

Compendium

Economic review: July 2018

An analysis of economic statistics related to sustainable development goals.

Contact:

economic.advice@ons.gov.uk
+44(0)1633 455867

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Economic review introduction: July 2018

A brief introduction to the Economic review: July 2018 edition and a summary of its focus on the Sustainable Development Goals.

Contact:
Ellis Daniel
economic.advice@ons.gov.uk
+44 (0)1633 455290

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1 . Authors

Hamish Anderson, Vasileios Antonopoulos, Vahe Nafilyan, Gueorguie Vassilev, Claudia Wells, Alice Whitfield.

2 . Introduction

This edition of the Economic review is the sixth following the introduction of economic statistics theme days in January 2017. Each Economic review in this new format will have an overarching analytical theme and follow a quarterly publication timetable.

The theme of this edition is Sustainable Development Goals, with analysis covering the measurement of inequalities, inclusive growth, and the effect of urban green space on property prices. Users are also provided with an overview of the Sustainable Development Goals.

Compendium

What are the Sustainable Development Goals?

An explanation of the United Nations (UN) Sustainable Development Goals and how progress is being monitored.

Contact:
Claudia Wells
claudia.wells@ons.gov.uk
+44(0)1633 455867

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1 . Introduction

This Economic review publication explores inclusive growth, inequality and the value of urban green space in the context of the United Nations (UN) Sustainable Development Goals (SDGs).

2 . What are the Sustainable Development Goals?

Back in September 2000, the UN General Assembly made the Millennium Declaration and initiated the [Millennium Development Goals](#) (MDGs). The MDGs made huge leaps and were the most successful global anti-poverty push in history. The target of reducing extreme poverty rates by half was met five years ahead of the 2015 deadline and while a number of other targets were narrowly missed, [Brookings Institute](#) concluded that progress was accelerated because of the MDGs. However, the MDGs were aimed at developing countries. As 2015 came closer, Secretary-General Ban Ki-moon launched an initiative to build upon the momentum for the next 15 years that would be aimed at all countries.

The UK was involved in forming the new goals from the start. The then Prime Minister, David Cameron, co-chaired a high-level panel that presented the first iteration of the [SDGs](#). These were then discussed further in the UN General Assembly and then at the UN Sustainable Development Summit. In New York, in September 2015, the 193 member states of the UN accepted the resolution “Transforming our World: The 2030 Agenda for Sustainable Development”.

The resolution states: “the goals and targets will stimulate action over the next 15 years in areas of critical importance: People, Planet, Prosperity, Peace and Partnership”. The high-level panel announced 17 SDGs and 169 associated targets, which are, as described in the resolution: “integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental”.

The Global Goals for Sustainable development



Source: Office for National Statistics

Immediately after the goals were launched, the UN Statistical Commission was tasked with developing the indicator framework that underpins the global targets, so that progress, or lack of progress, can be monitored. Responsibility for reporting global progress towards each of the 232 unique global indicators was assigned to relevant international organisations, referred to as custodian agencies, such as the World Bank, International Labour Organization (ILO), the Organisation for Economic Co-operation and Development (OECD), and UN Women. In the UK, ONS has the responsibility for sourcing and reporting UK data to feed into the global monitoring and reporting process. The challenge for all countries is finding relevant data for the indicators, not all of which can be reported using official statistics. National statistical offices will also need to work with the various custodian agencies to develop metadata as a significant number of indicators still do not have agreed methodology or standards. A further challenge will be disaggregating these data to show the picture by age, sex, geography, disability, migratory status, income and ethnicity so that we meet the SDG principle of “leave no one behind”.

3 . Economy, environment and society

Ahead of negotiations to finalise the goals, some of the world’s top economists warned the UN Secretary-General Ban Ki-Moon that: “Achieving the SDG targets will not be possible unless the agenda focuses squarely on individuals as active generators of their own income, lifting themselves out of poverty.”

In an [open letter](#) it was stated: “there is no magic bullet for delivering economic growth”, instead: “It requires an effective state, productive firms, functioning cities, and access to energy. Helping societies to achieve economic growth thus means empowering them to create their own solutions.” The result was an agreed set of SDGs that represent a global strategy for achieving economic growth that is consistent with the planet’s capacity, society’s basic needs and the capabilities and stability of the economy.

Many of the main concepts represented in the SDG framework (such as the multiple dimensions of well-being and the importance of measuring how people spend their time) clearly align with the recommendations of the Report by the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz, Sen and Fitoussi, 2009). Recommendations of both consider the distribution of income and the need to assess inequality across a range of characteristics. In the SDG framework, this is captured by the “leave no one behind” commitment, which requires data to be disaggregated by age, sex, geography, disability, migratory status, income and ethnicity plus other characteristics as needed. In the UK we have [pledged](#) to ensure that:

- every person has a fair opportunity in life no matter who or where they are
- people who are the furthest behind, who have the least opportunity and who are the most excluded will be prioritised
- every person counts and will be counted

These principles are given equal weight alongside the need to have clear measures of environmental resources and natural assets, which are captured within Goals 13, 14 and 15 covering Climate Action, Life Below Water and Life on Land.

The comprehensive framework for SDGs fits with our [Better Statistics, Better Decisions strategy](#). Sourcing and analysing data covering the economy, environment and society, which is then disaggregated to show the full picture, will enable better-evidenced policy decisions. The data required to report on all indicators will push us to be more innovative and creative and make more use of administrative data, “big data” and satellite imagery, to name a few.

Some may dismiss the goals as an unattainable wish list. In fact, they are a structure to help us monitor progress and to identify areas that may need development. The targets and indicators give us a way to measure whether we are actually on track to transform our world. They are not aimed just at the less-developed countries but are universal in nature so that all countries must play a part in meeting the global goals.

So, how are we doing, so far? You can see all the data we have on our [online reporting platform](#). To date, we have 148 indicators, around 61% of the total, many with disaggregation. However, we still have much work to do and this economic review gives just a flavour of some of that ongoing work. We welcome your support and comments and you can contact our team at sustainabledevelopment@ons.gov.uk.

You can read more about the [UN Sustainable Development Goals](#) or find out more about the [Global Goals](#), which has a wide online presence.

Compendium

Measuring inequalities in the UK for the Sustainable Development Goals

The UK's progress towards global Sustainable Development Goal (SDG) indicators and the past and present state of inequality in household income and expenditure.

Contact:
Claudia Wells
claudia.wells@ons.gov.uk
+44 (0)1633 455867

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1 . Sustainable Development Goals

The Global Goals for Sustainable development



Measuring inequalities in the UK for the Sustainable Development Goals

The [United Nations \(UN\) Sustainable Development Goals \(SDGs\)](#) began in 2016. They are a set of 17 Global Goals that aim to end all forms of poverty, fight inequalities and tackle climate change, by 2030.

As the UK's national statistics institute, Office for National Statistics (ONS) is responsible for reporting on UK progress towards the global SDG indicators. Goal 10 of the SDGs is about reducing inequality within and among countries, and both target 10.1 and indicator 10.1.1 aim: "by 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average".

The Global Goals for Sustainable development



2 . Main points

- The UK is currently meeting the Sustainable Development Goals' (SDGs) target 10.1 to sustain income growth of the poorest 40% of the population at a higher rate than the national average.
- The poorest 40% spend more than they receive in income, although this gap has reduced between 2001 and 2017; in contrast, on average, all households spend less than their income and this gap is increasing over time, therefore, we have also looked at an expenditure-based inequality measure.
- Expenditure growth rates of the poorest 40% of the population are much closer to the national average and in recent years have not sustained a higher rate of growth.
- Internationally, the UK sits among 14 OECD countries meeting the SDG target 10.1 in the period around 2010 to 2015.
- The bottom 40% of the income and expenditure distributions in the UK in 2016 was mostly made up of couples with children, and employed individuals; however, those most at risk of poverty in 2016 were single parent households with children and those who are seeking employment.
- The United Nations stipulated method used in this analysis is not an official measure of inequality in the UK.

3 . Things you need to know about this release

Definitions and calculations

[United Nations \(UN\) metadata](#) for this Sustainable Development Goal (SDG) indicator stipulates that both the national average growth rate and the growth rate of the bottom 40% is calculated as the annualised average growth rate in consumption or income of all households, compared with the bottom 40% of the consumption or income distribution, over a five-year period.

The bottom 40% has been chosen because of a “practical compromise” (see [UN metadata](#)). The World Bank also uses the bottom 40% in their shared prosperity goal and states that the decision to use this population relates to the practical implementation of the goal.

We tend to focus on the bottom 20% when we look at those with the lowest incomes, but this target is about equality and shared prosperity and so we want to consider a wider group than those seen to be living in relative poverty. However, if we select a higher threshold than 40%, we would be looking at people whose income is very close to the national mean income and this would not give us enough information about shared prosperity.

Rationale

The UN and the [World Bank](#) both recognise that it is necessary to consider economic growth as well as equality when measuring progress in shared prosperity.

This method has been specified to allow for international comparison that is easy to measure and communicate. The UN acknowledges that many dimensions of well-being comprise shared prosperity and that in a national context, it is important to consider a wider range of indicators of welfare and economic well-being (for example, wealth and assets).

Household expenditure

The expenditure measure includes spending on items that are usually purchased frequently (such as food, petrol), as well as less frequent expenditure (such as household appliances and furnishings). Housing costs such as rent, water rates, community water charges and council water charges, mortgage interest payments, structural insurance premiums, ground rent and service charges are excluded from the measure, meaning expenditure is counted on an “after housing costs” (AHC)¹ basis.

Household income

The measure we use for income is household disposable income, AHC. Disposable income is the amount of money that households have available for spending and saving after direct taxes (such as Income Tax, National Insurance and Council Tax) and pension contributions have been accounted for. It includes earnings from employment, private pensions and investments as well as cash benefits provided by the state.

