# Understanding Wales' Future

A resource to help us think systematically about the future of Wales.

Llywodraeth Cymru Welsh Government

### Structure

- Section A: An evaluation of global drivers likely to impact on Wales over periods for which reasonable projections can be made.
- **Section B:** Analysis of Wales' assets in terms of demography, environment, infrastructure and human capital, considering whether they are fit for the future in light of the global drivers.

### Index

#### **Section A: Global Drivers**

| Demographic Drivers Economic Drivers Energy Drivers Technology Drivers Climate Change, Environment and Food Drivers | (A.1.1 - A.1.5)<br>(A.2.1 - A.2.17)<br>(A.3.1 - A.3.6)<br>(A.4.1 - A.4.4)<br>(A.5.1 - A.5.16)              |  |  |  |
|---|--|--|--|--|
| Section B: Wales' Assets  |  |  |  |  |
| 1. Demography 2. Environment 3. Infrastructure  | (B.1.1 – B.1.19)<br>(B.2.1 –B.2.14)  |  |  |  |
| Transport ICT Energy Housing  | (B.3.1 –B.3.13)<br>(B.3.14 – B.3.26)<br>(B.3.27 – B.3.31)<br>(B.3.32 – B.3.38)                             |  |  |  |
| 4. Human capital  | ,  |  |  |  |
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### Wales' Futures

Section A:

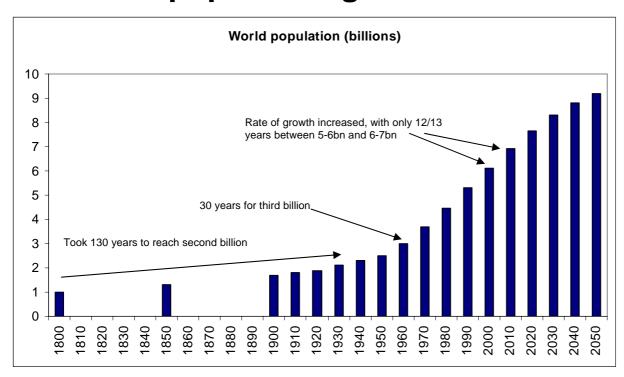
Long Term Global Drivers

### Wales' Futures

Section A: Global Drivers

1. Global Demographic Drivers

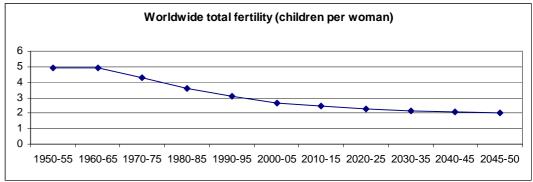
### As fertility rates decline in developing countries, worldwide population growth will slow



- World's population reached
   7bn in 2011
- Reaching the 8<sup>th</sup> billion will take 13 years.
- Reaching the 9<sup>th</sup> billion will take 20 years.

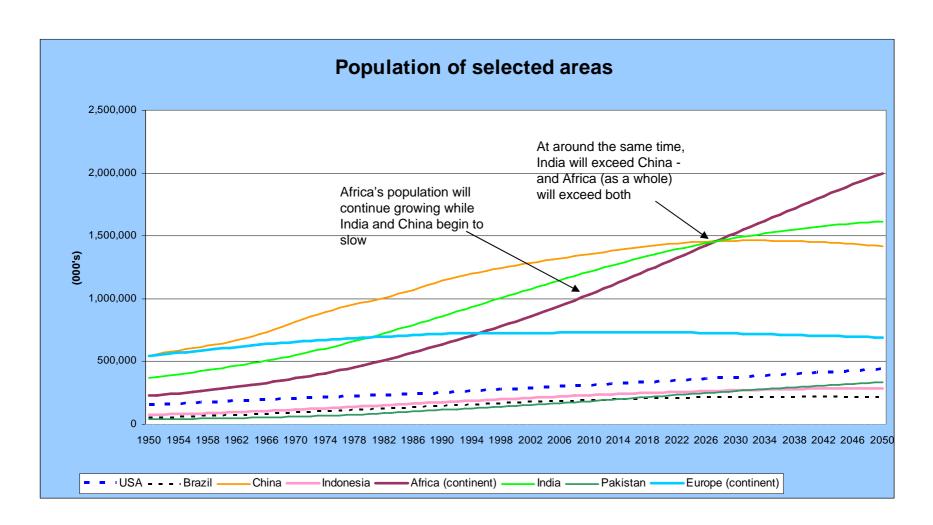
The increase in population over the last 250 years is mostly due to a decrease in mortality, not fertility increases (reduction in child mortality and major medical breakthroughs leading to longer life expectancy).

Fertility rates are declining in developing countries, and many countries are now reaching fertility rates below the replacement rate, leading to population stability. Total world population may be falling by end of the century.

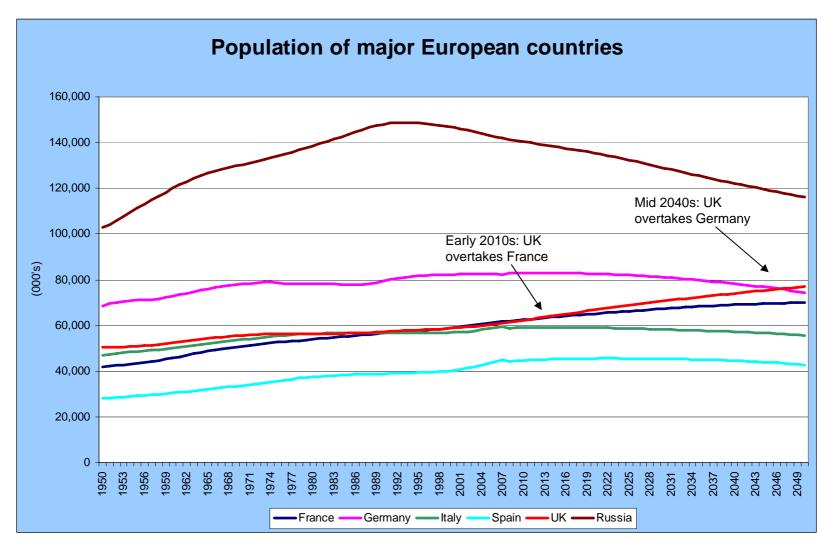


Source: UN Population Database A.1.1

## Growth will continue across most of the world, although Europe's population will soon start falling



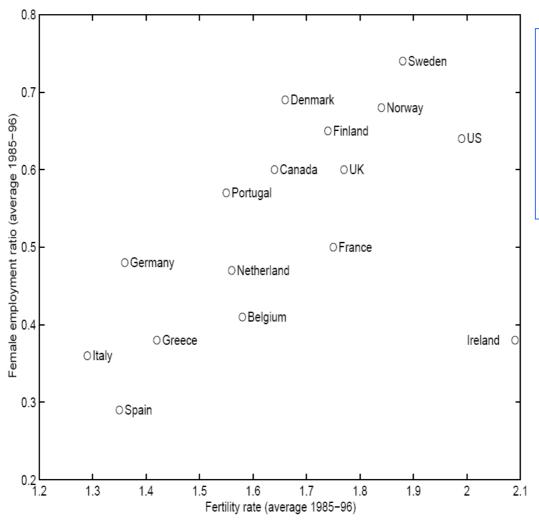
## However, with the UK population growing to 70 million we are likely to catch up and exceed Germany and France



Source: UN Population Database A.1.3

## Some limited evidence that higher female employment is consistent with higher fertility

Fertility rates and employment ratios in O.E.C.D. countries (averages of period 1985-96)



'Scandinavian' style policies (good childcare and flexible work) may play a part in boosting the birth rate, if that is a policy objective.

Source: Why are Fertility Rates and Female Employment Ratios Positively Correlated across O.E.C.D. Countries? José María Da Rocha, RGEA-Universidade de Vigo and Luisa Fuster, University of Toronto

### Global demographic drivers: summary of main messages

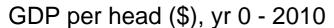
- The rise in world population is likely to plateau at about 9 billion by the middle of the century, and may be falling by 2100. On the whole, the growth will occur outside of Europe.
- The population of the African continent is likely to overtake that of either India or China by around 2030.
- The population of the UK is likely to grow in comparison to other parts of EU, and become largest (current) EU country by the middle of the century.
- The ageing demographic profile experienced in developed countries will be followed a little later in developing nations.

### Wales' Futures

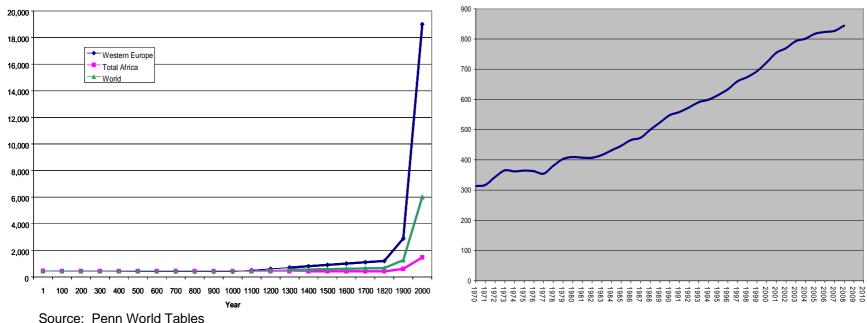
Section A: Global Drivers

2. Long Term Global Economic Drivers

# Global economic growth at 2%+ per annum is both a well established trend and a "tectonic" shift – over decades, it compounds and is therefore totally transformational...

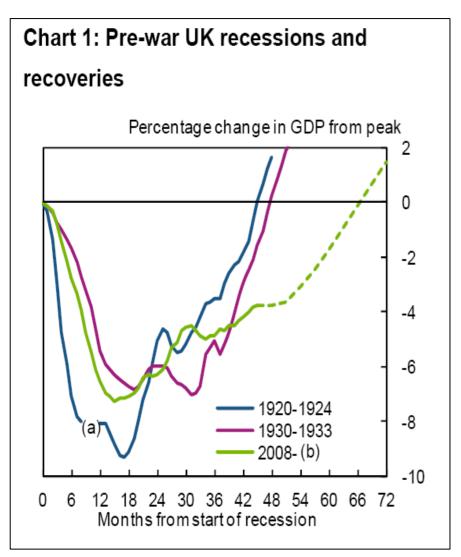


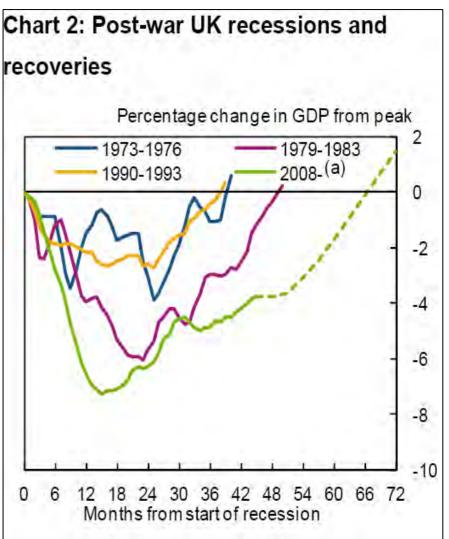
Real disposable income (£B), UK



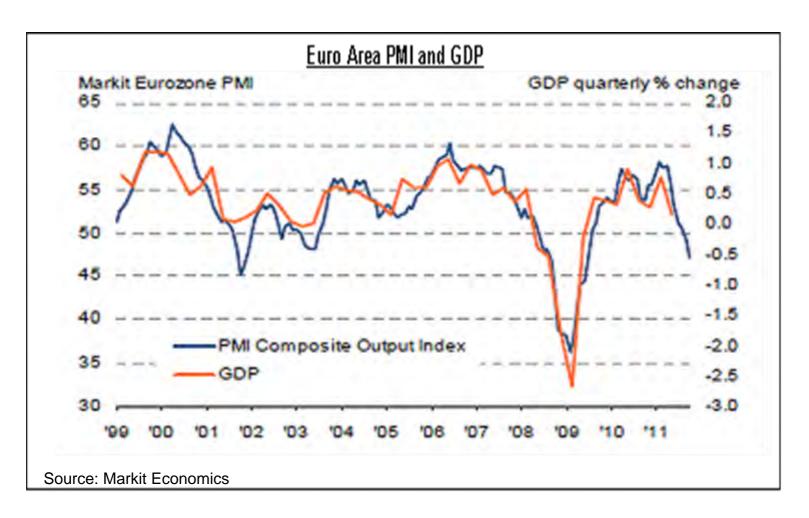
- Rapid economic growth is a historically recent phenomenon less than two centuries old.
- It has spread to most, but not quite all, parts of the world. So far, at least, those at the frontier have not lost out as others have caught up...
- And at/near the frontier (UK/Wales), living standards have doubled since the early 1980s.

## The financial crisis led to a prolonged recession, and a historically slow rate of recovery





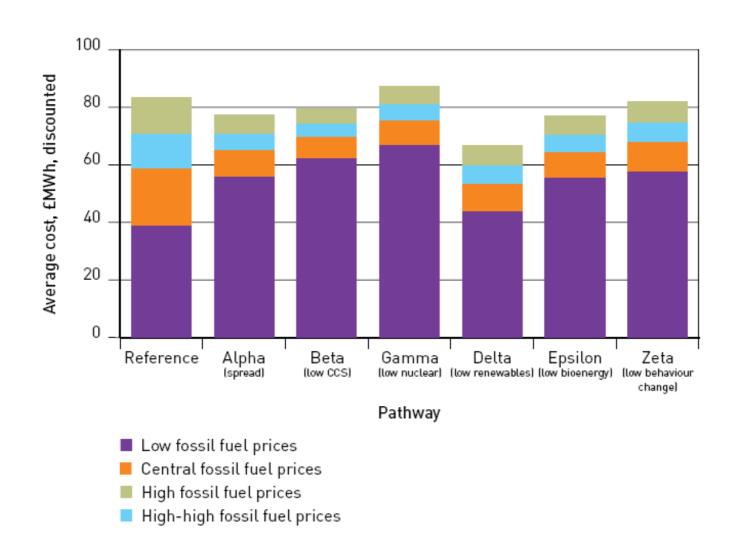
### And the continuing problems being experienced in the Eurozone pose serious risks to global economic recovery



High probability that GDP now contracting in eurozone and the probability of global recession taking hold in 2012 is uncomfortably high

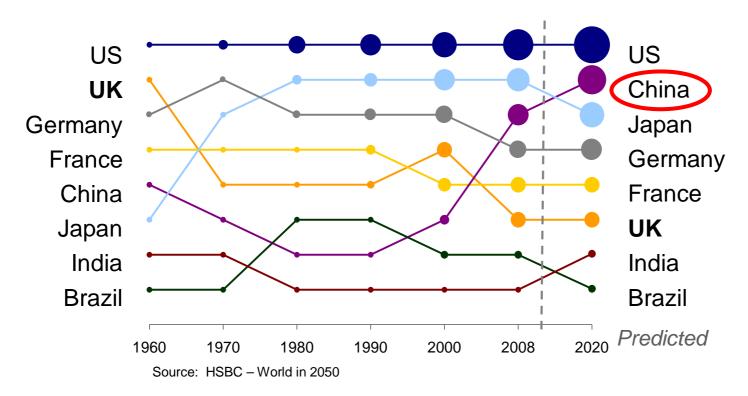
## Long-term energy prices are unlikely to rise so far as to choke off growth... but short term spikes pose a risk to recovery

Figure 4: Average gross cost per megawatt-hour of the illustrative pathways in 2050



## As countries catch up with those at the "frontier", the global "economic league table" is changing fast...

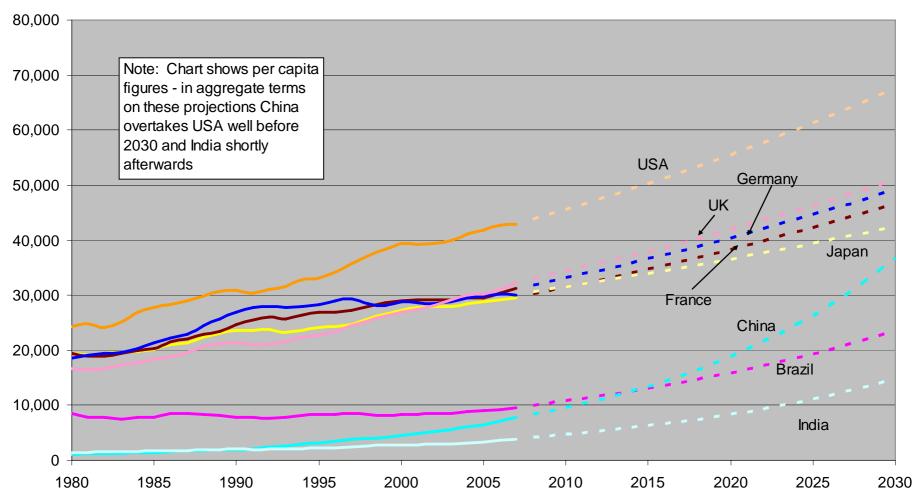
#### GDP ranking by country, 1960 – 2020 (current prices)



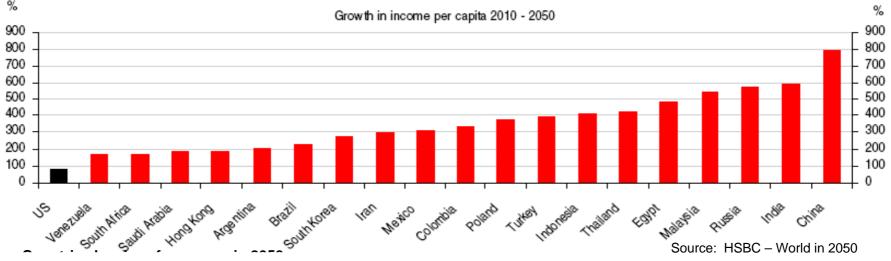
- The UK's relative position in the global economy is radically shifting in 1980, the UK economy was almost 3 times as large as the Chinese economy.
- The absolute size of the economy is less relevant to well-being than economic income per head.

### But economic catch-up in developing countries does not imply that – in the long term - growth per capita will stop for developed countries

GDP (\$) per capita, acutal and projected



Current difficulties notwithstanding, most studies do not predict a major decline in the long term rate of growth for developed countries... even very rapid growth in developing countries still leaves living standards well behind richer nations in 2050



Countries by size of economy in 2050

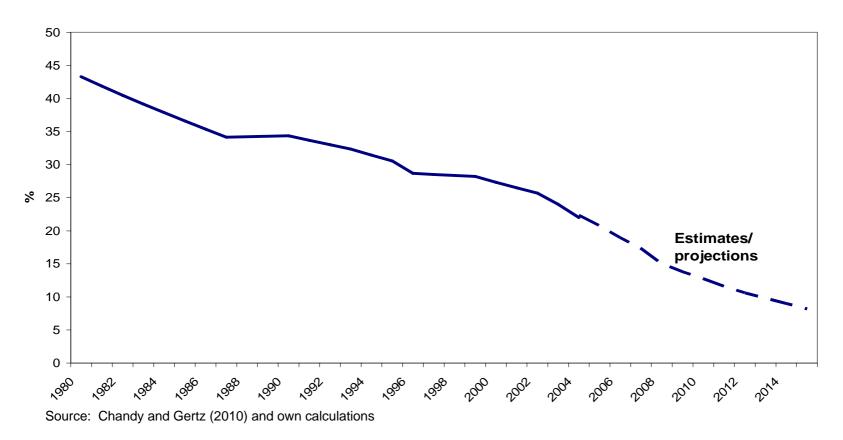
|    |         | Income per head (\$) |        |
|----|---------|----------------------|--------|
|    |         | 2010                 | 2050   |
| 1  | China   | 2,396                | 17,372 |
| 2  | US      | 36,354               | 55,134 |
| 3  | India   | 790                  | 5,060  |
| 4  | Japan   | 39,435               | 63,244 |
| 5  | Germany | 25,083               | 52,683 |
| 6  | UK      | 27,646               | 49,412 |
| 7  | Brazil  | 4,711                | 13,547 |
| 8  | Mexico  | 6,217                | 21,793 |
| 9  | France  | 23,881               | 40,643 |
| 10 | Canada  | 26,335               | 51,485 |

Source: HSBC - World in 2050

- At predicted rates of growth (broadly in line with recent trends), income per head in China will increase roughly eightfold by 2050, and China will be the largest global economy.
- Super-fast rates of growth reflect catch-up.
- Chinese incomes will still only be around one-third of those in the USA or UK.
- Most predictions suggest real incomes in the UK and Wales will at least double over this period.

## Growth brings benefits to most, if not all: the rapid global economic growth of recent years has been associated with a big reduction in poverty

Proportion living in absolute poverty (\$1.25 per day)



- Simultaneously, due to a combination of factors, the super-rich are pulling further away from the average.
- Africa is lagging, though with recent promising signs.

### Global competition

Who will prosper?

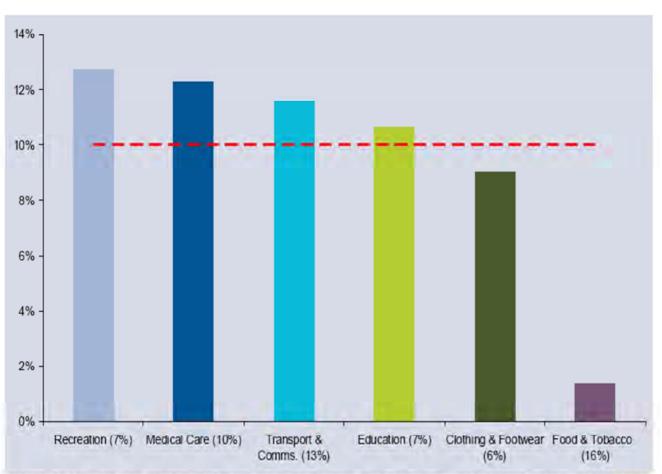
The highly educated/skilled (driver for increasing inequality within countries).

Which places will prosper?

Those that attract/retain such people.

## As people – and countries – get richer, their patterns of expenditure change in predictable ways

#### Change in expenditure following a 10% change in income



#### Full list, >10% expenditure:

- 1. Recreation
- Medical care
- 3. Other
- 4. Communications & transport
- Household operations
- 6. Housing and utilities
- 7. Education

#### **Full list, < 10% expenditure:**

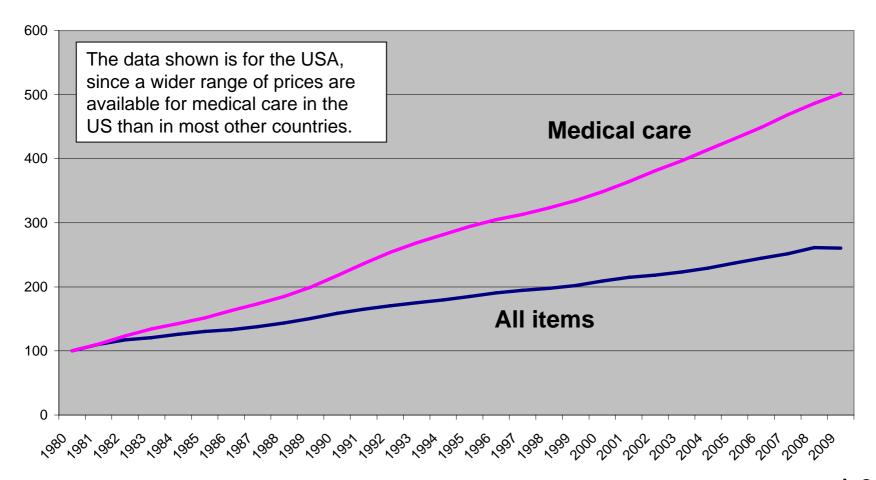
- 1. Clothing and footwear
- 2. Food at home and tobacco

Source: W. Michael Cox and Richard Alm, Federal Reserve Bank of Dallas, 2007 Annual Report. "Opportunity Knocks"

Note: Share of overall consumer expenditure given in brackets

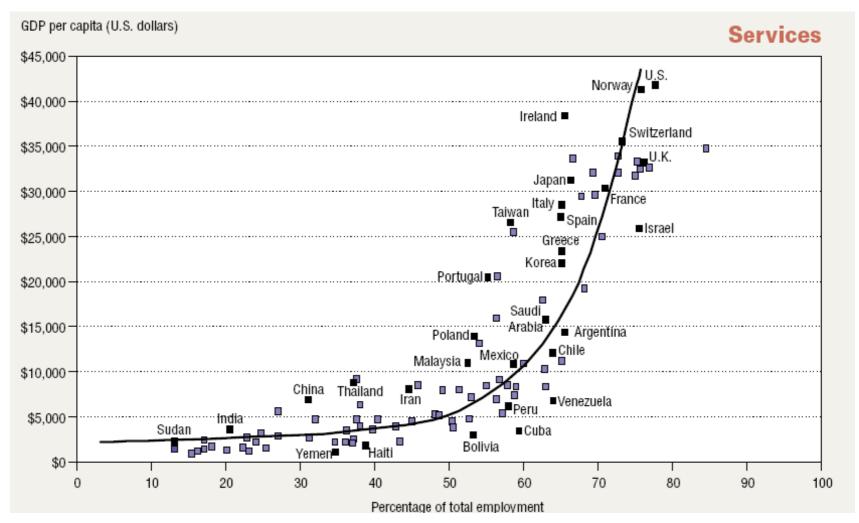
# Not only do people want more public services (and to a higher standard) as they get richer, costs tend to rise faster than average, since public services tend to remain relatively labour-intensive.

Prices for all CPI items and for medical care, USA, 1980=100

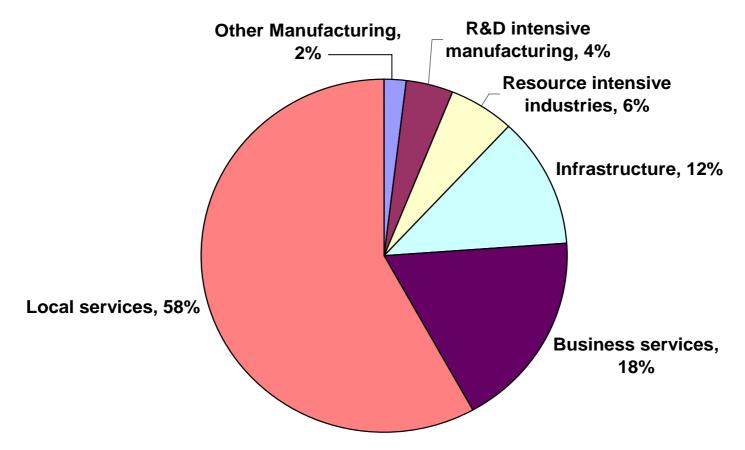


Source: US Census Bureau A.2.11

## This, coupled with rapid productivity growth in manufacturing, means that growth brings a shift towards employment in services



# The importance of R&D investment to local economies needs to be kept in perspective. From 1985-2005 manufacturing R&D contributed just 4% of GDP growth in high income countries

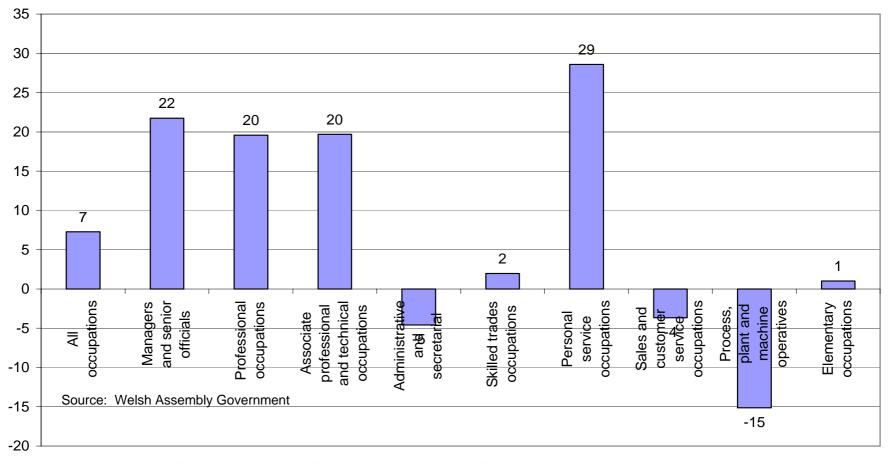


World Band defines high income countries as EU-15 plus Australia, Canada, Hong Kong, Japan, South Korea, New Zealand, Norway Singapore, Switzerland and the United States

Source: Global Insight; ILO; McKinsey Global Institute Analysis

# These trends have also been associated with an increase in the demand for more highly skilled workers, a reduction in demand for those with fewer skills, and some "hollowing out"\*... so not everyone is a "winner"

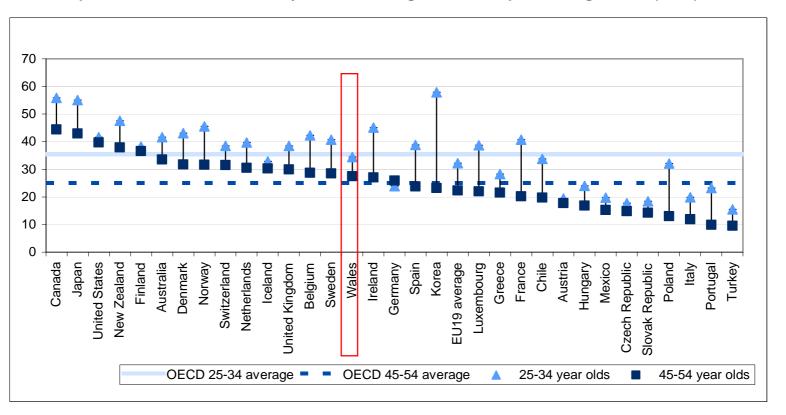
Percentage change in employment by occupation, Wales, 2001-2008



<sup>\* &</sup>quot;Hollowing out" refers to the loss of jobs in the middle of the pay distribution,

# Across developed countries, similar patterns are observed, with upgrading of education and skills being almost universal...Wales and UK performance is mixed in this context

Population that attained tertiary education – age 25-34 compared to age 55-64 (2008)



Source: OECD and Welsh Assembly Government

### A range of factors that have the potential to disrupt this picture

- Resource limits, reflected initially in high commodity prices, could inhibit growth it might be "different this time", perhaps because of the sheer scale of Chinese and Indian demand.
- Political instability within or between countries.
- Resurgence of protectionism.
- Renewed/repeated financial crises (perhaps partly as result of the above).
- Growth of inequality causes social tension.
- Pace of innovation slows limited stock of new ideas.
- Developments in ICT and/or global trade patterns could result in severe labour market dislocation, with major reductions in the demand for labour.
- Growth accelerates as a result of more people resulting in greater scope for innovation, specialisation and division of labour... a renewed "golden age".
- Catastrophic disaster (e.g. epidemic, runaway climate change etc)
- The unknown unknowns...

### Global economic drivers: summary of main messages

- Sustained global growth is resulting in increased affluence and reductions in absolute poverty.
- Despite the pressure on fossil fuels, and the need to reduce greenhouse emissions, energy prices are unlikely to put a stop to long-term growth, even though short term price spikes may pose a risk to recovery.
- Current difficulties notwithstanding, long run growth for developed countries is not slowing
  (at least so far) economically, it is more a case of developing countries "catching up" with
  the front runners than being in a zero-sum game of "competition" with them.
- Growing affluence leads to more spending on, and employment in, services.
- R&D is important in driving global innovation, but its importance for jobs growth needs to be kept in proportion.
- There is increasing demand for high skills, but also interpersonal skills.
- Pressures on the low skilled will continue to mount increasing relative poverty and inequality (reinforced by the super-rich pulling away).
- Places that are attractive to the well-educated will tend to "win".
- There is no evidence yet that ICT is undermining the "pull" of urban agglomerations for the well-educated: smaller urban centres will need to base their attractiveness on their overall quality of life.

• But some significant uncertainties remain...

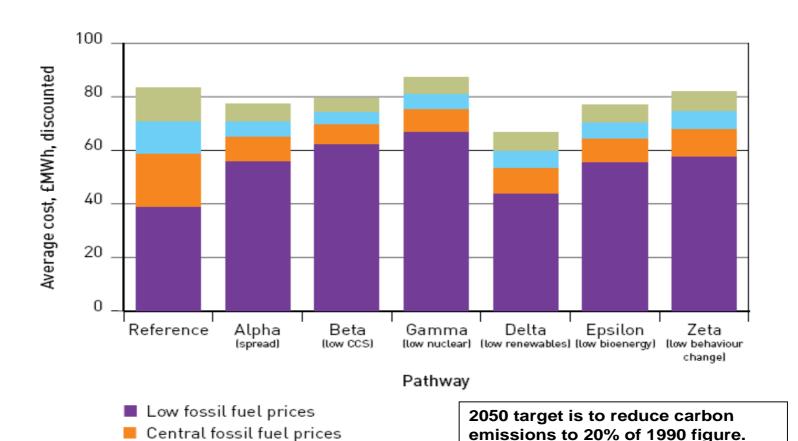
### Wales' Futures

Section A: Global Drivers

3. Global Energy Drivers

## Analysis of the Stern review and subsequent studies shows a variety of feasible alternative energy options – "expensive" in £, but affordable as % of GDP

Average gross cost per megawatt-hour of the illustrative pathways in 2050



Reference is BAU - emissions

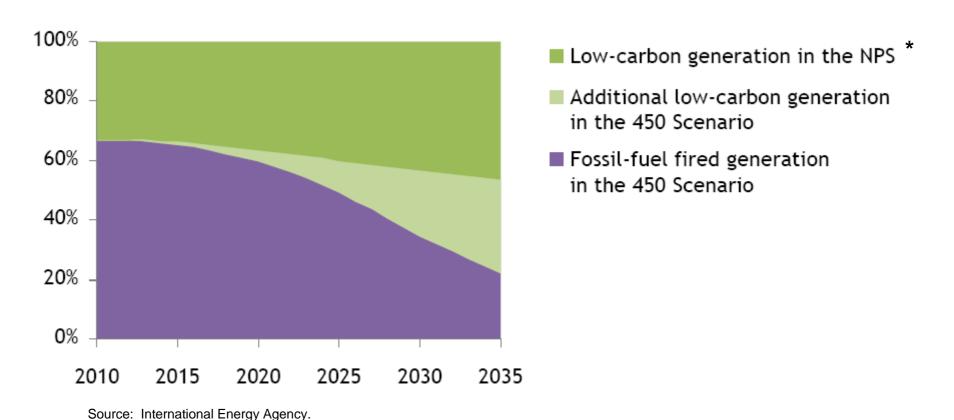
broadly flat

Source: 2050 Pathways Analysis, DECC

High fossil fuel prices

High-high fossil fuel prices

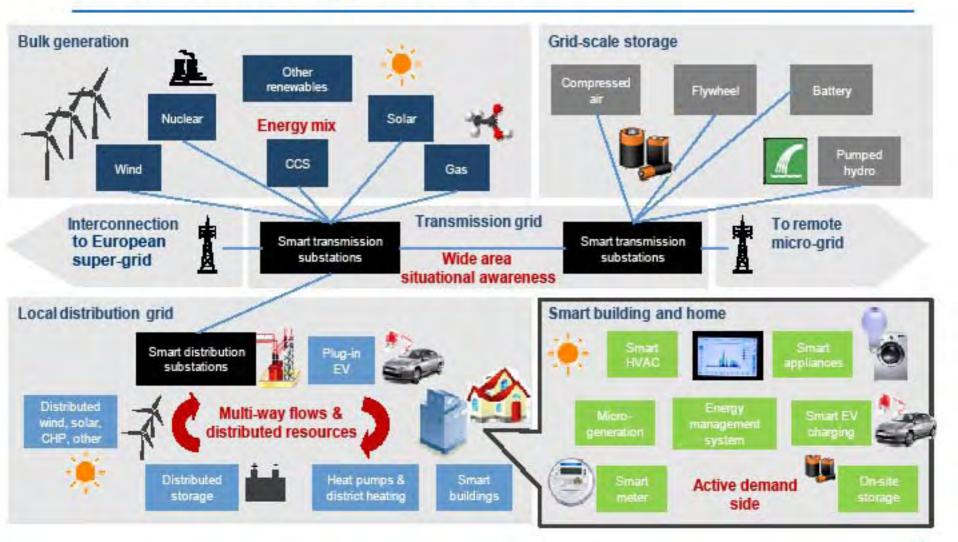
## IEA envisages an evolving global mix of sources for electricity generation



\* NPS = New Policies Scenario



### What technology will we use?



### The pace of innovation makes the future energy mix hard to read

- Demand side power management is very economically attractive and may drive storage (heat and electricity) developments.
- Technology developments likely to enable fuel substitution and, hence, convergence of coal, oil and gas prices.
- Decarbonising electricity production will be easier than decarbonising heating and vehicle transport. Economic large scale electricity storage could be paradigm changing: battery technology developing fast.
- Nuclear power, especially with modular-build reactors, looks increasingly economically attractive.
- Will carbon capture and storage become a practical and cost-effective option on a large scale?
- The attractiveness of renewables will depend on their cost and generation characteristics.
   Hydro, landfill gas and onshore wind are the cheapest for electricity. Offshore wind, however, has huge potential, but is expensive.
- Large scale biomass has extensive sustainable development issues.
- Marine (wave and tidal stream) is at an embryonic stage of development it is likely to need big R&D to achieve full potential.
- The rate of energy decarbonisation will depend on relative costs, which themselves will depend on innovation as well as fossil fuel and carbon price changes.

