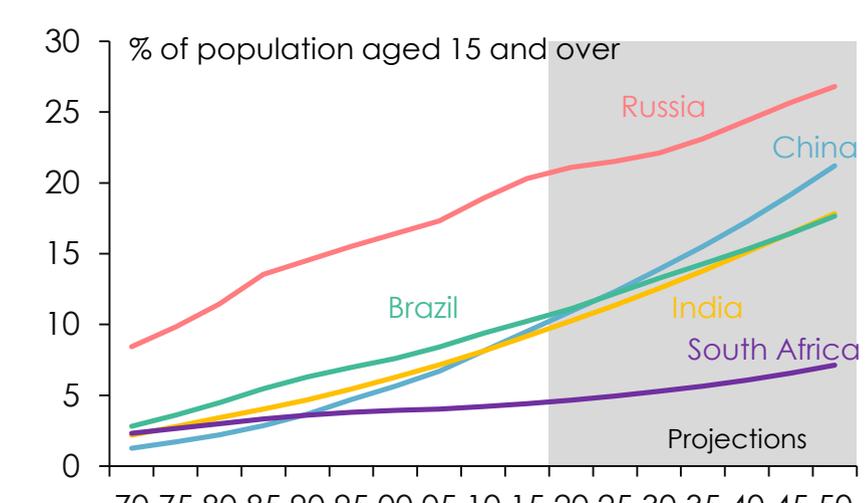
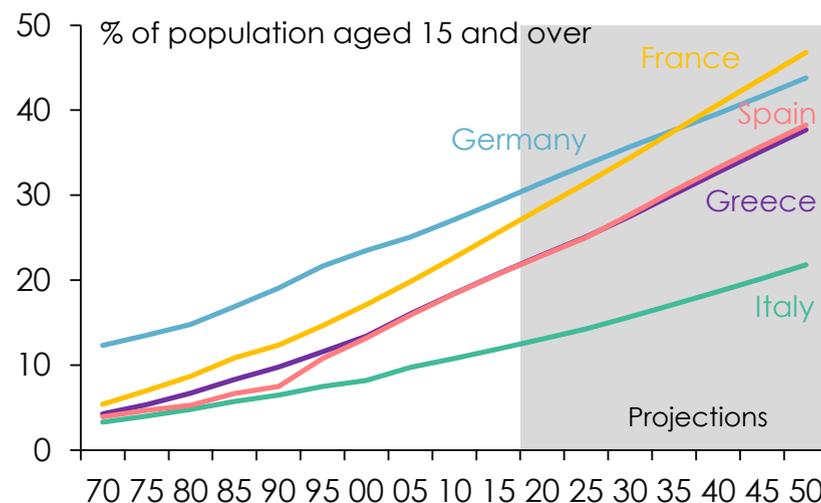
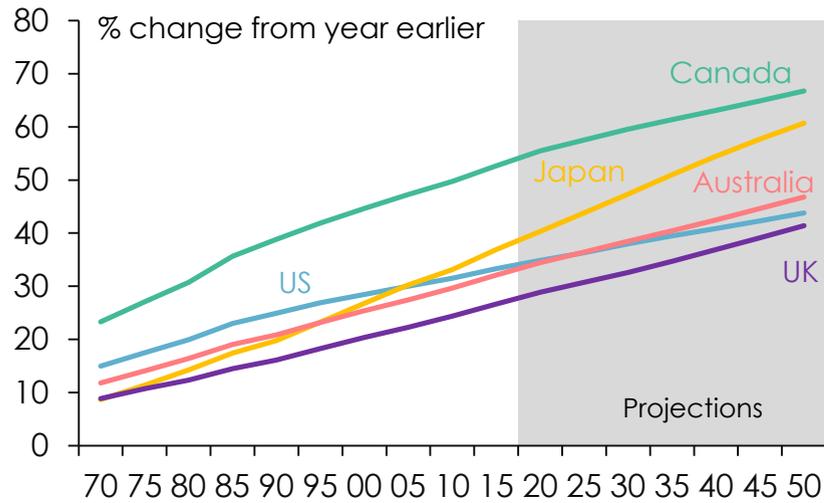
Note: Projections are based on 'medium' assumptions for population growth and a model-based projection of education-specific progression rates based on the cumulative experience of all countries over the past 40 years. Source: Wittgenstein Centre for Demography and Human Capital.

# School education is still far from universal in many developing countries - and access to post-secondary education can be widened in AEs and EEs