Reflecting household size

The expenditure and income measures used in this analysis are all equivalised. Equivalisation is the process of accounting for the fact that households with many members are likely to need a higher income to achieve the same standard of living as households with fewer members. Both income and expenditure are adjusted using the Organisation for Economic Co-operation and Development (OECD)-modified “companion” scales developed for AHC measures in the Department for Work and Pensions (DWP) Households below average income (HBAI) series².

Data sources

Throughout this analysis, the primary data source used to derive measures of both income and expenditure in the UK is the Living Costs and Food Survey (LCF). The LCF is an annual survey of the expenditure and income of private households; people living in hotels, lodging houses and institutions such as old people's homes are excluded. It is the only data source used to collect detailed data on both income and expenditure, thereby allowing analysis of the two measures.

As with all surveys, there are some limitations to be aware of. The LCF is known to not fully capture those at the poorest and richest ends of income distribution and suffers from non-response error³. When analysing inequalities, this can impact on the representation of the target population (in this case, the bottom 40%) and the overall appearance of income distribution.

In international comparisons, data have been sourced from the World Bank and data for the UK come from Eurostat's European Union Statistics on Income and Living Conditions (EU-SILC). Organisation for Economic Co-Operation and Development (OECD) countries have been selected from the World Bank data and used in our comparisons (see Figures 4 and 5).

The EU-SILC collects data on poverty, income, social exclusion and living conditions. In the international analysis, the total population and the target population (bottom 40%) are defined on a household level, before housing costs (BHC). Eurostat sets the reference year at T-1 from the survey year, therefore, 2009 reference year will refer to 2010 survey data.

In addition, data from the World Bank are from 91 countries. Not all these countries will have annual surveys, therefore, the reference years for the annualised growth rates are labelled at approximately 2010 to 2015. The annualised growth rate is calculated as:

$(\text{mean in year 2} / \text{mean in year 1})^{1/(\text{reference year 2} - \text{reference year 1})}$

Data period

Data used in this analysis are for financial years: April to March.

Notes for: Things you need to know about this release

1. For more details on how the AHC measures of income and expenditure are derived, please see [An expenditure-based approach to poverty in the UK](#).
2. Information on the OECD-modified “companion” scaled is provided in [An expenditure-based approach to poverty in the UK](#).
3. For further details of the sources of error, see [The effects of taxes and benefits upon household income Quality and Methodology Information report](#).

4 . Background information

In the UK, much of the policy focus has been on inequality measures based on income. According to Living Costs and Food (LCF) survey data, we have seen a [downward trend in income inequality](#) in recent years (from 2007 to 2017)¹. However, if looking from a longer-term point of view, levels of income inequality remain above those seen in the late 1970s and early 1980s.

This UN Sustainable Development Goal (SDG) measurement of inequality focuses on income and expenditure. Income data are more readily available, but often less stable in developing countries, therefore, expenditure is sometimes considered a better measure of living standards. The SDGs measure progress in 193 countries, including developing countries, so it is necessary to use a measure that works in multiple contexts.

Promoting shared prosperity is defined by the UN as “fostering income growth of the bottom 40% of the welfare distribution”. To what extent the shared prosperity should be boosted is for countries to decide, according to their national circumstances, so there is no global numerical target. In the case of this SDG indicator, progress is measured by how economic gains are shared with society’s poorest members and the target aims to ensure that economic growth also increases prosperity among the poor over time.

The background, and progress to date, in reducing inequality within and among countries has been mixed:

- a World Bank study of global trends of income inequality found that, between 1998 and 2008, there had been increases all along the total global income distribution, with two notable exceptions; the top 1% of the global income distribution report a much higher (60%) rise in real income in this time period, whereas the bottom 5% had not seen any change (Milanovic, 2012)².
- from 2008 to 2013, the per capita income or consumption of the poorest 40% of the population [improved more rapidly than the national average in 49 of 83 countries](#) (accounting for three-quarters of the world’s population).
- SDG target 10.1 seeks to ensure that income growth among the poorest 40% of the population in every country is more rapid than its national average; this was true in [56 of 91 countries with data available from approximately 2010 to 2015](#)

1. DWP's Households below average income (HBAI) statistics have an alternative Gini series, which shows a stable picture in recent years. HBAI includes an adjustment for high-income individuals based on tax records, whose incomes tend to be under-reported on voluntary surveys. Changes in the incomes of the very richest may have contributed to the differences in trends between these two sources.
2. Note that the top 1% of the global population will be different to the top 1% of each country's population.

5 . UK is meeting SDG target 10.1, income growth rate for the bottom 40% of households is higher than all households

Previous Office for National Statistics (ONS) research has found that the poorest households have seen more growth in income since the economic downturn in 2008 to 2009 than the richest 20%. The richest 20% [median disposable income returned to pre-economic downturn levels](#) for the first time since 2008, in 2016 to 2017.

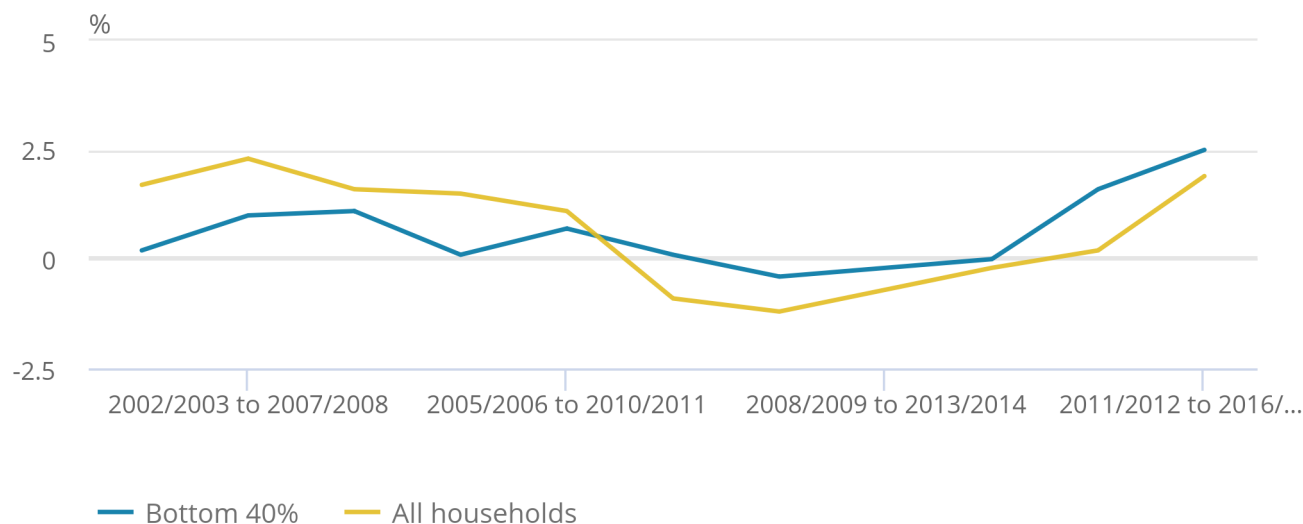
Our analysis using the United Nations (UN) Sustainable Development Goals (SDGs) method of looking at growth over rolling five-year periods (see the Things you need to know about this release section) is consistent with this, and shows us that the average growth rate for the bottom 40% has been higher than the national average since the five-year period ending 2011 to 2012. This means that in the UK, we are currently meeting SDG target 10.1. This is because income for the middle and richest households in the distribution fell the most following the economic downturn and took longer to recover. At the same time, those at the bottom of the distribution saw increases in income from employment (See: ONS Household Disposable Income and Inequality [financial year ending \(FYE\) 2015, FYE 2016, FYE 2017](#)) and certain cash benefits such as tax credits and Jobseeker's Allowance (now Universal Credit for some claimants).

Figure 1: Five-year annualised average income growth rate for all households and the bottom 40% of the income distribution

UK, 2001 to 2017

Figure 1: Five-year annualised average income growth rate for all households and the bottom 40% of the income distribution

UK, 2001 to 2017



Source: Office for National Statistics

Notes:

1. Data in the analysis refer to financial years ending March and are five-year averages of the five years preceding the stated year.

Figure 1 shows that, prior to the economic downturn, the five-year growth rate in income for all households was higher than the bottom 40%. More recently, the national and the bottom 40% five-year average income growth rates have been converging, again supporting data showing that income in the richest households is recovering. In addition, in the most recent year, the annual income growth rate was higher for all households (2.8%) than for the bottom 40% (2.5%). Going forward, it is therefore unclear whether the poorest households will continue to sustain a higher than average growth rate and whether the UK will continue to meet the SDG target.

The main source of official statistics on the percentage of people living in low-income households in the UK is the Department for Work and Pensions' (DWP) annual publication Households Below Average Income (HBAI), based on the Family Resources Survey (FRS)¹. The FRS has a larger sample size than the Living Costs and Food (LCF) survey, which means the HBAI measure of income is often considered a stronger measure than the estimates produced from the LCF. The FRS, however, does not have comprehensive information on household expenditure and therefore cannot be used for the type of analysis contained in this article.

For the purpose of this article, DWP provided income data from the HBAI, using the UN stipulated calculation (see the Things you need to know about this release section). It has not been used as a source for this article, but rather as a comparison for trend. The trend is similar to LCF results (shown in Figure 1) and tells us nearly the same about income growth rates for the bottom 40%.

The main differences in the two analysis results are the HBAI shows the income growth rate for the bottom 40% as falling below the national average in the periods between 2010 to 2011 and 2015 to 2016, and between 2011 to 2012 and 2016 to 2017. The LCF results do not show this, but do show a convergence in growth rates in recent years (see the Things you need to know about this release section for limitations of the LCF).

Notes about UK is meeting SDG target 10.1, income growth rate for the bottom 40% of households is higher than all households

1. A comparison of median after housing costs (AHC) disposable income and poverty rates from both the LCF and HBAI is available in a [recent publication on expenditure poverty](#).