#### Shale gas is a real game-changer:

The recent assessment made by the US Government's Energy Information Administration (2011) is that the international shale gas resource base is vast:

- The initial estimate of technically recoverable shale gas resources in the 32 countries (plus the US) is a total shale resource base estimate of 6,622 trillion cubic feet.
- This is enough to increase total world technically recoverable gas resources by over 40 percent, to 22,600 trillion cubic feet.

In addition, major shale gas basins are spread much more widely across the globe than oil deposits.

### Global energy drivers: summary of main messages

- Energy costs are unlikely to rise so far as to stop long-term economic growth (although short term spikes may pose a risk to the recovery).
- The rapid pace of innovation promises solutions that can substitute for fossil fuels, but also makes the future energy mix hard to read at this stage.
- Fossil fuels are, however, unlikely to run out quickly, especially given shale gas developments, which may hinder adoption of new low carbon energy technologies.
- This reinforces the global challenge involved in cutting greenhouse emissions.

### Wales' Futures

Section A: Global Drivers

4. Global Technology Drivers

## The Foresight Technology and Innovation Report (2010) 'predicts' key transformational advances

- Manufacturing on demand: the ability to manufacture a customised product at different sites using fabrication devices driven by softwareencoded design.
- Development of new materials and nanotechnologies, which can support a range of technologies, such as IT processing and 3D printing.
- **Smart infrastructure**. For example, the electricity distribution network will need new instrumentation to support micro-generation, electric vehicle recharging and smart metering.
- The Internet is set to enter a second transformative phase, with a 'web of data' or semantic web which adds meaning and ability to automatically process online data and documents.
- The energy transition will stimulate technology development in renewable energy generation, batteries and fuel cells, the smart grid, carbon capture and storage, and potentially widespread use of hydrogen as a fuel, along with the resurgence of nuclear.
- Regenerative medicine, based on stem cell products, can help grow the UK life sciences sector if research, regulatory and financial challenges can be overcome.

#### Some of the potential applications of new technology can be foreseen:

- There is the potential for a 21st-century manufacturing revolution, driven by new technologies, tools and materials, with local, bespoke manufacturing-on-demand (NB increasing productivity and, therefore, potential for the UK to keep an important share of manufacturing, but unlikely to slow the decline in manufacturing employment).
  - Reflecting local raw material availability and potential increases in shipping costs.
  - Offering distributed manufacturing, a move away from just-in-time logistics.
  - Business models based on move to product plus service.
- Smart infrastructure could include a smart electric grid, increased use of sensor networks, and 'cannibalisation' of existing infrastructure, to increase efficiency and interactivity of systems.
- Exploitation of 'white space' or redundant transmission bands from digital switchover may lead to improved wireless opportunities, which together with higher processing speeds increase the application of ICT devices such as converging models for tablets, phones and computers.
  - These types of consumer devices might come to dominate the workspace.
  - Social networking norms might begin to overtake working practises with potential impacts on productivity for early adopters.
- The second internet revolution has the potential to be hugely significant. By giving data and text
  within the web semantic meaning content can be searched and analysed at a level beyond the
  web-page, thereby transforming its value as a tool.
  - This might have massive impacts on the productivity of knowledge based systems.

...but the really important innovations will be hard to predict as they will apply generic technologies across boundaries: these are the ones which will be transformative, for example budget airlines were driven by application of ICT.

### Increasing dependence on technology also brings risks

#### For example:

- Increasing cyber security issues on several levels (criminal, terrorism, new styles of warfare).
- Increasing ease and complexity of transfer of funds in cyberspace poses a challenge for the tax systems of nation-states and for financial regulation.
- Solar flares pose major threat to ICT systems, in particular to space wireless based systems; which most essential services are now very dependent on.
- New military challenges from new technologies more generally.
- Risks of unpredictable consequences for human health from nanoparticle pollution.
- New ethical questions flowing from advances in medical science.

## Global technological drivers: summary of main messages

- Some areas of rapid technological advance can be foreseen (eg in the internet, energy, manufacturing on demand, Al and medical science).
- But the really important innovations will be hard to predict as they will apply generic technologies across boundaries: these are the ones which will be really transformative, for example the rise of budget airlines was driven by application of ICT.
- The key impacts of new technologies are likely to be felt through innovations in services capturing new growth opportunities, for example in social technologies such as Facebook or travel and tourism experiences.
- Increasing dependence on technology also brings risks; this will be facilitated by a more wireless and interactive world of mobile devices.

## Wales' Futures

Section A: Global Drivers

5. Global climate change, environment and food supply drivers

#### Climate change science is sound...

- The Greenhouse Effect is a natural phenomenon that warms the Earth's surface (Fig.1).
- Steady state climate is a balance between absorbed solar and emitted infrared radiation.
- Human activities are increasing the concentration of greenhouse gases in the atmosphere.
- The observed Earth is changing: e.g. warming and ocean acidification detected.
- Natural processes can affect the climate, and have done so in the past.
- Taking these facts into account, the only quantitative explanation that works to explain the
  observed climate of the past 100 years or so, within measured and modelled uncertainties, is
  increasing greenhouse gases plus aerosols (dust, volcanoes, sea salt, acid).
- If greenhouse gas concentrations continue to rise, temperatures will continue to rise as they did between 1900 and 2000 (Fig. 2), with potentially dangerous consequences: we are already committed to further warming, even if we stop greenhouse gas emissions tomorrow.

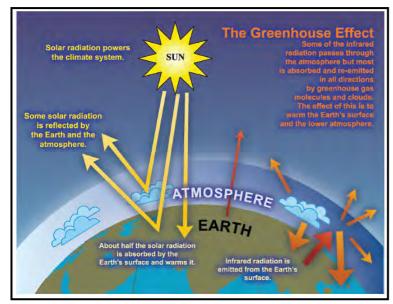


Fig. 1: The Greenhouse Effect

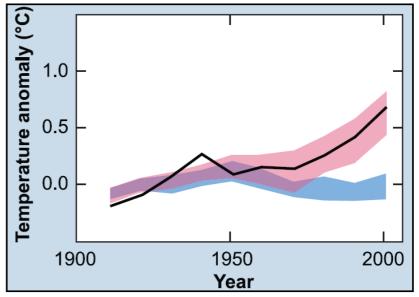
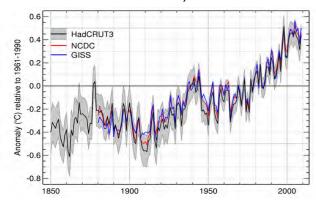


Fig. 2: Blue is natural processes only, pink is natural + anthropogenic, black is observed.

#### Climate change science is sound (continued)...

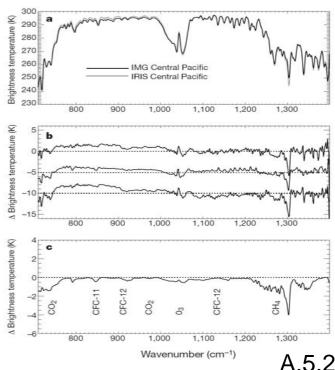
- The 3 main records of global surface temperature are produced by the UK Met Office/UEA Climatic Research Unit; NASA; and NOAA. The records are in close agreement, showing that global average temperature has increased by approximately 0.74°C since 1900 (Fig. 3). CO<sub>2</sub> measured 316 parts per million in 1959, rising to 387ppm in 2009.
- The hypothesis that greenhouse gases have caused the observed warming is also supported by direct, empirical evidence: satellite measurements of the infrared radiation emitted by the Earth in 1970 (IRIS experiment) and 1997 (IMG) show a decrease in the amount of energy escaping into space at the wavelengths that CO<sub>2</sub>, CH<sub>4</sub>, and other greenhouse gases (e.g. fluorocarbons) are known to absorb (Fig. 4).

Fig. 3: The three main records of global average surface temperature (grey shading indicates 95% confidence interval on the 'HadCRUT3' record).



#### Fig. 4

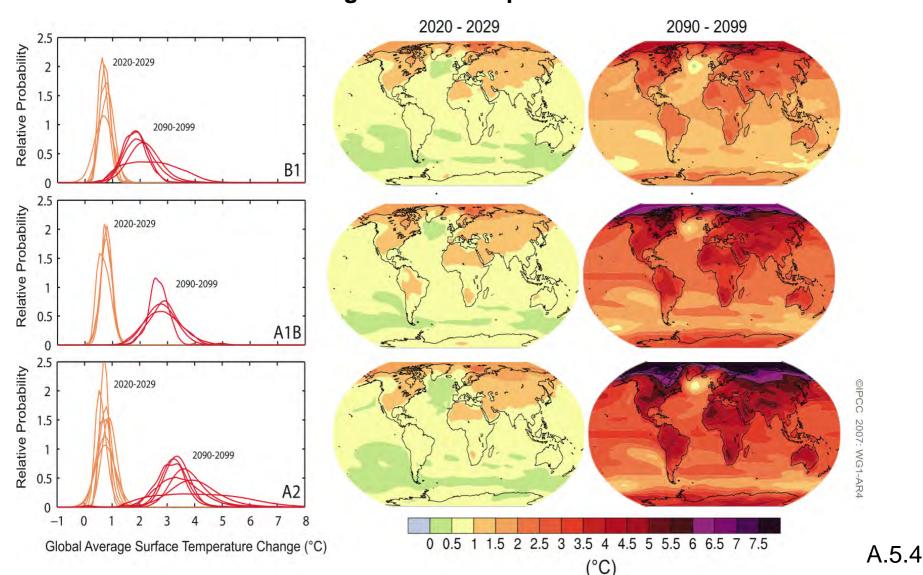
- (a) Shows IR spectrum of central Pacific from space in 1970 (IRIS) and 1997 (IMG).
- (b) Shows two observed difference spectra against (middle) a simulation.
- (c) Shows theoretical difference spectrum, knowing gas concentrations in 1970 and 1997. Difference spectra show clear evidence of growth of greenhouse gases, and effect on Earth's radiative balance.



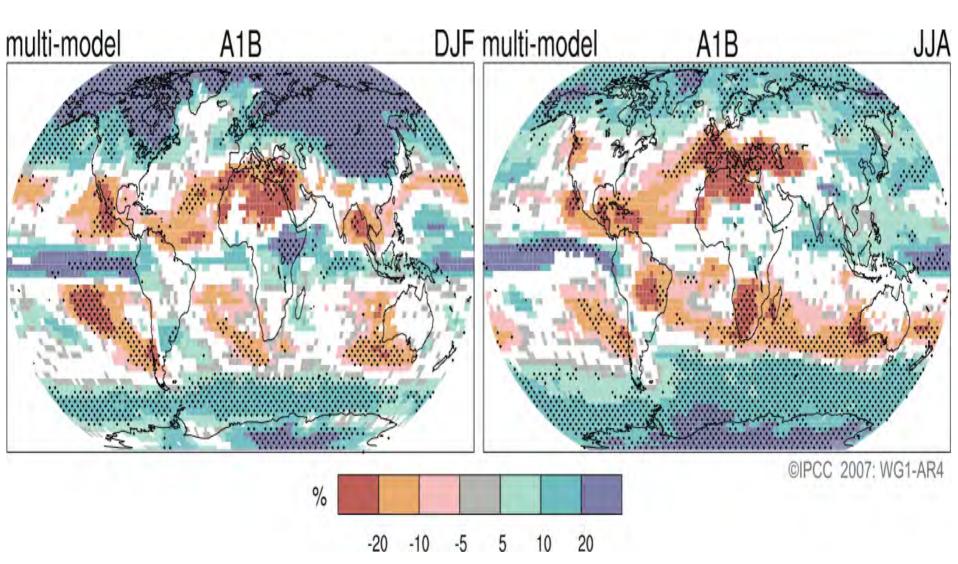
### The warming seen in temperature records is consistent with other trends

- Steady rise in global **sea level** (+10 cm over the past 50 years).
- Retreat of **Arctic sea ice** (in summer, no signal in winter).
- Retreat of northern hemisphere **snow cover** over the past 40 years.
- Increased heat storage in the ocean (80% of the total heat added to the system).
- Retreat of **mountain glaciers** in most parts of the world over the 20<sup>th</sup> century.
- Decrease in the volume of the Greenland ice sheet over the last 10-15 years.
- Increases in atmospheric humidity at the surface over the past 20-30 years.
- Changes in the salinity of the ocean (due to increase in tropical evaporation).
- Decrease in the frequency of cold days and nights, as well as frosts.
- Increase in the frequency of hot days and nights, as well as heat waves.

# The science of modeling how greenhouse gas emissions impact on future climate is very complex, with many variables, and deals in terms of probabilities e.g. surface temperature



#### For example, precipitation



## The EU and UK regard 2°C global average temperature rise as the threshold of "dangerous" climate change, which should not be exceeded... but recent scientific advice suggests this may be too optimistic

2009

TAR (2001) Reasons For Concern Proposed AR4 (2007) Reasons For Concern Rinks to Large Negative Higher Rinks to Large Negative Many Increase for Most Vegative Many Increase for Most Vegative Regions to All Regions in All Metrics Metrics Future Positive or Positive or Negative Negative Market Negative Negative Market for Some Impacts; Impacts: Regions; Majority Regions; Majority Positive of People of People Positive Risks to Adversely Very Risks to for Adversely Increase Others Affected Low Increase Others Affected Low Some Past

2001

Risk of

Extreme

Weather

Events

Risks to

Unique

and

Threatened

Systems

Distribution

of Impacts

The "burning embers diagram": Risks from climate change by reason for concern, 2001 (left) compared with 2007. (Credit: Smith et al., PNAS)

Risks to

Unique

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Risk of

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Impacts

Risks of Large

Scale

Discontinuities

Risks of Large

Scale

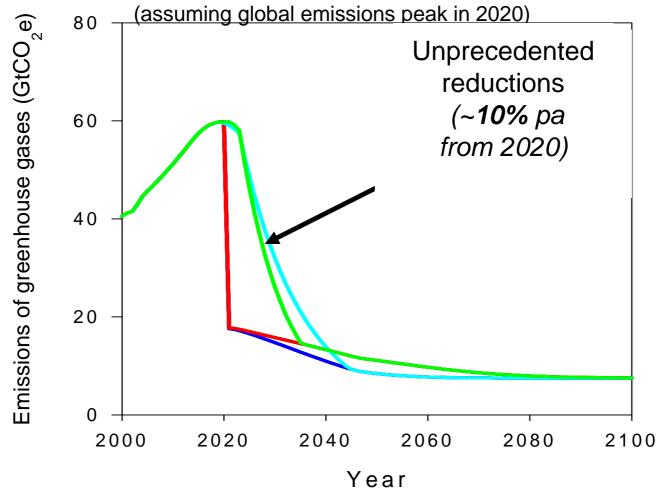
Discontinuities

Aggregate

Impacts

## Limiting warming to 2° C requires <u>very</u> steep reductions in emissions

Reductions in emissions required to have a 50:50 chance of limiting warming to 2°,



### Even if reasonably optimistic assumptions are made...

#### If:

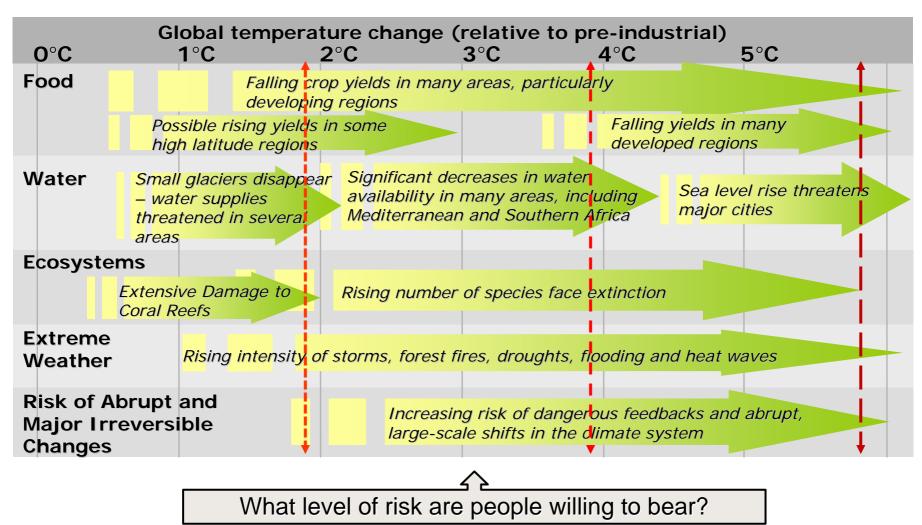
- IPCC's link between cumulative emissions and temperature is broadly correct.
- The emissions of Non-Annex 1 nations (developing countries) peak by 2025.
- There are rapid reductions in emissions from deforestation.
- Food emissions halve from today's values by 2050.
- No 'discontinuities' (tipping points) occur.
- Stern/CCC/IEA's maximum "feasible" reductions of 3-4% p.a. is achieved.

#### Then:

- 2°C stabilisation is not possible according to Tyndall Centre analysis.
- 4°C by 2070 looks likely (on the way to 6°C..?).

Even a very optimistic global peak of emissions in 2016, and a large buyout of emissions from poor countries (CCC 17% & 27%), would leave a 60% chance of exceeding 2°C.

## So what are the potential implications of going beyond 2°C?



### Water will be one of the first areas where climate change will have an impact

- Water scarcity is increasing by 2025 more than half of the world's population is projected to live under conditions of severe water stress.
- Water quality is declining in many parts of the world.
- 70% of all freshwater is used for irrigation 15-35% of irrigation withdrawals exceed supply rates and are therefore unsustainable.
- 50-60% of wetlands have been lost.
- Water has the lowest rate of cost recovery among all infrastructure sectors (about 20%).
- Human-induced climate change is projected to decrease water quality and availability in many arid- and semi-arid regions, and increase the threats posed by floods and droughts in most parts of the world.

#### Global food security will be a big challenge due to...

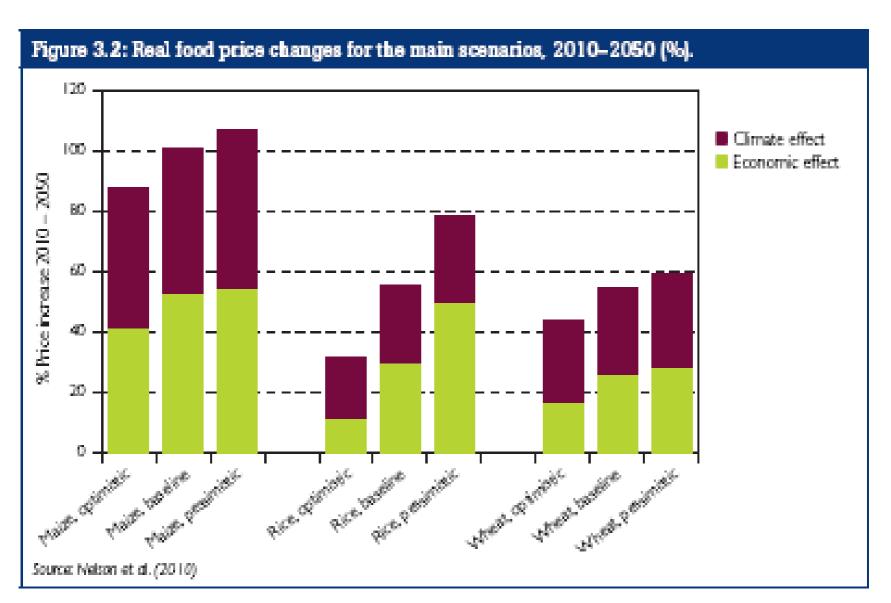
- Demand for food doubling within the next 25-50 years, primarily in developing countries, and the type and nutritional quality of food demanded will change.
- Changing climate.
- Increased volatility of climate: droughts and intense rainfall.
- Less water competition from other sectors.
- High energy prices increasing the cost of fertiliser and fuel.
- The need to reduce greenhouse gas emissions from farming.
- Land policy conflicts.
- Loss of biodiversity: genetic, species and ecosystem, increased risk of pests and diseases.
- Increasing levels of air and water pollution.

#### ...but one that can be met, by:

- Farming much more smartly, applying technology in "sustainable intensification".
- Relying on global, not local, food security.
- Reducing the loss of food after harvest and food waste.

NB GM likely to play an increasing role world-wide.

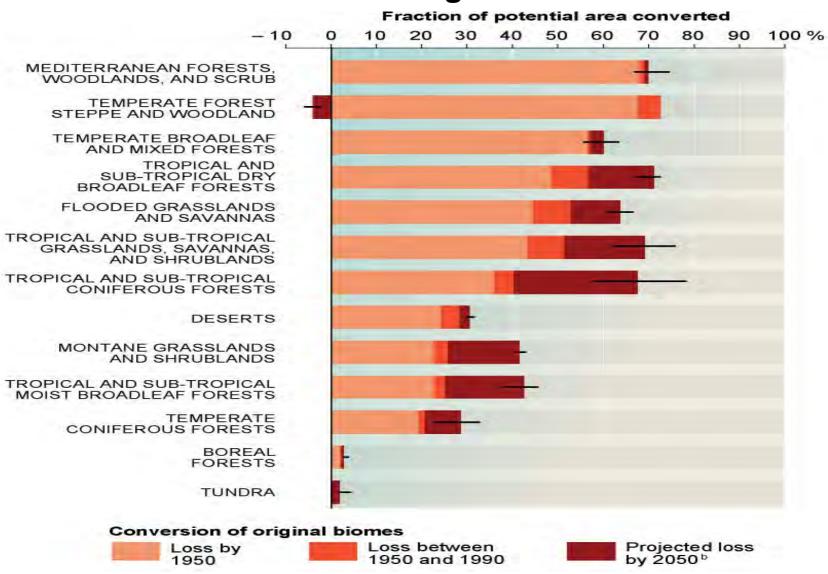
#### ...yet this will result in higher food prices



# Severe consequences for biodiversity and ecosystems are unavoidable, and these pose unpredictable risks to the sustainability of farming, fishing and other ecosystem services

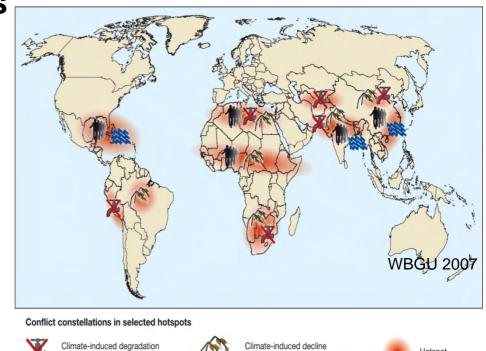
- An increasing number of ecosystems, including areas of high biodiversity, are likely to be further disrupted by a temperature rise of 2°C or more above pre-industrial levels.
- 10% of species will face an increasingly high risk of extinction for every 1°C rise in global mean surface temperature (up to an increase of about 5°C). The rate of extinction is already 100 times the natural rate and is likely to rise much higher.
- Wetlands, mangroves, coral reefs, Arctic ecosystems and cloud forests are particularly vulnerable to climate change.
- Without strong mitigation action, some cloud forests and coral reefs would may cease to function within a few decades.

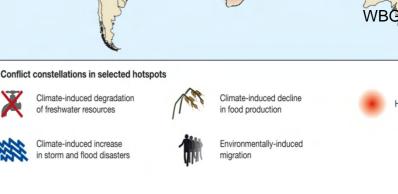
## Natural habitats are already experiencing unprecedented change



#### Climate change also increases the risks of conflict and "natural" disasters

- Tens of millions of people displaced:
  - Low lying deltaic areas.
  - Small Island States.
- Further food shortages in areas with hunger and famine today.
- Water shortages in areas already with water shortages.
- Natural resources depleted with loss of ecological goods and services.
- Increased incidence of disease.
- Increased incidence of severe weather events.





Climate change, coupled with other stresses, can lead to local and regional conflict and migration depending on the social, economic and political circumstances A.5.15

#### Global climate change drivers: summary of main messages

- The basis of climate change science is sound, although modeling the impact on future climate is very complex, and the assessments of probabilities will continue to evolve.
- Limiting average global temperature rise to the 2°C degree target looks unrealistic given the very rapid, steep reductions in emissions that would be required.
- Going beyond the 2 degrees average global temperature rise takes the world into levels of risk that are substantial and unpredictable (and 2 degrees itself may well not be "safe").
- Water will be one of the first areas where climate change will impact.
- Global food security will be a big challenge, but one that can probably be met at a cost in higher food prices.
- Global interdependence is the route to food security, especially given the unpredictability of drought, flood etc.
- Natural habitats are already experiencing unprecedented change and the impact of climate change - in addition to other factors - on biodiversity and ecosystems will be severe. This poses unpredictable risks to the sustainability of farming, fishing and other ecosystem services.
- Climate change also increases the risks of conflict and "natural" disasters and is likely to displace people in significant numbers.

## Wales' Futures

Section B:

Wales' Assets

#### Wales' SWOT analysis (of *relative* strengths etc)

#### **Strengths**

Stable, developed, orderly society.

English-speaking (major global language).

Distinctive culture including Welsh language.

An integral part of very large UK and European economies.

Attractive to in-migrants (mainly from rest of UK) who raise the educational and earnings base.

Attractive natural environment which has relatively close links to significant conurbations with good international gateways.

#### Weaknesses

Lagging economy reflecting low skills/educational attainment and lack of an effective major conurbation / agglomeration.

Associated with this, a small private sector.

Weaknesses on infrastructure, with issues around connectivity.

Long tail of persistent poverty and deprivation, in which children's life chances are damaged from birth.

Life expectancy rising more slowly than in EU15, and big health inequities, driven in part by unhealthy lifestyles (unhealthy lifestyles not restricted to those in poverty). Less attractive built environment in many places.

#### **Opportunities**

Intensive early years interventions with children and families to help raise educational attainment and life-chances.

Improve connectivity through wireless technologies.

Better transport links to exploit potential "agglomeration" effects in city-regions and perhaps strengthen international connectivity.

Renewable energy opportunities.

Optimise Welsh "brand" as distinctive part of UK

Exploitation of water supply.

Low congestion to attract more development into Wales.

Climate change may make Wales relatively more attractive over the (much?) longer term.

#### **Threats**

Key weaknesses (eg in lifestyles) are less amenable to our policy interventions.

UK/European economies sluggish over prolonged period.

Planning/regulation rules may choke development, including restrictions on housing.

Poorly-thought out development damages quality of life.

Environmental degradation from climate change.

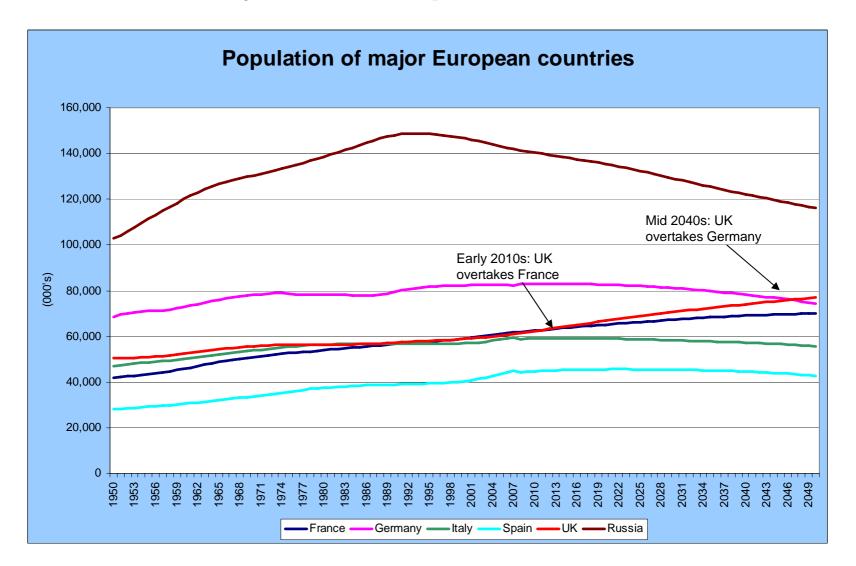
Natural disasters e.g. tidal surge, solar flare.

## Wales' Futures

Section B:

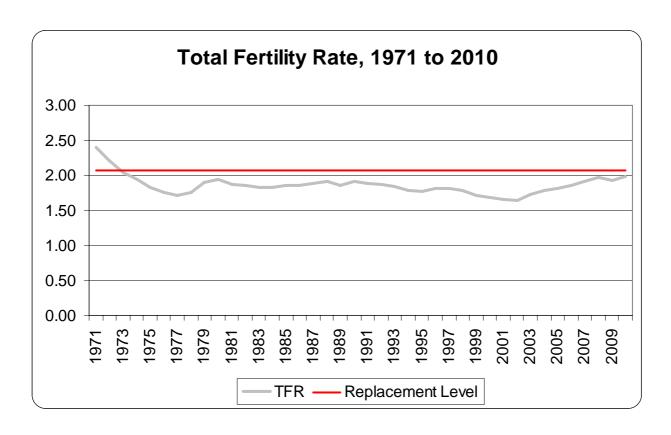
1. Wales' Demography

## The UK population is on a growing trend, in contrast to many other European countries



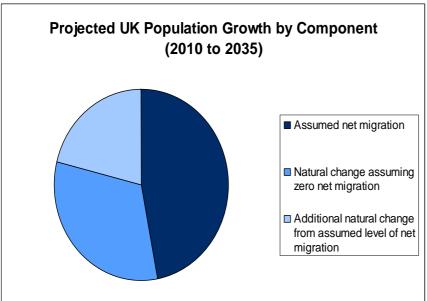
Source: UN Population Database

## Despite a recent increase in the birth rate we have yet to reach the replacement rate and it remains to be seen whether that will happen

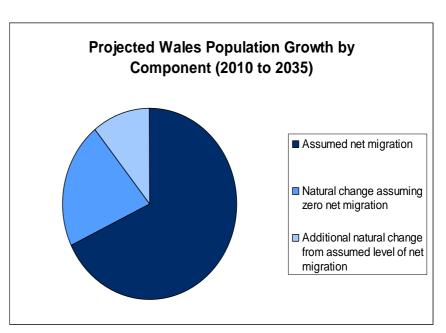


**Source:** ONS (Birth Registrations)

## Migration from the rest of the UK and beyond will therefore be the main driver for Wales' population growth over the next 25 years:



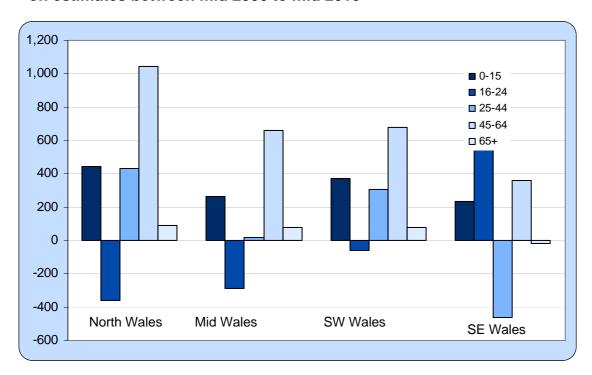
Just under two-thirds of the UK projected increase is either directly or indirectly due to migration (47 per cent directly attributable to future migration and a further 21 per cent indirectly due to future migration through its effect on natural change).



Nearly 80 per cent of the Wales projected increase is either directly or indirectly due to migration (68 per cent directly attributable to future migration and a further 11 per cent indirectly due to future migration through its effect on natural change).

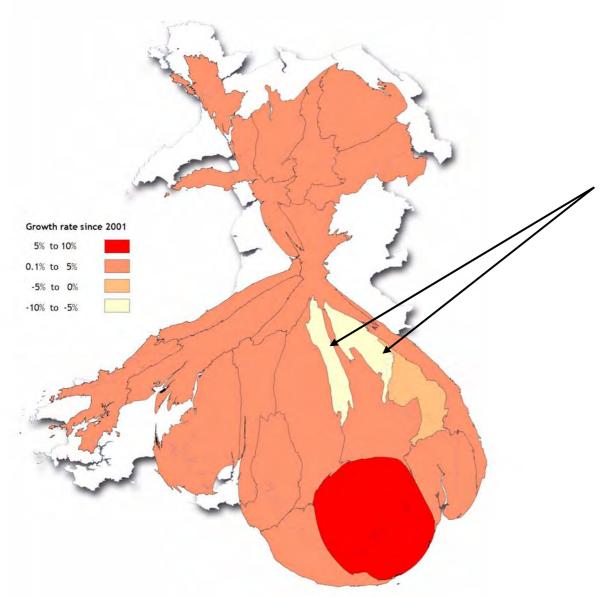
## There are net inflows into all major Welsh regions from rest of UK

Average net migration flows per year with rest of UK by age group, based on estimates between mid 2006 to mid 2010



Source: ONS (NHS Records)

Welsh Local Authorities by Population Size and Growth Rate, All Ages (2009 Mid Year Population Estimates)



But population in the Heads of the Valleys is continuing to decline

Source: WAG Cartographics B.1.5

## It is a myth that Wales loses young people and gains retirees

Average annual cross border migration with the rest of the UK 06 -010

| Т | hou | san | ds |
|---|-----|-----|----|
|   |     |     |    |
|   |     |     |    |

|                   | Population (a) | Inflow      | Outflow     | Net<br>Migration | Total<br>Migration |
|-------------------|----------------|-------------|-------------|------------------|--------------------|
| All ages          | 2,986.8        | 57.4        | 53.0        | 4.4              | 110.4              |
| Under 16<br>16-24 | 553.7<br>368.0 | 7.4<br>21.4 | 6.1<br>21.6 | 1.3<br>-0.2      | 13.5<br>43.0       |
| 25-44             | 740.3          | 17.3        | 17.0        | 0.3              | 34.2               |
| 45-64             | 784.5          | 8.2         | 5.4         | 2.7              | 13.6               |
| Over 65           | 540.3          | 3.1         | 2.9         | 0.2              | 6.0                |

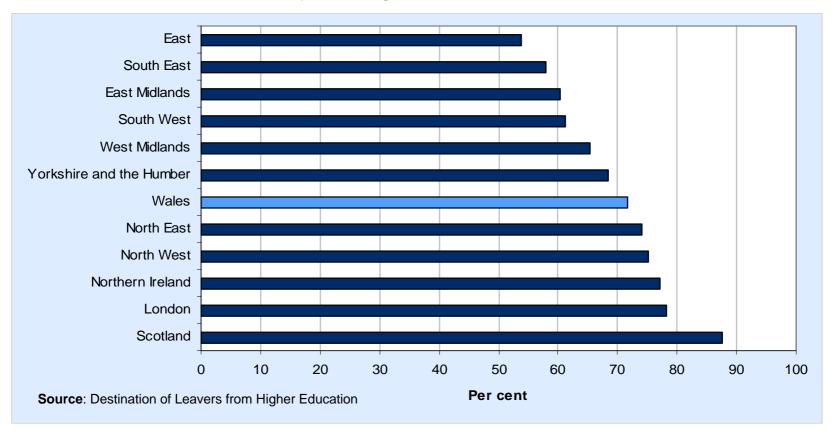
Source: Internal Migration Estimates, Office for National Statistics

- Wales is a net gainer from England.
- Wales gains more aged 0-14 than it loses aged 15-24.
- Wales gains more aged 45-64 than over 65.