## Proportion of population aged 15 and over with no education at all



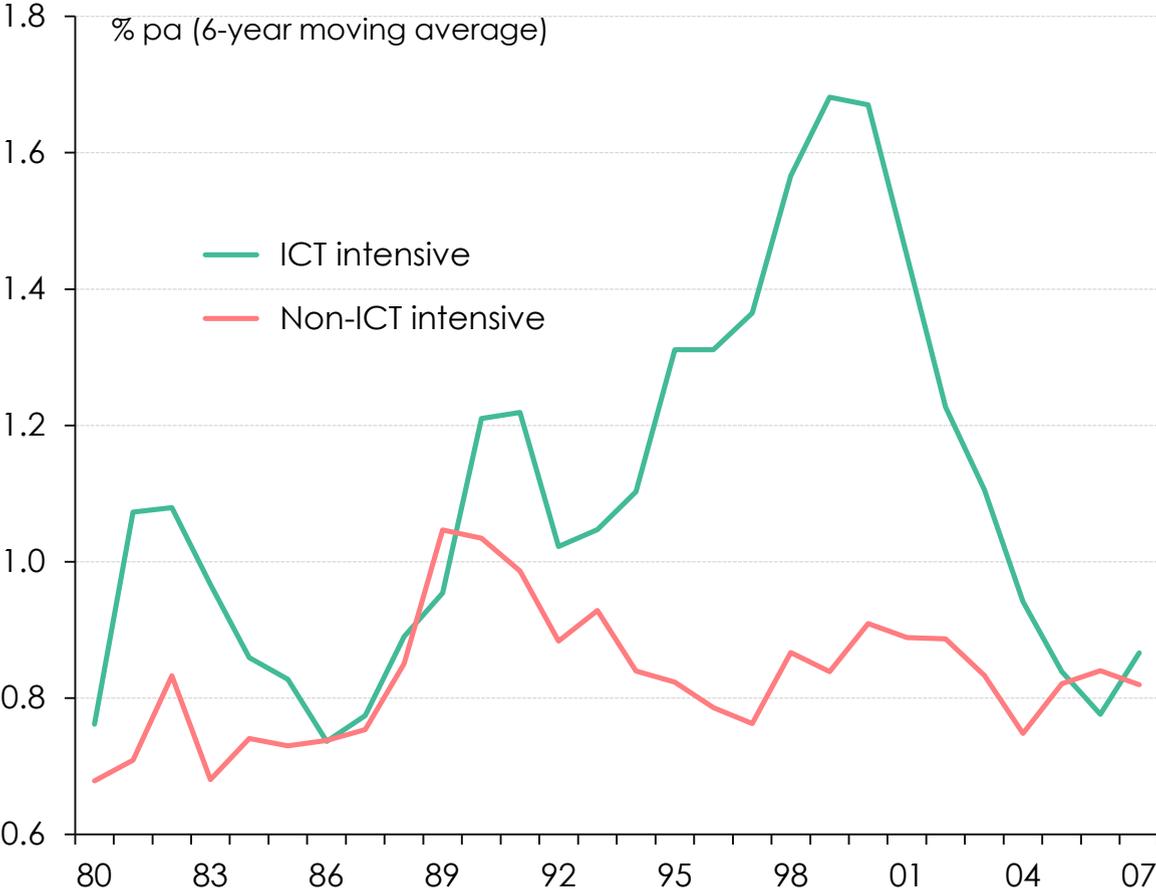
## Proportion of population aged 15 and over with post-secondary education



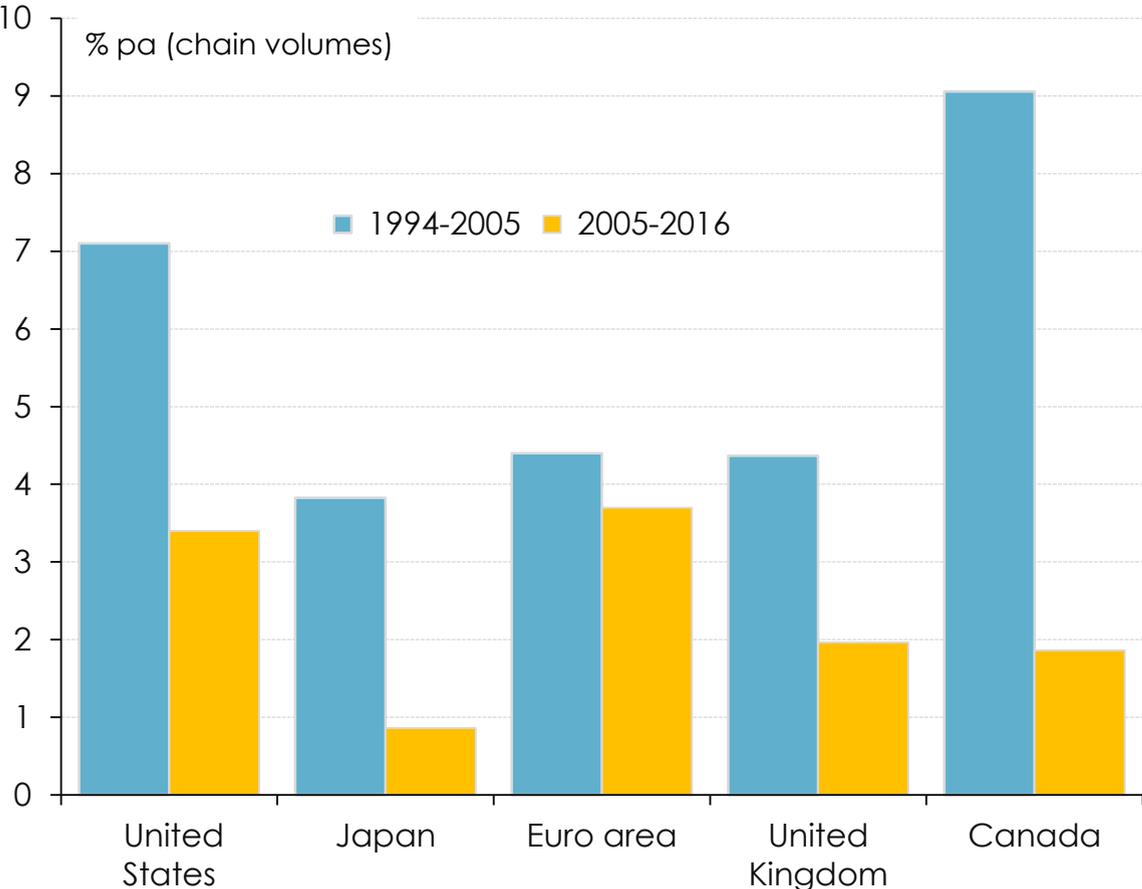
Note: Vertical axes in these charts are different. Projections are based on 'medium' assumptions for population growth and a model-based projection of education-specific progression rates based on the cumulative experience of all countries over the past 40 years. Source: Wittgenstein Centre for Demography and Human Capital.