6 . Bottom 40% have been spending more than their income since 2001

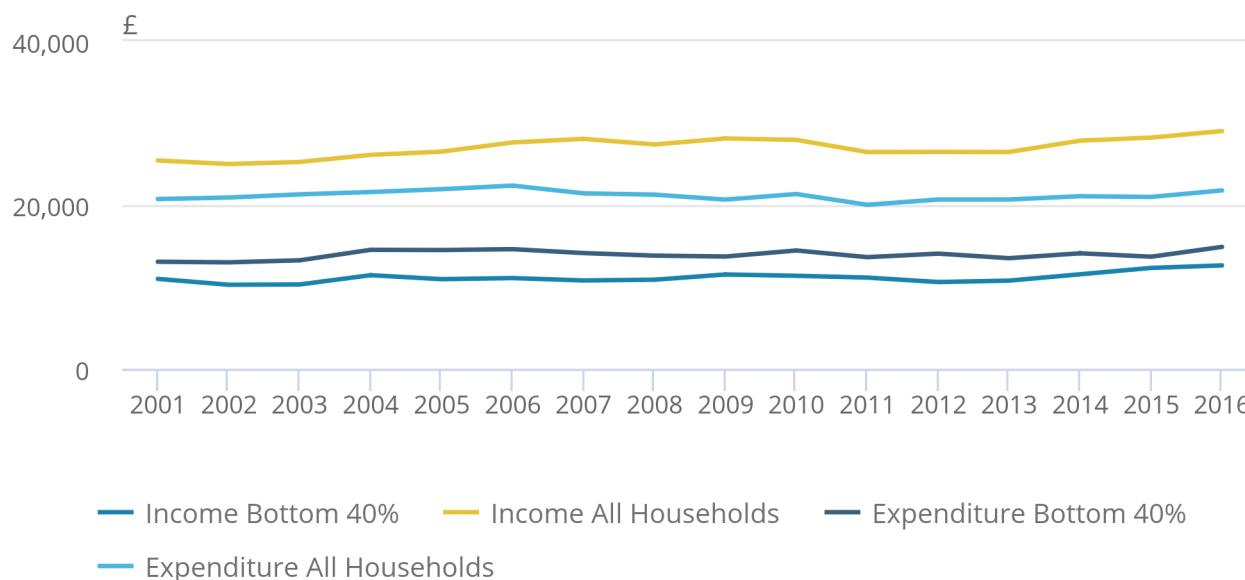
The poorest 40% of households in the UK spent more than their disposable income between 2001 and 2016, however, the gap between this group's income and expenditure has lessened (see Figure 2). In contrast, on average all households in the UK were spending less than their disposable income, but this gap has increased between 2001 and 2016.

This is consistent with findings from other studies showing relatively high levels of expenditure at the bottom of the income distribution (Brewer M. and O'Dea, 2017) (Carrera, 2010). There are several reasons, including instability of income, at the bottom of the distribution (such as temporary periods of low income where consumption is maintained through the use of savings or borrowing). In addition, people towards the bottom of income distribution tend to have multiple sources of income, making errors in reporting more likely.

It is for these reasons why it is also important to consider an inequality measure based on expenditure alongside a measure based on income.

Figure 2: Mean household income and expenditure of all households and the bottom 40% of income distribution in the UK

Figure 2: Mean household income and expenditure of all households and the bottom 40% of income distribution in the UK



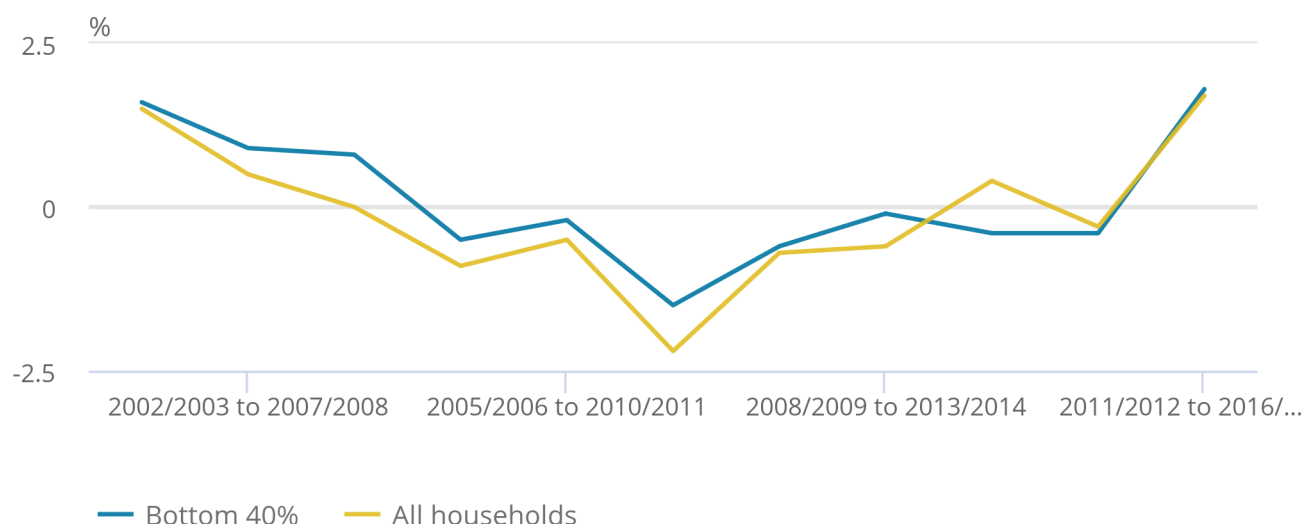
Source: Office for National Statistics

7 . Expenditure growth rate for bottom 40% of households is higher than all households

The average growth rate of expenditure for the bottom 40% was higher until the five-year period ending 2014 to 2015, where it fell below the national average (see Figure 3). Both populations have recovered to pre-economic downturn rates of growth expenditure (bottom 40%: 1.8%, all population: 1.7%), increasing steeply in the latest two years.

Figure 3: Five-year annualised average growth rate in expenditure for all households and for the bottom 40% of the expenditure distribution, UK, 2001 to 2017

Figure 3: Five-year annualised average growth rate in expenditure for all households and for the bottom 40% of the expenditure distribution, UK, 2001 to 2017



Source: Office for National Statistics

The differences in growth rates are less than 0.2 percentage points, suggesting that growth rates based on expenditure do not show any reduction in inequality over the period. This means that, based on this measure it is unclear whether the UK will meet Sustainable Development Goal (SDG) target 10.1.

8 . UK amongst 14 OECD countries where income growth among the bottom 40% was faster than average

Based on annualised average income or expenditure growth rates, the UK is placed amongst 14 other Organisation for Economic Co-operation and Development (OECD) countries - including France, Finland and the Czech Republic - meeting target 10.1 of the Sustainable Development Goals (SDGs) and achieving faster growth for the poorest 40% than the average (see Figure 5)^{1 2}.

Using internationally comparable data from the World Bank and using UK data on income sourced from the EU Survey for Income and Living Conditions (EU-SILC), the UK had an overall income growth rate between (approximately) 2010 and 2015 of 0.11%, whereas the bottom 40% income grew at double the rate, at 0.26% (see Figure 6). This is a different result to the Living Costs and Food (LCF) Survey findings, due to it being a different source. The EU-SILC also uses income before housing costs (BHC) and a different definition of income.

The World Bank data (adjusted for international comparisons), for growth rates between approximately 2010 and 2015, show 16 OECD countries where inequality was increasing (income or expenditure growth among the poorest 40% was slower than average) and 14 OECD countries where inequality was decreasing (income or expenditure growth among the poorest was faster than average) (see Figures 4 and 5).

For example, in Sweden between about 2010 and 2015, the bottom 40% experienced a slower average growth rate (0.62%) compared with the national average growth rate in the same period (1.91%). In contrast, the bottom 40% of households in Spain, Belgium and Latvia had higher than average growth rates compared with the national average for the same period.

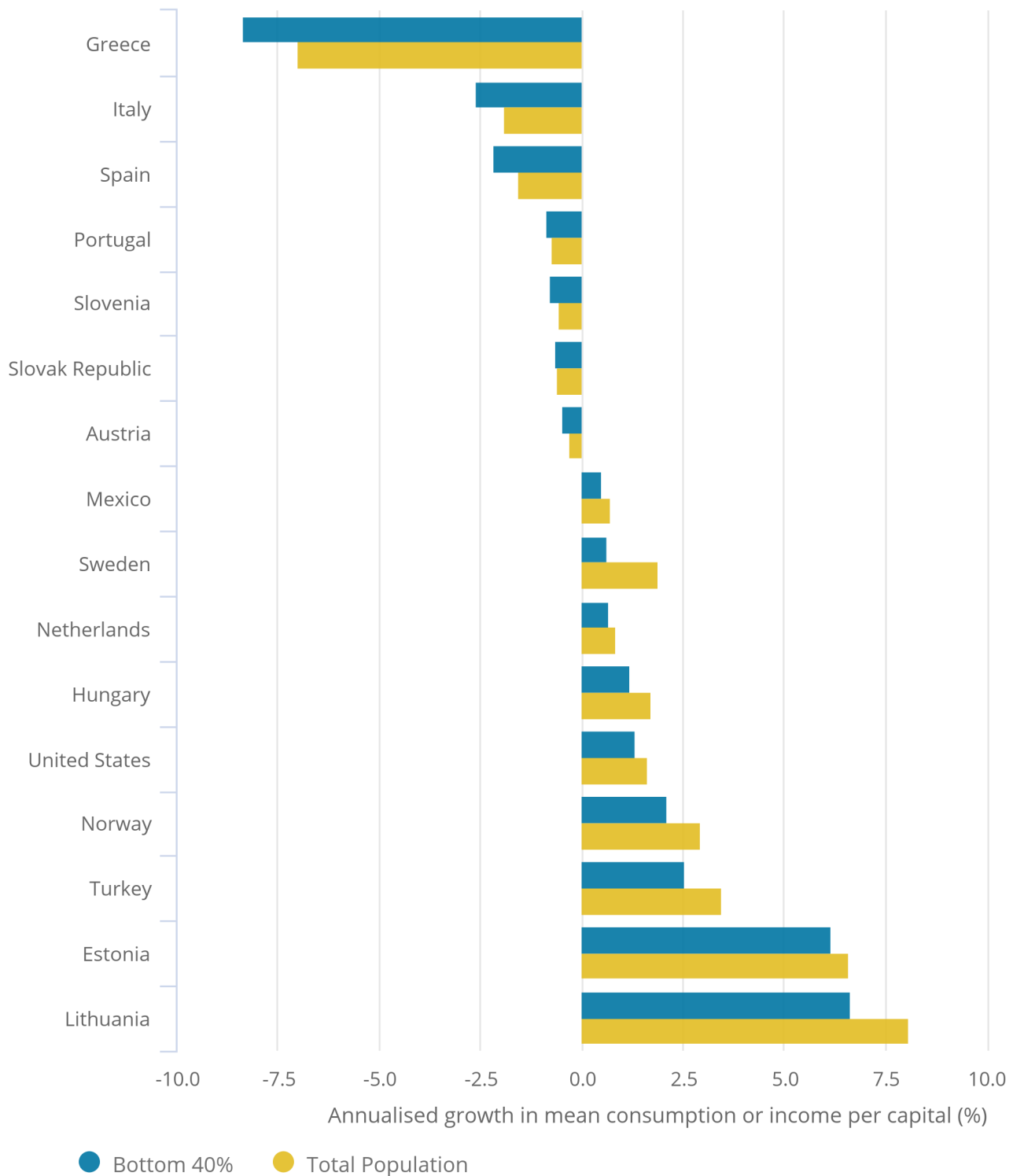
Of the listed G7 Summit countries (UK, France, Italy), only France and the UK are achieving the SDG 10.1 target of higher than national average growth rate for the bottom 40%. Research from the OECD shows that income inequality in rich countries (using the Gini coefficient) has been rising since the mid-1980s (Keeley, 2015). It was found that this increase has been more pronounced among the top 1% of earners and especially in English-speaking countries. For example, in the United States, the share of (pre-tax) income going to the richest 1% more than doubled in 2012.