•

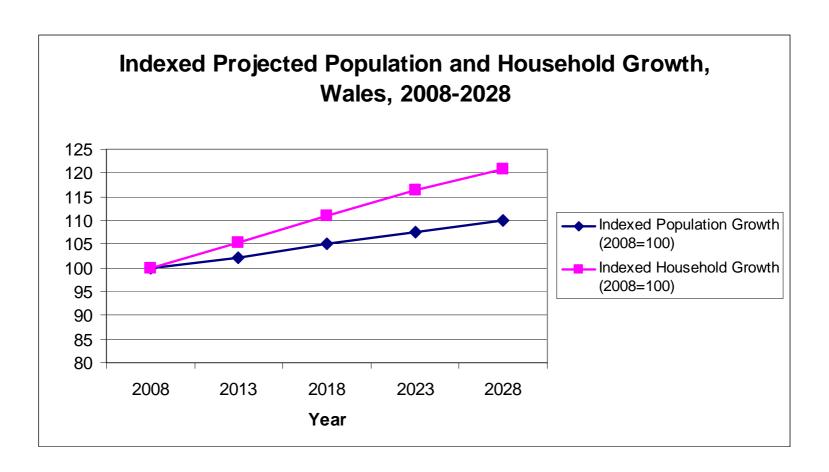
## Wales loses young graduates, but this is in line with many English regions

Proportion of full-time first degree graduates entering employment in region (or country) of original domicile, 2008/09

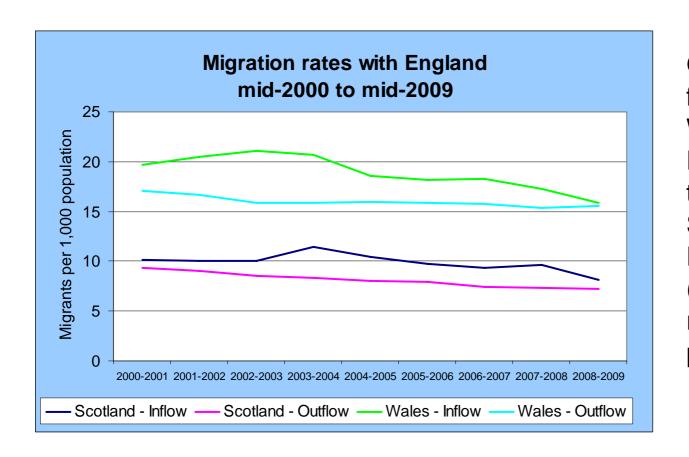


Welsh domiciled first degree graduates were less likely to remain or return to Wales than the equivalent 'retention' figure for other UK countries, but higher than many English regions.

# The number of households is growing faster than the population, and there is a long run trend to smaller households (with a large increase in the number of single person households)



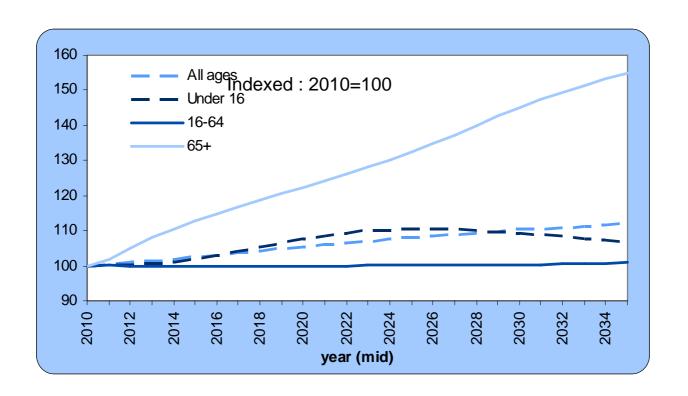
## Wales is part of an England and Wales pool of people....Scotland is slightly different



Gross migration flows between Wales and England higher than between Scotland and England (particularly in relation to population size)

Source: ONS (NHS records)
B.1.9

#### The number of older people will rise significantly

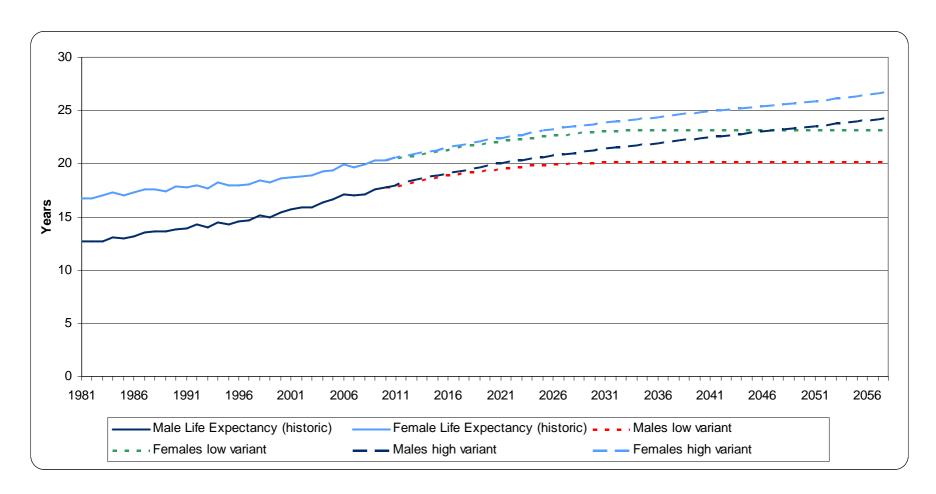


Source: ONS (2008-based national projections)

• The number of children is projected to rise in the medium term, before falling slightly in the longer term.

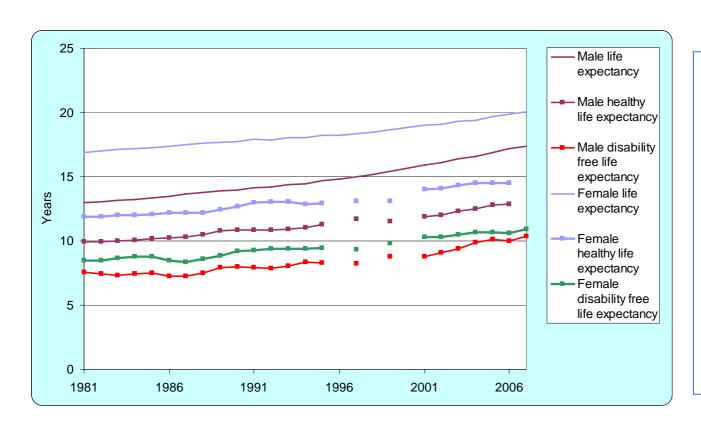
## Life expectancy is expected to continue to increase, but there are big uncertainties about how far this will continue...

Life expectancy at age 65



Source: ONS

## "Healthy" life expectancy in GB has been increasing as fast as overall life expectancy: a major uncertainty is whether this will continue...



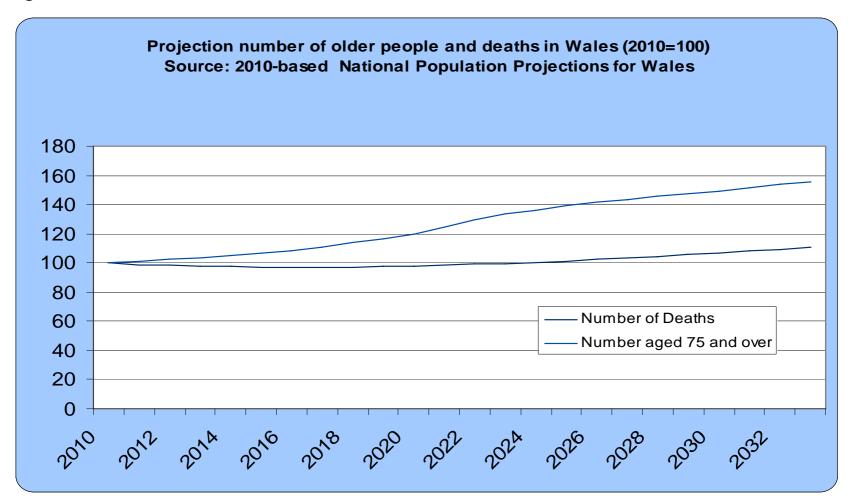
Based on selfreported health status, which may not reflect real quality of life.....

.....other evidence suggests the health of older people has been improving faster; major uncertainties here

Source: ONS

### So although the number of older people is projected to increase, the number of deaths is not.....

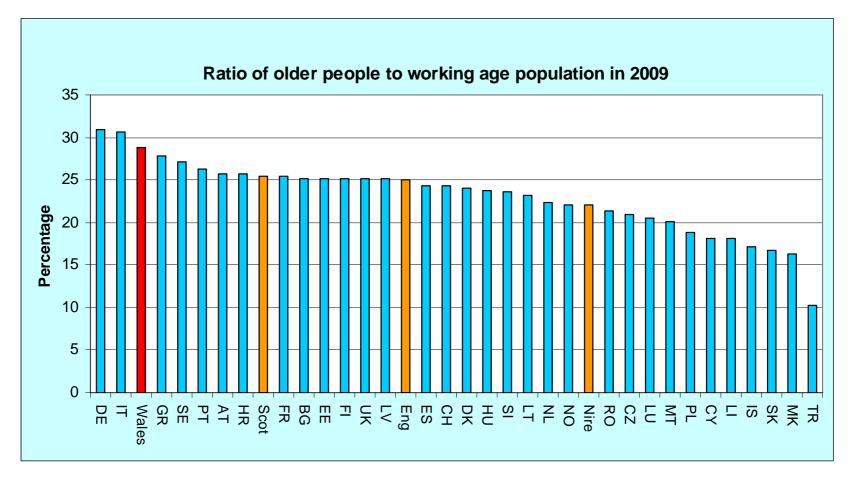
....and health costs may be more related to the two years before death than to age



Source: ONS (2010-based national projections)

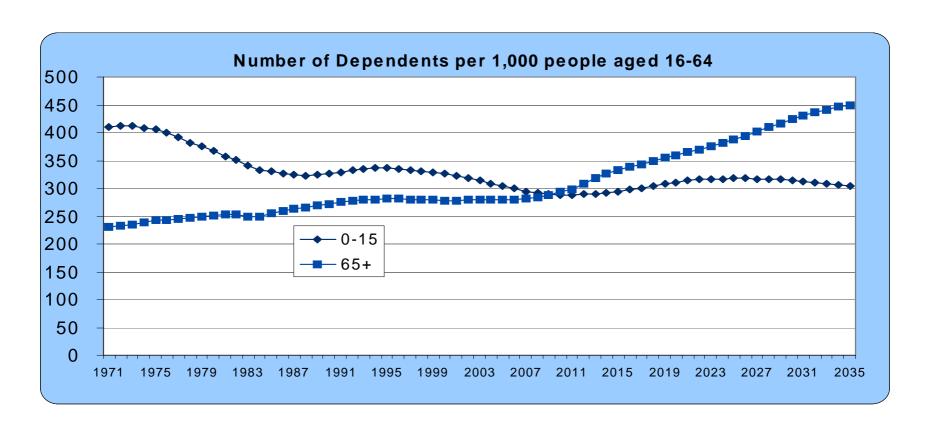
#### Wales' dependency ratio is high within the UK and also internationally

NB the concept of an old-age dependency ratio at Wales level is artificial if the UK Government takes account of variations in old age resident populations in allocating spending to devolved administrations, as recommended by the Holtham Report, and continues to pay pensions on a UK basis.



Source: Eurostat

# Although the dependency ratio in relation to older people is due to increase sharply, the combined ratio in relation to children and older people looks more stable over time



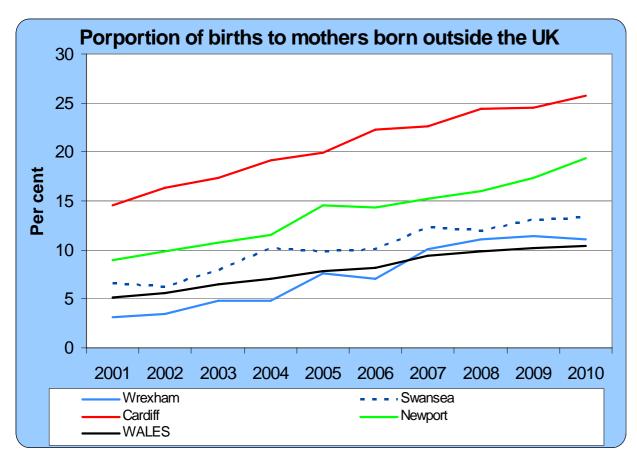
## The proportion of the Welsh population born in Wales is in slow, but steady, long term decline

#### Country of Birth

|      |       |          |            | Per cent |
|------|-------|----------|------------|----------|
| Year | Wales | Other UK | Outside UK | Total    |
| 1991 | 77.2  | 20.1     | 2.7        | 100.0    |
| 2001 | 75.4  | 21.5     | 3.2        | 100.0    |
| 2002 | 74.7  | 22.0     | 3.3        | 100.0    |
| 2003 | 74.3  | 22.4     | 3.3        | 100.0    |
| 2004 | 74.0  | 22.6     | 3.4        | 100.0    |
| 2005 | 73.6  | 22.7     | 3.7        | 100.0    |
| 2006 | 73.3  | 22.5     | 4.2        | 100.0    |
| 2007 | 72.2  | 23.3     | 4.5        | 100.0    |
| 2008 | 72.0  | 23.4     | 4.6        | 100.0    |
| 2009 | 72.1  | 23.0     | 5.0        | 100.0    |
| 2010 | 71.9  | 23.0     | 5.1        | 100.0    |

Source: 1981, 1991 and 2001 Census, Annual Population Survey (2002-2010)

# The proportion of Welsh births to mothers born outside UK has nearly doubled over the decade, driven by growth in urban areas – but not exclusively



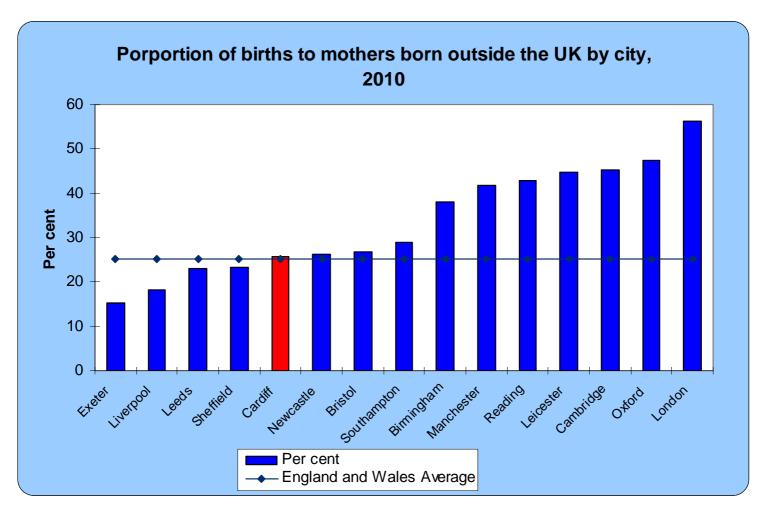
All Local Authorities outside the major conurbations have also seen increases

(selection below)

| 2001 | 2010                                      |
|------|---|
| 35   | 7.6                                       |
| 38   | 83  |
| 5.5  | 11.5                                      |
| 34   | 8.6                                       |
| 1.2  | 6.8                                       |
| 4.0  | 7.6                                       |
| 0.8  | 36  |
| 4.7  | 7.3                                       |
|      | 35<br>38<br>55<br>34<br>1.2<br>4.0<br>0.8 |

Source: ONS

# About a quarter of births in Cardiff are to mothers born outside the UK, about the level of the England & Wales average



#### **Demography: summary of main messages**

- Wales' population is due to rise, mainly through in-migration from England and outside the UK.
- Wales gains more aged 45-64 than over 65, and more aged 0-15 than it loses aged 16-24.
- Although the number of older people is increasing, this may not lead to major extra health costs if serious illness continues to be concentrated in the last 2 years of life. We cannot know at this stage whether this will be the case or not.
- There is a long-term trend to smaller households.
- The % of people in Wales who were born here is in slow long-term decline, and the % born to mothers born outside the UK is rising. This underlines the challenge of fostering a shared culture which has common values while celebrating particular cultural traditions.

## Wales' Futures

Section B:

2. Wales' Environmental Assets

#### **Climate change impacts on Wales**

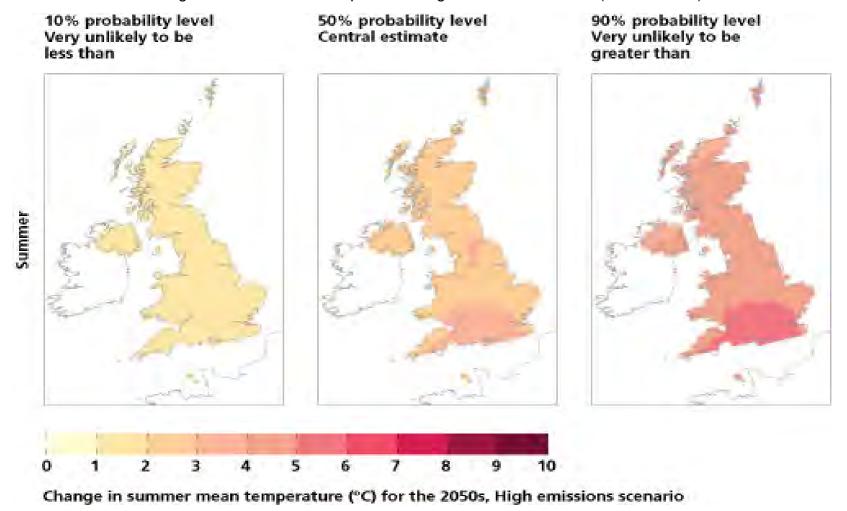
#### Welsh climate in the 21st century

How will the Welsh climate change? A detailed and sophisticated model run for the UK Climate Impacts Programme predicts that by 2080 Wales will experience

| • | greater warmth all year round                             | by 1.1-2.9 °C   |
|---|---|---|
| • | more precipitation in winter                              | by 7-24 %   |
| • | less precipitation in summer                              | by 7-14 %   |
| • | greater annual precipitation                              | by 2-9 %  |
| • | a rise of sea level                                       | of 18-79 cm   |
| • | a higher mean windspeed                                   | by 1-4 %  |
| • | more evapotranspiration                                   | by 13-27 %  |
|   |   | •   |
| • | more variability from year to year                        | the number of<br>extreme years<br>will increase                 |
|   | more variability from year to year more frequent and more | the number of extreme years                                     |
|   |   | the number of<br>extreme years<br>will increase                 |
|   | more frequent and more                                    | the number of<br>extreme years<br>will increase<br>more rain in |

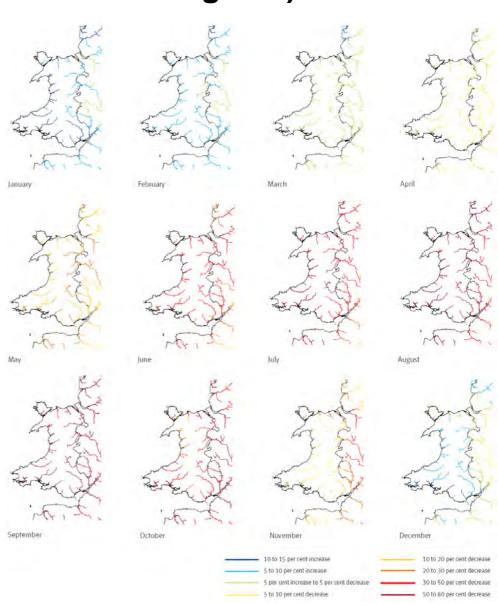
# This doesn't sound much, but, if emissions continue on a high track, the central estimate suggests that by the 2050s mean summer temperatures in SE Wales and Southern England will be similar to Northern Spain today

Change in mean summer temps: 2050s high emissions scenario (UK CIP 2009)

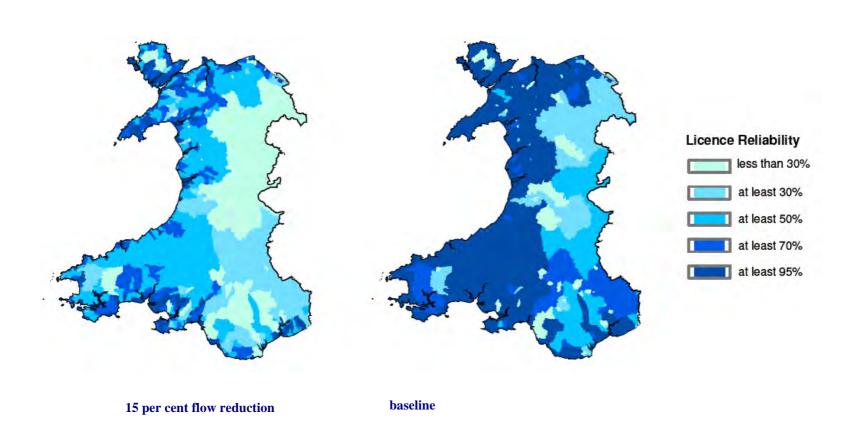


## Water supply will become more difficult to manage (in Wales, but much more in England)

- Significant changes are expected for water resources by the 2020s with a projected decrease in summer rainfall of 7% and a similar increase in Winter.
- 2050s range for Wales at 50% probability level +14% in winter and -17% in summer.
- Potential decrease in summer river flows of 50-80%.
- Potential increase in winter river flows.
- Wide range of projections.
- More 1976 style droughts: by 2030s every other summer might be as hot as 2003.
- A rising population will need more water.
- Dwr Cymru plan to invest £1.3bn 2010-2015. This broad scale of investment will need to continue, funded via consumer bills and via the markets.

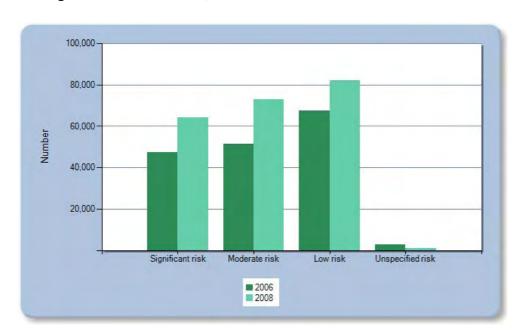


## Access to water will become more limited: a 15% reduction in water flows would have a significant impact on the reliability of licences to abstract water



#### Flooding risks are increasing

- oThe Environment Agency *'Flooding in Wales: A National Assessment of Flood Risk'* (July 2009) shows that 1 in 6 properties in Wales, a total of 357,000, are at risk of flooding. One in five people in Wales live or work in flood risk areas.
- oWithin this, 65,000 properties (including 22 % of electricity infrastructure sites) are at significant risk of flooding. This is likely to rise to 115,000 by 2035, due to climate change. Keeping the number at 65,000 would mean tripling investment in flood defence (cost £135m pa).
- o The potential annual economic risk from flooding to residential and business properties and their contents was estimated at £200 million in April 2008.
- oNumber of properties in Wales with a significant, moderate or low risk of flooding from the rivers or sea, 2006 and 2008



#### **KEY CHALLENGES**

- In 2013 the UK Government's agreement with the Association of British Insurers runs out. Insurers may be reluctant to offer insurance to some householders at high risk of flooding.
- •A rigorous estimate of the possible increase in flood hazard is a crucial task for planning future climate adaptation strategies, and our understanding of this change in risk needs to be improved.

Climate change drivers of increasing risk: more intense rainfall patterns leading to river overflows and localised surface run-off in urban areas, sealevel rise, increased storminess.

## Wales has important natural carbon sinks: the extent to which they are retaining their carbon is uncertain

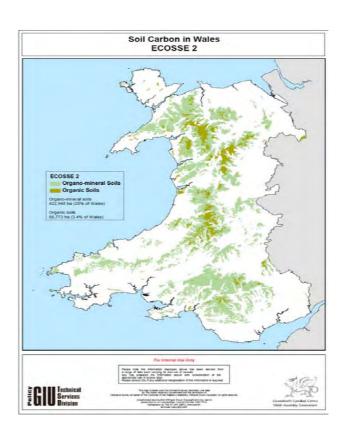
There is approximately 400 million tonnes of CO2 equivalent in Welsh soils, and over 50 million tonnes in trees. If 1% of the carbon in Welsh soils oxidises in a given year, Wales total greenhouse gases would rise by about a third (Farrar et al 2003).

There are threats to soil carbon, including ploughing, drainage, fertilising, and reseeding.

The rate at which the soil carbon store is changing in Wales is the subject of considerable debate, with apparently contradictory results from two major UK surveys.

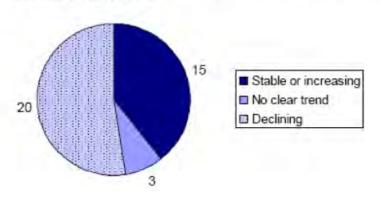
Projections show that within a decade woodlands in Wales could become an annual emissions source, not a sink, as a result of a decline in planting rates.

The announced programme of creating 100,000 hectares of new woodland over the next 20 years would create an additional sink of 1.6 M tonnes of CO2 equivalent annually by 2040.



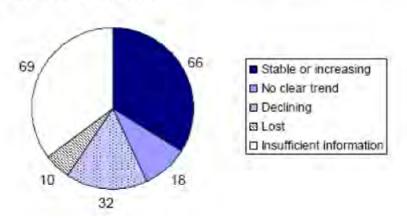
## Bio-diversity is already under pressure... and climate change will intensify this in future

Figure 3. Wales trend for priority BAP habitats, using 2008 reporting trend estimates. The total number of priority habitats was 38



In 2005, the majority of Biodiversity Action Plan priority habitats in Wales were declining. This trend has increased since 2002, with 59% of priority habitats declining in 2005, compared with 46% in 2002.

Figure 4. Wales trend for priority BAP species, using 2008 reporting trend estimates. The total number of priority species was 195



32% of Biodiversity Action Plan priority species in Wales were declining in 2008.

Climate change will increase the pressures: and fragmented habitats will make it hard for species to adapt by migrating

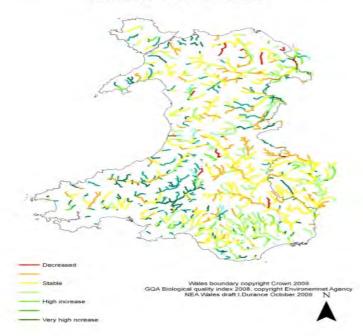
#### Pressure on water habitats is part of this...

Recent Environment Agency data shows that Wales has some of the best quality river habitat in England/Wales, however the majority of freshwater features within designated sites in Wales are in unfavourable or declining condition.

•Upland Welsh freshwater ecosystems are very vulnerable to acid deposition. In 1986-88 nearly 80% of the sites were exceeded for total acid deposition. This figure has reduced to just over 50% in 2002-04. While these water courses are beginning to recover, biological recovery has lagged behind.

•Nutrients from diffuse and point sources, and other forms of pollution such as sheep dip, are responsible for a decline in the health of freshwater ecosystems across Wales, with significant slippage of rivers (700-800km) from "verv good" quality to "good" from around 1995 onward. (Ormerod & Jüttner 2009).

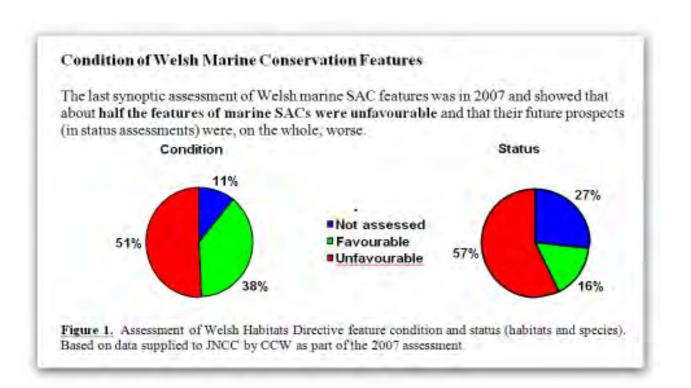
Trends in biological quality of streams in Wales between 1990 and 2008



#### Marine environments are also under pressure...

Marine designated sites in Wales total more than half a million hectares. Seven in every eight hectares of Welsh Natura 2000 sites are in the marine environment, reflecting the high conservation importance of the marine habitats in Wales.

- •An assessment of Welsh marine SAC features in 2007 showed that about half the features of marine SACs were in unfavourable condition and that their future prospects (in status assessments) were, in general, not likely to improve in the short term.
- •The major factors affecting marine habitats in Wales are: fisheries, coastal development, non-native species introductions and climate change.



#### **Future Challenge**

In the longer term, rising carbon dioxide (CO2) concentrations in sea water will lead to increased acidification of marine environments. This will likely have a negative impact on hard-shelled marine organisms

## Climate Change means opportunities and challenges for Food Production

#### **Opportunities**

- •Opportunities for high value niche crops such as grape vines, soft fruits and flowers.
- Longer grass growing season in uplands, but water shortages may limit production in some years, especially in lowlands.

#### **Challenges**

- Climate change plus increasing trade will affect the patterns of plant and animal diseases.
- increasing risk of vector borne diseases being introduced e.g. bluetongue.
- •Need more drought-resistant crop varieties, improved water storage and use efficiency, changes in soil management, and altered sowing and harvest dates.
- •Integrated land management needed to produce food, manage carbon emissions and stocks, manage water and diffuse pollution while maintaining and enhancing underpinning ecosystem services.

#### ....and for managing woodlands and forests

#### **Opportunities**

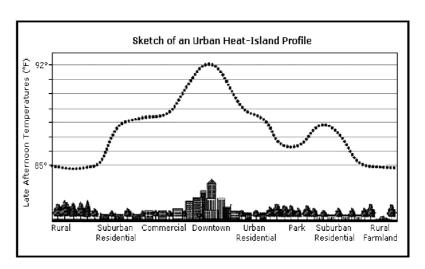
- Timber and biomass as a major source of renewable fuel and other products.
- Carbon sequestration increasing the area of forests and woodlands is a highly cost effective way of meeting emission reduction targets.
- WAG programme to plant 100,000 ha of new woodland over the next 20 years will create a major sink of 1,600 kt CO2e annually by 2040.

#### **Challenges**

- Need to greatly increase the diversity of forests and woodlands to make them more resilient to future risks (pests and disease, fire, drought and wind damage) that are predicted to increase as a result of climate change.
- Drought stress in summer may increase susceptibility to tree diseases eg specific concern about the threat posed by Phytophthora diseases which are favoured by higher temperatures and higher rainfall events. In 2010, 800 hectares of Japanese larch in Wales were found to be infected with Phytophthora ramorum.
- Currently Spruce accounts for 60 70% of timber production: we have far too many eggs in one basket.
- Our native species are at risk too eg through Sudden Oak death and Acute Oak decline.
   We need to look at the genetic diversity of all the species we use and protect our native species.

## Planting more trees in urban areas can help our towns and cities be more comfortable and healthier in the 2030s, but only if we act now....

- •By the 2030s, every other summer might be a heat wave like the summer of 2003. Life will be uncomfortable in cities, especially given the urban "heat island" effect. Trees on roadsides and in and green spaces can reduce the heat island effect significantly, but for this, planting needs to start now.
- •Urban trees also bring health benefits: eg in Wales they currently absorb each year between 45 and 73 megatonnes of particulates and between 91 and 165 megatonnes of sulphur dioxide (Small, 2009), delaying deaths and preventing hospital admissions from poor air pollution. These benefits could be enhanced through further urban tree planting.
- •Green spaces in urban areas will also be increasingly important to help manage surface water from intense rainfall.
- •Grahn (2003) found that people who have access to a green open space within 50 metres suffer stress less often than do people who have to walk further.

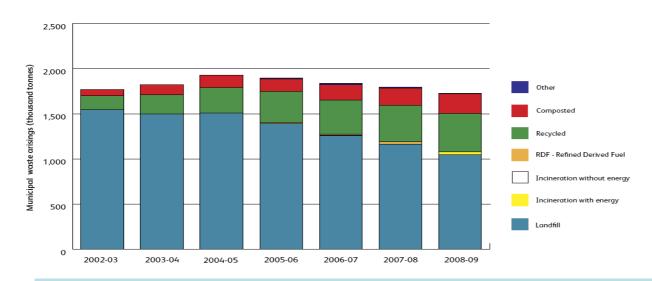


### We are making strong progress on waste but there is much more to do....

Wales has caught up with the EU average for the % of municipal waste recycled or composted.

At the end of 2008 there were 8 years of landfill life left at sites for non-hazardous wastes in Wales, at 2008 input rates.

Municipal waste management in Wales (Source Waste Data Flow)



Waste prevention is the best way of reducing the ecological footprint of waste in Wales. To achieve One Wales: One Planet levels by 2050 we need to reduce our waste across all sectors by around 1.5%, each year, from now to 2050.

#### **CHALLENGES**

- •To reduce the impact of waste in Wales to within our environment limits we need to reduce the ecological footprint of waste by 75% by 2050.
- •We need to focus on waste prevention, and more sustainable ways of consuming and producing.
- •Where waste is produced, we need to focus on very high levels of recycling, and make sure that it is the right type of recycling.

B.2.13

#### **Environment: summary of main messages**

- The degree of climate change for Wales to adapt to by the 2050s might not sound dramatic but there are serious practical implications.
- We need to start planning now if we are to manage water availability within Wales.
- From 2013, insurers may be reluctant to cover homes at serious risk of flooding.
- Investment in flood defence needs to triple if the number of properties at significant risk is to remain at its current level by 2035.
- Welsh biodiversity is already under real pressure and this will ramp up as the climate changes.
- We need a joined-up approach to managing land at landscape scale if we are to manage water and carbon while getting the food and timber we need and helping biodiversity to survive: so the Glastir approach is crucial.
- Farming and woodland management need to start adapting now if they are to seize the opportunities and reduce the risks brought by climate change.
- Urban areas need to act now if they are to reduce heat island effects of 20 years' time.
- Wales will be affected as much, or more, by the environmental impacts on others eg if by the 2050s SE Wales is like Bilbao in summer, what will Bilbao be like?...and climate change will not stop in 2050.

## Wales' Futures

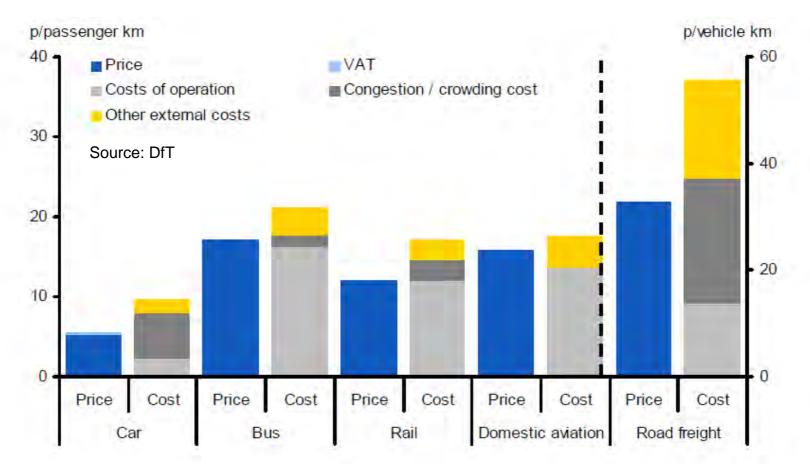
Section B:

3. Wales' Infrastructure

Part One: Transport

Transport is "under-priced": social costs exceed prices for all powered transport modes, with the greatest underpricing for road freight and cars. Congestion costs (internal to transport users) play a major role...

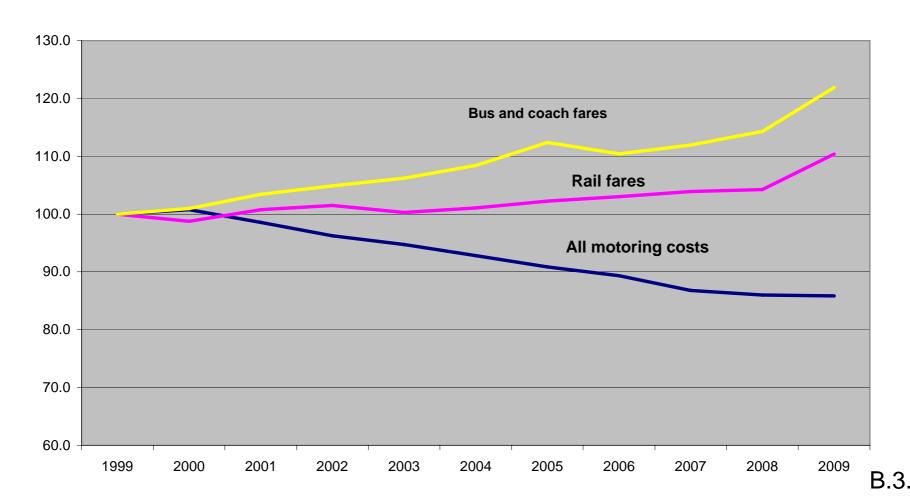
Estimated average marginal price and cost of additional travel by mode 2009



Congestion plays a major part in under-pricing for most modes, and plays a larger role than pollution for cars, where tax more than covers all other social costs

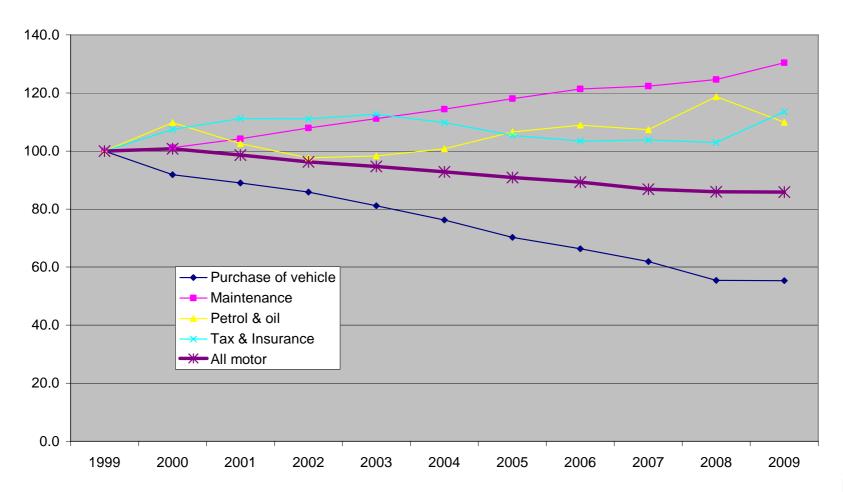
### Despite increasing fuel costs, overall motoring costs have fallen in real terms over the most recent decade

Real transport costs, UK, 1999=100 (deflated by all items RPI)



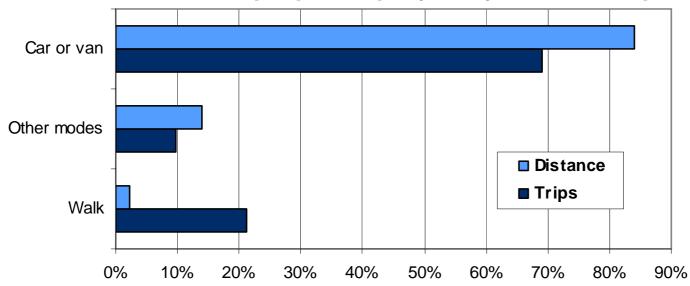
### ....because increases in fuel costs have been (more than) offset by reductions in vehicle costs

#### Real motoring costs, UK, 1999=100 (All items RPI deflator)



Cars (and vans) are the overwhelmingly dominant mode of travel. It is unclear to what degree correcting "under-pricing" and other measures in support of modal shift would change this. Low carbon (probably electric or hydrogen) vehicles appear central to cutting greenhouse gas emissions by the degree that will be necessary, but are some way off...