# Productivity growth has slowed in ICT-intensive industries, perhaps because growth in IP investment has slowed since the mid-2000s

## TFP growth in ICT- and non-ICT-intensive sectors in 'advanced' economies



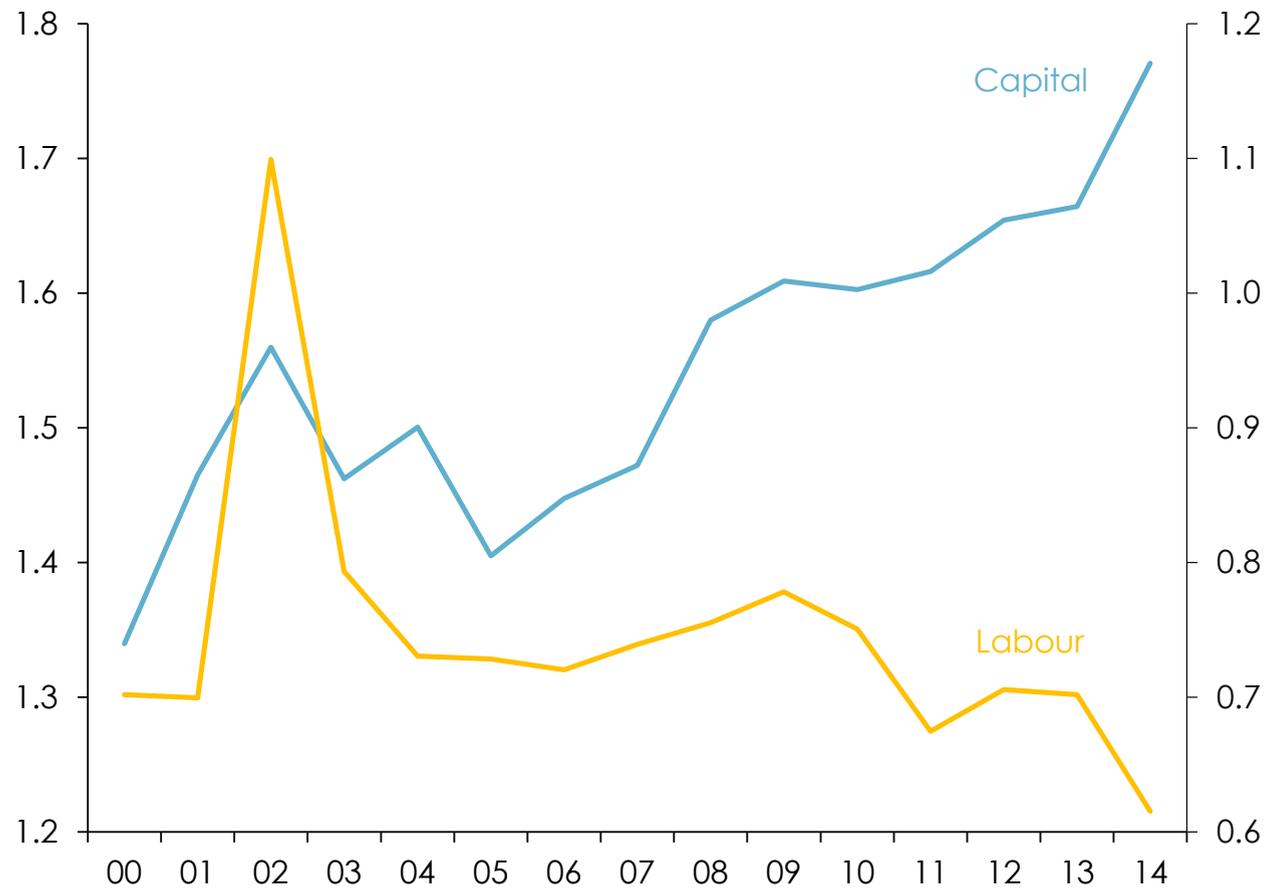
## Investment in intangibles / intellectual property in major 'advanced' economies



Note: Data for Japan in second chart are for fiscal years ended 31 March; Euro area data commences in 1995; Canada data excludes mineral and petroleum exploration expenditure. Sources: Gustavo Adler et al., *Gone with the Headwinds: Global Productivity*, IMF Staff Discussion Note 17/04, April 2017; US Bureau of Economic Analysis; Japan Economic & Social Research Institute; Eurostat; UK Office for National Statistic; Statistics Canada; Corinna Economic Advisors.

# Capital may have been 'mis-allocated' both before and after the financial crisis, impeding the flow of resources to higher-productivity firms

## Standard deviation of factor returns across industries in 'advanced' economies



Sources: Romain Duval, Gee Hee Hong & Yanick Timmer, *Financial Frictions and the Great Productivity Slowdown*, IMF Working Paper No. 17/129, May 2017; Daron Acemoglu, *Technological Change, Lecture 10: Misallocation and Productivity*, MIT, October 2011; Chang-Tai Hsieh and Pete Klenow, *Productivity and Misallocation*, NBER Reporter 2016 No. 1.