Figure 4: OECD member countries where five-year average income or expenditure growth among the bottom 40% was slower than the five-year national average

Approximately 2010 to 2015

Figure 4: OECD member countries where five-year average income or expenditure growth among the bottom 40% was slower than the five-year national average

Approximately 2010 to 2015



Source: World Bank EU Survey for Income and Living Conditions

Notes:

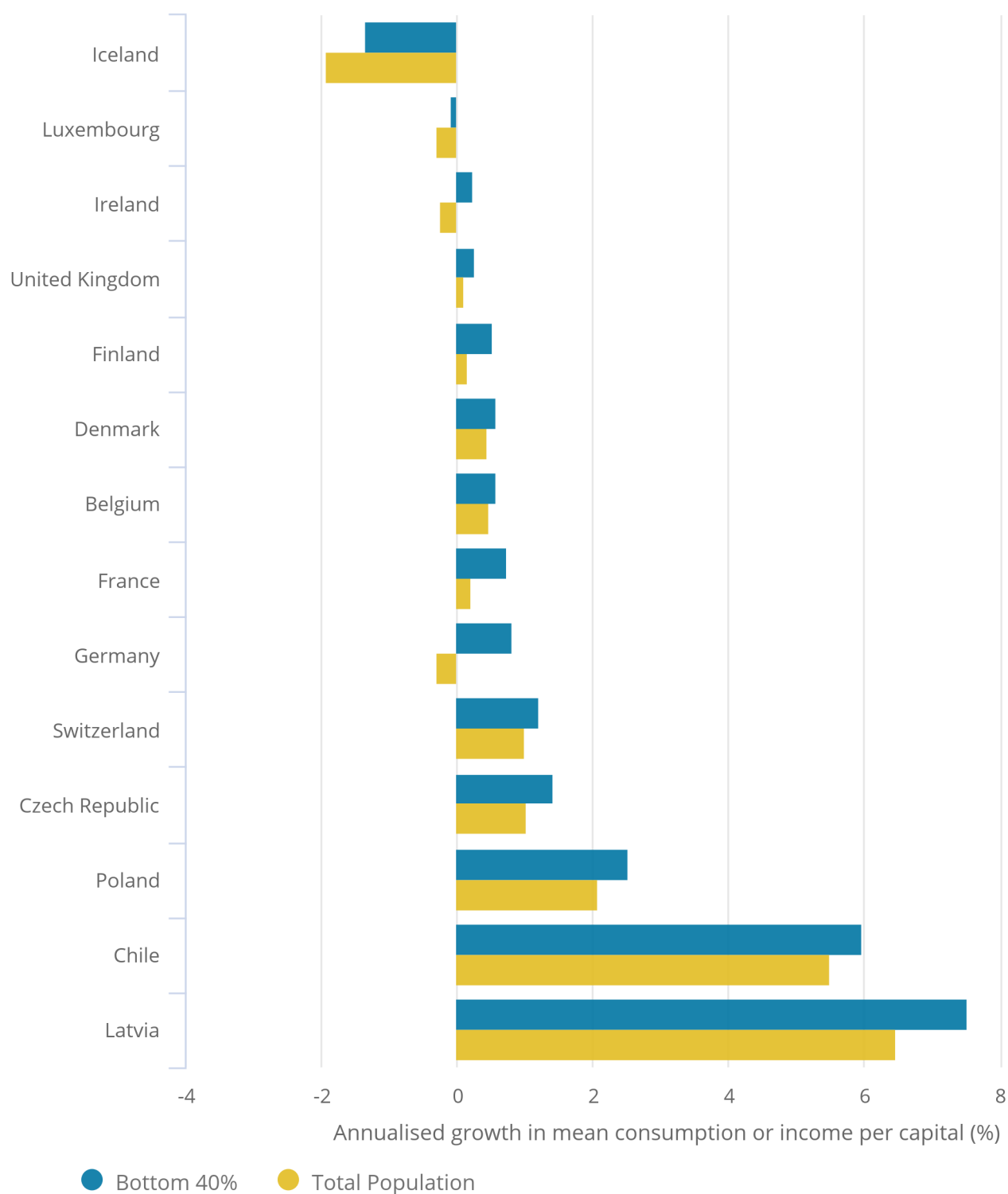
1. No data available for Japan, Australia, Republic of Korea, Canada, New Zealand and Israel. Data refer to income or expenditure growth, for the time period approximately 2010 to 2015

Figure 5: OECD member countries where five-year average income or expenditure growth rates among the bottom 40% was faster than the five-year national average

Approximately 2010 to 2015

Figure 5: OECD member countries where five-year average income or expenditure growth rates among the bottom 40% was faster than the five-year national average

Approximately 2010 to 2015



Notes:

1. No data available for Japan, Australia, Republic of Korea, Canada, New Zealand and Israel. Data refer to income or expenditure growth, for the time period approximately 2010 to 2015

Faster income growth amongst the poorest 40% does not necessarily mean that a country was more prosperous, as there are nine OECD countries amongst the 30 that experienced negative growth rates. For example, Luxembourg shows a faster than average income growth rate for the bottom 40%, but an overall negative growth rate for both total population (negative 0.28%) and poorest 40% (negative 0.09%).

Notes for: UK amongst 14 OECD countries where income growth among the bottom 40% was faster than average

1. See the Things you need to know about this release section for explanation of World Bank data.
2. Data include the 30 OECD member countries with World Bank data available. Japan, Republic of Korea, Australia, New Zealand, Canada and Israel are not included.

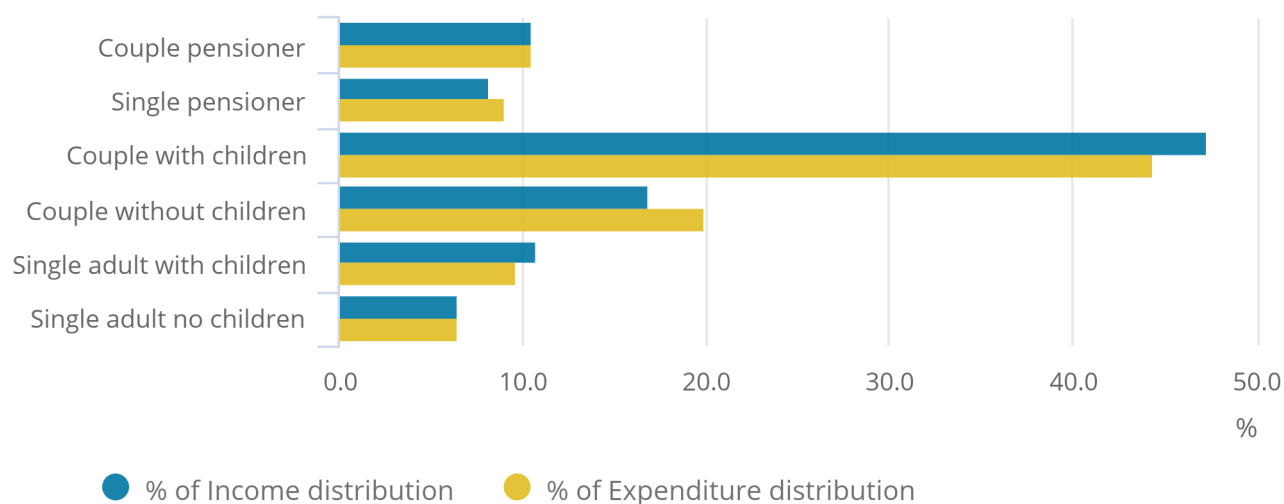
9 . Characteristics of the bottom 40%

Figure 6 shows the proportion of different types of household composition in the bottom 40% of both income and expenditure in the UK in 2016.

Couples with children made up the highest proportion of the bottom 40% in 2016, by at least double compared with all other household types.