Trips and Distance travelled per person per year by main mode - persons

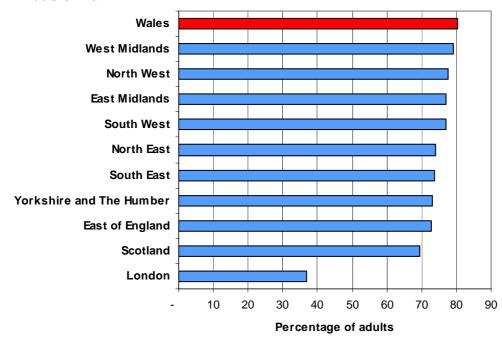


Source: national Travel Survey

- Excluding walking, after cars and vans, buses are the next most important mode.
- The dominance of cars and vans means that even if, for instance, use of public transport doubled or trebled as a result of modal shift, cars and van would remain the majority mode of travel. Modal shift might, however, ease congestion on specific routes.

### A relatively high proportion of people in Wales use private road transport as their main mode of travel to work

Percentage of adults whose main mode of travel to work is car minibus or van

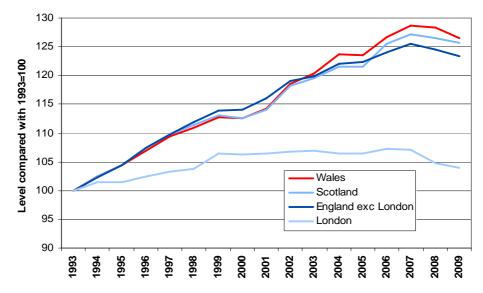


Source: Labour Force Survey

- Car ownership in Wales is not untypical amongst UK countries and regions.
- •Proportion driving to work in Wales is broadly constant over time (slightly falling for men, rising for women).
- Average time taken to travel to work in Wales is 21 minutes, a minute or two less than most regions (except London). So while congestion is an issue in SE Wales, it is not a problem everywhere.

## There is no real sign of road use falling; traffic (as opposed to travel, see later) peaked in 2008, before falling back; so this probably reflects the recession

Estimated change in traffic volume for all motor vehicles by region/country: As index, 1993 =100

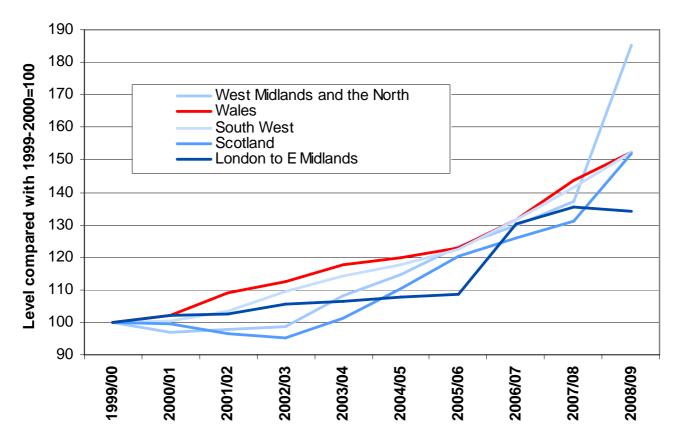


Source: DfT National Road Traffic Survey

- Growth in traffic in Wales has been higher than in rest of UK, though matched by the South West and Scotland.
- Within Wales, Cardiff had the slowest growth in traffic.
- There are some indications that distance travelled per person (as distinct from total traffic) may have started to level off, but too soon to be sure.
- •Air travel is continuing to increase rapidly.

## Growth in rail usage in Wales is broadly consistent with the rest of the UK, and appears on a solid upward trend (though volumes will remain far below private road travel)

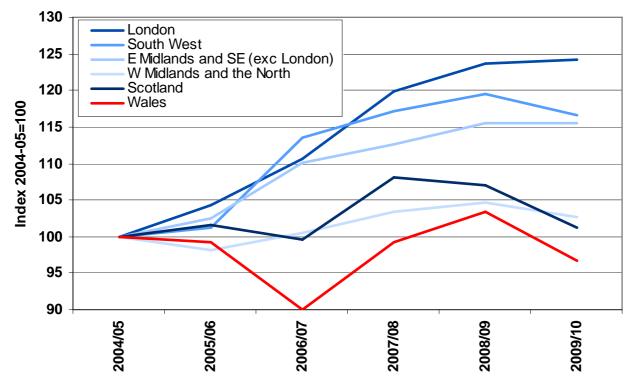
Estimated change in rail passenger traffic by region/country: As index, 1999/00 =100



Source: ORR

## However, over the medium term, growth in bus passengers in Wales has been unimpressive compared with the rest of Great Britain

Annual passenger journeys on local bus services by region as index 2004-05=100: Great Britain to 2009/10



Source: DfT Public Service Vehicle Survey, Transport for London

Over the longer term, the big story is the way London out-performs other areas.

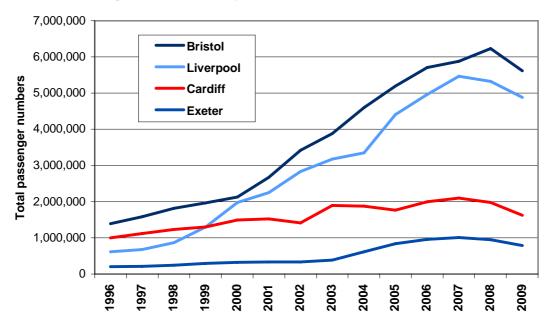
#### City-regions?

- The "global drivers" underline that urban agglomerations are economic magnets.
- Wales lacks such agglomerations, but improved internal transport links are a factor that could strengthen the economic performance of SE Wales, and to a lesser extent Swansea and its hinterland, so that they can harness their economic potential more effectively as "cityregions"
- Need to consider what would be the most effective ways of achieving this. How big a contribution would electrification of the Valleys lines make?

### Wales' access to major international airports is also a factor in the attractiveness of our urban centres as places to do business...

...and Cardiff airport has been less successful than others in attracting users:

#### Annual passenger numbers, by airport



Source: Civil Aviation Authority

- •Easy access to a major international airport is a significant factor in the economic attractiveness of an area. The speed and ease of access from N Wales to Manchester and from South Wales to Heathrow are key factors.
- •A new Severnside international airport might have a significant impact on the economic vitality of the region, but there would be environmental costs.

### In respect of attracting mobile development, high speed rail to the north of England may also place Wales at a relative disadvantage

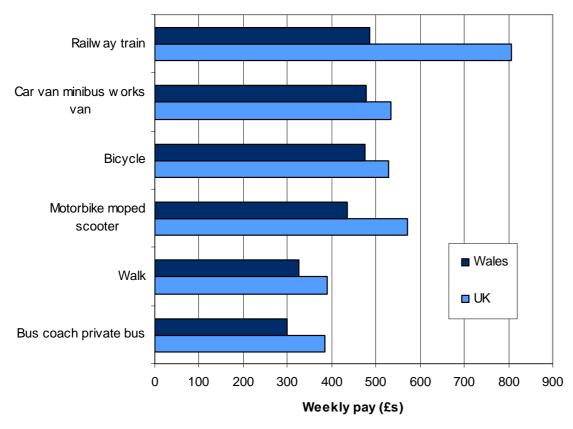
|            | Rail journey time    |                                |  |
|------------|----------------------|--------------------------------|--|
| London to: | Typical current time | After full construction of HS2 |  |
| Birmingham | 1:25                 | 0:45                           |  |
| Nottingham | 1:50                 | 0:55                           |  |
| Cardiff    | 2:05                 | 1:45                           |  |
| Manchester | 2:10                 | 1:20                           |  |
| Leeds      | 2:25                 | 1:25                           |  |

Source: Greenguage: <a href="http://www.greengauge21.net/hsr/hsrand-journey-times/">http://www.greengauge21.net/hsr/hsrand-journey-times/</a>

Note: The indicative Cardiff journey times after HS2 reflect electrification of the Great Western Main Line, which has been announced, and not HS2 itself.

## Bus commuters have low incomes; in Wales (unlike the UK overall) rail commuters have broadly similar incomes to car commuters

Mean gross weekly pay by usual method of travel to work, full time employees only, (based on residence), 2008: Wales and UK



• The low average incomes of bus commuters raises issues of social justice in connection with the distribution of transport subsidies

Source: Annual Population Survey

#### Transport: summary of main messages

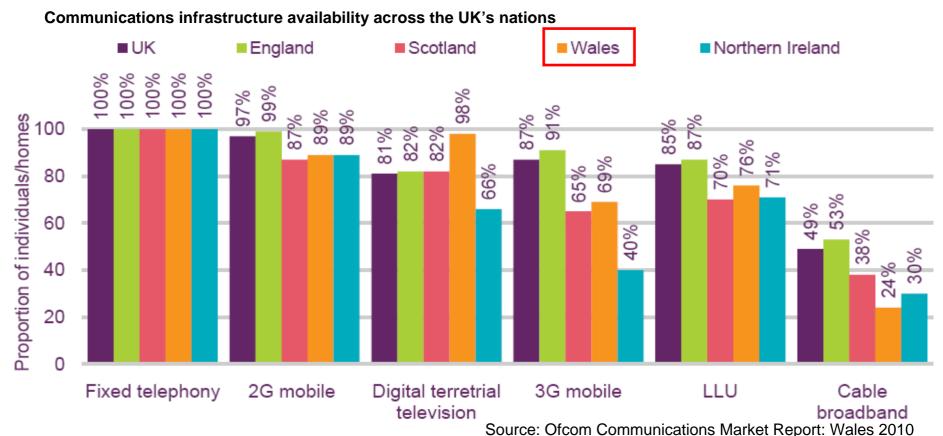
- Transport is generally underpriced, especially for road freight.
- The car remains the overwhelmingly dominant mode.
- Growth in demand for all modes (except bus) is likely to continue over the longer term – but some uncertainties here.
- Major economic issues relate to helping Wales' city-regions to work more efficiently as "agglomerations" and easing journeys to work, when cars will remain dominant.
- Decarbonising car travel seems crucial: given the extent to which the car is dominant, it is easier to see modal shift easing congestion on key routes in city-regions than delivering the scale of cut in vehicle emissions needed to meet climate change targets.
- International connectivity: there are a number o options including direct links to Heathrow and/or new Severnside airport? But tensions with environmental objectives here.
- Major social issues relate to bus usage, and perhaps to the effects of increasing fuel costs, particularly in rural areas.

### Wales' Futures

Section B: Wales' Infrastructure capital

Part Two: ICT

## Wales' position in relation to overall access to digital technology is mixed

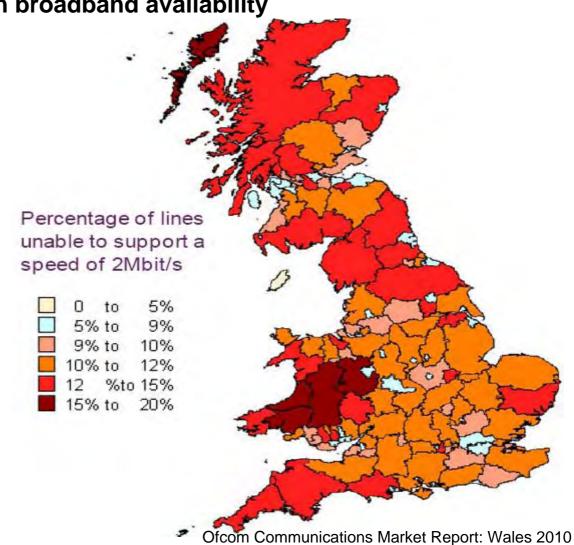


- Mobile voice coverage (2G) and mobile data coverage (3G) are described in the chart by population covered rather than by geography covered.
- High digital terrestrial television coverage reflects early switch over.
- LLU and cable availability indicate competition in the broadband market.
- Cable broadband are households passed by Virgin's cable network.

#### And our connections are poor

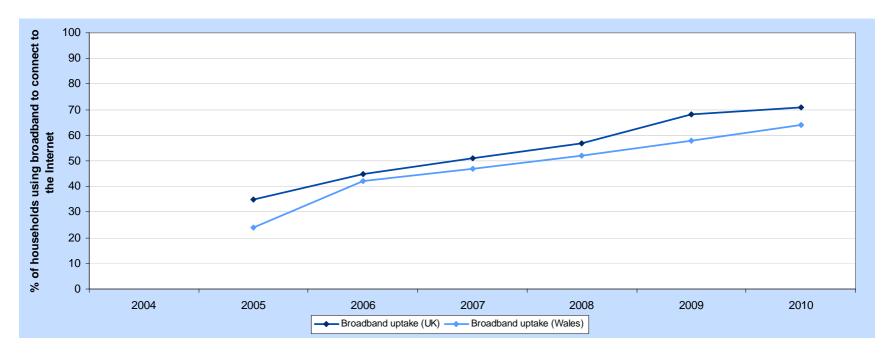
Infrastructure influence on broadband availability

- Ofcom (2006) has reported since 2006 that 100% of Welsh households are connected to a 512KB/s broadband enabled BT exchange
- Though this is higher than the UK average, the UK Government Digital Britain report of 2009 indicated that Wales has relatively high proportion of 'bad lines' compared with other parts of the UK



## The proportion of <u>households</u> with internet access in Wales still lags the UK average:

#### Household Broadband Internet uptake, UK versus Wales, 2005-2010



Ofcom Communications Market Report: Wales

# ...but this may partly be explained by the demographic composition of the Welsh population in terms of age and poverty

- Certain demographic groups have much lower internet usage:
  - Individuals over pensionable age are less than half as likely to have ever used the Internet as 16-24 year olds (37% vs 87%).
  - Individuals with no educational qualifications are over 2.5 times less likely to have ever used the Internet as those with a degree or higher (34% v 88%).

Welsh Assembly Government, National Survey for Wales 2010

# Consistent with this, survey evidence is that personal choice is the most reported reason for households not having internet access

| Reason for household not having internet | Percentage |
|--|------------|
| Don't need or want the internet          | 59         |
| Equipment or access costs too high       | 33         |
| Lack of skills                           | 21         |
| Have internet access elsewhere           | 8          |
| Privacy or security concerns             | 4          |
| Physical disability                      | 2          |

ONS, Internet Access at Home, 2010

 43% of those without the internet at home said that even if they were offered a free computer and broadband subscription they still would choose to remain "offline".

Ofcom / Ipsos MORI, Accessing the Internet at Home, 2009

#### The Welsh use of online public services lags behind England

While we have seen a steady rise in the availability of public services online, only around 18% of the Welsh population have made use of the internet to access public services

#### Use of the internet to access local council and government websites

Use of internet for local council/government websites (%)



Source: Ofcom research, Q1 2010

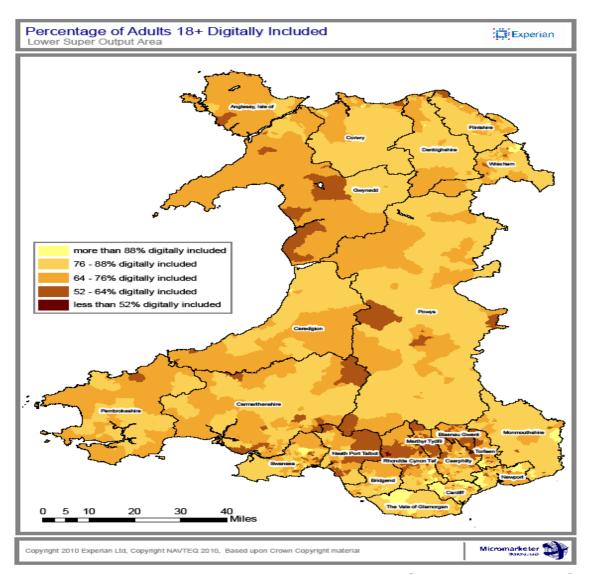
Online delivery of public services is one way of combating the relative price effect which increases the relative cost of public services over time. (see global economic drivers)

### But demand to use the internet to access public services is limited

| Means of obtaining information about services | Actual use of website | Prefer to use website | Most preferred methods             |
|---|-----------------------|-----------------------|------------------------------------|
| Recycling<br>Services                         | 7%                    | 10%                   | Leaflets 54%<br>Letter 18%         |
| Bus<br>Services                               | 14%                   | 19%                   | Bus Stop 26%<br>Leaflet 25%        |
| GP<br>Surgery                                 | 3%                    | 10%                   | At surgery 36%<br>Telephone<br>29% |

Living in Wales Survey: 2008

# The map of digital exclusion suggests however that rural infrastructure issues play a role as well as the primary socioeconomic factors



31% of adults in Wales are digitally excluded with those in social housing, the economically inactive, those on low incomes and the disabled more likely to be excluded.

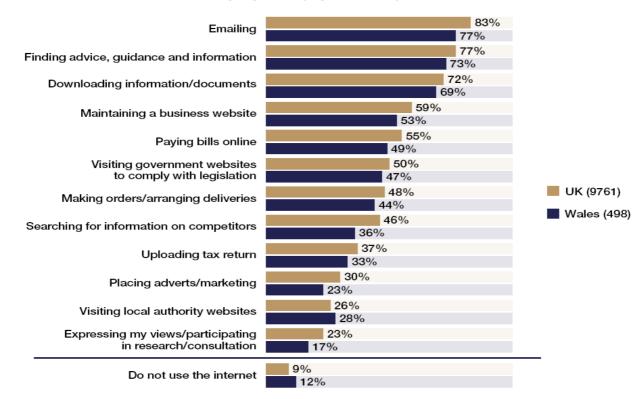
Those over 50 are more likely to be digitally excluded with 63% of those of pensionable age excluded compared with 13% of those under 25.

## But next generation broadband should transform the connectivity landscape

- Procurement is underway to ensure Europe-leading broadband availability throughout Wales:
  - By June 2016
    - all businesses and public sector organisations will have access to at least 30Mbit/s.
  - By End of 2020
    - All citizens will have access to at least 30Mbit/s.
    - 50% of all citizens, businesses and public sector organisations will have access to at least 100Mbit/s.
- The procurement will also be one component in a drive to improve geographic coverage of both voice and data mobile services.
- There are risks in terms of private companies seeking subsidy for what they could do commercially, and in whether we back the right technological horses. E.g. wireless may be a better solution than fibre in some areas.

# There is evidence that <u>business</u> use of the internet is linked to business performance and use in Wales lags behind the UK:

Uses of the internet for business purposes (top answers)



Q11a To which of the following has your business supplied goods and/or services during the past 12 months? Base: All UK respondents (9.761), Wales (498)

FSB Annual Survey - February 2010 - Wales Report

# ...and without public intervention, business access to next generation broadband in Wales may be limited outside the main urban centres

- It is estimated that the market deployment of next generation broadband may only reach 35% of the Welsh population (internal Welsh Government estimate).
- 2020 WAG targets for broadband relate to 30 mbps speeds contrasting with 1000 mbps that some predict.
- Market deployment of next generation broadband infrastructure in Wales will, to a large extent, remain concentrated in the more densely populated urban centres of South Wales and parts of the North East.
- It is reasonable to conclude that large swathes of rural Wales will only see rapid, early deployment of new digital next generation infrastructure with some form of public sector intervention (unless novel technological solutions rapidly become widespread).
- But there are pitfalls: we could back the wrong technological "horse".
   Technology is developing fast and wireless solutions may be the best for rural areas.

#### The environmental impact of ICT is double-edged:

- ICT has a significant potential contribution to reducing carbon by:
  - Decarbonising energy production.
  - Improving resource efficiency and reducing demand.
  - Reducing the need to travel.
  - Opportunities for home working and distributed economies.
- But no evidence, as yet, that ICT is reducing the economic pull of urban agglomerations (see global drivers).
- ICT itself has a carbon footprint second only to the aircraft industry.

#### ICT: summary of main messages

- Public sector support to ensure top-class access to broadband is important, but there are pitfalls to avoid (will we back the right technological horses: wireless or fibre optics?).
- Mobile broadband access is playing an increasing role in people's use of the internet.
- Take-up of broadband by the public in Wales is lower than England, but this
  mainly reflects our demographic profile rather than limited access.
- Online public service delivery has a key role in improving productivity, but current demand from the public in Wales is low, and below that in England, although ahead of Scotland.
- Welsh business is slow to make widespread use of ICT: which is a worrying indicator of general business performance.
- There is little current evidence internationally that advanced ICT is reducing the pull of cities as economic magnets, so such an impact would seem unlikely in Wales.

### Wales' Futures

Section B: Wales' Infrastructure

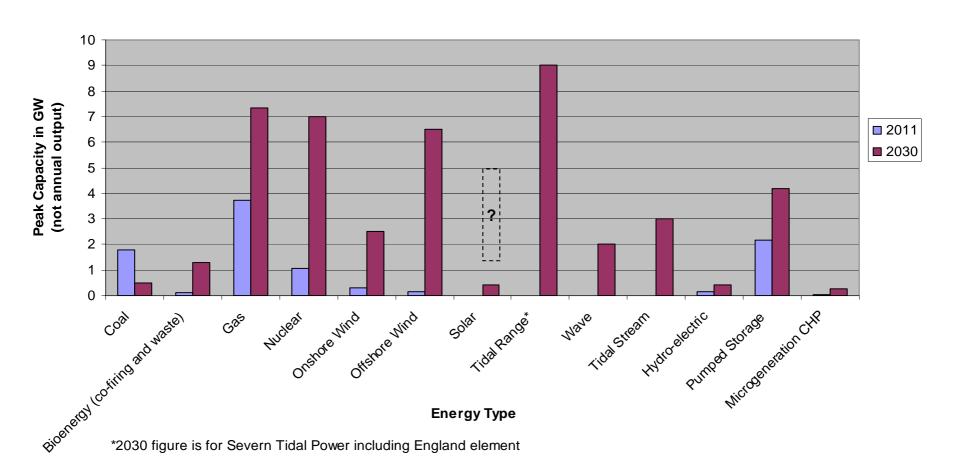
Part Three: Energy

### Big investment will be needed in energy efficiency, the "grid" and the electricity generation system:

- Energy efficiency unglamorous but very important: eg only 30% of private housing in Wales currently has all available insulation installed: other sectors worse.
- Heavy investment needed to replace parts of infrastructure dating from decades ago, in addition to move to low carbon system.
- Significant UK investment required in the electricity-grid: to enable us to move to a low carbon, energy-efficient, economy.
- An all-electric UK energy system in 2050 may need 160GW of generation capacity (more if intermittent renewable sources): currently circa 80GW.
- Investment costs will be borne ultimately by consumers.

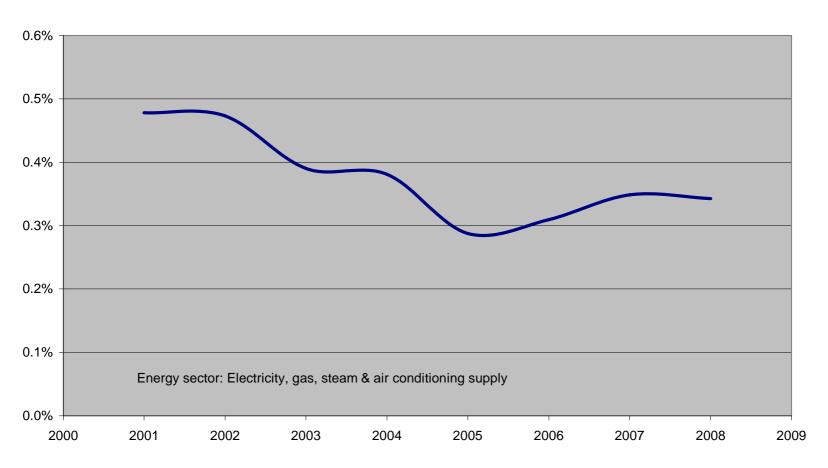
## Wales has big potential to generate electricity, which could make us a net exporter of electricity...

Wales' current and potential electricity generating capacity



#### Most energy facilities are very capital intensive and employ relatively few people: expanding the energy sector will not necessarily create many extra jobs

#### **Energy sector - share of employment (Wales)**



#### Wales' energy future: key issues?

- How to generate low carbon energy attracts most debate (eg nuclear v renewables, wind power, Severn barrage) but risks taking attention away from the less glamorous, but essential, need to insulate and raise energy efficiency in all sectors.
- In a low carbon energy world, that will be increasingly energy efficient and electricity dominated, how fast can we modernise buildings and the local electricity grid system? What will be the long term role for gas when it comes to domestic heating?
- Over the medium/long term, at what rate will fossil fuel prices increase and how will such changes increase the economic attractiveness of secure indigenous sources of energy?
- As we try to balance the desire for rapid transition to a low carbon energy economy against the demands for affordable, secure and diverse sources of energy, which electricity-generation, transport and heating technologies will pre-dominate?
- How should Welsh Government judge what electricity generating opportunities should be pursued, taking account of all the potential benefits and potential local trade-offs?

#### **Energy: main messages**

- Big investment will be needed in energy efficiency, the "grid" and the electricity generation system: investment costs will be borne ultimately by consumers.
- Wales has big potential to generate electricity, which could make us a net exporter of electricity.
- Most energy facilities are very capital intensive and employ relatively few people: expanding the energy sector will not necessarily create many extra jobs.
- Increasing energy efficiency is much less glamorous than choices about how to generate electricity, but is at least as important, in all sectors.

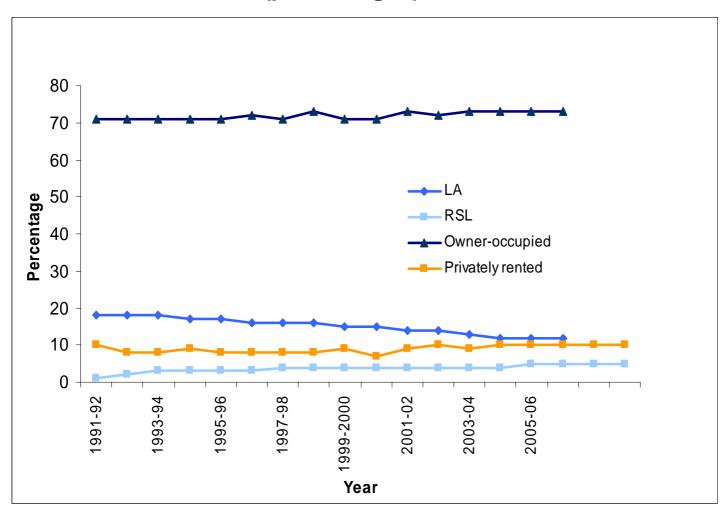
### Wales' Futures

Section B: Wales' Infrastructure

Part Four: Housing

## Owner-occupation dominates tenure and investment in housing stock

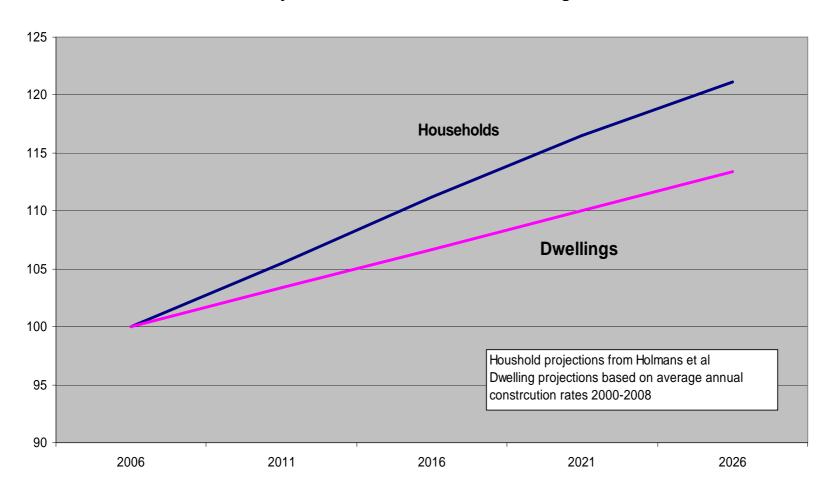
#### **Tenure structure, (percentages)**



The 25 years to the recession witnessed continued growth of the owneroccupied sector from 62% in 1981 to 73% in 2007. This is the highest proportion of owneroccupation of all the UK countries.

#### The rate of house building is lagging behind...

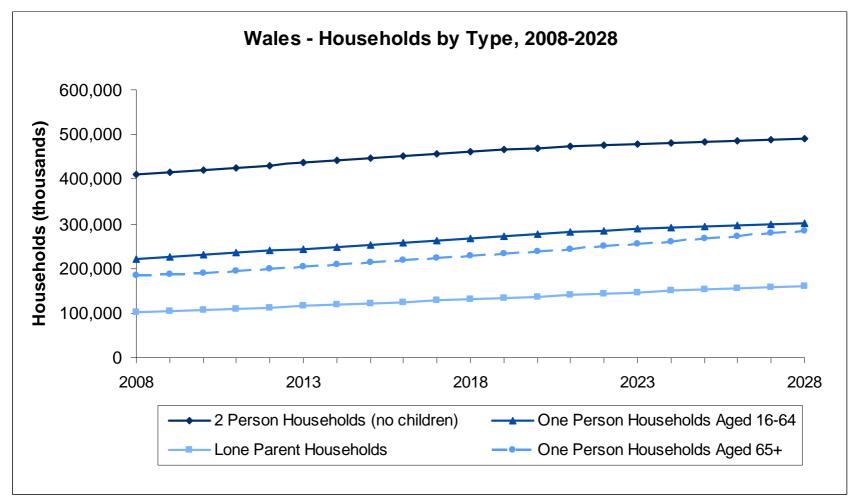
#### Projections of households and dwellings



Source: Holmans review

## The number of households in Wales will grow significantly, particularly single person households

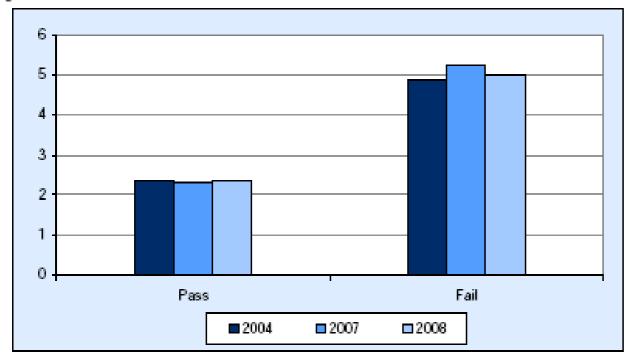
#### Household type projections



Source: Statistical Directorate, Welsh Assembly Government, 2007

#### ....and we are already overcrowded

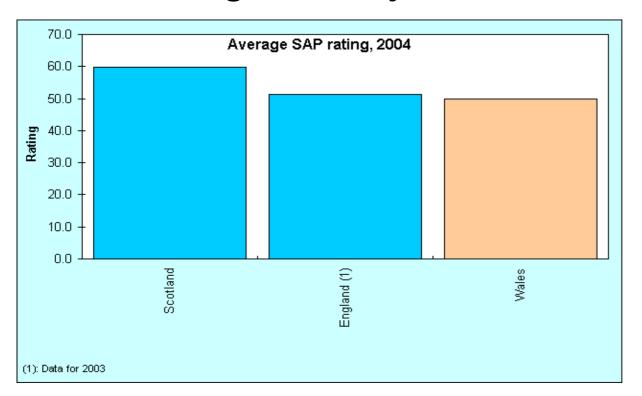
Chart 13.1: Average number of people living in a household by whether the household passed or failed the bedroom standard, by year



Households where it was not possible to measure the bedroom standard have been excluded from the chart. No Living in Wales data exists for the bedroom standard measure in 2005 or 2006.

In 2008 4.3% (130,500) of all people in Wales were living in an 'overcrowded' household. This has increased from 4.1% in 2007 and 3.7% in 2004

#### Our housing faces major environmental challenges:

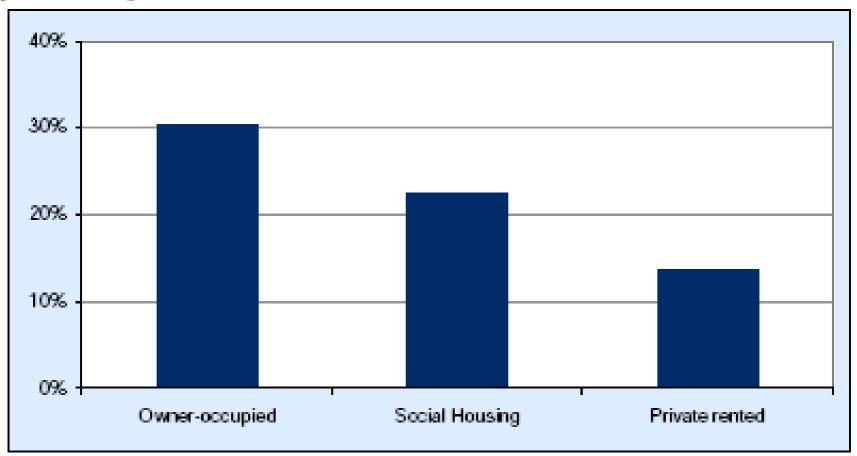


Welsh Government has set Standard Assessment Procedure (SAP) standards for social housing: For a home of 80m2 the target is a SAP of 65 (calculated under SAP 98, not SAP 2001).

- Housing accounts for 23% of domestic energy consumption in Wales and 25% of Wales' total ecological footprint.
- Around 140,000 properties in Wales, or 12% of the total housing stock, is at risk of flooding by rivers or the sea.

### ....and all housing sectors still need to do much more on insulation:

Chart 14.4: Households which had all possible insulation measures present, by tenure



Living in Wales 2008 B.3.37

#### Housing: main messages

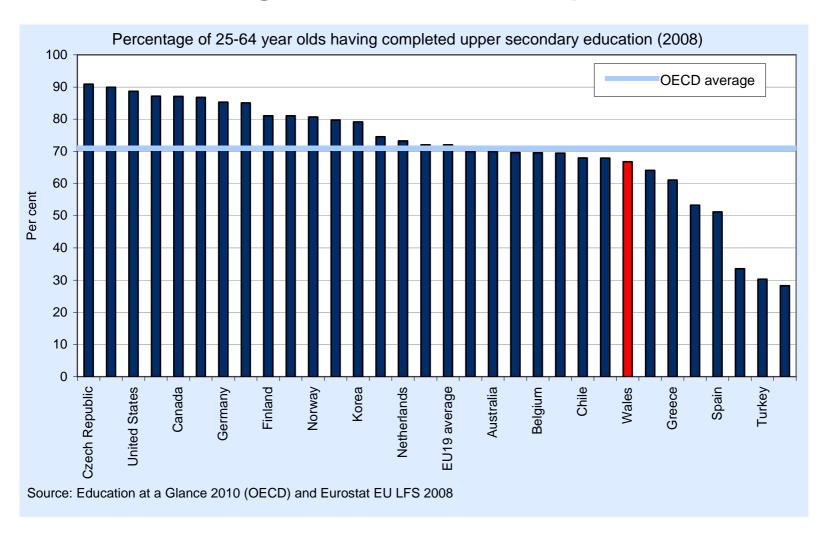
- Current rates of house building are not keeping pace with with growth in the number of households, and on current trends this gap will widen, contributing to further house price inflation in the long term.
- The growth of single person households poses an affordability challenge, in a market which has been driven by dual income households.
- This is likely to result in pressure on the rented market, in particular on social renting for older people.
- Levels of insulation need to increase greatly in all sectors of housing. Owner-occupiers will need to bear the cost in privately owned houses but there is also much more to do in social housing.