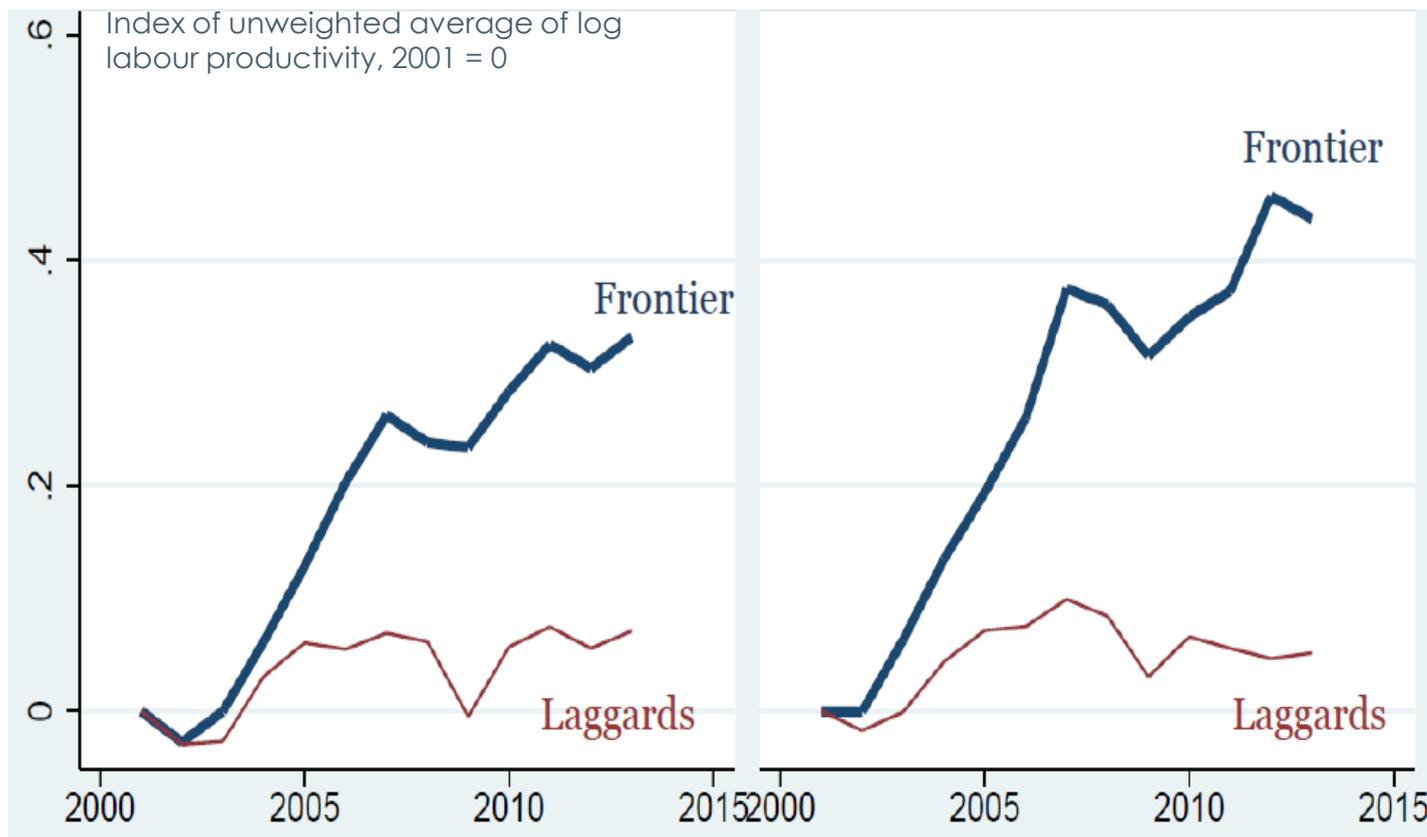
- ❑ Wide variations in factor returns across an industry sector are indicative of 'misallocation' of labour and/or capital (since, in principle, 'market forces' should ensure that factors of production move within industries to equalize factor returns)
- ❑ The standard deviation of returns to capital across industries in 'advanced' economies widened during the credit boom which preceded the financial crisis, and widened further in the aftermath of the crisis – whereas the standard deviation of returns to labour declined
- ❑ *Prima facie*, this suggests that capital was mis-allocated both before the crisis (research suggests, especially in Europe) and afterwards – when very low interest rates and a reluctance to recognize 'bad loans' may have fostered the emergence of 'zombie firms' (a phenomenon previously documented in Japan)
- ❑ This mis-allocation of capital may have impeded the flow of factors of production from low- to higher-productivity firms within industries