Figure 6: Household types in the bottom 40% of income and expenditure distribution in the UK, 2016

Figure 6: Household types in the bottom 40% of income and expenditure distribution in the UK, 2016



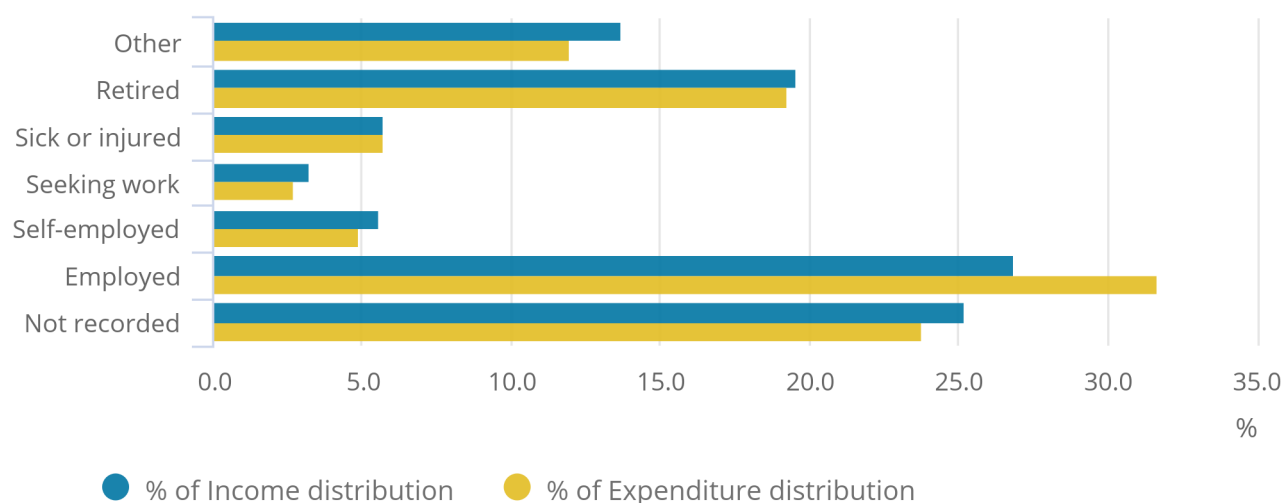
Source: Office for National Statistics

Figure 7 shows the employment status of people in the bottom 40% of the income and expenditure distributions, in 2016.

In the same year, individuals who were employed appear to be the only group that made up a higher proportion of the bottom 40% of expenditure distribution (31.7%) than income distribution (26.9%).

Figure 7: Proportion of individuals in the bottom 40% of income and expenditure distribution, by employment status, UK, 2016

Figure 7: Proportion of individuals in the bottom 40% of income and expenditure distribution, by employment status, UK, 2016



Source: Office for National Statistics

It is important to understand that these charts do not represent households that are most at risk of poverty, rather the proportion of household types and the employment statuses of individuals in those households, that make up the bottom 40% of income and expenditure distributions in the UK in 2016.

Poverty in the UK is often measured as households with an income or expenditure that is 60% below the national median, although there is no standard measure or definition of poverty. This method is a relative poverty measure that compares a household's income or expenditure with other households. The rationale for this approach comes from a definition of poverty that considers individuals' capacity to fully participate in society.

Poverty is another measure of the Sustainable Development Goals (SDGs), under Goal 1, which aims to eradicate poverty by 2030. UK progress against Goal 1 indicators is available at our [National Reporting Platform](#), along with all 17 SDGs.

By understanding who is also at risk of poverty, we can make some additional observations about economic inequalities. Poverty draws attention to the potential of unequal distribution of the means that people seek to be able to “meet their needs and pursue their goals” (Kabeer, 2015).

[Recent Office for National Statistics \(ONS\) research on expenditure and income poverty measures](#) highlighted who was at most risk of experiencing poverty. Data show that, in 2017:

- children were more likely to be experiencing both expenditure and income poverty than working age adults and pensioners
- single parent households with children were most likely to be experiencing income and expenditure poverty
- those who are sick or injured, or those who are seeking employment were more likely to be experiencing income and expenditure poverty

10 . Conclusions

Economic inequalities can have impacts across many aspects of life. The Organisation for Economic Co-operation and Development (OECD, 2015) argues that they can reduce social mobility and can impact on people's health and well-being. Goal 10 of the Sustainable Development Goals (SDGs) calls for reducing economic inequalities as well as those based on age, sex, disability, race, ethnicity, religion or other status within a country. The Goal also addresses inequalities among countries, including those related to representation, migration and development assistance.

Goal 10 will be reviewed in depth at the United Nation's [High Level Political Forum](#) (HLPF) in 2019. The HLPF is the UN's main platform for monitoring progress and reviewing the SDGs at a global level and at the same time, the UK will be presenting its Voluntary National Review on progress made towards achieving the SDGs.

In this article, we have shown UK progress against SDG target 10.1, nationally and internationally. In the UK, we are meeting the target for 10.1, of goal 10, and sustaining a higher than average income growth rate for the bottom 40%, but it is unclear whether this will continue.

Internationally, the UK was among 14 OECD countries achieving the target. However, the UK is also among other richer countries that have seen a widening in income inequality between the richest and poorest households. Whilst from an economic perspective it could be seen to be sensible to improve at least some incomes, wider economic inequality does not make economic sense if it means that the capacity of the bottom 40%, to improve their and their children's position in the future, is reduced (OECD, 2015).

The SDGs not only have an overarching focus on inequalities, but also have a unifying aim to "leave no one behind". Therefore, it is crucial to understand who may be left out in policy, data and development. By exploring the growth in income or expenditure in the bottom 40% of the income or expenditure distribution compared with the national average, we can draw some conclusions about the extent to which those with the lowest incomes or expenditure are catching up or being left behind.

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Compendium

Inclusive growth: measures and trends

Overview of recent economic growth trends in the UK, inequalities arising during the different phases of economic growth, income and inequalities trends in the constituent countries and regions, and feasibility analysis on social mobility, focused on earnings progression of the youngest generation.

Contact:
Gueorguie Vassilev
economic.wellbeing@ons.gov.uk
+44 (0)1633 456265

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1 . Authors and acknowledgements

Vasileios Antonopoulos and Gueorguie Vassilev.

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2 . Main points

- Regional disparities from UK median income have been broadly sustained comparing the periods 2006 to 2008 and 2015 to 2017.
- Most regions that have median income below the UK average also have median wealth below the national average, when looking at the latest time periods.
- Regionally, there is a consistent growth difference before and after the economic downturn, in both gross household disposable income (GHDl) per head and average employment growth.
- Income inequality, as measured by the Palma ratio, has slowly decreased since the financial downturn, while the Gini coefficient of total wealth inequality has remained stable, rising from 0.61 to 0.62 between 2006 and 2016.
- Net financial wealth inequality is the largest of all types of wealth inequality, with the Gini coefficient rising from 0.81 to 0.91 between 2006 and 2016.
- For 25- to 29-year-olds who were in the bottom 20% of the earnings distribution in 2011, 54% of those who had degree-level, higher, or equivalent qualifications experienced wage progression by 2015, compared with 37% of those who held a maximum of five A* to C GCSE-level education qualifications or equivalent in 2011.
- Young people who were the lowest earners that live in the south of England, London and the Midlands were more likely to experience wage progression, compared with young people living in the north of England, Wales and the East of England.
- 70% of the lowest-earning young people who moved regions experienced wage progression between 2011 and 2015 and were twice as likely to experience it as those who did not move.

3 . Introduction

The UK Office for National Statistics (ONS) launched its Measuring National Well-being programme in 2010, with the aim to “develop and publish an accepted and trusted set of National Statistics, which help people understand and monitor well-being”. Since then, ONS has monitored UK progress against a wide set of indicators, including economic and personal well-being, social and human capital, and the environment, which complement national accounts. They provide statistics that are more informative about the progress of UK citizens and households than gross domestic product (GDP) alone.

More emphasis is being placed on developing statistics that inform on inclusive growth, that go beyond average per head measures, placing more focus on the equity of overall progress. Whilst the ONS indicators have been successful at regularly reporting on the progress of households and citizens in general, they do less to inform on the relative allocation of growth. The Organisation for Economic Co-operation and Development (OECD)'s Inclusive Growth Framework (OECD, 2018) recommends translating measures of growth into improvements across the range of outcomes that matter most for people's lives. ONS is expanding its development more in this area through its newly-created Centre of Expertise on Inequalities, looking to measure and supplement analysis on all forms of inequalities in the UK.

More recently, the Inclusive Growth Commission (Royal Society for the Encouragement of Arts, Manufactures and Commerce (RSA), 2016) promoted a strategy that is national in scale, but local in delivery. It emphasised poor productivity – due to skills shortages of workers, but also the proliferation of low-skilled jobs – as the main barrier to improving low-pay and highlighted the need for more sophisticated statistics that inform on these issues. Additionally, the Scottish Government (Scotland's Economic Strategy, 2015) supports economic growth through “a fair and inclusive jobs market and regional cohesion”.

This article adapts the well-established Measuring National Well-being Framework, developing indicators to provide insight into inclusive growth. The article will provide an overview of economic growth trends in the UK. It then discusses the trends on inequalities measures during different phases of economic growth to consider how well this growth has been distributed to different parts of the population. In addition, the article provides further analysis on income and inequalities trends in the different regions of the UK. Finally, the article presents ONS feasibility analysis on social mobility, which is focused on the earnings progression of the youngest generation.

4 . Economic growth in the UK

This section discusses the trends of economic growth, measured by gross domestic product (GDP) and gross national disposable income (GNDI) per head, in three different time periods: before the downturn (Quarter 1 (Jan to Mar) 1998 to Quarter 1 2008), during the downturn (Quarter 2 (Apr to June) 2008 to Quarter 2 2009) and during the economic recovery (Quarter 3 (July to Sept) 2009 to Quarter 4 (Oct to Dec) 2017). The aim of this section is to describe what drove economic growth in the UK during the different phases.