### Wales' Futures

Human capital: Part One

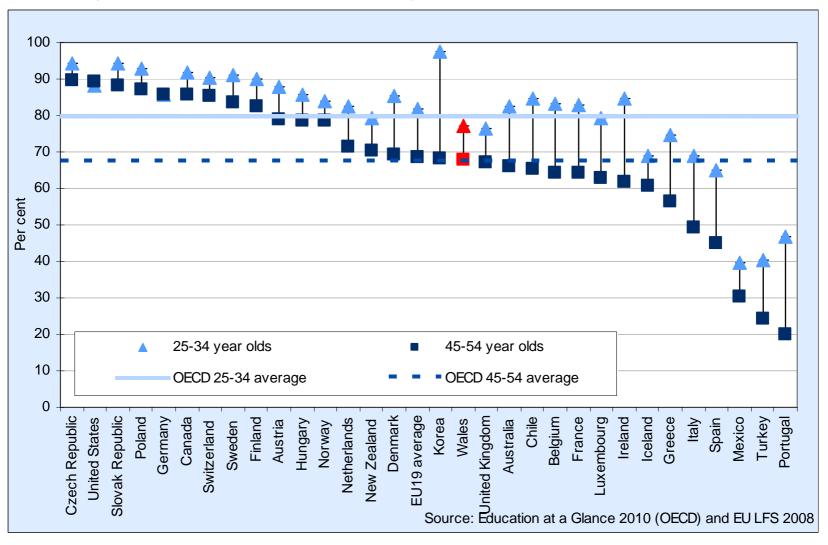
**Education and Skills** 

# Education is of crucial importance for social and economic outcomes and internationally, Wales is below the OECD average in terms of adult qualification levels



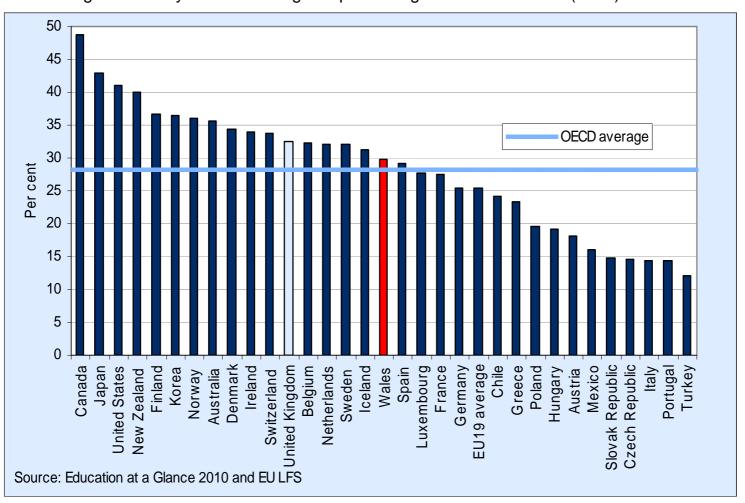
### And other countries are catching up - with higher young attainment levels

Percentage of 25-34 and 45-54 year olds having completed upper secondary education (2008)

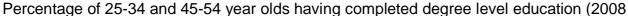


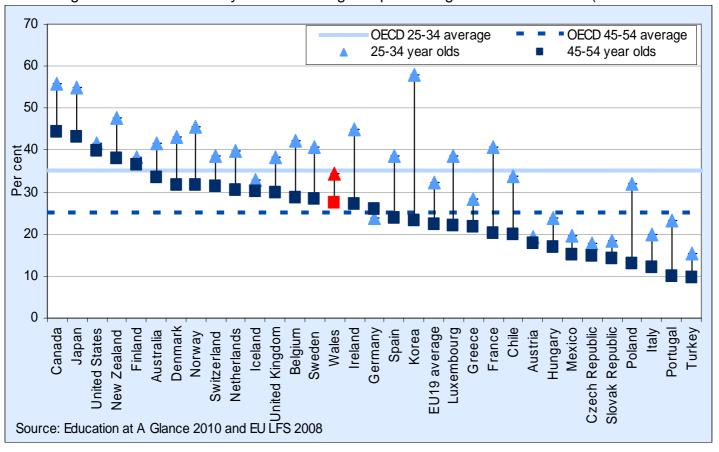
### Wales stands at around the OECD average in terms of adults with degrees

Percentage of 25-64 year olds having completed degree level education (2008)

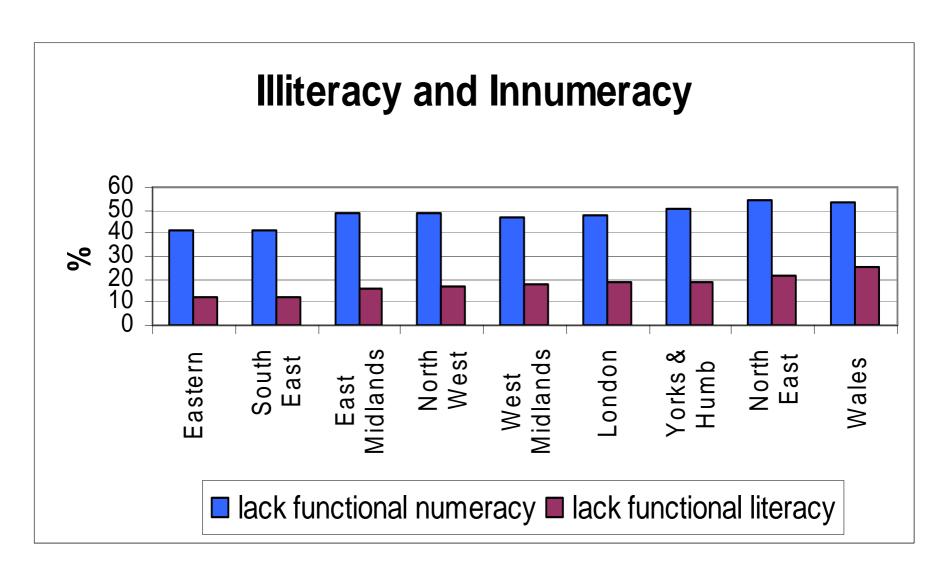


## But expansion in some countries again means we are being caught up

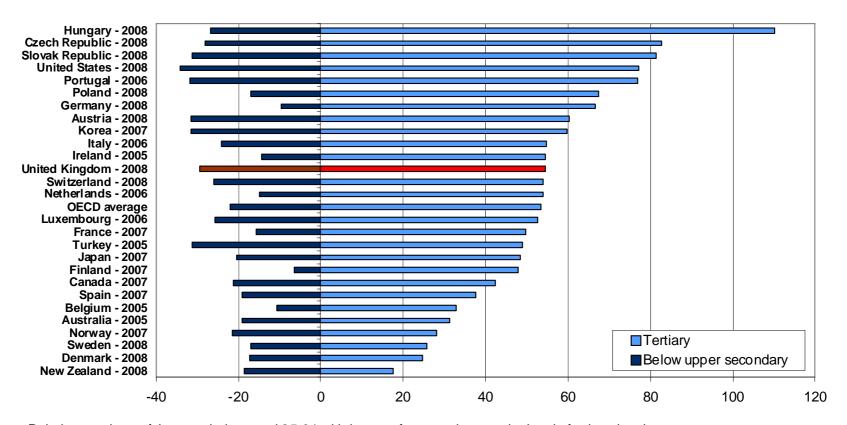




#### Wales' basic skills base is poor



In the UK (and Wales), both the graduate earnings premium, and the penalty for not attaining upper secondary education, have at least, until recently, remained relatively high internationally:

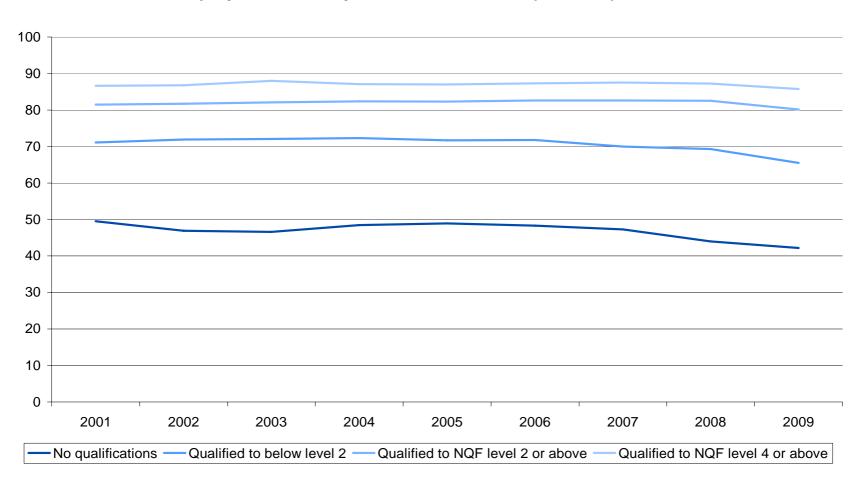


Relative earnings of the population aged 25-64 with income from employment by level of educational attainment. Percentage variation from the level for those with upper secondary education, year as annotated.

Source: OECD Education at a Glance 2010

# Low educational attainment attracts a <u>major</u> labour market penalty – and one that increased through the recession

**Employment Rate by Qualification Level (18-59/64) - Wales** 



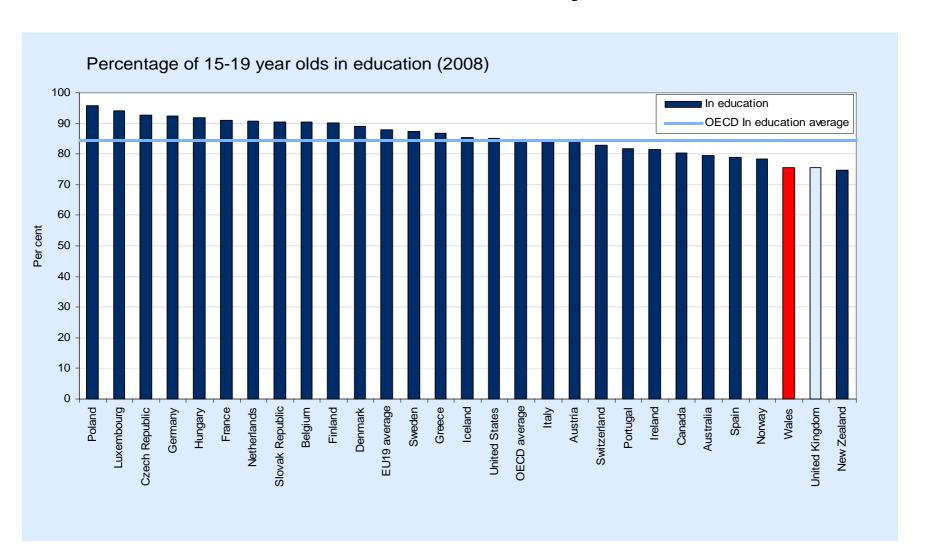
B.4.1.7

## International evidence (PISA) shows that Wales is continuing to lag in respect of those currently coming through the education system

|             | Wales | OECD<br>mean | Wales<br>rank | Spain | Poland | Nether-<br>lands | Hong<br>Kong | Finland |
|-------------|-------|--------------|---------------|-------|--------|------------------|--------------|---------|
| Science     | 496   | 501          | 30            | 488   | 508    | 522              | 549          | 554     |
| Reading     | 476   | 493          | 38            | 481   | 500    | 508              | 533          | 536     |
| Mathematics | 472   | 496          | 40            | 483   | 495    | 526              | 555          | 541     |

Source: PISA 2009, OECD

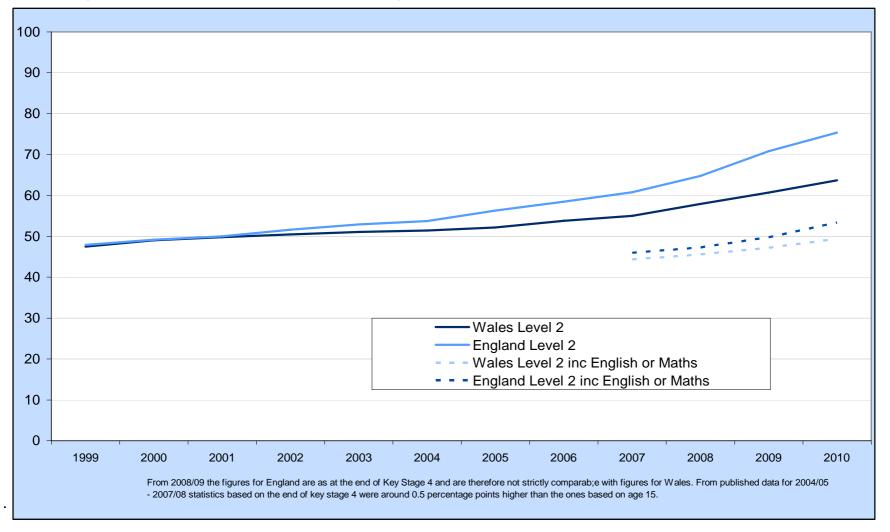
#### And post-16 staying on rates are comparatively low internationally



B.4.1.9

### The attainment gap with England increased until 2010, although not appreciably in the narrower measure

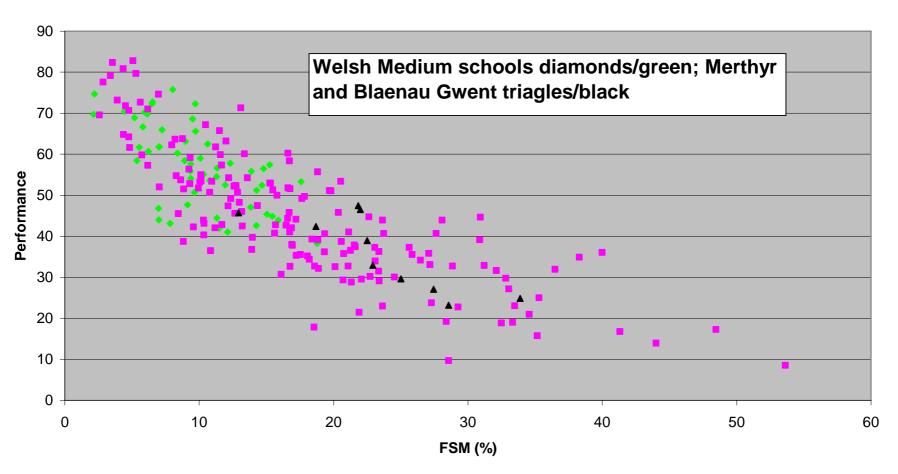
Key Stage 4 attainment, comparisons with England



Source: WAG B.4.1.10

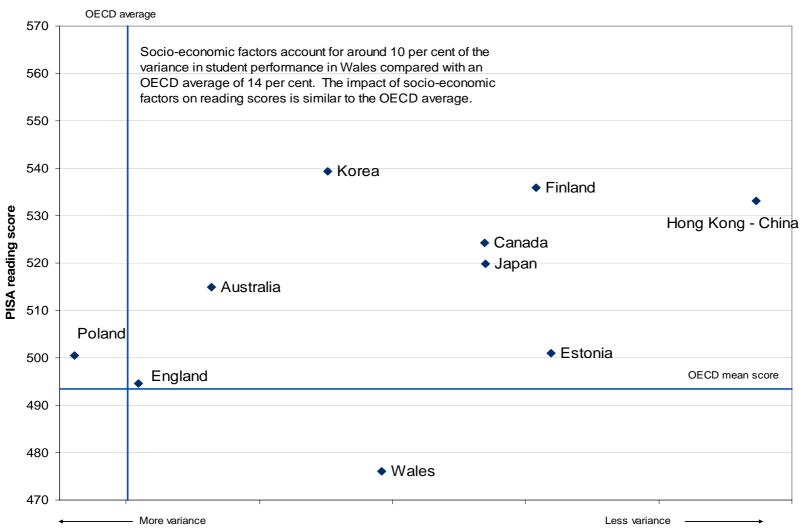
# There is a broad correlation between socio-economic circumstances and attainment within Wales (however location and Welsh medium schools are much less important)

Level 2 performance (inc Maths & English/Welsh) and eligibility for FSMs (2009)



#### However PISA results can't be explained by the socioeconomics of Wales

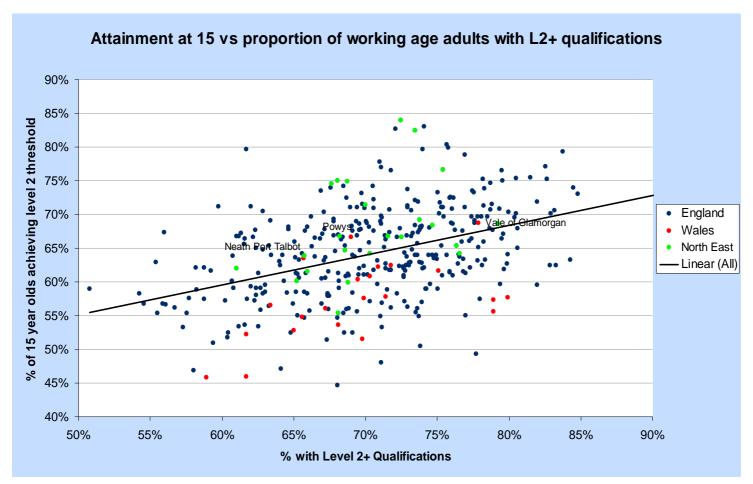
PISA 2009 mean reading scores and impact of socioeconomic background



Source: WAG

## And taking socio-economic factors into account, school attainment in Wales does not compare favourably within the UK

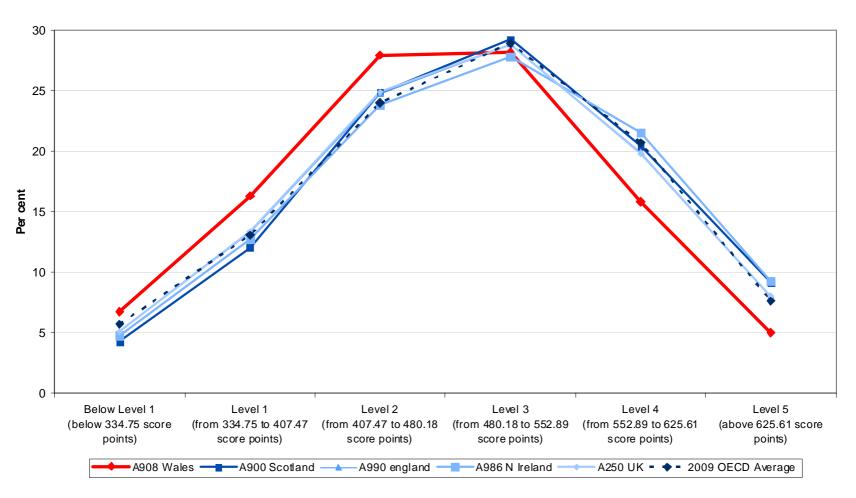
North East authorities are performing relatively well.....



Source: Internal Statistical Directorate analyses

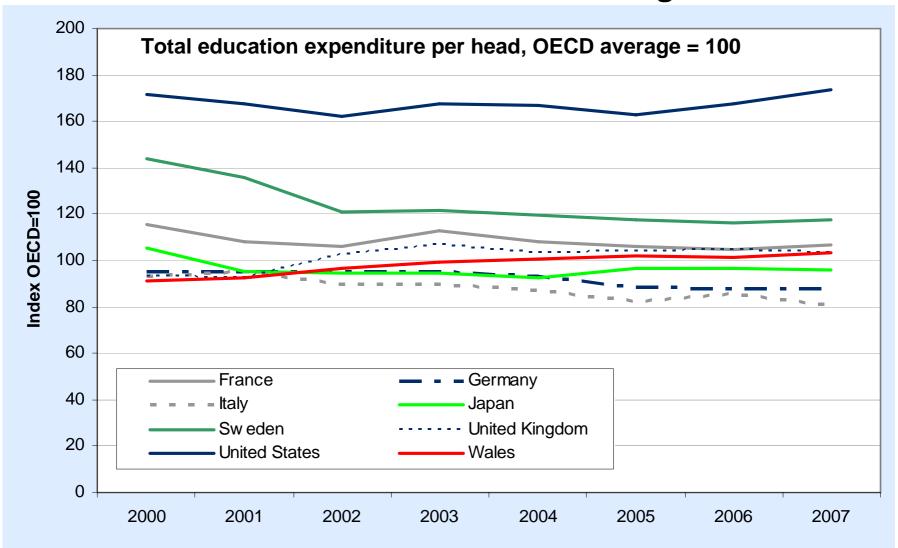
#### And we have fewer higher achievers as well as more low achievers - so we need to shift the whole curve

Percentage of students at each proficiency level on the reading scale PISA 2009

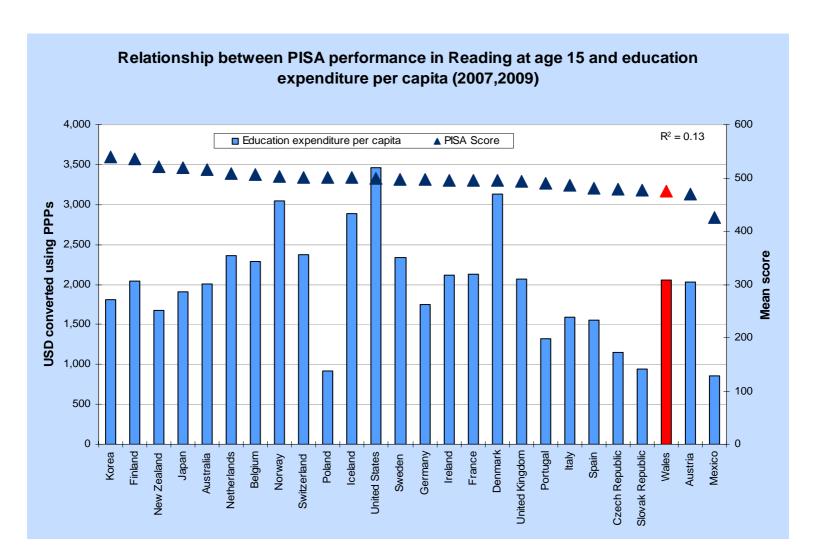


N.B. There are similar patterns for other PISA results e.g. maths

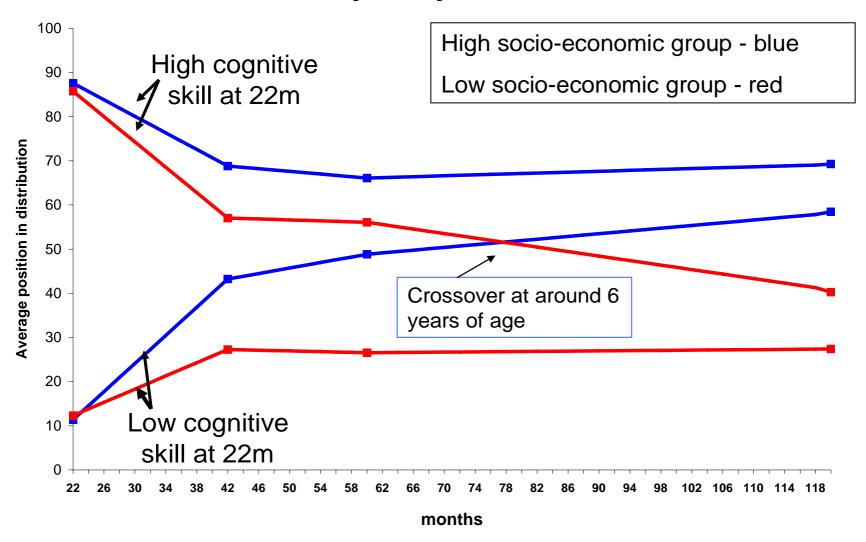
### Our education spend per capita (schools, FE and HE) now exceeds the OECD average



#### PISA performance shows an imperfect correlation with expenditure



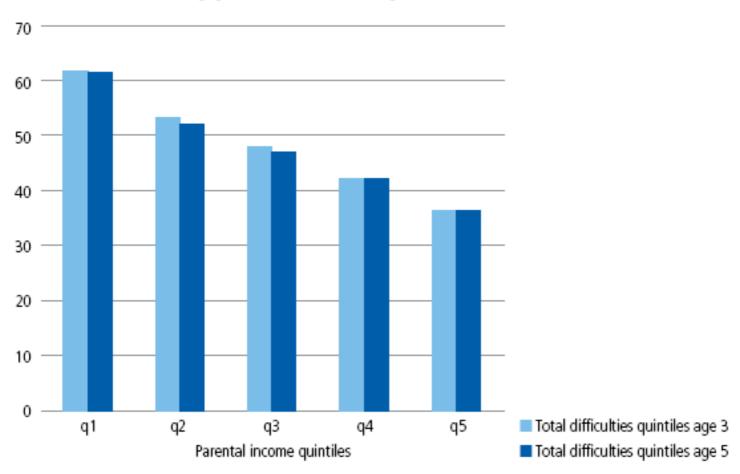
#### The factors that lead to educational under-attainment start very early in childhood



Source: Feinstein (2003) 'Inequality in the Early Cognitive Development of British Children in the 1970 Cohort',

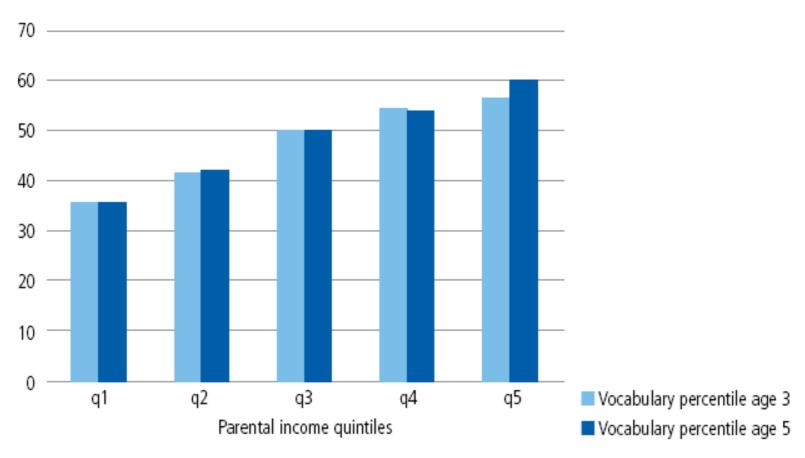
### The UK Millennium Cohort Study shows that differences in non-cognitive skills open up early in life

#### Behaviour scores by parental income quintile in the MCS



#### The same is also true of vocabulary development

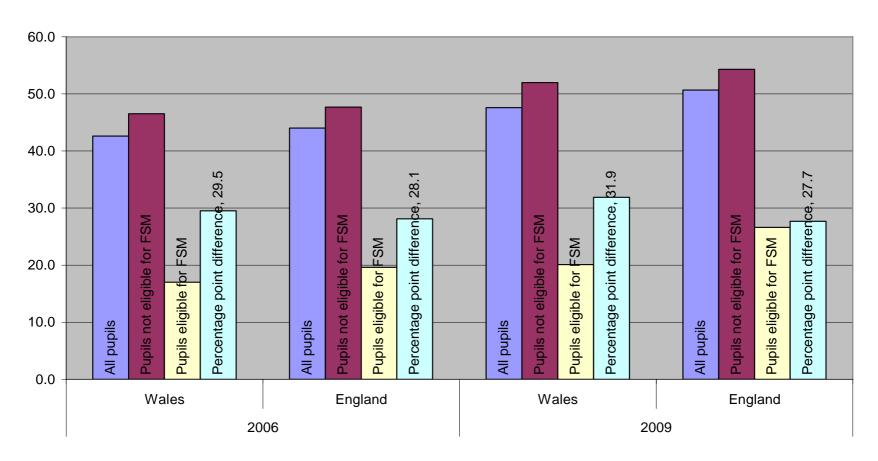
#### Vocabulary scores by parental income quintile in the MCS



By age 3, the vocabulary of children from the most advantaged backgrounds is roughly a year ahead of those from the most disadvantaged

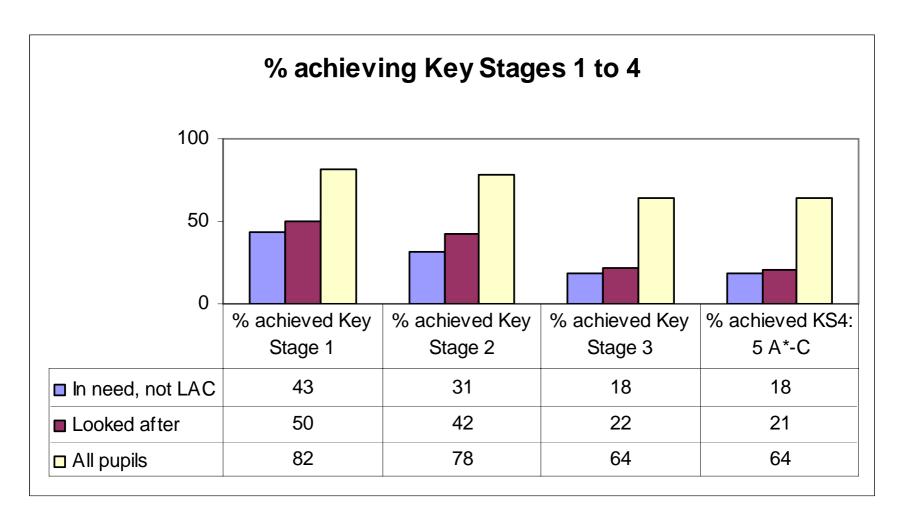
## The attainment gap associated with disadvantage is wider in Wales than in England, and has widened further in recent years

Percentage of pupils who achieve the level 2 threshold including English/Welsh and Maths at key stage 4



Source: WAG

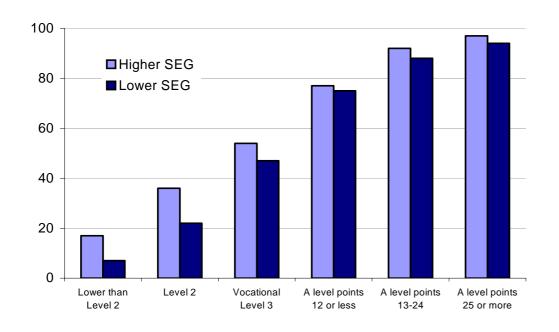
## Educational outcomes for children in care are poor, but are worse for children in need who are not taken into care



Children in Need census 2010 B.4.1.21

### Fewer young people from poor backgrounds go to HE, largely as a result of general school attainment

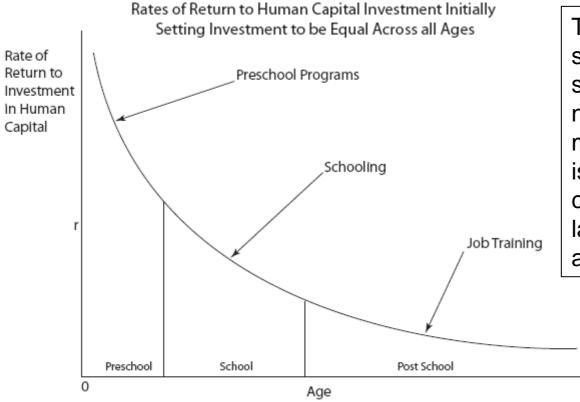
Entry into higher education by age 21: by socio-economic group (SEG) and highest qualification<sup>1</sup> at age 18, 2002
England & Wales
Percentages



People from lower socio-economic groups are less likely to get the A levels needed for HE, but there is little class difference in attendance at HE for a given A-level score

Source: Youth Cohort Study, Department for Education and Skills

## In fact, international evidence suggests the biggest opportunities for changing life chances lie in the preschool years



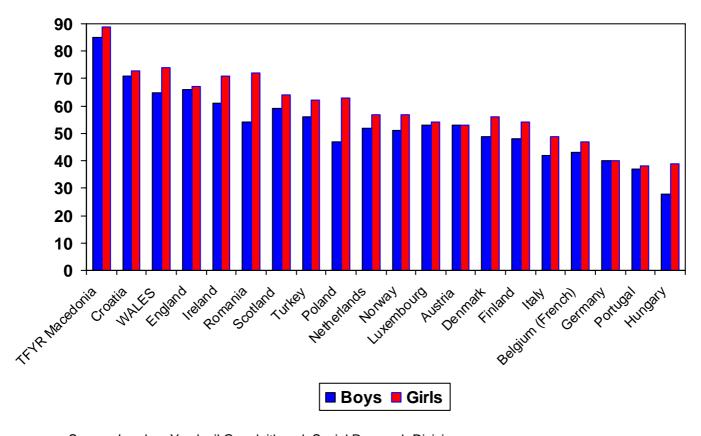
The same research suggests that the scope for improving non-cognitive skills (eg motivation, teamwork) is even greater than for cognitive skills, and the labour market gains are about as large

Rates of Return to Human Capital Investment Initially Setting Investment to be Equal Across all Ages

Source: Carniero and Heckman (2003)

### Wales' 15 year olds have – on average – an optimistic view of how well they are doing at school

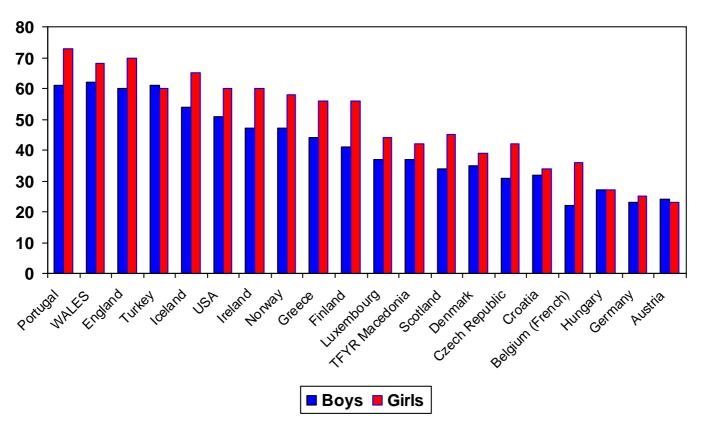
Percentage of 15 year-olds reporting good or very good perceived school performance, selected HBSC countries, 2005/06



Source: Is-adran Ymchwil Gymdeithasol, Social Research Division

### And feel much more pressured by school work than 15 year olds in other countries with higher attainment:

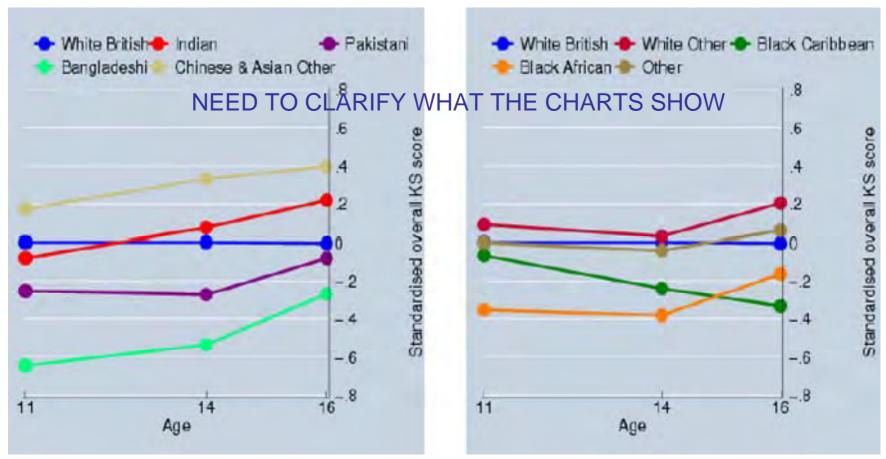
Percentage of 15 year-olds feeling a lot or some pressure from schoolwork, selected HBSC countries, 2005/06



Source: Is-adran Ymchwil Gymdeithasol, Social Research Division

### "Raw" English data shows disparities in educational attainment across ethnic groups

Charts show performance relative to "White British" (set at zero)