# There's some evidence that productivity gains at the 'frontier' are being diffused more slowly

## Average growth rate of labour productivity across 2-digit sectors in 'advanced' economies

### Manufacturing

### Services

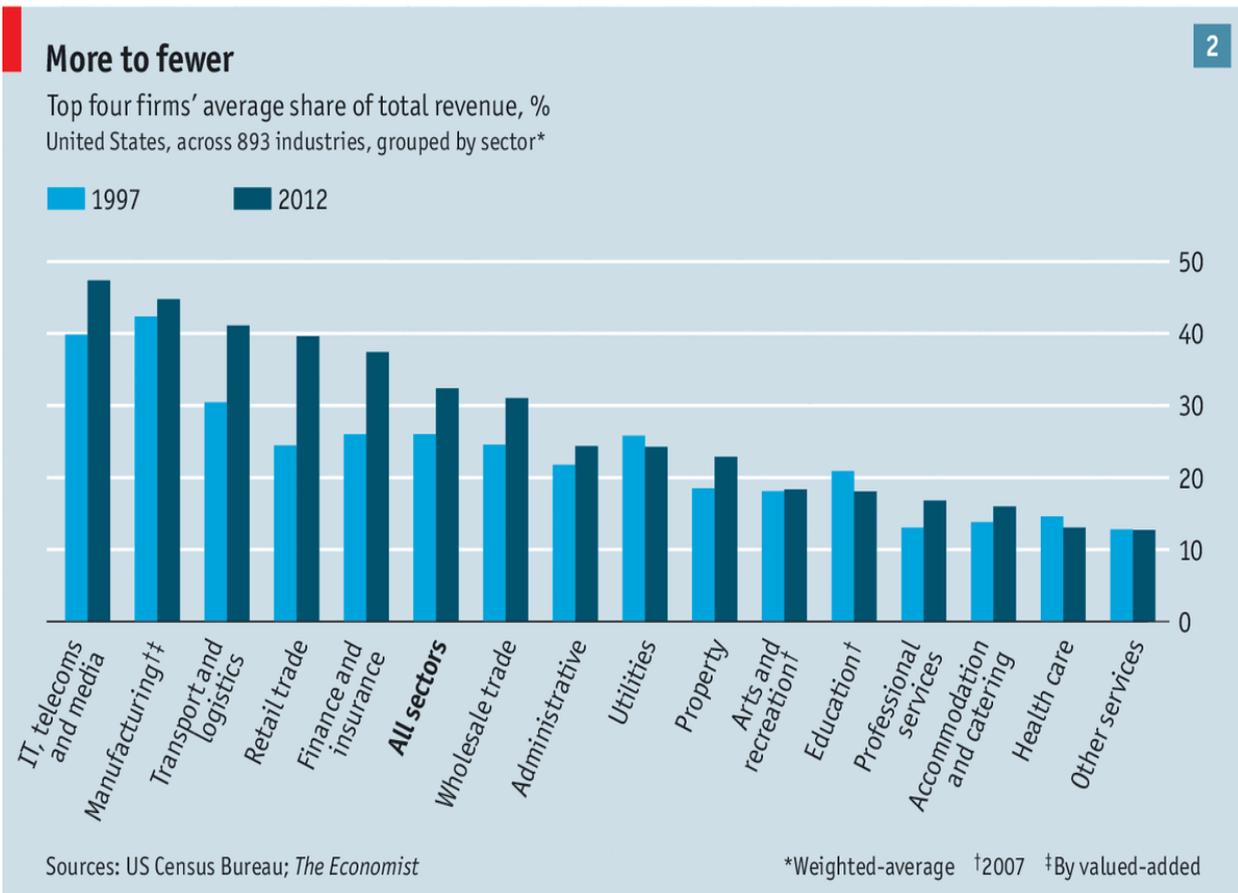


Note: 'Frontier' firms are the top 5% of firms in terms of labour productivity within each 2-digit industry in the OECD-Orbis data base; 'laggard' firms are all others. Source: Dan Andrews, Chiara Criscuolo & Peter Gal, *The Global Productivity Slowdown, Technology Divergence and Public Policy: A Firm Level Perspective*, OECD Global Forum on Productivity, July 2016.