Real GDP per head

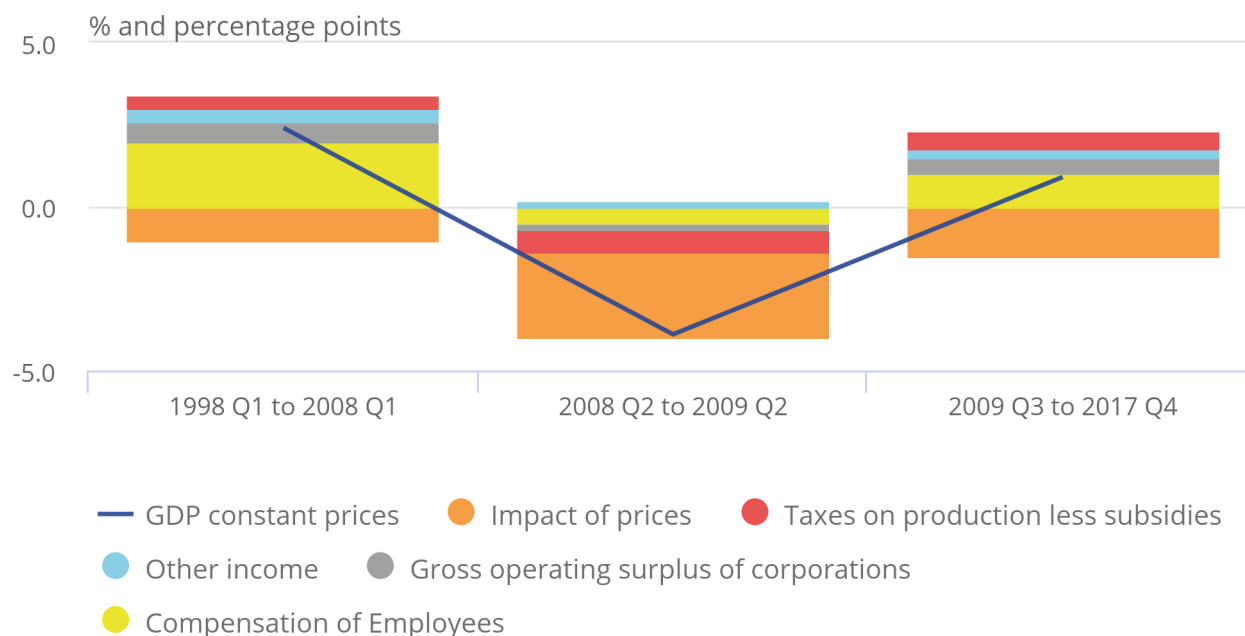
We focus on real GDP per head because the value of goods and services produced within the UK economy is divided by the number of people to help to remove the effects of a growing population. Additionally, it removes the effect of rising prices and is a typical measure of economic growth.

Figure 1: Contributions to annual growth in gross domestic product per head since Quarter 1 1998, by income component

UK, Quarter 1 (Jan to Mar) 1998 to Quarter 4 (Oct to Dec) 2017

Figure 1: Contributions to annual growth in gross domestic product per head since Quarter 1 1998, by income component

UK, Quarter 1 (Jan to Mar) 1998 to Quarter 4 (Oct to Dec) 2017



Source: Office for National Statistics

Notes:

1. Average growth rates for the time periods, growth rates are calculated as quarters compared with the same quarter a year ago.
2. GDP per head is in constant prices. Components are in current prices, with the impact on prices identified separately.
3. Other income refers to mixed income, as well as gross operating surplus of government and non-profit institutions serving households (NPISH).
4. Q1 refers January to March, Q2 refers April to June, Q3 refers July to September, Q4 refers to October to December.
5. Components may not sum due to rounding.

Figure 1 examines the role of different contributions to GDP per head growth for the UK, between Quarter 1 1998 and Quarter 4 2017. It shows that growth in compensation of employees per head provided a strong contribution to GDP growth per head before the economic downturn. Compensation of employees includes the wages and salaries payable in cash or in kind to an employee in return for work done and the social insurance contributions payable by employers.

During the years of economic downturn, GDP per head in the UK decreased by an average of 3.9% per quarter compared with the quarter a year ago. The decrease was supported by a decrease in most of the components of GDP, particularly the negative growth of compensation of employees and negative operating surplus growth. Furthermore, the changes in prices offset GDP growth by an average of 2.6 percentage points per quarter, 1.6 percentage points higher on average than before the downturn.

After Quarter 3 2009, the UK's recovering economy supported a return to positive contributions from compensation of employees. However, GDP per head growth during the recovery period was an average of 1.5 percentage points lower than the period before the economic downturn.

Gross national disposable income

Gross national disposable income (GNDI) measures the income available to the nation for final consumption and gross saving. It equals gross national income (at market prices) minus all current transfers (current taxes, social contributions, social benefits other than social transfers in kind and other current transfers) payable to non-resident units, plus all transfers receivable by UK resident units from the rest of the world. In other words, national disposable income is derived from national income by adding all current transfers receivable by UK residents, government and corporations from abroad and subtracting all current transfers payable overseas by the UK.

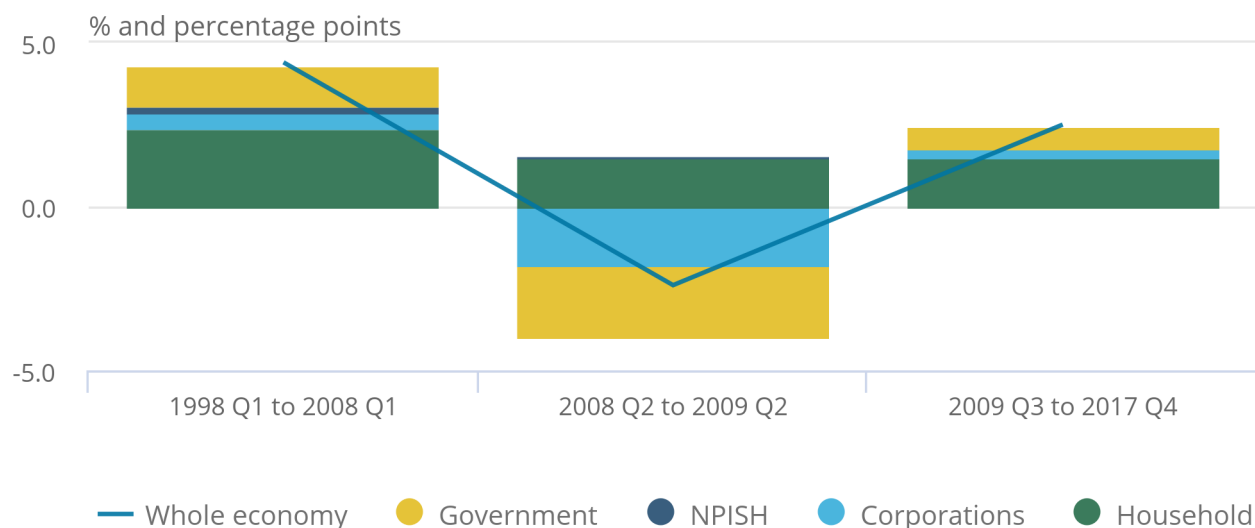
Figure 2 examines the contributions to growth of GNDI per head by sector between Quarter 1 1998 and Quarter 4 2017. When looking at gross disposable income by sector, all current transfers listed previously are also accounted for between sectors, such as taxes paid out by sectors captured as an income to the government, while benefits paid out by government will increase household disposable income. Office for National Statistics (ONS) reports these estimates quarterly, on a current price basis.

Figure 2: Contributions to annual growth in gross national disposable income per head since Quarter 1 1998, by sector

UK, Quarter 1 (Jan to Mar) 1998 to Quarter 4 (Oct to Dec) 2017

Figure 2: Contributions to annual growth in gross national disposable income per head since Quarter 1 1998, by sector

UK, Quarter 1 (Jan to Mar) 1998 to Quarter 4 (Oct to Dec) 2017



Source: Office for National Statistics

Notes:

1. Average growth rates for the time periods, growth rates are calculated on quarters compared with the same quarter a year ago basis.
2. GNDI and components are in current prices.
3. Q1 refers Jan to Mar, Q2 refers Apr to June, Q3 refers July to Sept, Q4 refers to Oct to Dec
4. Components may not sum due to rounding.
5. NPISH means Non-profit institutions serving households.

Figure 2 shows that growth in disposable income of households per head provided a strong contribution to GNDI per head growth before the economic downturn.

Between Quarter 2 2008 and Quarter 2 2009, GNDI per head in the UK decreased by an average of 2.4% per quarter compared with the same quarter a year ago. The disposable income from corporations and government contributed to the decrease of GNDI by an average of 1.8 and 2.2 percentage points per quarter compared with the same quarter a year ago respectively. However, GNDI growth was supported from the positive contribution of household disposable income, which contributed by a positive average of 1.5 percentage points per quarter compared with the same quarter a year ago.

After Quarter 3 2009, the UK's recovering economy supported a return to positive contributions from general government. However, the GNDI per head growth during the recovery period was on average 1.9 percentage points per quarter compared with the same quarter a year ago lower than the period before the economic downturn and household disposable income growth was on average 0.9 percentage points per quarter compared with the same quarter a year ago lower than the period before the economic downturn.

In conclusion, economic growth in the UK measured through GDP per head and GNDI per head has recovered to its pre-economic downturn levels. However, in both measures the average growth rates are lower than the years before the economic downturn and this is mainly because of lower growth from compensation of employees and household income respectively. This shows that from a macroeconomic picture, the returns to growth across components and sectors of the UK have varied before and after the downturn most starkly for households.

5 . Inequalities within the UK

The analysis presented so far has been entirely based on aggregate measures of production and income, albeit on a per person basis. However, when measuring inclusive growth, distributions need to be considered alongside average measures. As noted in Stiglitz and others (2009) and Organisation for Economic Co-operation and Development (OECD) (2011), increases over the last couple of decades in average household income have also coincided with widening inequalities in many countries, meaning that the benefits have not been felt fully by all.

Inclusive growth strategies consider a wide range of inequalities, such as inequality of income and wealth. Also, they move beyond monetary inequalities, considering inequalities of health. For this article, we will discuss the trends of income and wealth inequalities over time. Analysis on health inequalities can be found at the [Health state life expectancies by national deprivation deciles, England and Wales: 2014 to 2016](#).