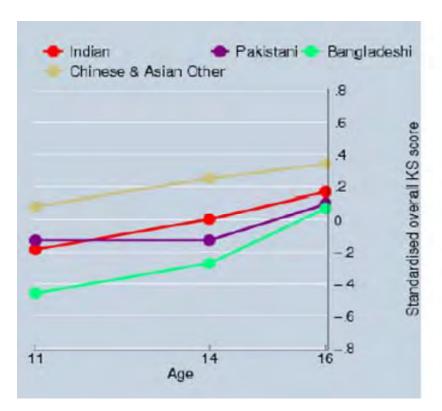


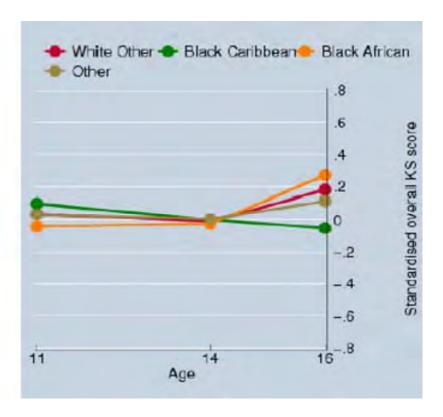
Source: The Dynamics of School Attainment of England's Ethnic Minorities

Deborah Wilson Simon Burgess and Adam Briggs CMPO, The University of Bristol October 2005

## But once allowance is made for socio-economic circumstances, most ethnic groups are doing as well or better than White British

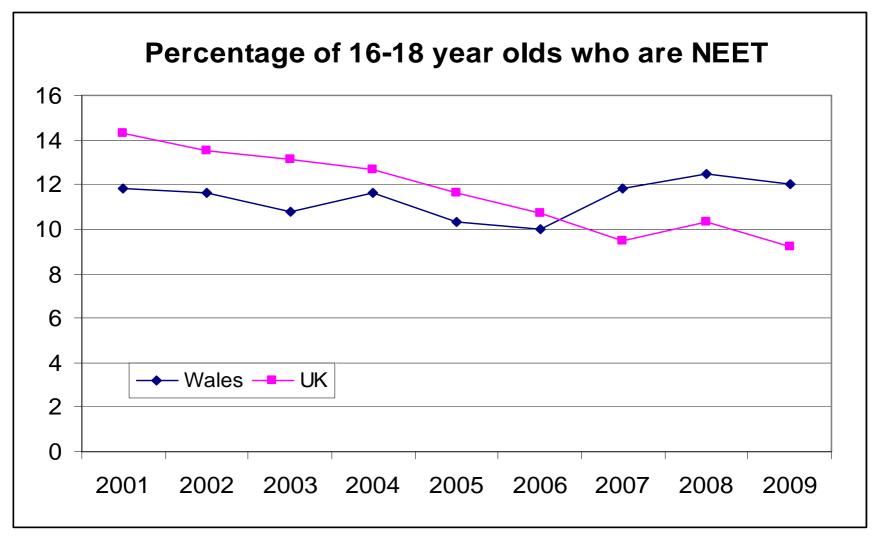
Charts show performance relative to "White British" (set at zero)



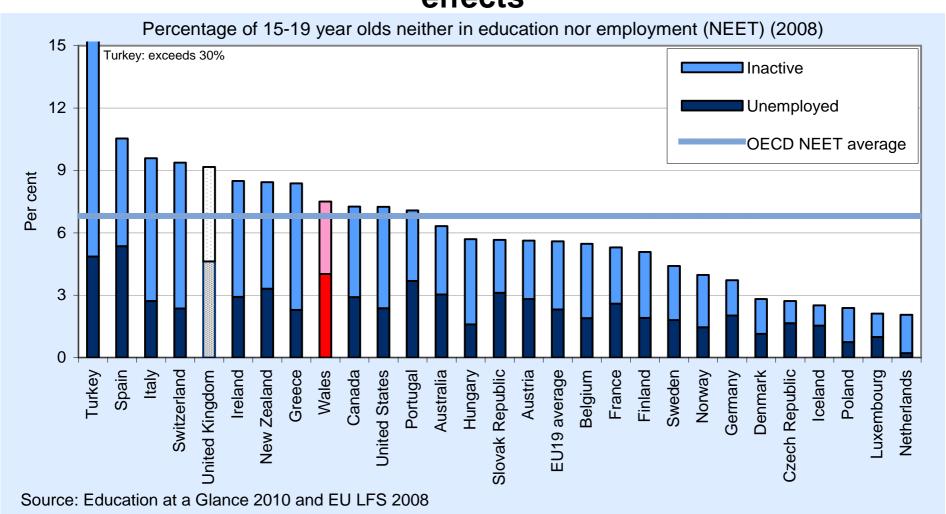


Data adjusted for factors such as eligibility for FSMs and neighbourhood characteristics

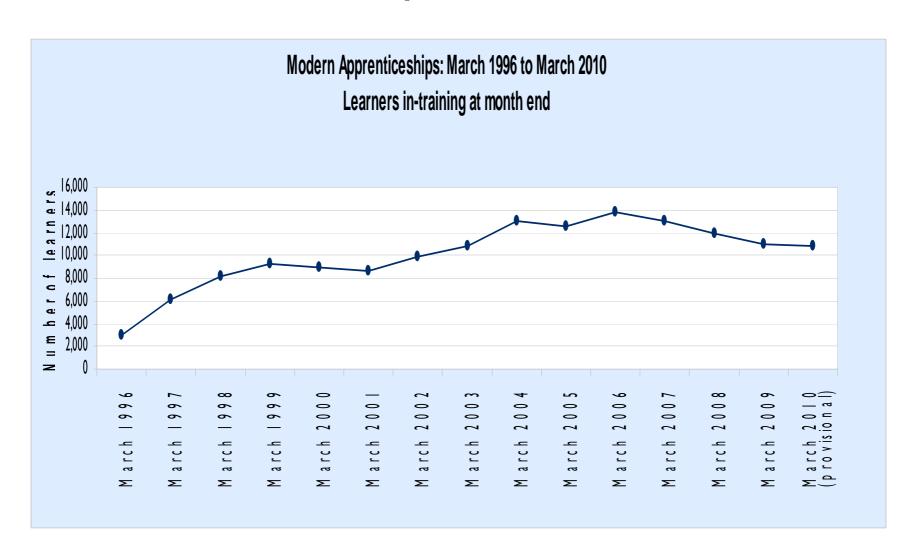
### The proportion of young people who are not in educational, employment or training (NEET) has not fallen



Internationally, Wales has a high proportion of young people NEET, and it's well documented that persistent unemployment, when young, has long-term "scarring" effects



### The numbers on modern apprenticeships have hit a plateau



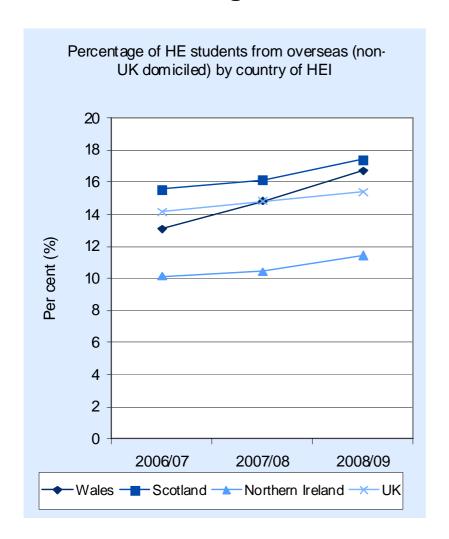
Source: Lifelong Learning Wales Record

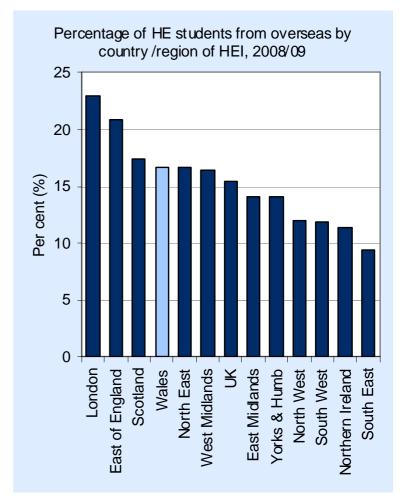
## Numbers taking modern foreign languages at GCSE have fallen by 31% in eleven years, and Chinese and Japanese constitute just 0.2%

|   | 2000   | 2005  | 2010  |
|---|--------|-------|-------|
| French  | 11,227 | 8,870 | 6,798 |
| German  | 3,047  | 2,423 | 1,758 |
| Spanish   | 752    | 1,268 | 1,645 |
| Italian   | 111    | 91    | 46    |
| Chinese/Japa<br>nese  | 22     | 69    | 23    |
| Asian sub-<br>continent   | 59     | 67    | 28    |
| Other (includes; Dutch,<br>Modern Greek, Portugese,<br>Arabic, Polish, Russian, Persian,<br>Hebrew, and Turkish | 25     | 90    | 134   |

B.4.1.31

#### HE in Wales is more reliant on overseas students than HE in most UK regions: a vulnerability and an opportunity





The proportion of overseas students - both undergraduate and postgraduate - in relation to the total HE student population is higher in Wales than for most UK regions, with the exception of London and the East of England.

B.4.1.32

#### There is no room for complacency about the strength of research in Welsh HE

HE Research strengths: UK Performance Comparison

|     | Wales | England | Scotland | N Ireland | UK  |
|-----|-------|---------|----------|-----------|-----|
| 4*  | 14%   | 18%     | 15%      | 14%       | 17% |
| 3*  | 35%   | 37%     | 37%      | 36%       | 37% |
| 2*  | 36%   | 32%     | 34%      | 37%       | 33% |
| 1*  | 14%   | 11%     | 13%      | 12%       | 11% |
| u/c | 1%    | 1%      | 2%       | 1%        | 1%  |

4\*= world leading

3\*= internationally excellent

2\*=internationally recognised

1\*= nationally recognised



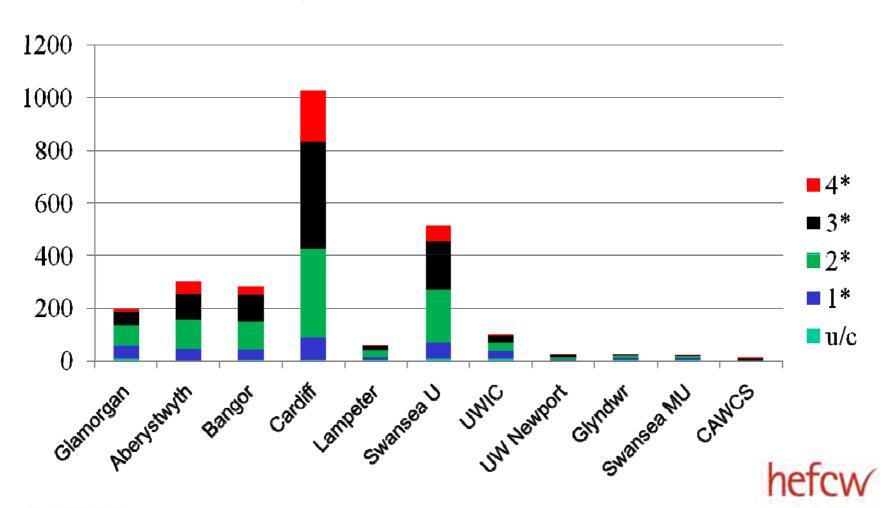
### And our position relative to Northern Ireland has weakened since 2001

|                  | 2001 RAE – Overall<br>Weighted Average Scores<br>(on 7-point scale) |  |  |
|------------------|---|--|--|
| Wales            | 5.16  |  |  |
| England          | 5.45  |  |  |
| Scotland         | 5.37  |  |  |
| Northern Ireland | 5.09  |  |  |
| UK               | 5.42  |  |  |



#### ...and most of our strength is concentrated in one institution

Category A (research) staff by Quality Level



#### Education and Skills: summary of main messages

- Wales is under-performing internationally in educational attainment, which has implications for the economy, health and the general life chances of our people.
- Neither expenditure nor socio-economic circumstances can explain this.
- We need to shift the whole distribution curve of attainment upwards, and also target help on those at the bottom end: the same as the Marmot message on health.
- The largest proportionate gains (but not necessarily the easiest) are likely to come at the bottom end.
- Gaps in development between children from affluent and deprived families are already marked by the age of 3: international evidence suggests the biggest opportunities for changing life chances lie in the pre-school years, although action at every stage of a child's life is important.
- Fewer young people from poor backgrounds go to HE, but this is largely due to their general school attainment.
- The numbers of modern apprenticeships have hit a plateau; and the % of 16-18s not in education, training or employment has remained stubbornly high.
- The success of Welsh HE in a competitive market cannot be taken for granted.
- Wales is more reliant on overseas students than HE in most UK regions: a vulnerability and an opportunity.

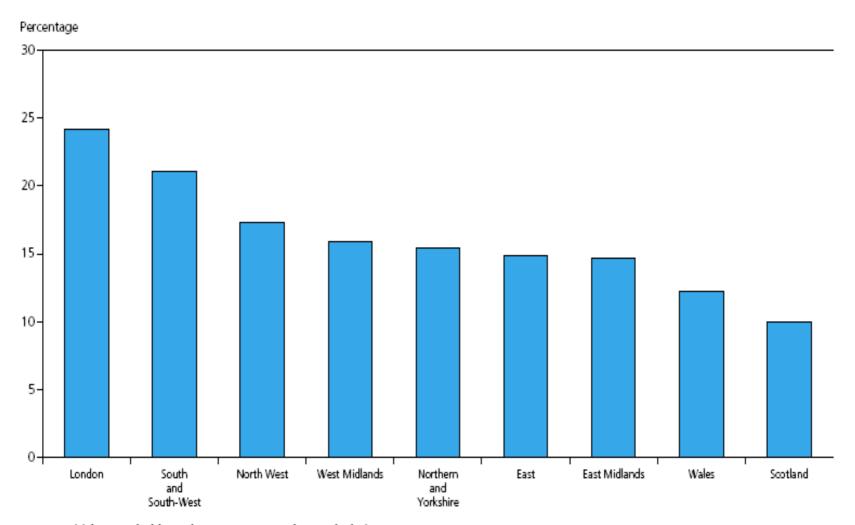
#### Wales' Futures

Human capital: Part Two

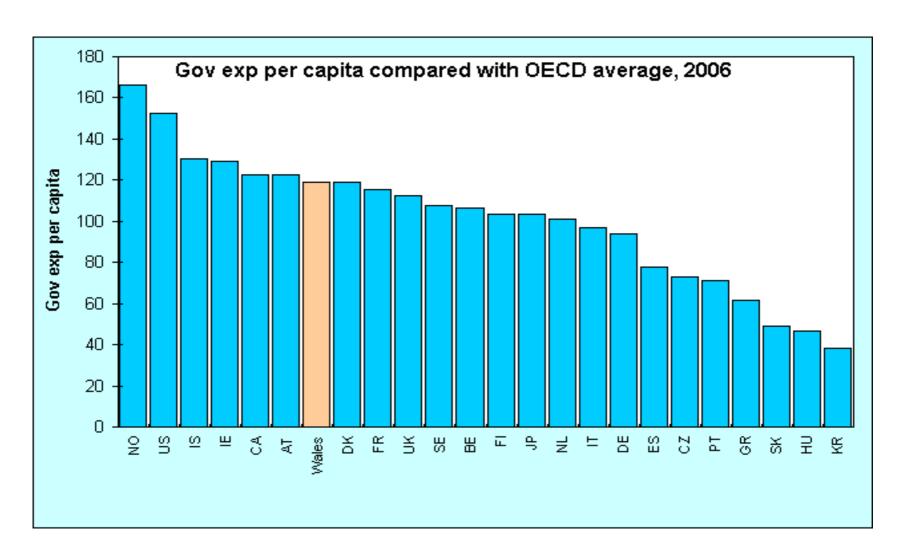
Health

#### Wales relies on the NHS more than England

Percentage of adults covered by private medical insurance by region, 2001



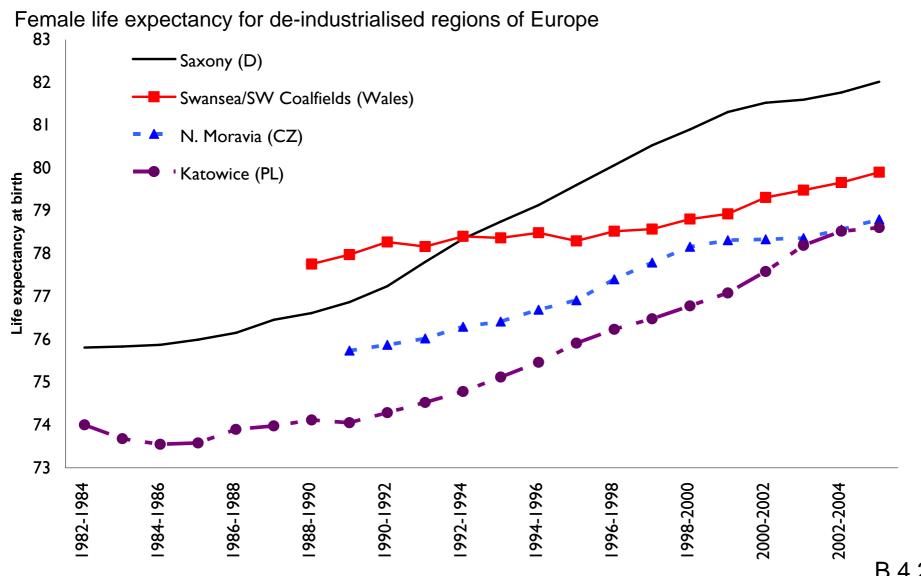
### Our public spending on health is relatively high internationally



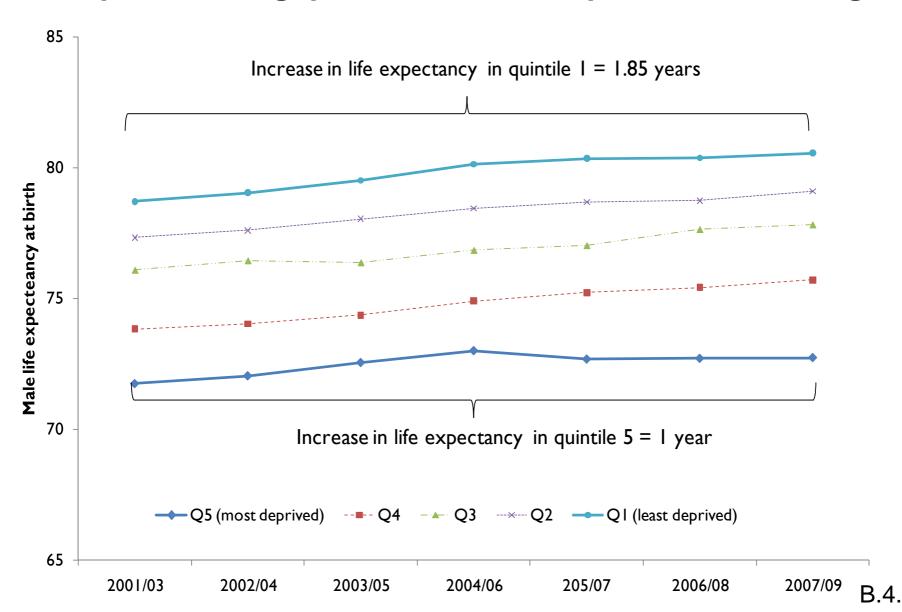
### But although life expectancy in Wales is rising, it is rising slightly faster in EU 15 and 27

|  | Wales' male<br>life<br>expectancy<br>1992 | Wales' male<br>life<br>expectancy<br>2008 | Wales' female life expectancy 1992 | Wales' female life expectancy 2008 |
|--|---|---|------------------------------------|------------------------------------|
| Difference<br>between life<br>expectancy in<br>Wales and<br>EU15 average     | -0.27                                     | -0.73                                     | -1.45                              | -1.79                              |
| Difference<br>between life<br>expectancy in<br>Wales and EU<br>27<br>average | +1.27                                     | +0.74                                     | -0.29                              | -0.89                              |

#### A comparison with broadly similar Eastern European regions seems to show the same pattern

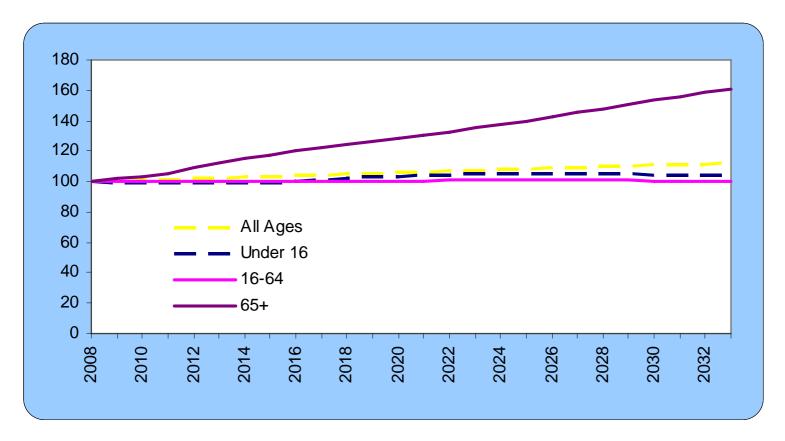


### And life expectancy is increasing slowest for the most deprived: the gap with the least deprived is widening



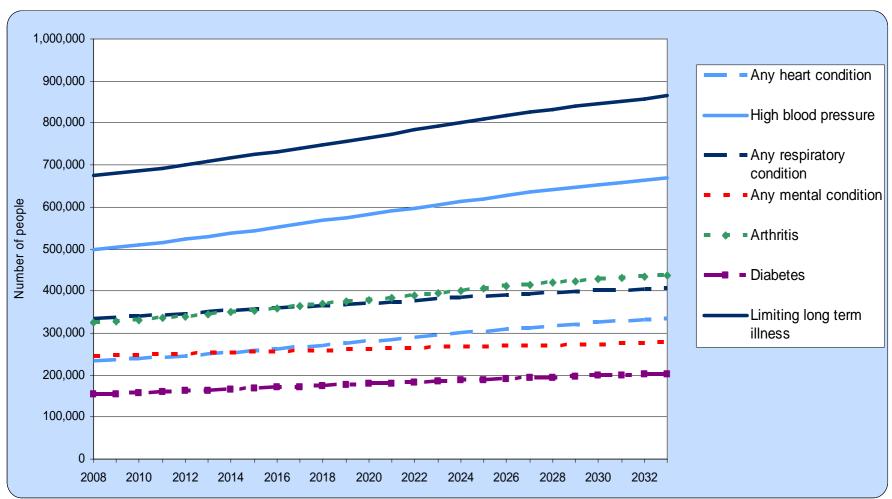
#### An ageing population poses challenges for health and social care

Indexed: 2008=100



Source: ONS (2008-based national projections)

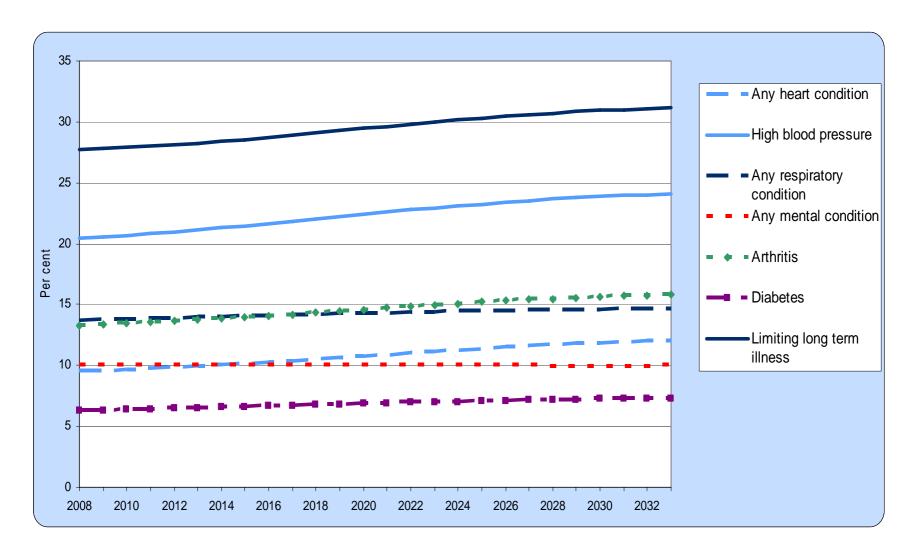
# All other things remaining unchanged, the projected increase in population and ageing demographic profile means the number being treated for illnesses will increase



Calculated by applying 2009 Welsh Health Survey age-specific prevalence rates for selected conditions to the 2008-based national population projections for Wales.

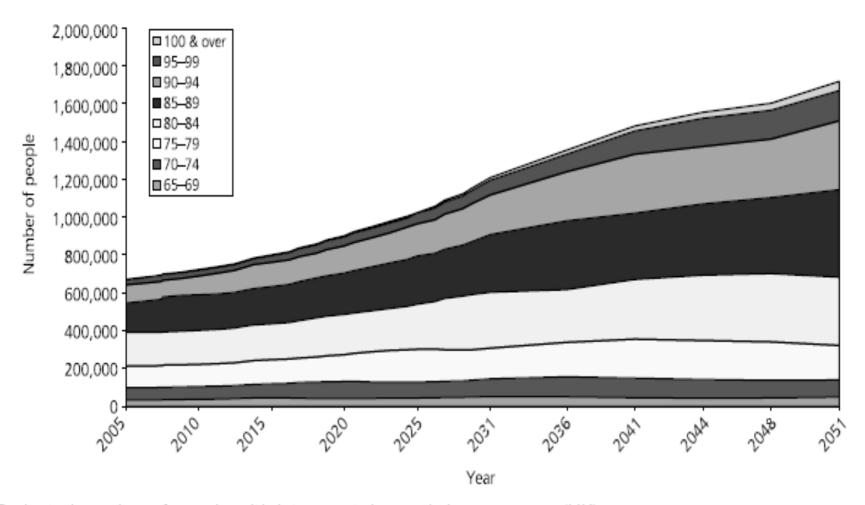
B.4.2.7

### And this is true, even holding Wales' total population constant.



Calculated by applying 2009 Welsh Health Survey age-specific prevalence rates for selected conditions to the 2008-based national population projections for Wales.

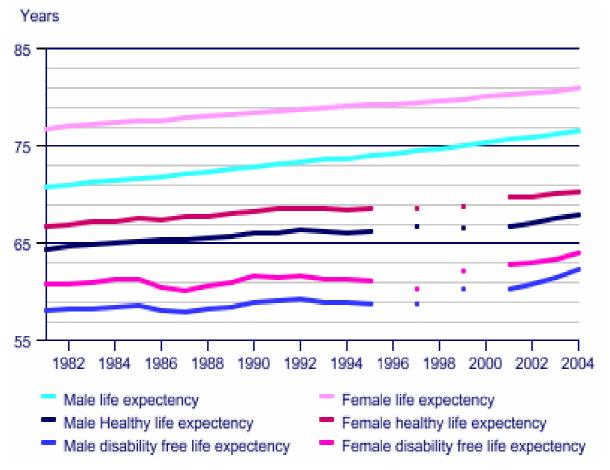
## As part of this, the number of people with dementia is projected to increase significantly



Projected number of people with late onset dementia by age group (UK)

B.4.2.9

But other things are <u>not</u> constant. "Healthy" life expectancy has been increasing as fast as life expectancy overall (GB data): the jury is out on whether this will this continue, but if it does, projections based on age-related conditions would be too pessimistic



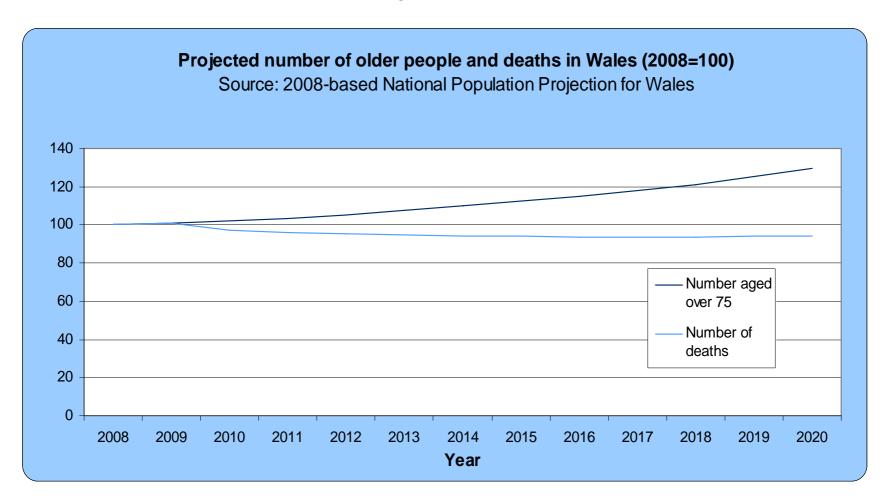
Based on selfreported health status, which may not reflect real quality of life...

...other evidence suggests the health of older people has been improving faster; major uncertainties here.

Source: ONS

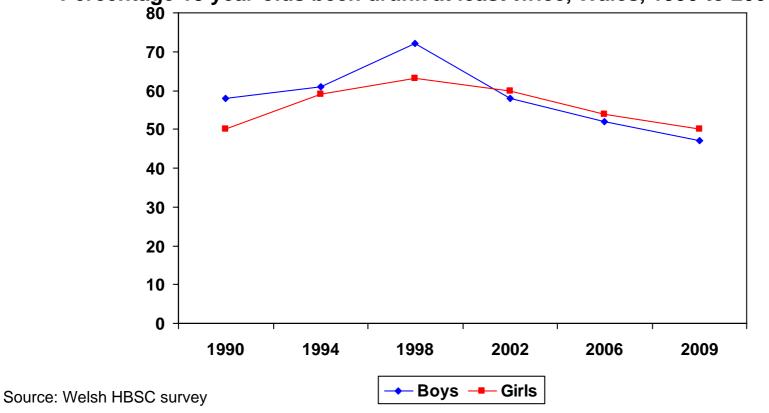
## So although the number of older people is projected to increase, the number of deaths currently is not...

....and health costs may be more related to the two years before death than to age per se



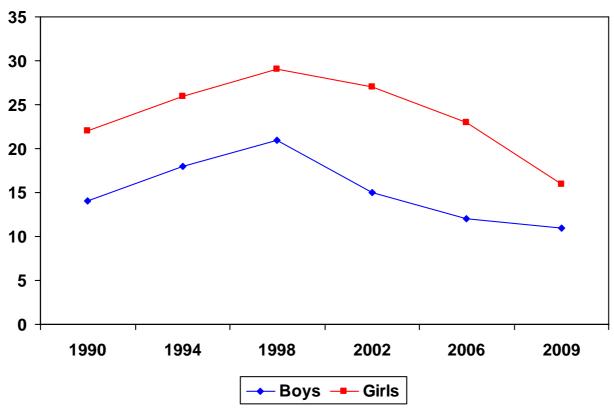
# Lifestyle patterns will, however, have a key influence on future incidence of disease: and there are some signs of healthier lifestyles spreading among teenagers

Percentage 15 year-olds been drunk at least twice, Wales, 1990 to 2009



#### Fewer are regular smokers

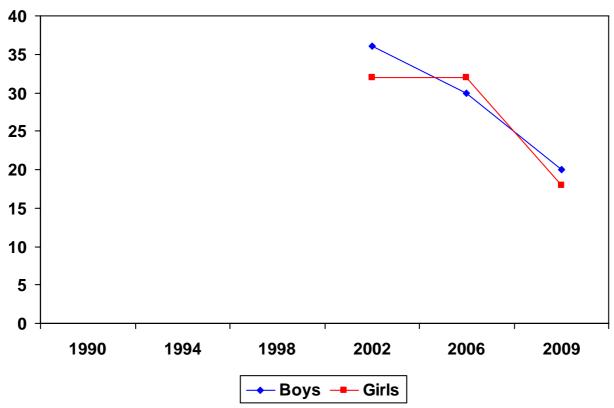
Percentage 15 year-olds smoking weekly, Wales, 1990 to 2009



Source: Welsh HBSC survey

#### And their use of cannabis is falling

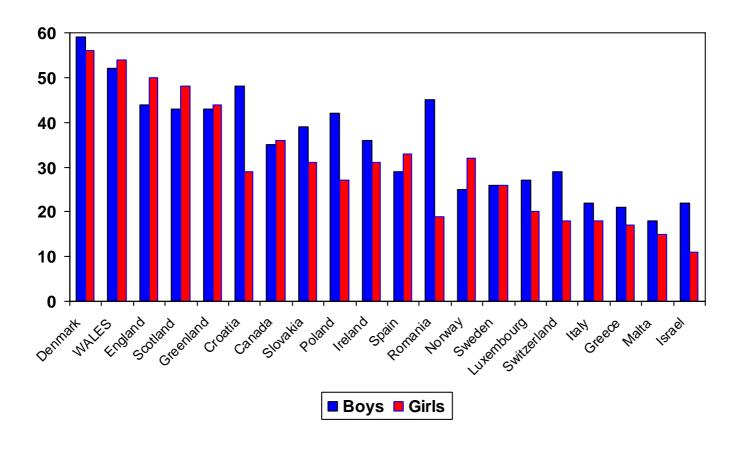
Percentage 15 year-olds using cannabis in their lifetime, Wales, 2002 to 2009



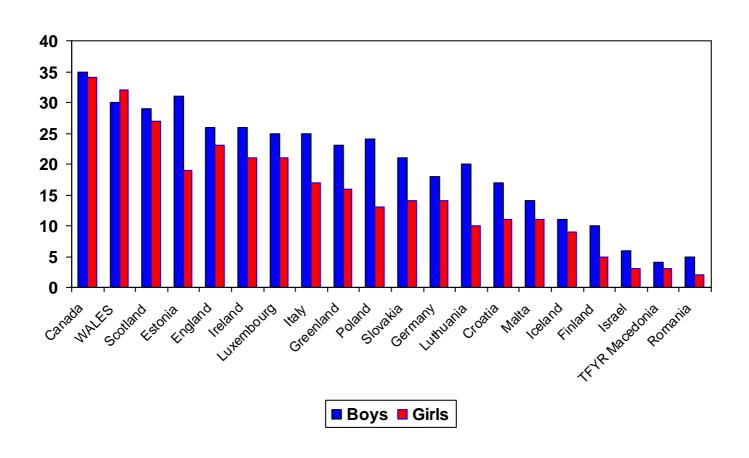
Source: Welsh HBSC survey

#### But Wales remains exposed on European comparisons

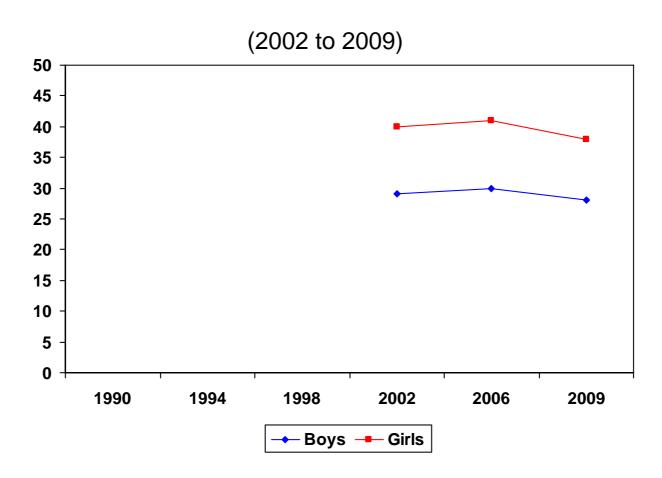
Eg percentage of 15 year-olds who have been drunk at least twice, selected HBSC countries, 2005/06



## And also when it comes to the percentage of 15 year-olds using cannabis in their lifetime, selected HBSC countries, 2005/06



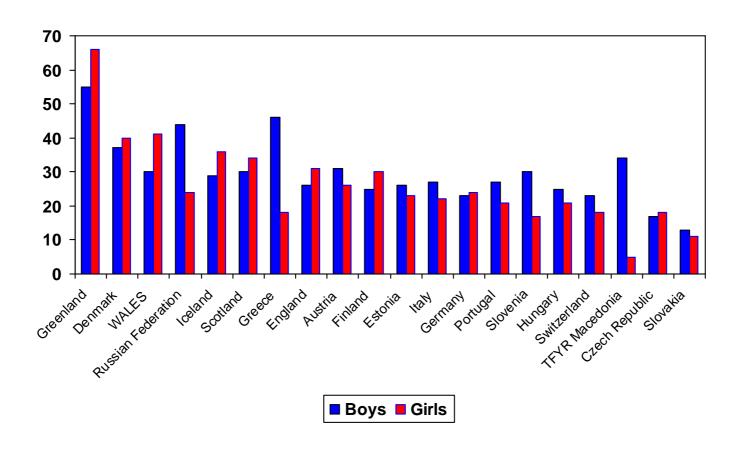
## There is no clear fall in the percentage of 15 year-olds in Wales reporting to have had sexual intercourse