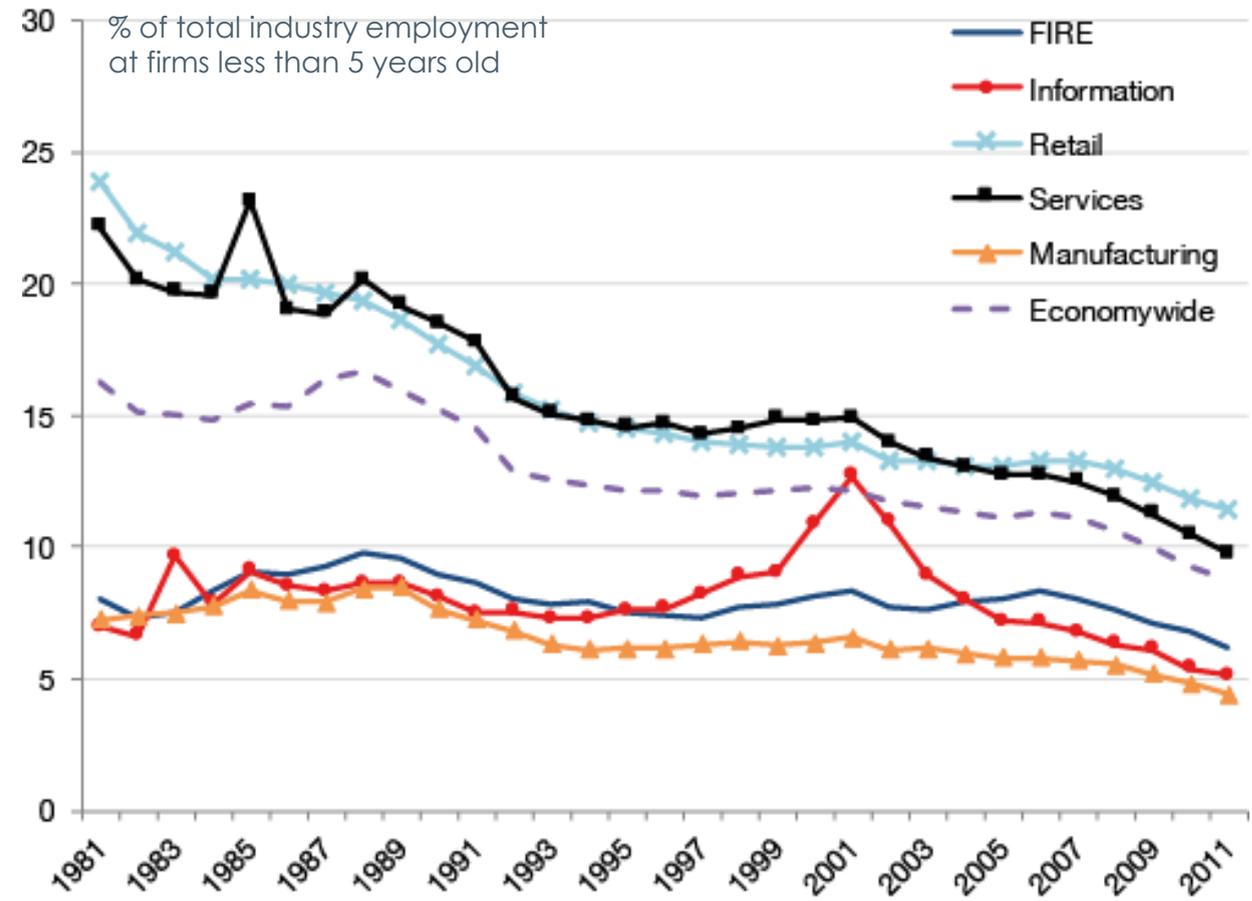
- ❑ Productivity at firms at the 'global frontier' rose at an average annual rate of 2.3% in manufacturing, and 3.6% in services, between 2001 and 2013, compared with 0.6% and 0.4%, respectively, for 'non-frontier' firms
- ❑ Productivity growth at 'frontier' firms was much faster before the financial crisis (4-5% pa) than after (1% pa), while productivity growth at 'non-frontier' firms slowed from ~1% pa to zero after the crisis
- ❑ One possible reason for the widening 'productivity gap' between 'frontier' and 'laggard' firms is 'winner take all' dynamics in globalized markets, especially in ICT-intensive services (where the divergence is most apparent)
- ❑ Another possible explanation is the greater capacity of 'frontier firms' to combine technological, human and organizational capital, and to undertake investment on the scale now required for technology adoption – slowing the rate of technology diffusion
- ❑ Productivity divergence appears to have widened most in sectors where pro-competitive product market reforms have been least extensive

# Increasing industry concentration and declining business dynamism may be sapping productivity growth

## Share of total US industry revenues accruing to top four firms, 1997-2012



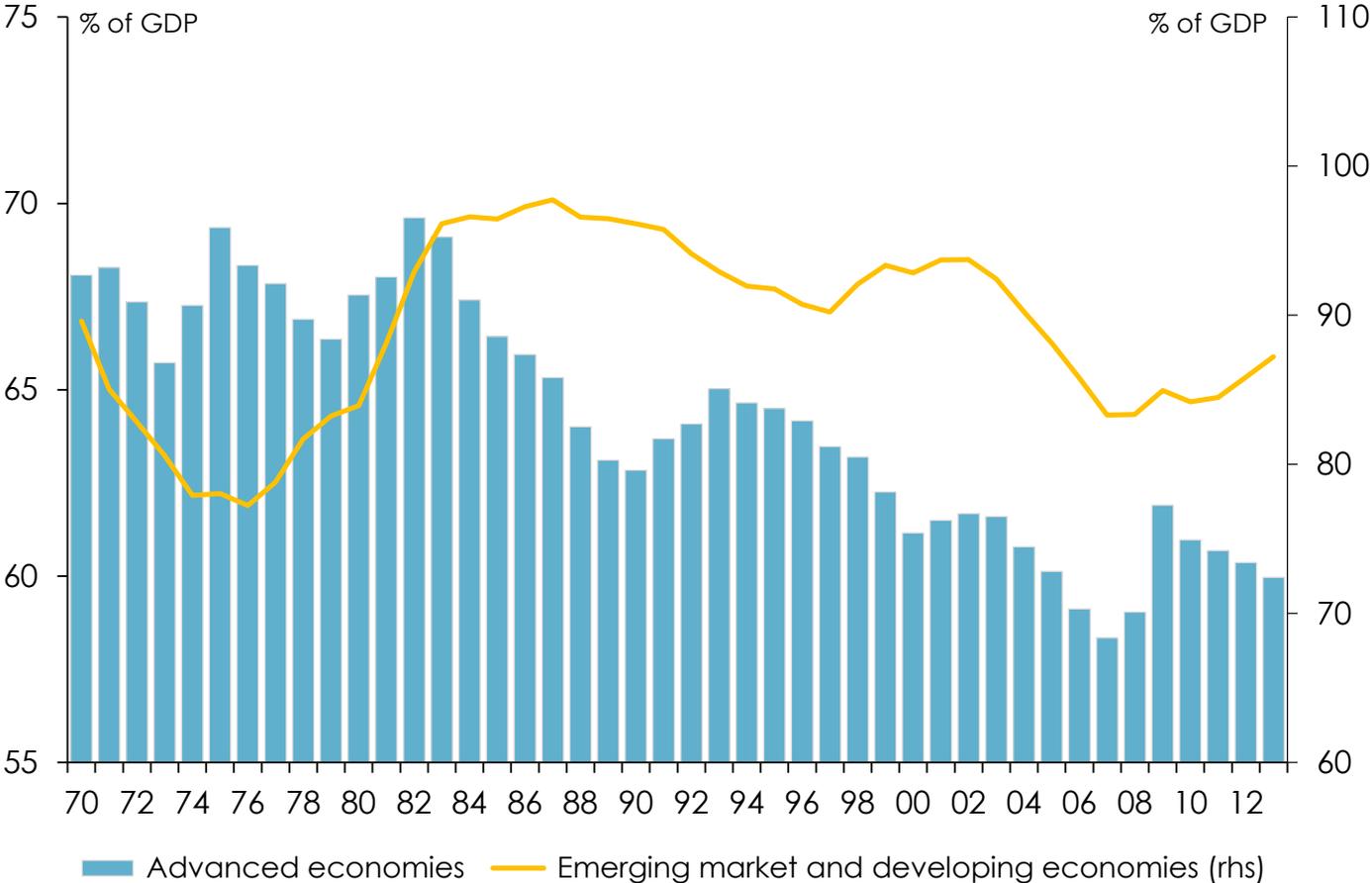
## Share of US industry employment at 'young' firms