Income inequality

Income inequality has become an issue of considerable public debate in recent years, particularly since the economic downturn. Additionally, recent evidence has suggested that rising income inequality may be associated with lower economic growth (OECD, 2015), making it an important issue for consideration by policy-makers.

For this analysis, we present a relatively recently-developed inequality measure, the Palma ratio, which takes the ratio of the income share of the richest 10% of households to that of the poorest 40% of households. There is evidence that the middle 50% of households are likely to have a relatively stable share of income over time and hence isolating them should not lead to a substantial loss of information (Cobham and Sumner, 2013). This measure provides evidence on how incomes are shared across households and how this is changing over time. It is broadly consistent with trends outlined by other measures such as the Gini coefficient of disposable income, but accentuates differences at the top and bottom of the distribution.

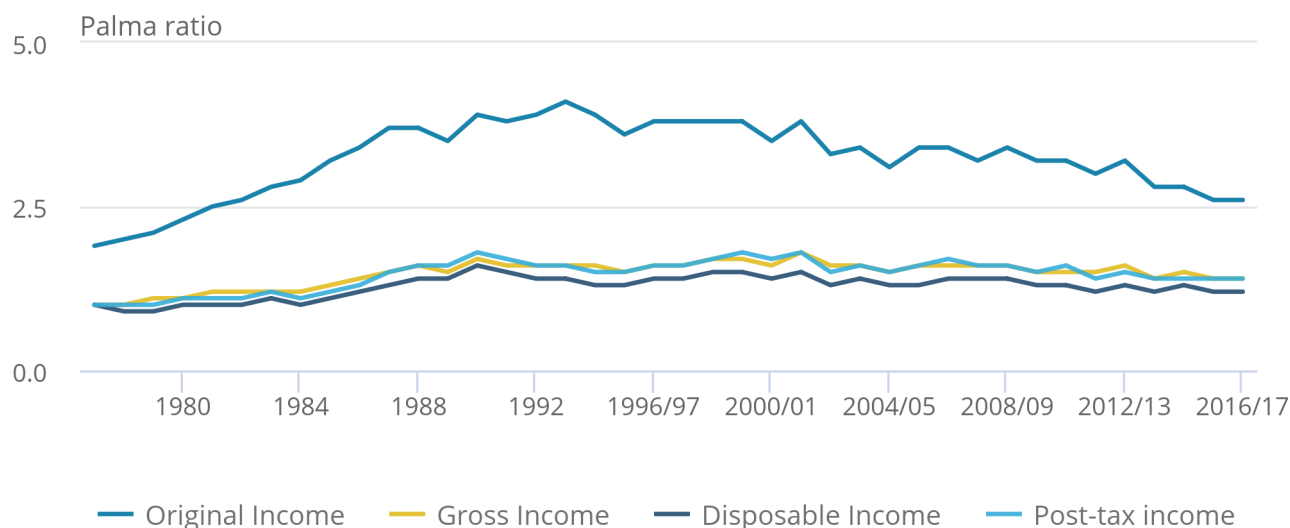
The Palma ratios for original income (income before any taxes and benefits), gross income (after cash benefits are added), disposable income (after cash benefits are added and direct taxes subtracted) and post-tax income (after cash benefits are added and both direct and indirect taxes are subtracted) for all households are represented in Figure 3. Because significant changes in inequality happen over longer time spans, Figure 3 includes data from 1977. It also presents the equivalised income: equivalisation is a standard methodology that adjusts household income to account for the different financial resource requirements of different household types. More details can be found in [Effects of taxes and benefits: financial year ending 2017](#).

Figure 3: Palma ratio for equivalised household disposable income, gross income, post tax and original income

UK, 1977 to financial year ending 2017

Figure 3: Palma ratio for equivalised household disposable income, gross income, post tax and original income

UK, 1977 to financial year ending 2017



Source: Office for National Statistics

Notes:

1. Data from 1977 to 1993 are in calendar year. From 1994 to 2017 data are in financial year.
2. The Palma ratio increases if the growth rate of the average income of the richest 10% of households is greater than the growth rate of the income of the poorest 40% of households, and decreases in the reverse scenario.
3. NPISH means Non-profit institutions serving households.

Figure 3 presents that throughout the 1980s, the Palma ratio for equivalised original income grew. It continued increasing in the beginning of the 1990s, though at a slower rate than in the 1980s. For the remainder of the decade, the Palma ratio declined slowly, indicating that the level of income inequality was relatively unchanged and returning to the levels reached at the end of the 1980s. Then, between the financial year ending (FYE) 2002 and FYE 2008, income inequality fell slightly, due to faster growth in income from earnings and self-employment income at the bottom end of the income distribution and this decrease has continued until FYE 2017.

In contrast, the other measures of income have sometimes had differing trends. In the 1980s, they were relatively stable during the first part, while in the latter half of the decade they then saw a sharp increase in the Palma ratios. This was due to a change in the impact of taxes and benefits midway through the decade. While gross income inequality continued to increase in the 1990s, inequality of disposable income reduced slowly from 1990 until the mid-1990s, although it did not fully reverse the rise seen in the previous decade. Finally, between FYE 2010 up to the most recent period, the Palma ratios for gross, disposable and post-tax income have stayed flat, indicating no change in inequality.

The extent to which cash benefits, direct taxes and indirect taxes work together to affect income inequality can be seen by comparing the different income Palma ratios. Cash benefits tend to reduce income inequality the most, by an average of 1.4 between FYE 2010 up to the most recent period. Direct taxes further reduce inequality, by an average of 0.2. In contrast, indirect taxes increase income inequality – the Palma ratio of post-tax income was 0.2 higher than that of gross income. Consequently, taxes have had a negligible effect on income inequality.

Wealth inequality

Considering wealth inequality can give perspectives on longer-term inequalities, as returns on wealth assets can provide a further source of income without labour input. Additionally, as wealth is passed down through generations, it can present whether there is intergenerational mobility.

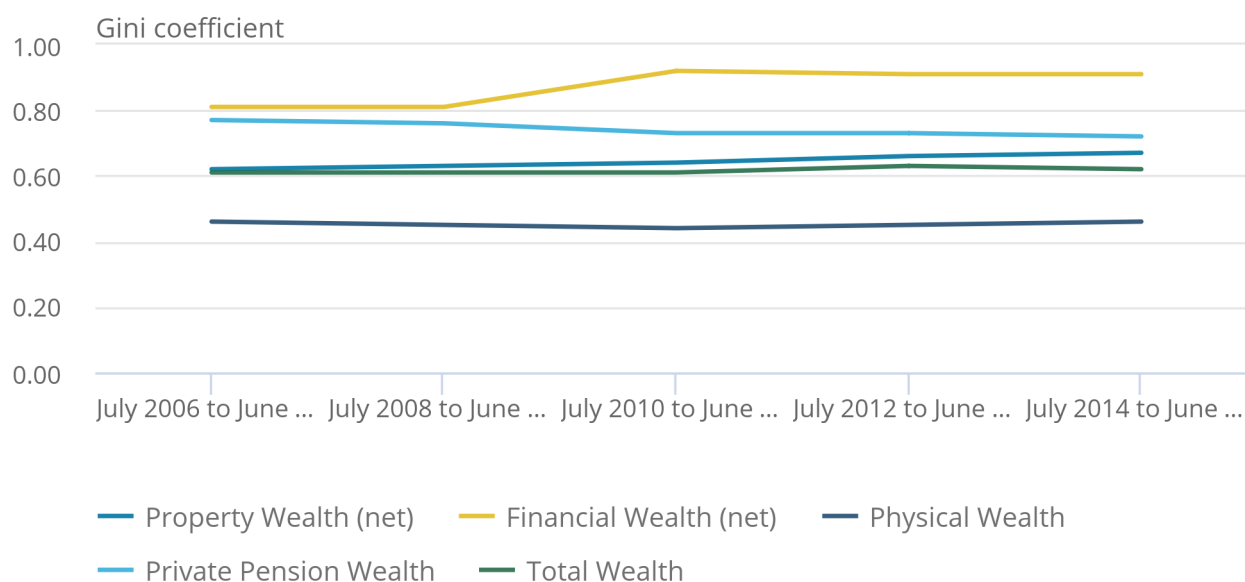
The inequality in total wealth and its components across the whole wealth distribution can be compared using several methods. Here we present Gini coefficients to demonstrate wealth inequality, which is perhaps the most widely used measure internationally. The Wealth and Assets Survey is used in this analysis, which defines four categories of wealth net of any liabilities associated with these assets, to create a total net wealth.

Figure 4: Gini coefficients for aggregate total wealth, by components

Great Britain, July 2006 to June 2016

Figure 4: Gini coefficients for aggregate total wealth, by components

Great Britain, July 2006 to June 2016



Source: Wealth and Assets Survey, Office for National Statistics

Notes:

1. The Gini coefficient is a measure of inequality, where 0 expresses no inequality (for example where everyone has the same wealth) and 1 expresses maximal inequality (for example one person has all the wealth and all others have none).
2. July 2006 to June 2008 estimates for physical and total wealth are based on half sample.
3. Descriptions of the types of wealth can be found in the [Wealth in Great Britain latest release](#).

Figure 4 presents that, of the four wealth components, inequality for physical wealth was the lowest since 2006, with a Gini coefficient of 0.46 in the periods July 2006 to June 2008 and July 2014 to June 2016. Its inequality has differed by a gini coefficient of no more than 0.02 over all five survey periods.

The wealth component with the highest inequality over all five survey periods was net financial wealth. Financial wealth has always had the highest Gini coefficient since July 2006 to June 2008, but inequality increased substantially between July 2008 to June 2010 and July 2010 to June 2012 when the Gini coefficient increased from 0.81 to 0.92. This reflected the difference in recovery of financial assets following the economic downturn by those with higher levels of financial assets.