Source: Welsh HBSC survey

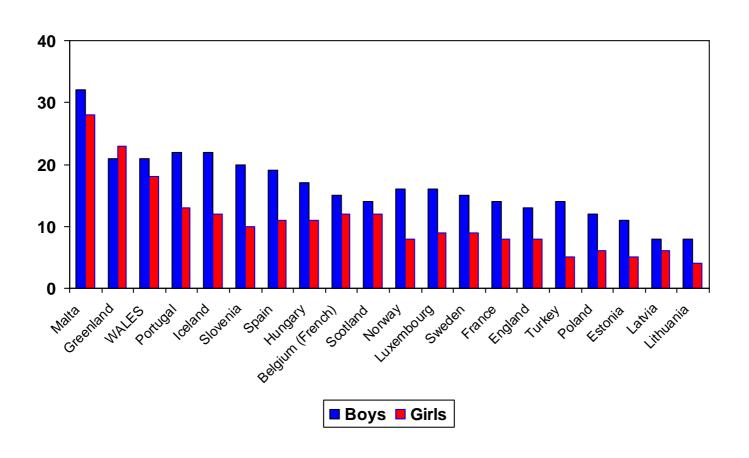
#### Where we remain high in comparison to other countries

Percentage 15 year-olds reporting sexual intercourse, selected HBSC countries, 2005/06



## ... and we are much worse than comparison countries on obesity

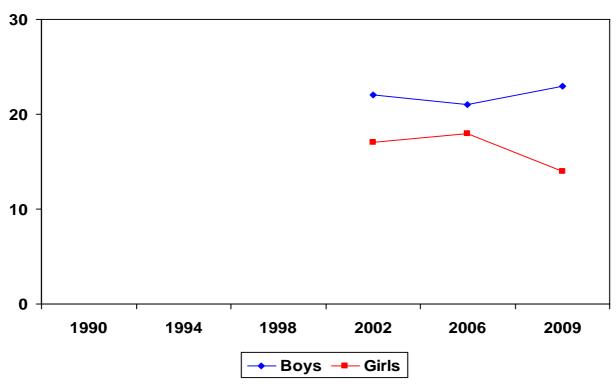
Percentage of 15 year-olds who report they are overweight or obese according to BMI, selected HBSC countries, 2005/06



#### ...where there is no clear trend of improvement

NB wider evidence indicates that there is a social gradient in obesity with a lower % of the obese in higher income groups. English data suggests that the % who are obese nearly doubles between the lowest and highest deprivation deciles

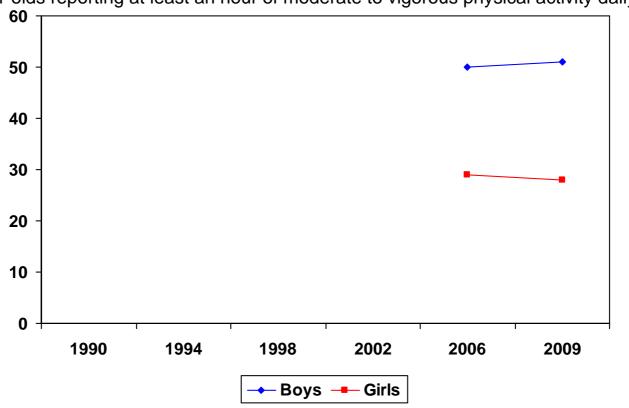
Percentage 15 year-olds overweight/obese, Wales, 2002 to 2009



Source: Welsh HBSC survey

On average boys exercise much more than girls, but suffer more from obesity (previous slide). Medical advice is that obesity is driven more by how much a person eats than by how much they exercise

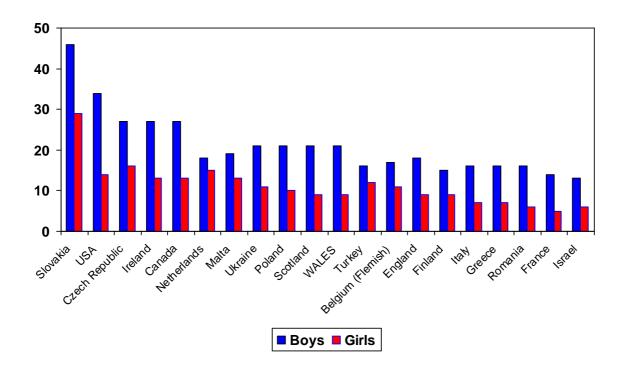
% of 15 year-olds reporting at least an hour of moderate to vigorous physical activity daily



Source: Welsh HBSC survey

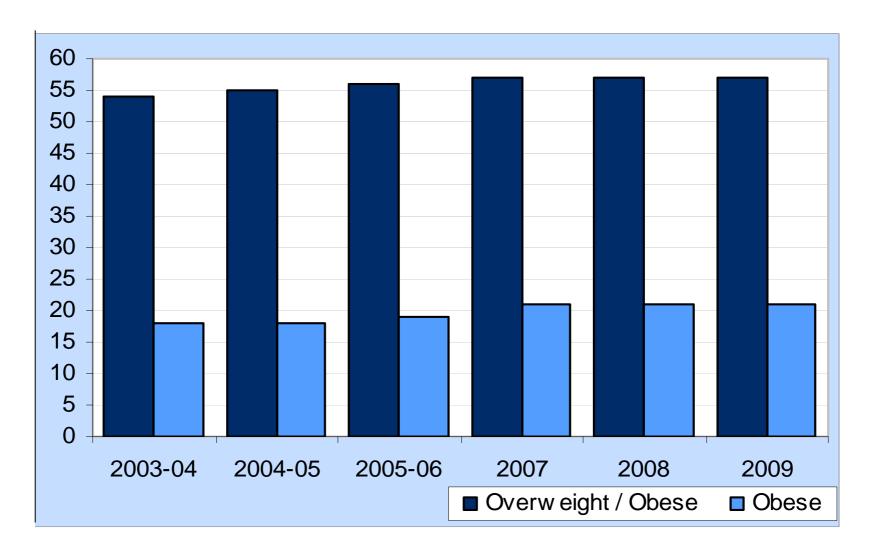
#### And this is borne out by the fact that Wales is mid-table on the exercise taken by 15 year olds

Percentage 15 year-olds reporting at least an hour of moderate to vigorous activity daily, selected HBSC countries, 2005/06



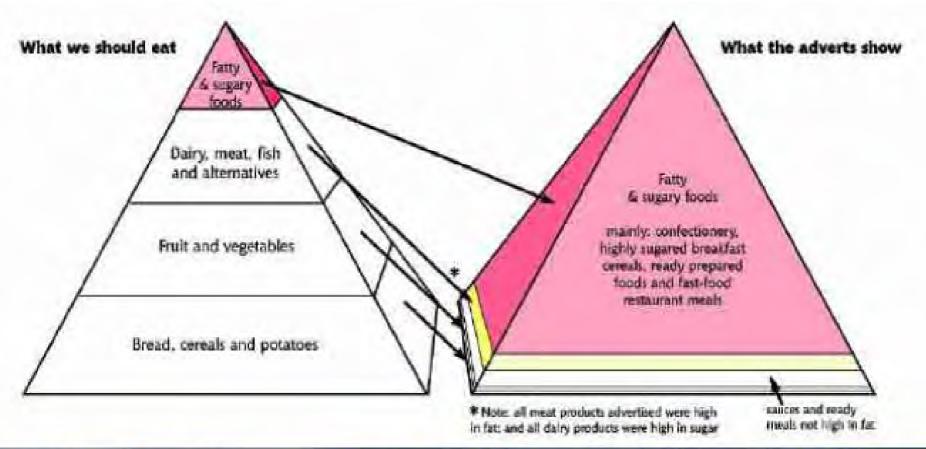
#### Among adults, obesity is increasing...

Percentage of adults who reported being overweight /obese or obese increased by three percentage points between 2003-04 and 2009



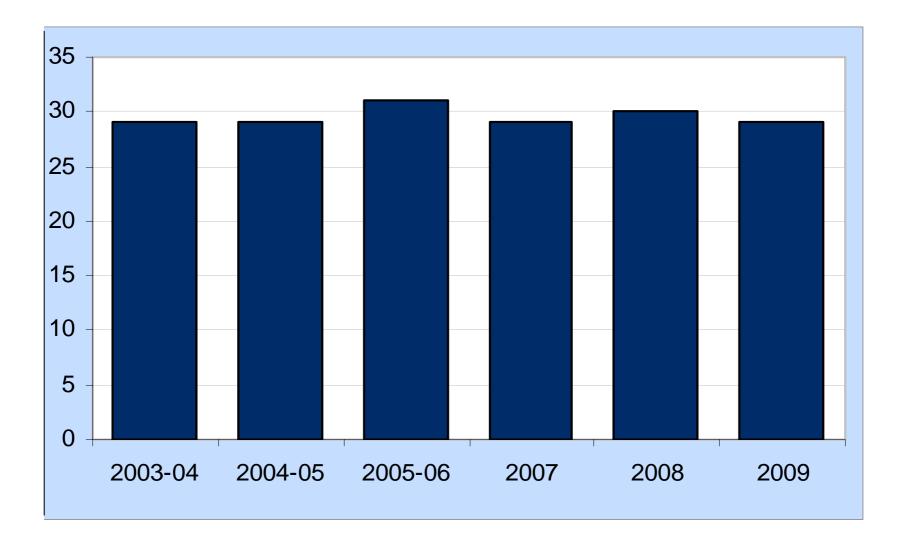
Source: Welsh Health Survey

## And the weight of private sector advertising of fatty and sugary foods is stark



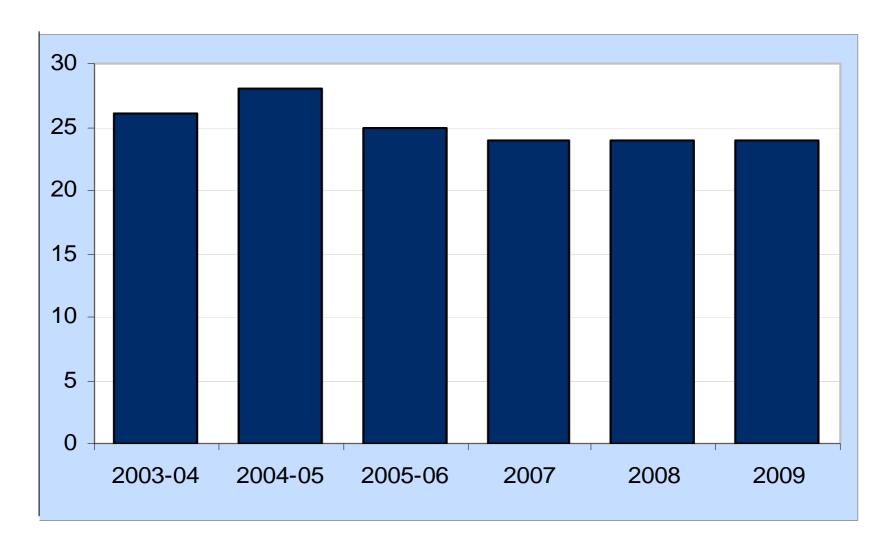
Around three-quarters of food advertising to children is for sugary, fatty and salty foods. For every £1 spent by the WHO promoting healthy diets, £500 is spent by the food industry promoting unhealthy foods
B4.2.24

## There has been no improvement in the percentage of adults meeting the physical activity guidelines



Source: Welsh Health Survey B.4.2.25

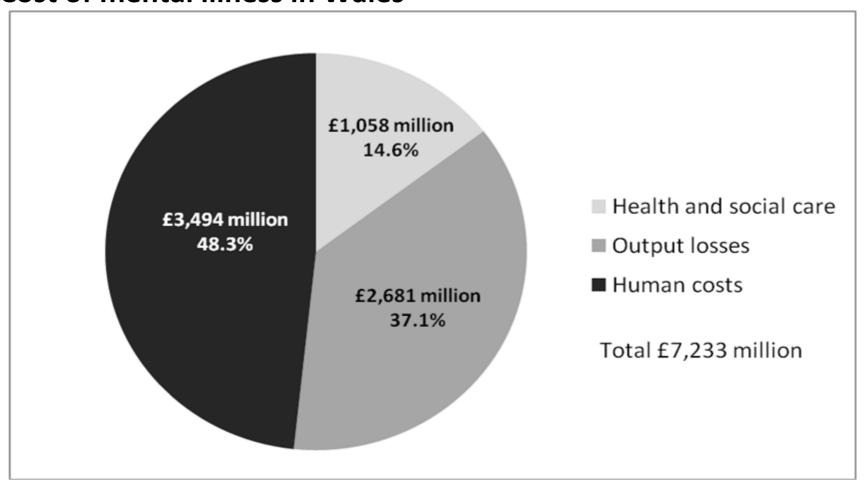
## And the percentage of adults reporting to currently smoke seems to have stopped falling



Source: Welsh Health Survey B.4.2.26

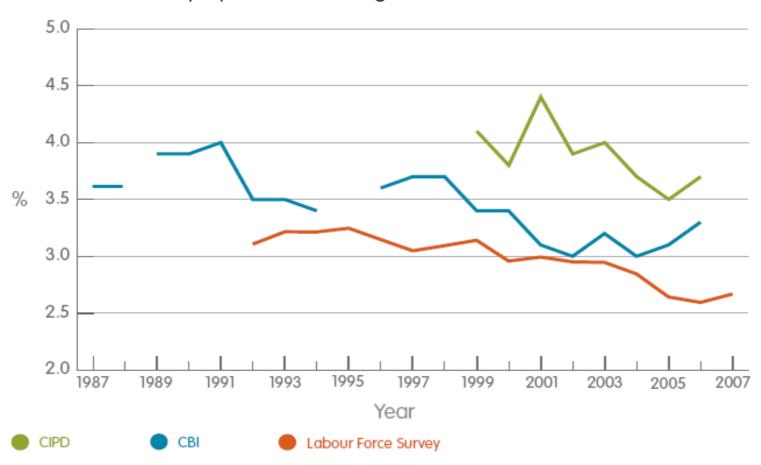
#### The cost of mental ill-health to Wales is significant

#### Cost of mental illness in Wales



### Overall levels of sickness absence have been on a downward trend...

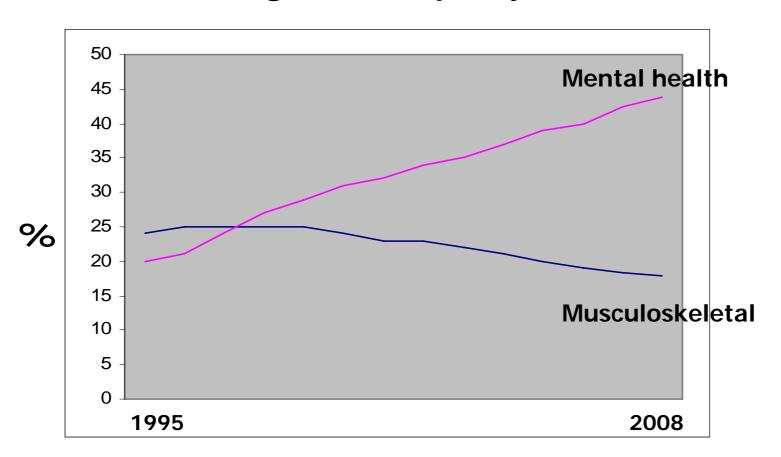
Sickness absence as a proportion of working time



Note: CBI data not collected in 1988 and 1995.

Source: Labour Force Survey, Office for National Statistics; CBI; CIPD

## ...but mental health accounts for a growing share of long term incapacity for work

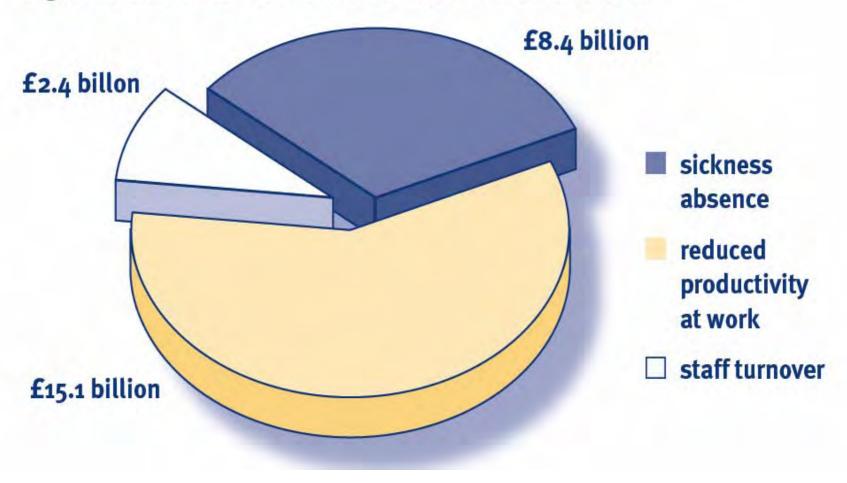


% Incapacity Benefit Claimants Waddell, Burton & Kendall

NB Wales' suicide rates are below OECD average and stable over last decade

## And absence from work hides a significant group who are in work but whose productivity is affected:

Figure 1: The business costs of mental ill health at work



#### Health: summary of main messages

- Life expectancy in Wales has been rising, but not as fast as either the EU15 or EU27: and seemingly not as fast as in similar European regions.
- This does not seem to be driven by our relative spend on health: lifestyles
  are likely to the main factor whether the performance of the health
  system plays a part is unclear.
- It is still unclear how far ageing will add to health costs: the key uncertainty is whether healthy life expectancy will continue to rise in step with total life expectancy.
- Health inequalities within Wales are widening.
- Levels of smoking and exercise among adults appear fairly static.
- Although the % who smoke tobacco or cannabis is falling, Welsh 15 year olds generally compare poorly with 15 year olds in other European countries in terms of healthy lifestyles; and Wales stands out in Europe as having one of the highest % of 15 year olds who are obese.
- The incidence of obesity decreases with income, but levels among the richest is still a cause for concern: in line with the Marmot Report, we need to both improve across the board and also target extra help on the poorest.

### Wales' Futures

Human capital: Part Three

**Economy** 

## Why is Wales at the bottom of the UK league table on GVA per capita?

- 1 London is in the UK average...
- 2 Working age population low relative to total population.
- 3 Some income earned outside Wales (not in GVA).
- 4 Low employment rates.
- 5 Low GVA / wages per hour worked (low "productivity").
- (1) is unchangeable.
- (2) & (3) not the most important factors, but not negligible.
- (4) & (5) are major factors, and in recent years relative importance is 1:2 respectively when comparing with UK (1:1 with RUK).
- causes are deep-rooted and long term, but not mysterious: mainly a combination of weak skills, especially "at the bottom" and lack of a major agglomeration (plus some effect from industry mix).

## Reflecting this analysis, Wales does better on measures of income, wealth and poverty than on GVA

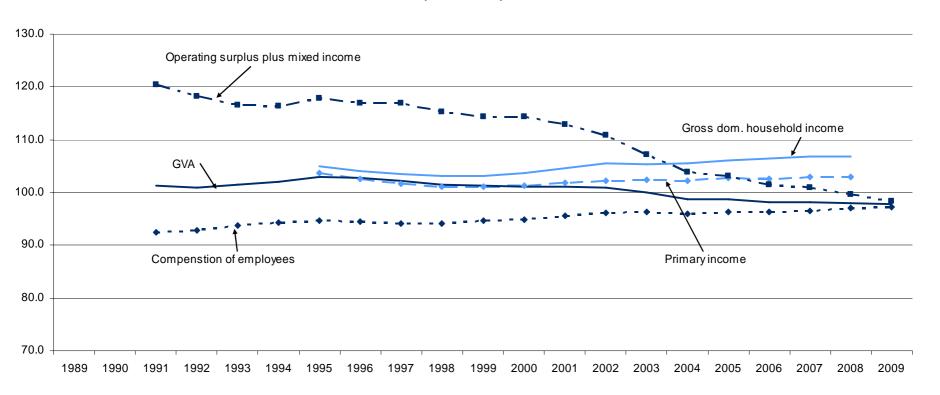
Welsh economic performance: rank amongst UK countries / regions - latest data

|             | GVA per cap | Primary<br>Income per<br>cap | GDHI per<br>cap                     | Employment rate                   |                     | Poverty (all<br>age)                                   | Wealth per<br>household   |
|-------------|-------------|------------------------------|-------------------------------------|-----------------------------------|---------------------|--|---|
| Rank/12     | 12          | 11                           | 10                                  | 10                                | 10                  | =6   | 5*  |
| Below Wales | None        | North East                   | North East<br>Yorkshire &<br>Humber | North East<br>Northern<br>Ireland | Northern<br>Ireland | North East<br>North West<br>London<br>West<br>Midlands | North East Yorkshire & Humber North West W Midlands E Midlands Scotland |
| Date        | 2009        | 2009                         | 2009                                | Q end Jan11                       | 2010                | 2006/7-8/9   | 2006/8  |

<sup>\* 5</sup>th from 11 (no data for Northern Ireland)

# Comparing Wales with North East England, both current Welsh performance and trends are better on Household Income and Primary Income; adverse Welsh performance on GVA is explicable, and trend driven by operating surplus

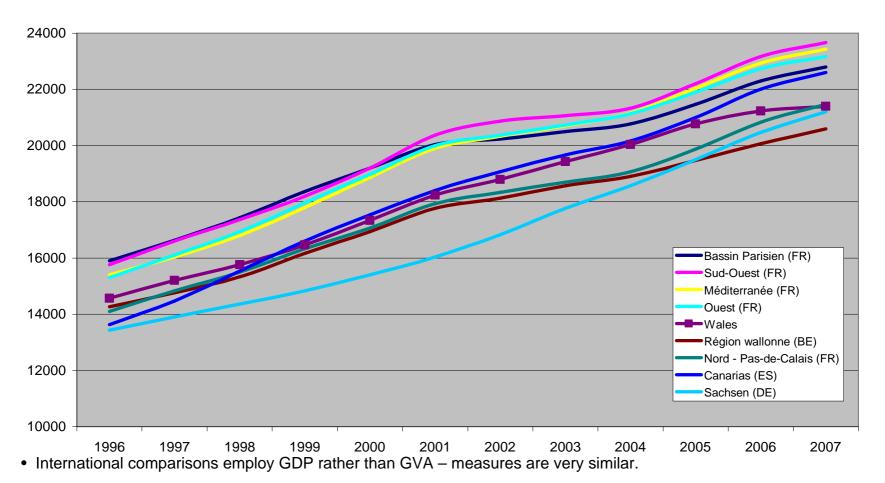
Relative Economic Performance for Wales (North East=100), per head of population aged 16-64 (residence)



 Factors explaining adverse Welsh relative current performance on GVA include demography, commuting and industry mix

# The sharp relative decline in GVA and income per capita in the late 1990s reflected the out-performance of London, so Wales more or less held its own against its base-year European comparators

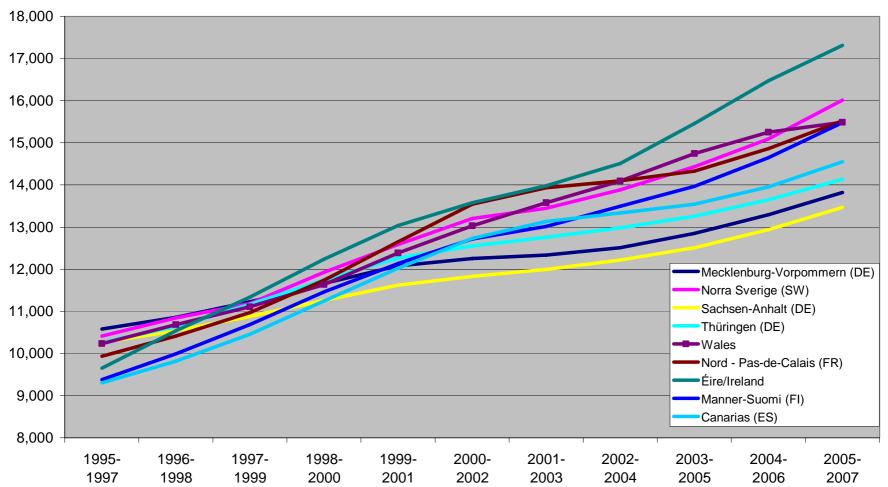
GDP per capita, PPS, 3 year average\*



• "Flattening off" over most recent period reflects a UK effect driven by the purchasing power parity calculation

#### Similar (in fact slightly better) story on Primary Income

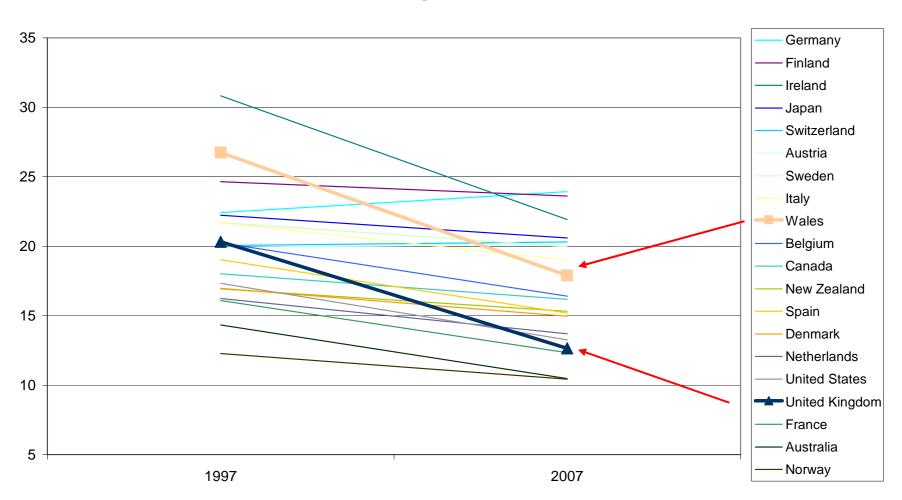
#### Primary Income - 3 year average



• "Flattening off" over most recent period reflects a UK effect driven by the purchasing power parity calculation

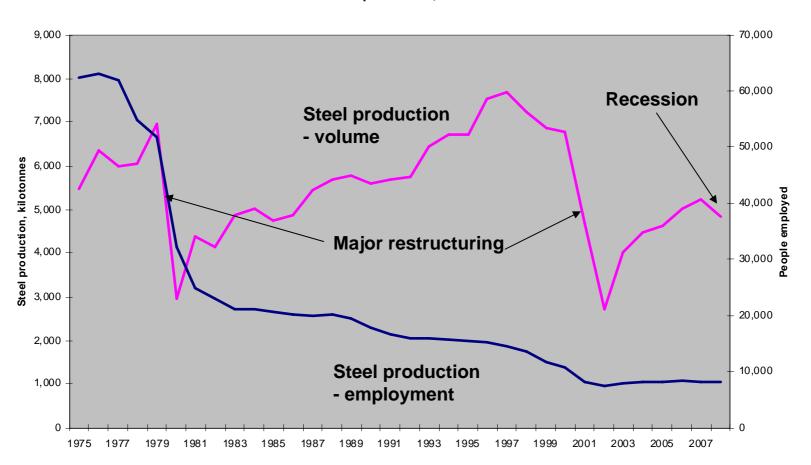
## The decline in manufacturing's share of GVA has still left Wales broadly typical (and the UK is not an outlier)

#### Manufacturing - share of GVA



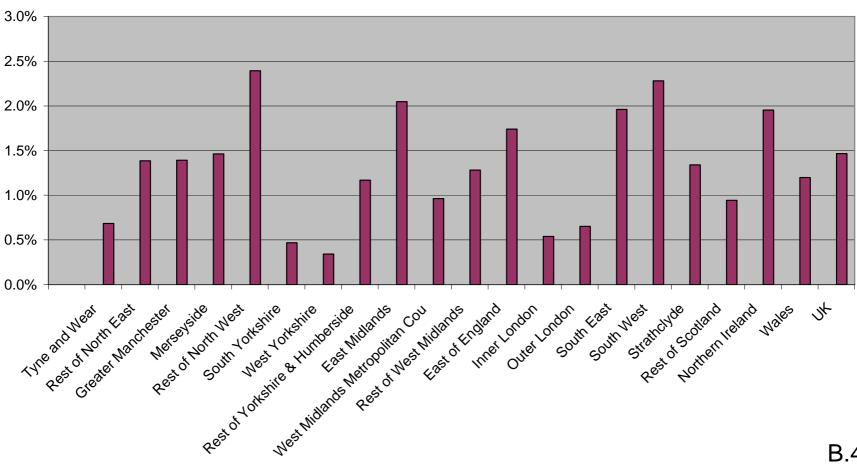
## The big factor is productivity, not imports. We still make a lot of things – but with many fewer people – eg steel

#### Steel production, Wales



#### Need to remember that high-tech is "small" everywhere

#### Share of employment in high tech manfuacturing, 2009-2010



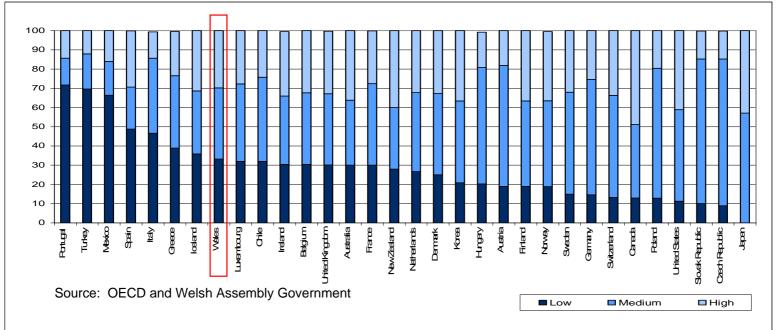
## We know what contributes to Wales' economic performance compared to much of the rest of the UK (<u>reminder</u>):

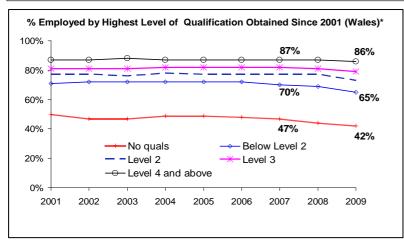
- 1 London is in the UK average...
- 2 Working age population low relative to total population.
- 3 Some income earned outside Wales (not in GVA).
- 4 Low employment rates.
- 5 Low GVA / wages per hour worked (low "productivity").

The underlying causes are deep-rooted and long term, but not mysterious: mainly a combination of poor skills, especially "at the bottom" and economic geography, particularly the lack of major agglomeration

## In respect of <u>people</u>, the biggest problems are at the bottom end, where Wales (and the UK) does badly... raising education/skills at all levels is fundamental to Wales' future economic performance







- Across countries, employment rates and wages are much lower for those with poor qualifications (for employment rates in Wales, see left)
- Generally, such disadvantages are increasing over time

## In respect of <u>places</u>, over and above agglomeration, quality of life is becoming an increasingly important driver success, so in this sense, places do remain in "competition":



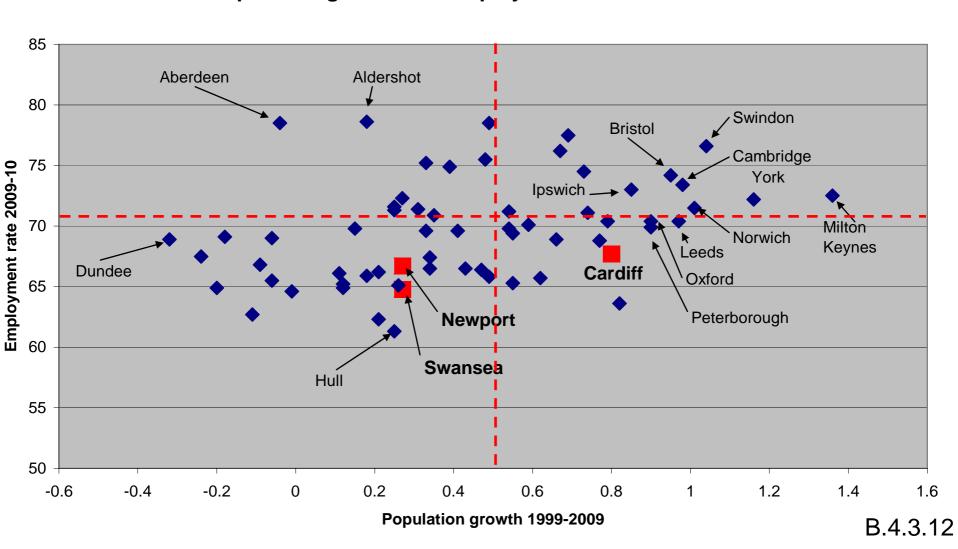
Factors driving geographical differences in "revealed" quality of life (UK):

- Employment accessibility.
- Climate (especially rainfall).
- Air pollution (capturing also visual disamenties, eg busy roads).
- Cultural amenities (museums).
- Crime.
- Woodland cover.
- "Hilly" landscape.
- Proximity to the South East.

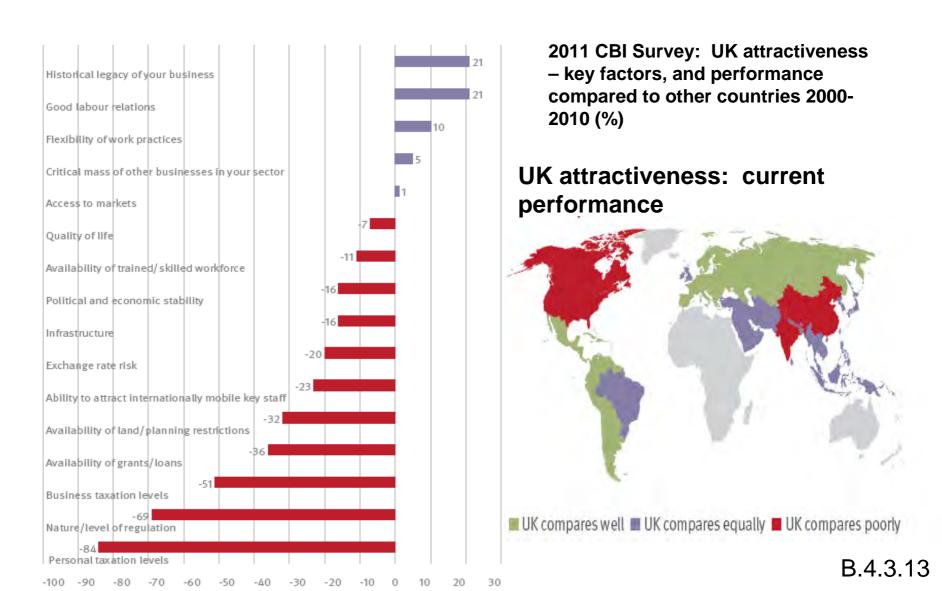
Source: Gibbons et al, 2011

### Cardiff is our only player in the major league

#### Population growth and employment rate - GB cities



## And the recent CBI survey underlines the importance of infrastructure and skills to attracting investment



### **Economics: Summary of main messages**

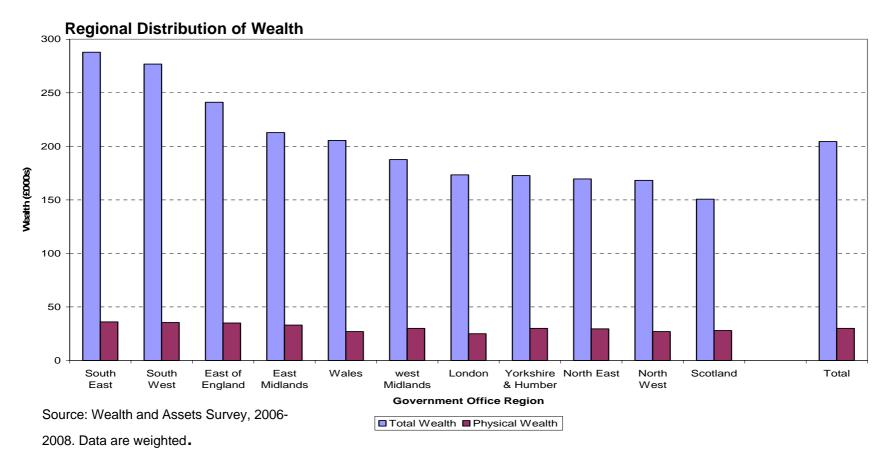
- Welsh economic performance should not focus on GVA numbers we need to look at a wider range of measures.
- Which is not to say there aren't concerns...
- Wales economic performance is unsurprising given our fundamental economic "assets"- in terms of human capital and economic geography.
- In respect of **people**, key weaknesses exist in education and skills, particularly towards the bottom of the skills distribution.
- This is reflected in a low employment rate (and low well-being for those affected).
- Relatively low wages/productivity are more an issue towards the top of the skills distribution - probably an effect of a lack of agglomeration.
- We need to improve the attractiveness of places to attract and retain the highly skilled: factors such as "quality of place" and accessibility important here.