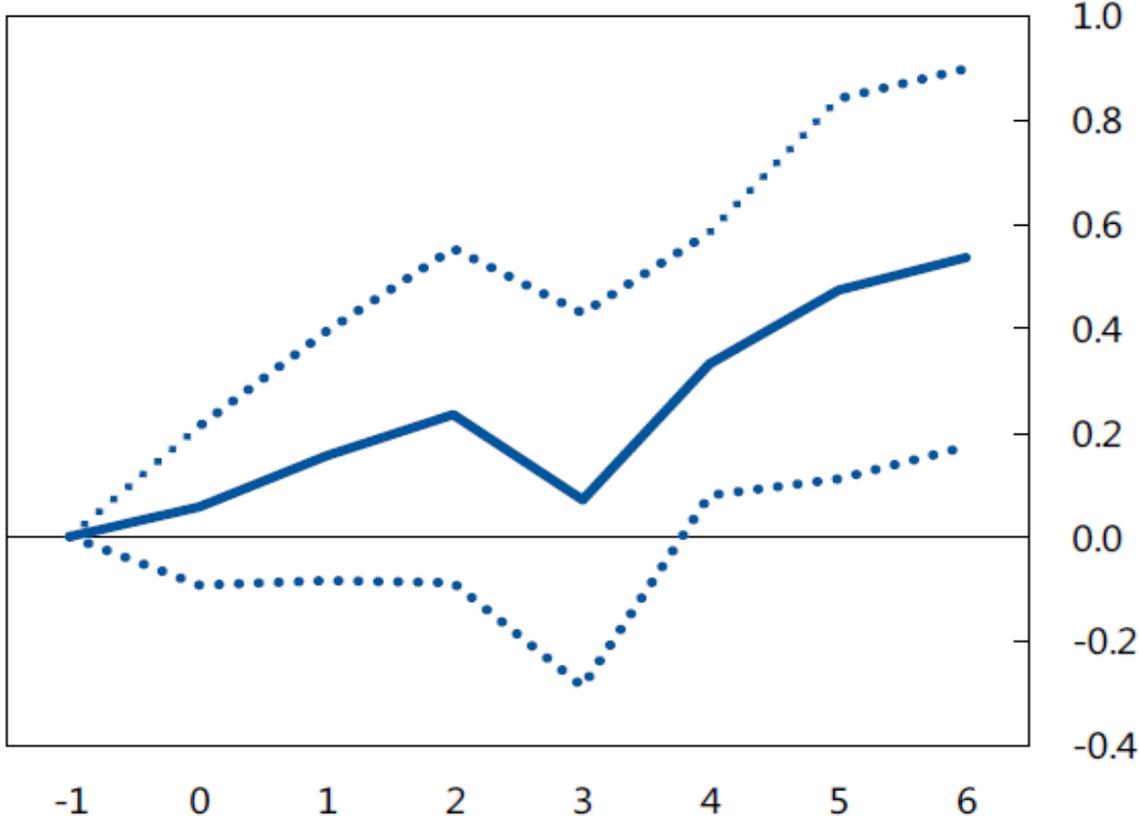
Sources: 'Too Much of a Good Thing', *The Economist*, 26<sup>th</sup> March 2016; Ryan Decker, Ron Jarmin & Javier Miranda, *The decline of high-growth entrepreneurship*, VoxEU, Centre for Economic Policy Research, 19<sup>th</sup> March 2016.