### Wales' Futures

Human capital: Part Four

Poverty

### Wealth in Wales is similar to the UK average

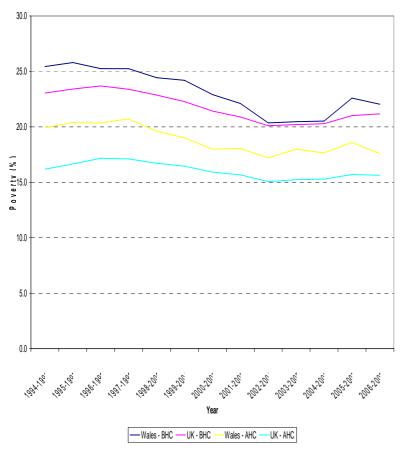


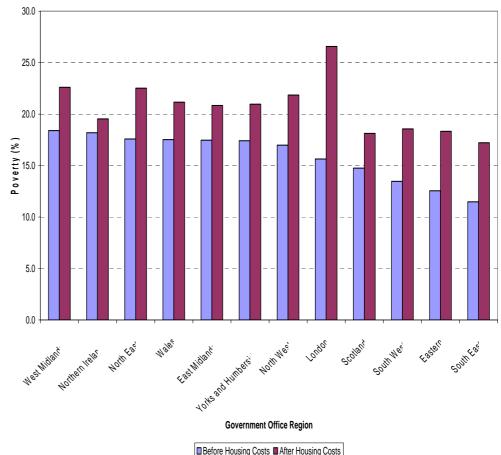
Median wealth in Wales is estimated to be £205,000, higher than outer regions of the UK at £190,000.

Wales has high levels of owner occupation and ownership without a mortgage.

## Wales has higher than average levels of poverty, but the gap narrows after housing costs have been taken into account

Population Living in Households with <60% Equivalised Median Household Income Regional Variations Population Living in Households with less than 60% Equivalised Median Household Income





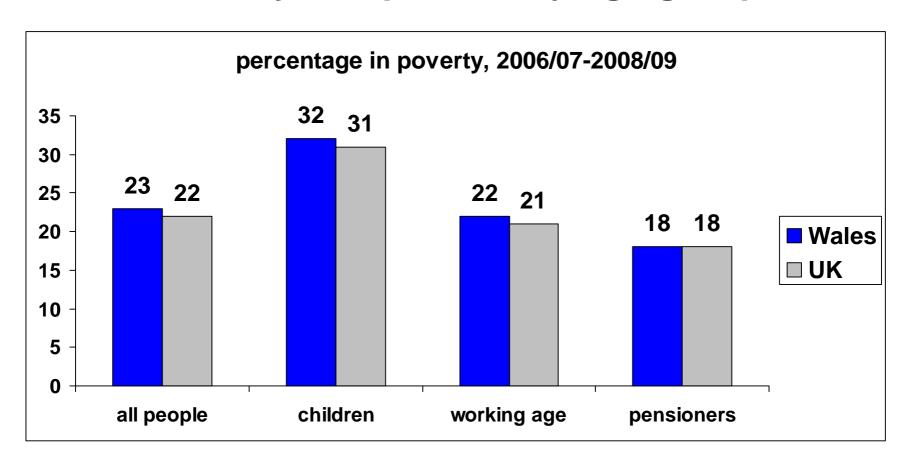
"An Anatomy of Economic Inequality in Wales" (Equality and Human Rights Commission)

Source: HBAI, 2004-2008:

natorny of Economic mequality in wates (Equality and Human Rights Commission

B.4.4.2

### Poverty comparison by age group



While poverty rates are currently one percentage point higher in Wales than the UK (except for pensioners for which they are equal), rates in Wales are similar to half the English regions (less than some and equal to others; including NE, NW, Yorks, E Mid, and W Mid).

### There is significant churn in and out of poverty

#### **Poverty Persistence and Exit from Poverty**

|                             | Wales | Outer GB | LESE |
|-----------------------------|-------|----------|------|
| 1999-2000                   |       |          |      |
| Headcount 1999              | 22.1  | 20.0     | 13.7 |
| Exited poverty in 2000      | 12.8  | 9.1      | 7.0  |
| Remained in poverty in 2000 | 9.4   | 10.9     | 6.7  |
|                             |       |          |      |
| 2005-2006                   |       |          |      |
| Headcount 2005              | 18.9  | 17.0     | 12.3 |
| Exited poverty in 2006      | 9.6   | 8.7      | 5.3  |
| Remained in poverty in 2006 | 9.3   | 8.3      | 7.0  |
|                             |       |          |      |
| 1999-2006                   |       |          |      |
| Headcount 1999              | 22.1  | 20.0     | 13.7 |
| Exited poverty by 2006      | 17.5  | 16.1     | 11.8 |
| Remained in poverty by 2006 | 4.7   | 3.9      | 2.0  |

London the South East and East distort UK comparisons.

Between 1999 and 2006, 79% of those living in poverty exited poverty; this is roughly equivalent to the outer GB figure.

In work poverty stands at 12.9% compared to 13.1% in outer GB.

In-work poverty is higher in younger and lone-parent households.

Source: HBAI, 2004-2008:

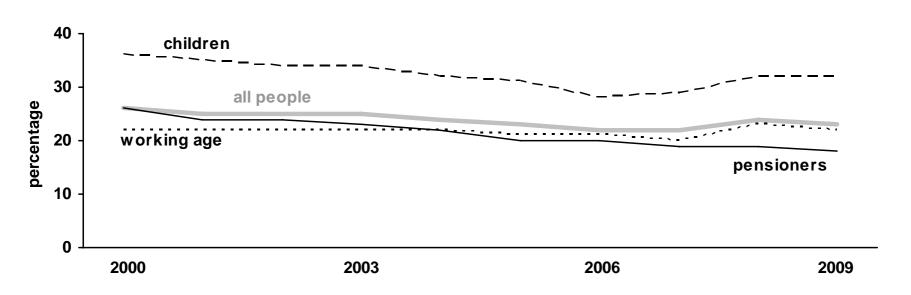
<sup>&</sup>quot;An Anatomy of Economic Inequality in Wales" (Equality and Human Rights Commission)

## ...and persistent poverty has bigger impacts than temporary periods of poverty

- British Household Panel Survey (2001-2004) estimated UK persistently poor at 12% (poor in all four years).
- People who are persistently poor more likely to do no physical exercise, be offered drugs, be in trouble with the police, be considered - by parents - to be poor at Maths and English, not to see friends nor be engaged in clubs and sports.
- Very significant associations with living in bad housing, being expelled or suspended from school.
- Work status obviously key determinant but also associations with:
  - Size of family.
  - Social housing tenure.
  - Parental qualifications.
  - Mother under 25.

# Over the last decade the general trend has been for the % of children and pensioners in poverty to be falling, although the % of working age people in poverty has remained relatively flat

percentage of different groups living in poverty in Wales (AHC)



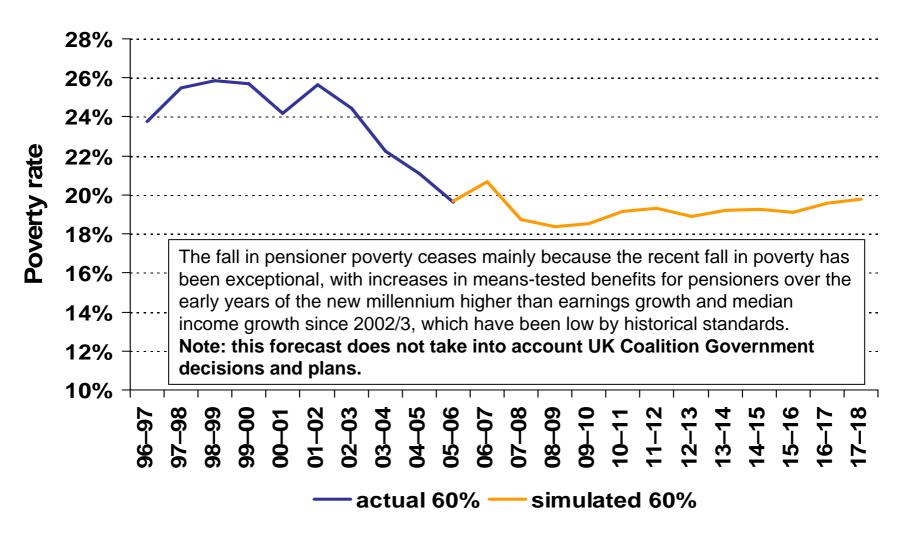
### ...but recent UK Government tax and benefit changes are estimated to increase poverty

• The IFS estimate that by 2012-13 the coalition government's tax and benefit reforms act to increase relative and absolute poverty for both families with children and working-age adults without children.

Including previous governments plans and changes in earnings, the IFS forecast that for the UK (and hence Wales):

- In the two years between 2010–11 and 2012–13, poverty rates will be relatively stable for families with children, but continue rising for working-age adults without children.
- In 2013–14, relative and absolute poverty will rise for both families with children and working-age adults without children.

## Pensioners are now <u>less likely to be poor than other age</u> groups and the most recent (2009) IFS projection for UK suggests stabilisation (but no major increase)



#### **Drivers of poverty: the international evidence**

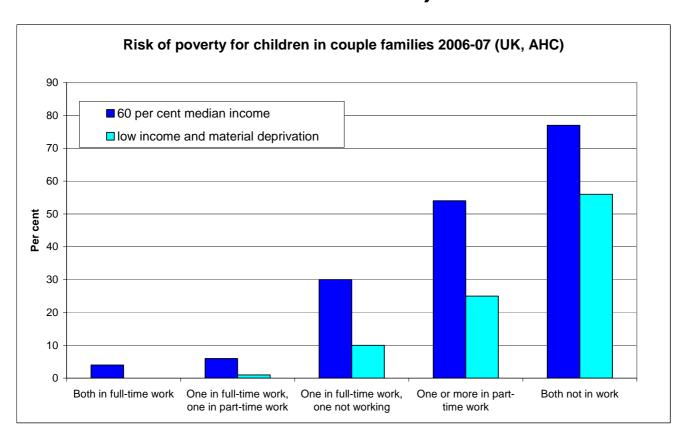
Major drivers of differences between countries / regions include:

- Demography (eg numbers of children).
- Non-employment/worklessness.
- Tax and benefits systems.
- But low pay relatively less important the large majority of low paid people are in non-poor households eg as second earners.

Major drivers of differences over time include changes to the above plus:

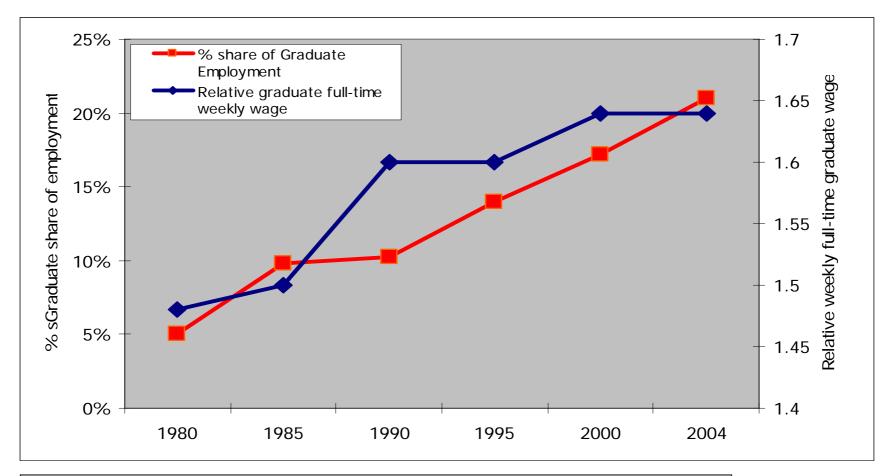
Trends in occupational mix and relative wages.

## Jobs strongly protect families from poverty (UK data)



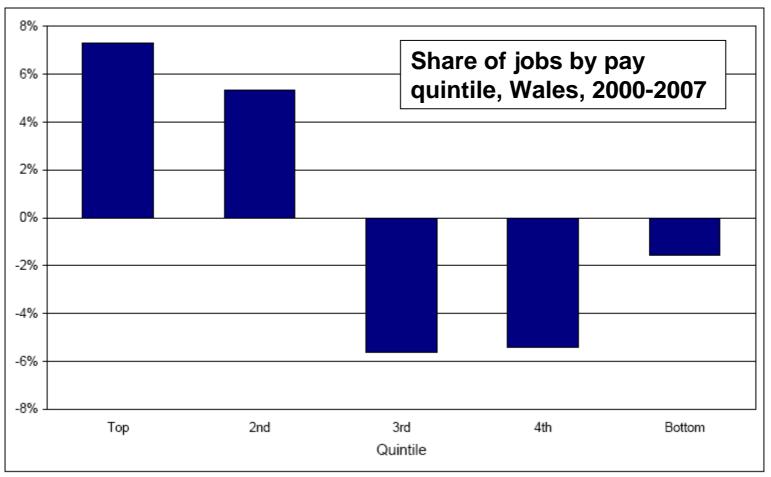
•JRF (2004) estimates that around 85% of low paid individuals are <u>not</u> in poor households. (Low pay defined as less than 2/3 of median wage.)

# In the UK, and internationally, a key underlying driver of increasing inequality (and hence poverty) has been the high (and until recently increasing) wages premia associated with qualifications



Source: Machin and Vignoles, 2006, updated from Machin and Vignoles, 2005. Relative wage ratios derived from a regression analysis with controls for age and gender.

## A further factor is changing job "mix": the average quality of jobs is increasing, but "hollowing out" is driving increasing wage inequality



Source: Annual Population Survey, ASHE

## Deprivation shows a degree of concentration in certain locations, but the concentration is less than commonly assumed

Percentage of benefit claimants by Welsh Index of Multiple Deprivation (WIMD) grouping

| Lower Super Output Area  | income domain | employment domain |
|--------------------------|---------------|-------------------|
| most deprived 10% LSOAs  | 20            | 20                |
| most deprived 20% LSOAs  | 35            | 35                |
| most deprived 30% LSOAs  | 49            | 49                |
| least deprived 10% LSOAs | 3             | 4                 |

Note: Even in the 5% most deprived areas, more than one half of the population are *not* deprived

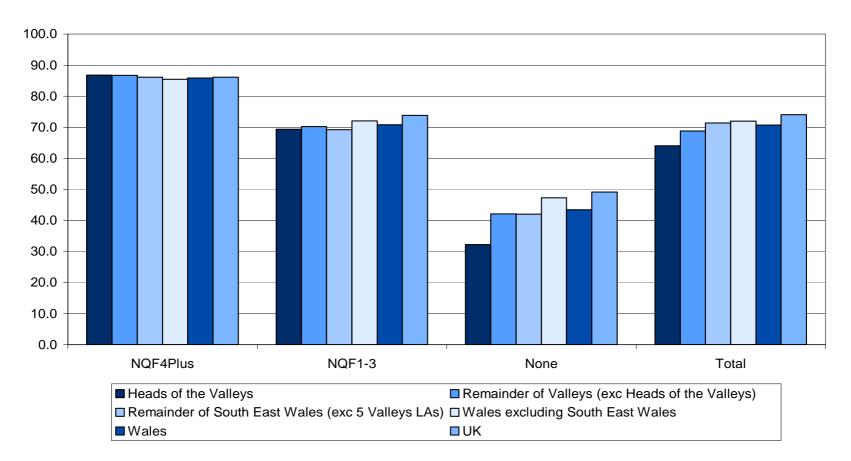
## The picture is similar with the other dimensions of disadvantage

| percentage of affected | limiting  | no             |
|------------------------|-----------|----------------|
| population             | long term | qualifications |
|                        | illness   |                |
| 20                     | 13        | 13             |
| 50                     | 38        | 37             |
| 95                     | 90        | 90             |

The table shows that 20% of those with a limited long term illness live in the 13% of areas with the highest incidence of illness (but therefore 80% do not). The picture is similar for those with no qualifications. These dimensions of deprivation are therefore, if anything, rather *less* spatially concentrated than for low income and lack of employment.

## Individual and family characteristics are more important for outcomes than geography – eg employment rates link more strongly to qualification levels than to area:

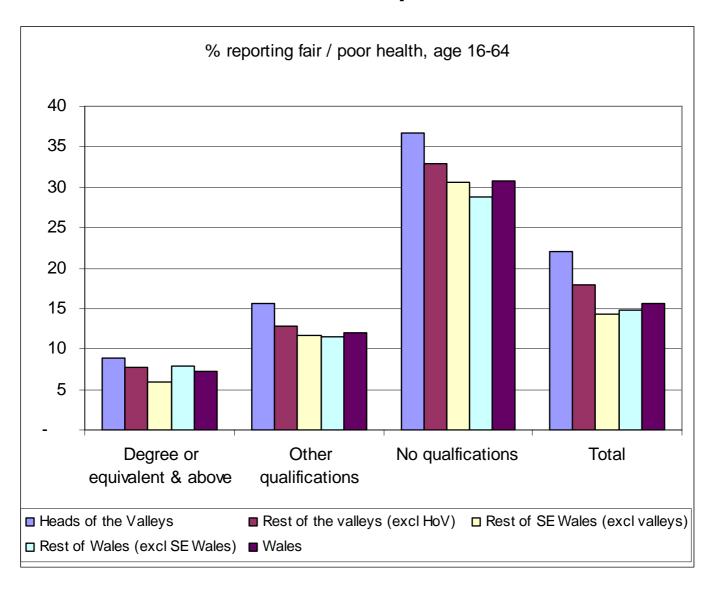
#### Working Age Employment Rate by Qualification Level



For children, area seems to play rather more of a role in longer term educational outcomes, although it is still very much secondary to family characteristics, particularly maternal education and, to some extent, family income.

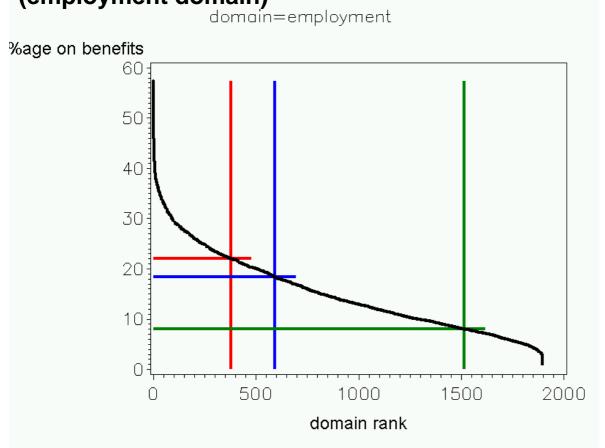
B.4.4.15

## ...and the percentage of the working age population reporting fair/poor health correlates much more strongly with qualification levels than with deprived "areas"...



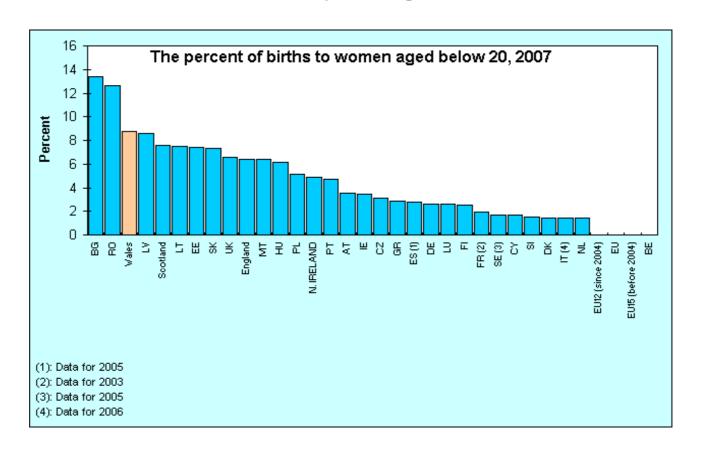
## While a small number of areas do show relatively high concentrations of deprivation, for the large majority of areas, differences in the level of deprivation change only gradually

Percentage of benefit claimants by WIMD grouping (employment domain)



The coloured lines mark: red – the most-deprived 20% of LSOAs (Lower Super Output Areas); green – the least deprived 20% of LSOAs; blue – the LSOA rank where half the number of people in receipt of the relevant benefits resides in a more deprived LSOA and half reside in a less deprived LSOA.

### Wales stand out internationally for our relatively high % of births to young mothers



Being born to a teenage mother is associated with a child growing up in a low income household

### **Poverty: Summary of main messages**

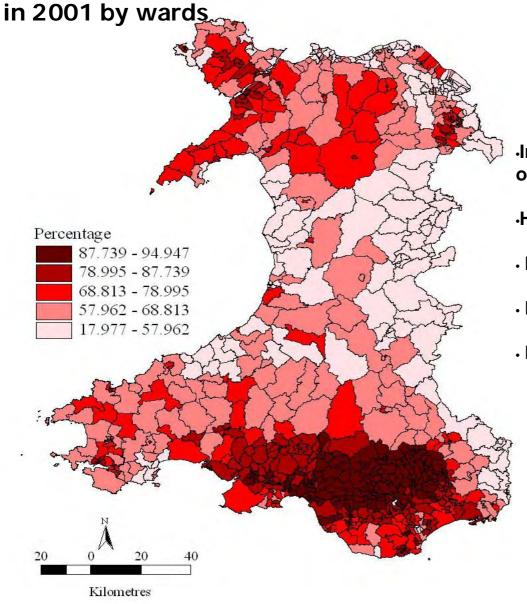
- Poverty rates in Wales are marginally higher than the UK average, but lower than a number of English regions – particularly after allowing for differences in housing (and potentially other) costs.
- Pensioners as a whole are less likely to be poor than the general population, and the rate is not currently forecast to rise significantly: but this may change, especially for some groups of pensioners.
- Location is a much less important risk factor for poverty than skills.
- Over the short run, non-devolved policy levers have the greatest influence on poverty, particularly policies on taxes and benefits.
- Employment offers a high level of protection against poverty, and particularly against deep and persistent poverty (and also contributes directly to well-being).
- Education and skills are therefore crucial, and evidence suggests that intensive interventions, as early as possible, in the lives of those most at risk are needed to break the cycle of disadvantage.

### Wales' Futures

Human capital: Part Five

Culture and Identity

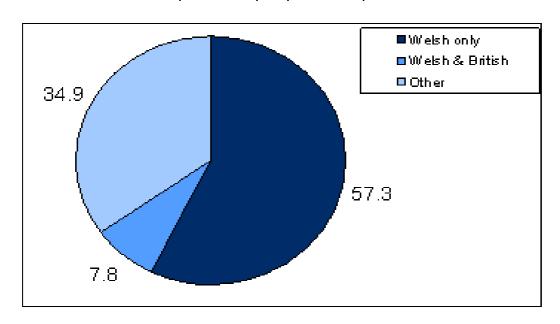
Percentage of the population born in Wales



- In slow long-term decline across Wales overall:
- ·High in Valleys.
- · High in parts of the North.
- · Low on the border (to be expected).
- Low in many rural areas.

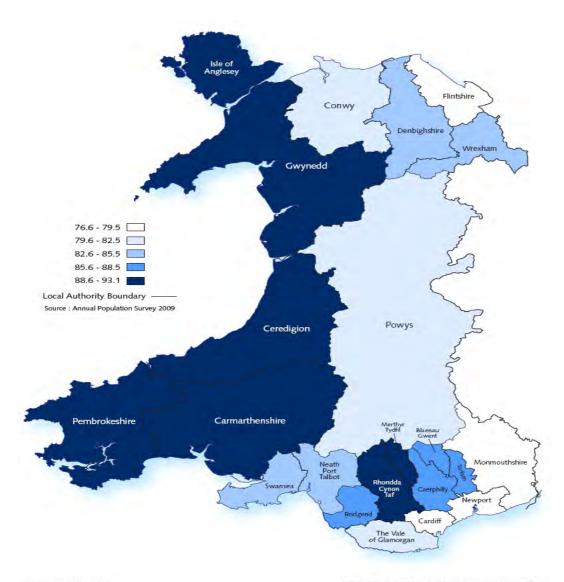
### 65% of adults identify as being of Welsh National Identity:

National Identity: 65% of people identify themselves as Welsh



Source: Annual Population Survey, 2009

### And identity is not evenly spread geographically



People born and resident in Wales: Proportion who regard themselves as having a Welsh national identity 2009.

## Patterns of phone calls show Wales is much more linked in to England than Scotland:

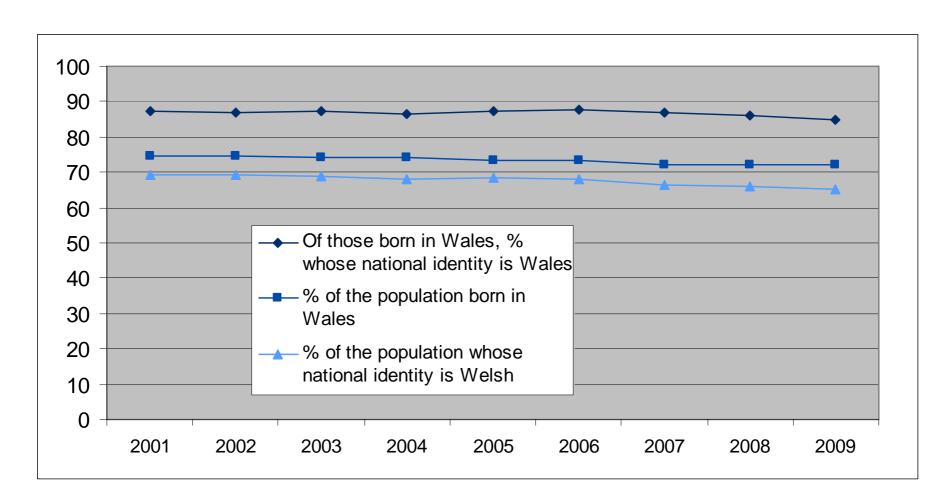


• Parts of Wales are closely linked into regions dominated by the major cities of the West Midlands and North West (and "South Wales" incorporates part of Gloucestershire north of the Severn).

• The difference between Scotland and Wales is striking, with Scotland very separated from the rest of Great Britain.

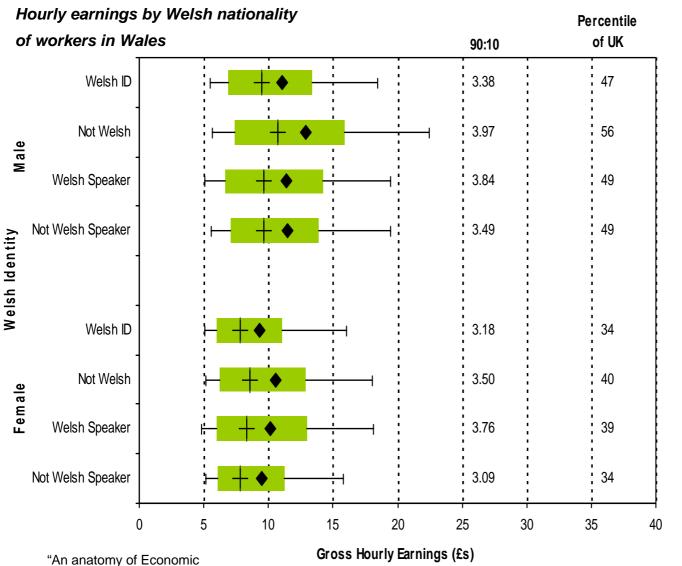
Source: Carlo Ratti.MIT

### Sense of Welsh identity is broadly stable



Annual population survey B.4.5.5

### Migrants economically out-perform those with a Welsh identity



Migrants from other parts of the UK as well as from outside of the UK, are more likely to be wellqualified.

Migrants tend to be far younger on average than the Welsh-born population.

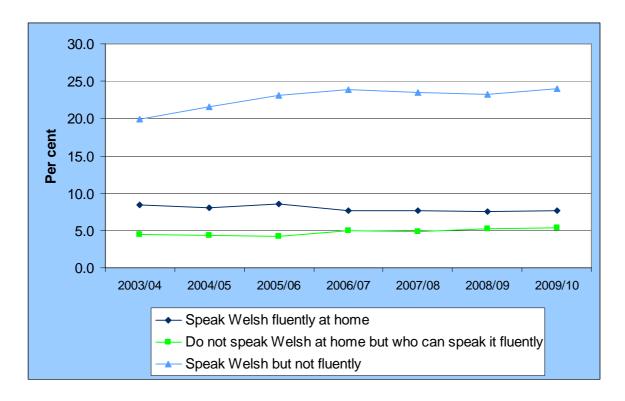
<sup>&</sup>quot;An anatomy of Economic Inequality in Wales 2011" EHRC

### Increasing numbers of people can speak Welsh

- 20.8% of the population of Wales could (but not necessarily did see later) speak Welsh in 2001 compared to 18.7% in 1991.
- 16.3% of the population of Wales said that they are fully literate in Welsh (can read, write and speak Welsh).

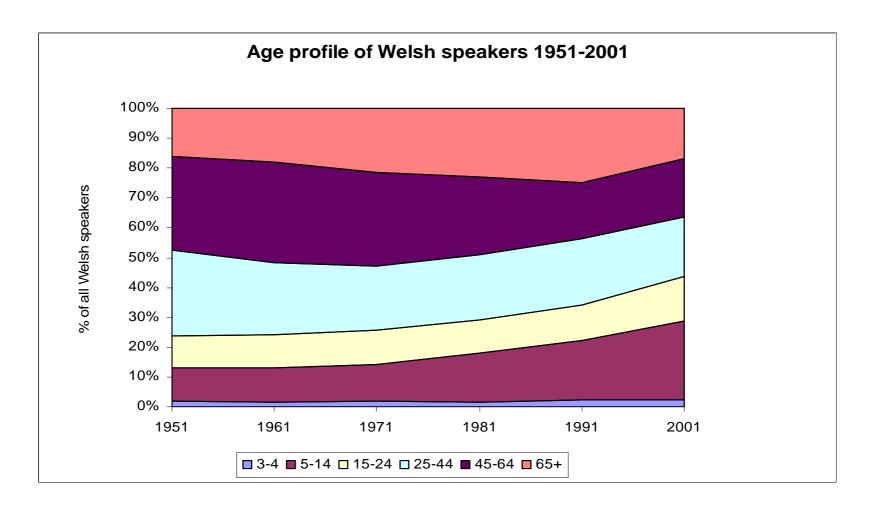
## There has been a large increase in speaking Welsh amongst primary school children...although not reflected in speaking Welsh at home

Maintained primary school pupils, aged 5 years and over, by ability to speak Welsh, as assessed by parents (a) (b)



- (a) School Census, at January each year.
- (b) The data mainly represents parents perceptions of their children's fluency and will not necessarily be the same as the ability shown by the pupil in their school work.

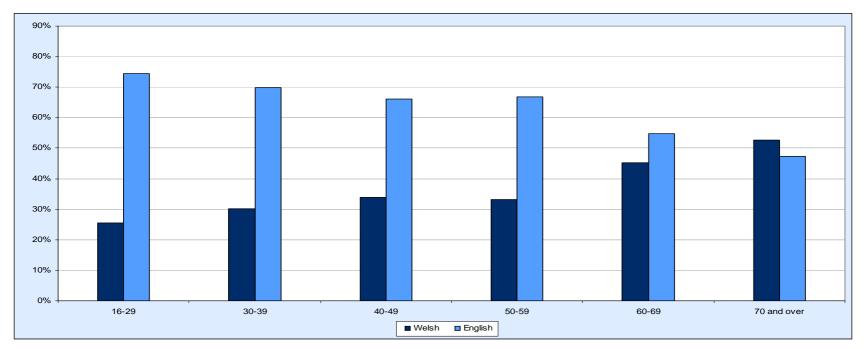
## And the Welsh speaking population has become significantly younger in the past 20 years



Source: Census

Note that the values are discrete and correspond to each Census point.

# But over 25% of Welsh speaking survey respondents spoke Welsh less than once a week; younger age groups are less likely to use the language, probably reflecting a lesser degree of fluency



Most recent conversation (Living in Wales 2008)

Fluent speakers speak Welsh more often. In the Welsh Language Use Survey (2004-2006, Welsh Language Board), 87 per cent (276,000) of fluent speakers said they spoke Welsh every day, compared to 29 per cent (66,000) of those who were not fluent.

## Rates of parental transmission mean that the future of the language cannot be taken for granted

#### 3-4 year olds:

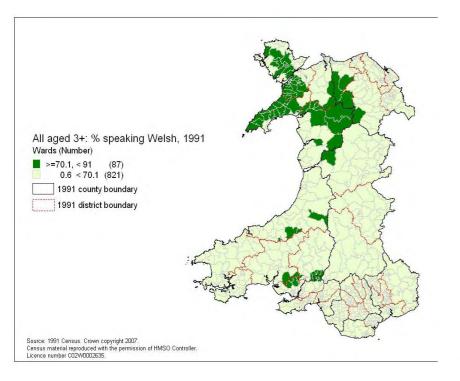
- There has been a decrease in the percentage of children aged 3-4 living in households where both parents spoke Welsh (from around 9% in 1991 to around 7% in 2001).
- Where both parents spoke Welsh, 18% of 3-4 year olds still didn't speak Welsh in 2001 (not possible to compare with 1991).
- Where one parent spoke Welsh, 61% of 3-4 year olds didn't speak Welsh in 2001.

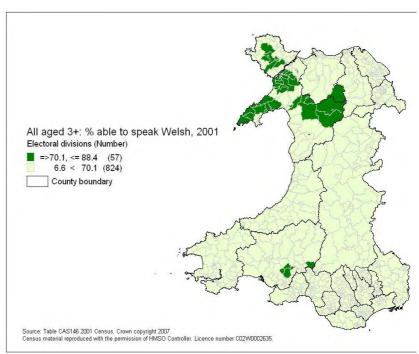
#### 3-15 year olds:

- In families where both parents spoke Welsh, 91% of children spoke Welsh in 2001 (similar to 1991).
- In couple families where one adult spoke Welsh, around 61% of children could speak Welsh in 2001 (an increase of around 7 to 8 percentage points since 1991).
- In families where no adult spoke Welsh, around 28% of children spoke Welsh in 2001 (an increase of around 15-16 percentage points since 1991). Welsh medium education is a likely key influence here.

Source: 1991 and 2001 Census

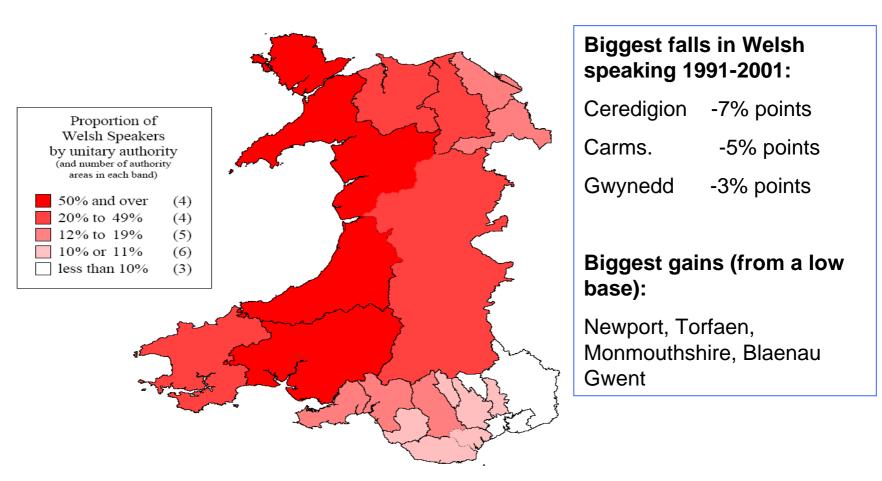
#### The Welsh language heartlands continue to decline





### But still possible to identify a Welsh speaking 'heartland' in the North and West...

...provided we use 50% as the threshold for a heartland area



Source: 2001 census

### Wales has an opportunity to maximise her nation brand image

- The UK is ranked No. 1 overall as a nation brand and is particularly well ranked in areas such as encouraging immigration and investment.
- There are big differences in the familiarity and visibility of Wales as a nation brand, those that know Wales better, such as Commonwealth and European countries, score her relatively highly.
- Wales also scores relatively well in its ability to attract human capital. Better, for example, than Ireland, Signapore, Brazil, South Africa and India.
- The challenge is to capture enough of the positive branding of the UK for the distinctive offer of Wales.

### **Culture and Identity: Main messages**

- Wales has very different demographic flows, within the UK, from those in Scotland.
- Despite progress, the future of Welsh can not be taken for granted.
- The character of Welsh society is bound to change, we need to think about how to make the change positive.
- The issue is how to foster a Welsh identity which is distinctive, but inclusive, outward looking and helps Wales to position itself successfully in an ever evolving world.