# Inadequate or mis-directed infrastructure investment may have detracted from productivity growth

## Real public sector capital stock as a pc of GDP



## Estimated impact of a 1% of GDP increase in public investment on labour productivity



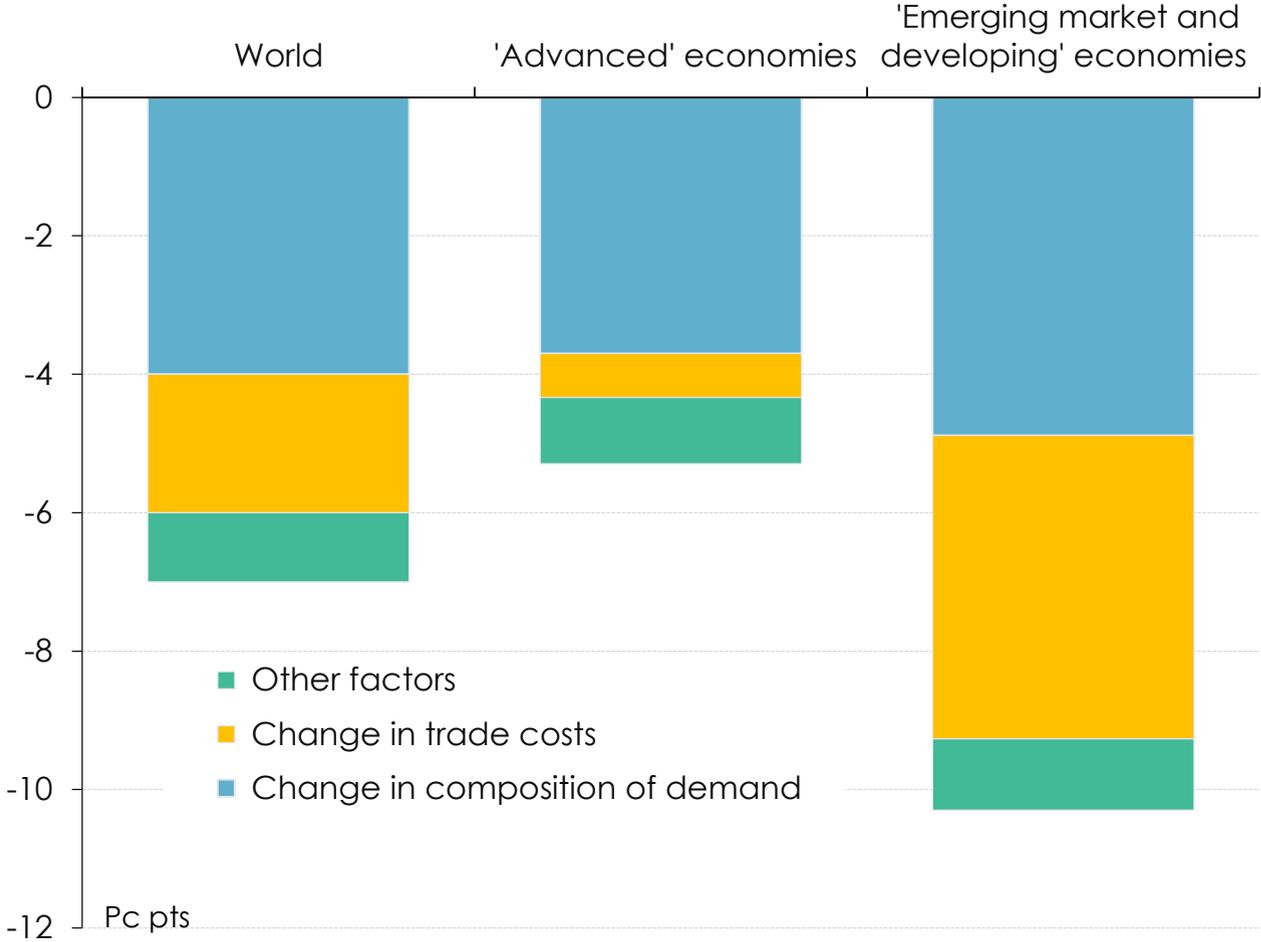
Source: Gustavo Adler et al., *Gone with the Headwinds: Global Productivity*, IMF Staff Discussion Note 17/04, April 2017.

# The slowing in global trade growth since the financial crisis has dampened one of the important spurs to productivity growth

## Changes in exports and imports as shares of OECD GDP



## Contributors to the change in nominal imports to GDP ratio between 2003-07 and 2002-15



Sources: OECD, Quarterly National Accounts; Corinna Economic Advisors; IMF, World Economic Outlook, October 2016, p. 77.

# Conclusions and policy implications

- ❑ **The growth rate of the ‘working age’ (15-64 year-old) population has slowed sharply in most ‘advanced’ economies (and some, mainly Asian, ‘emerging’ economies) since about 2010, and will slow further (becoming negative in countries with low immigration rates) over the next decade**
  - the boost to real per capita growth coming from faster growth in the working-age population than in the total population between about 1960 and about 2010 has therefore come to an end
- ❑ **All else being equal, this means that less growth in real GDP is required to achieve a given reduction in the unemployment rate**
- ❑ **However it also implies that a growing number of ‘advanced’ economies are very close to their levels of potential output**
  - and that includes countries where unemployment is still very high but where most of it is ‘structural’ rather than ‘cyclical’
- ❑ **Combined with what appears to be a structural slowing in productivity growth, this in turn means that potential growth rates in most ‘advanced’ economies (and some ‘emerging’ economies) are a lot lower than in recent decades (and perhaps lower than currently recognized)**
- ❑ **One of the lessons from the mid-1970s is that efforts to engender above-potential GDP growth, once the ‘output gap’ has closed, result in higher inflation, not in faster GDP growth**
  - although altered demographics suggest that such efforts may not be accompanied by higher unemployment as they were in the 15 years after the first oil shock
- ❑ **Countries which seek sustained higher real GDP growth rates should pursue policies aimed at boosting the growth rate of the working-age population (eg immigration), and/or lifting productivity growth**