The rankings of level of inequality of the four wealth components has remained the same over the five survey periods. However, there is widening inequality in net property wealth between July 2006 to June 2016. Figure 4 presents that inequality increased in net property wealth from 0.62 to 0.67 during that time. Over the same period, net pension wealth inequality has decreased from a coefficient of 0.77 to 0.72. This may be due to higher enrolment into private pensions.

From an inclusive growth perspective, it is important to understand how household wealth has been distributed into households with different characteristics or in different generations. [Wealth in Great Britain Wave 5: 2014 to 2016](#) provides results of the distribution of wealth by household characteristics and the [Economic well-being, UK: October to December 2017](#) analysis revealed a widening generation gap on property wealth.

To sum up, wealth in the UK is more unevenly distributed than income. The reason for this phenomenon is the consistently high coefficient of inequality of net financial wealth and subsequent increases of net financial wealth and property wealth inequalities since the financial downturn. On the other hand, income inequality seems to have slightly improved after the economic downturn as a result of increases in the income of the poorest 40% of households. These trends in income and wealth inequality are uncorrelated with the economic growth experienced over this period. Before the downturn, economic growth has tended to be associated with an increase in income inequality, while since the downturn there has tended to be a small decrease in income inequality while wealth inequality has stayed the same.

6 . Regional analysis

According to Organisation for Economic Co-operation and Development (OECD) (2017) many OECD countries see large regional divides. Galbraith (2012) pointed out the need to focus on within-country measures and within-country policies, such as a focus on different regions, to promote inclusive growth. To support regional policies, Office for National Statistics (ONS) provides a wide range of regional statistics such as gross value added (GVA), gross household disposable income (GHDl) and employment. This section is focused on analysis on regional well-being in the UK. Firstly, we discuss the growth rates of regional GHDl compared with the growth rate of regional employment. Also, we describe the regional differences of median income and wealth. This analysis looks at averages across regions and does not consider within-region inequalities.

Regional income and employment

The nearest equivalent metric to gross domestic product (GDP) per head that is available at regional level is GVA per head. At the national level GDP per head is regarded as a useful indicator for inclusive growth framework and the health of the economy. However, at regional level, we advise that GVA per head should not be used as either an estimate or proxy for economic well-being. This is because the value of GVA per head at regional level is impacted by the level of commuting across regions. For places with high levels of in- or out- commuting, GVA per head ceases to be a useful economic well-being (or economic performance) proxy.

Instead, when assessing regional inclusive growth performance, the preferred regional accounts measure is gross household disposable income (GHDl) per head (OECD, 2017). This measures the total amount of money that households have for spending or saving, after they have paid direct and indirect taxes and received any direct benefits, divided by the population of each region. In the following analysis, this is overlaid against employment rate growth, a vital dimension of inclusive growth as it provides important information on the availability of jobs, which is the main source of income for most households.

Figure 5: Relationship between regional gross household disposable income per head growth and regional employment growth

Figure 5 compares the average growth rate of regional GHDl per head and regional employment growth for three different time periods: before the economic downturn (1997 to 2007), during the economic downturn (2008 to 2009) and during the economic recovery (2010 to 2016). We should state that the time periods have been selected based on the economic trends in the national economy; specific regions may have faced different economic fluctuations.

Broadly, there is a consistent pattern across regions that higher average GHDl growth rate correlates with higher average employment growth, whether before or after the downturn. Hence, a region is more likely to be doing well in labour market outcomes as well as household income, though the period after the downturn shows a marked decrease of GHDl growth, around a percentage point less than the period 1997 to 2007. This is despite slightly higher average employment growth when compared with the earlier time. It is also interesting to note that GHDl growth rates are much more divergent across regions during the downturn, highlighting the fact that people across the UK had differing experiences to their incomes during that time.

For the time period from 1997 to 2007, London had the highest GHDl per head growth among all the UK regions, increasing by 4.9% per year. This was 1 percentage point higher than the UK's GHDl per head growth. Also, London had the highest employment growth for the same period. The employment growth was 1.7% per year, 0.6 percentage points higher than the UK. On the other hand, the West Midlands region had the lower annual growth rate for this period on both GHDl per head and employment, of 3.2% and 0.6% per year respectively.

Between 2008 and 2009, the employment rate decreased in all regions except Northern Ireland, which had a 0.5% growth. On the other hand, the South West had the highest decrease, with a decline of 2.8% per year, followed by London with a decline of 2.4% per year in employment.

In contrast with the employment growth rates during the downturn, GHDl per head growth rates were positive for all regions except London, which had a decrease of 0.6% per year. The North East had a 4.6% increase in its GHDl per head – the highest among the regions followed by the North West with an increase of 3.6% per year. The main reason for the high growth rates in the North East and North West was the high increase in social contributions and social benefits received – which increased by 8.4% and 9.1% respectively.

During the years of economic recovery (2010 to 2016), London had the highest employment growth of 2.7% growth per year, which was 1.3 percentage points higher than the UK annual growth per year. London also had the highest GHDl per head growth, with an average increase of 3.8% per year.

Regional median equivalised household income

GHDl per head is not a direct estimate of the income of a typical individual or household. Regional measures of median income are instead sourced from the Households below average income data from Department for Work and Pensions (DWP) and are based on the Family Resources Survey. Due to limitations in sample size, median income by regions is calculated as a three-year average. Hence the analysis that follows only considers the periods before and after the downturn.

This section therefore compares regional median income, allowing some assessment of the equality of overall economic gains. The median income is measured as total weekly household income from all sources after tax (including child income), National Insurance and other deductions. Household “equivalisation” is used to make income comparable across households of different size and composition. The median is the value at the very middle of the distribution.

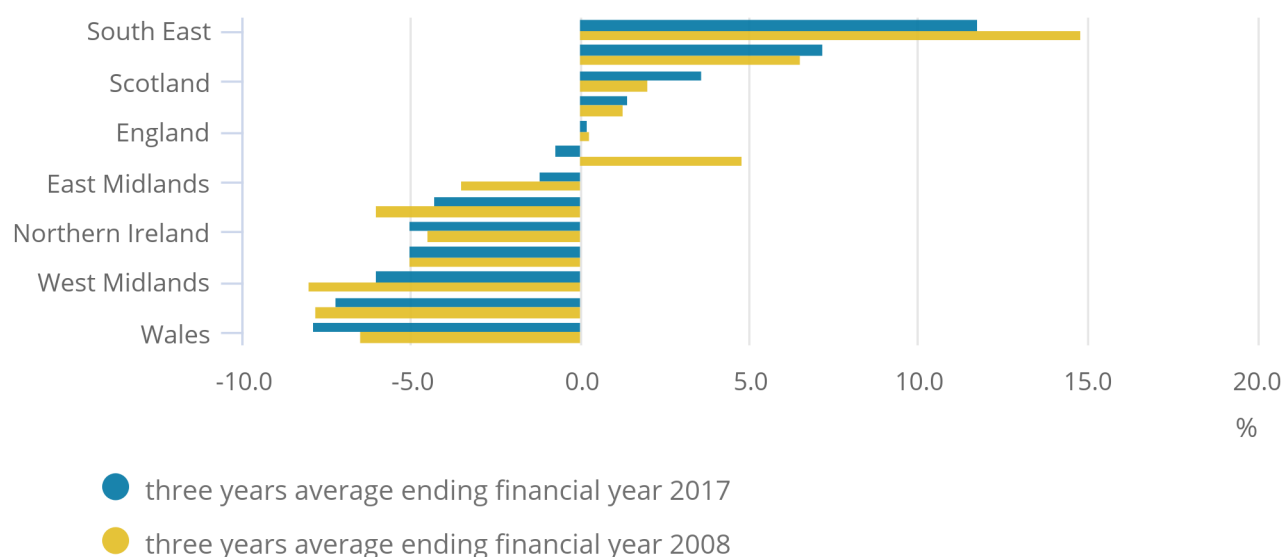
This analysis reports median income after accounting for housing costs (AHC), therefore accounting for the regional variations in rents and other housing costs, which are known to vary significantly across regions. Housing costs include rent (gross of housing benefit), water rates, community water charges and council water charges, mortgage interest payments, structural insurance premiums, ground rent and service charges.

Figure 6: Percentage difference between median income in each region/nation and UK median income

for financial year ending 2008 and financial year ending 2017, accounting for housing costs

Figure 6: Percentage difference between median income in each region/nation and UK median income

for financial year ending 2008 and financial year ending 2017, accounting for housing costs



Source: Wealth and Assets Survey, Office for National Statistics

Figure 6 presents the percentage of difference between the median income in each region from the overall median of the UK, for the three-financial year average ending 2008 and the three-financial year average ending 2017. At a country level, compared with the UK median, Wales and Northern Ireland experienced consistently lower median incomes, while Scottish median incomes were higher, before and after the downturn. While English median incomes were marginally higher than the UK before and after the downturn, at 0.3% and 0.2% respectively, regional differences varied largely.

Broadly, those regions who had below UK median income before the crisis still had below UK average income for the latest three-year period. Similarly, with the notable exception of London, those above the UK median income before the crisis continued to be above median. This implies that median incomes after housing costs are continuing to diverge across regions. The divergence for England is also broadly along the north-south divide.

Looking in more detail, for both periods Wales, Northern Ireland, the North East, North West, Yorkshire and The Humber, West Midlands and East Midlands had median income below the UK average. Of those, the East Midlands, West Midlands, Yorkshire and The Humber, and North East at least decreased their gap to the UK average by 2.3, 2.0, 1.7 and 0.6 percentage points respectively. On the other hand, Wales and Northern Ireland increased their gap to the UK average further by 1.4 and 0.5 percentage points respectively.

Interestingly in London, median income after housing costs was 4.8% above the UK average during the three years ending 2008. This difference decreased by 5.5 percentage points for the three years ending 2017 and London now has 0.7% below UK median income after housing costs for the latest period. This clearly demonstrates the impact of high rents and other associated costs relating to dwellings, on economic well-being, as the weekly median income before housing costs was £697 compared with £414 after housing costs.

Regional wealth inequalities

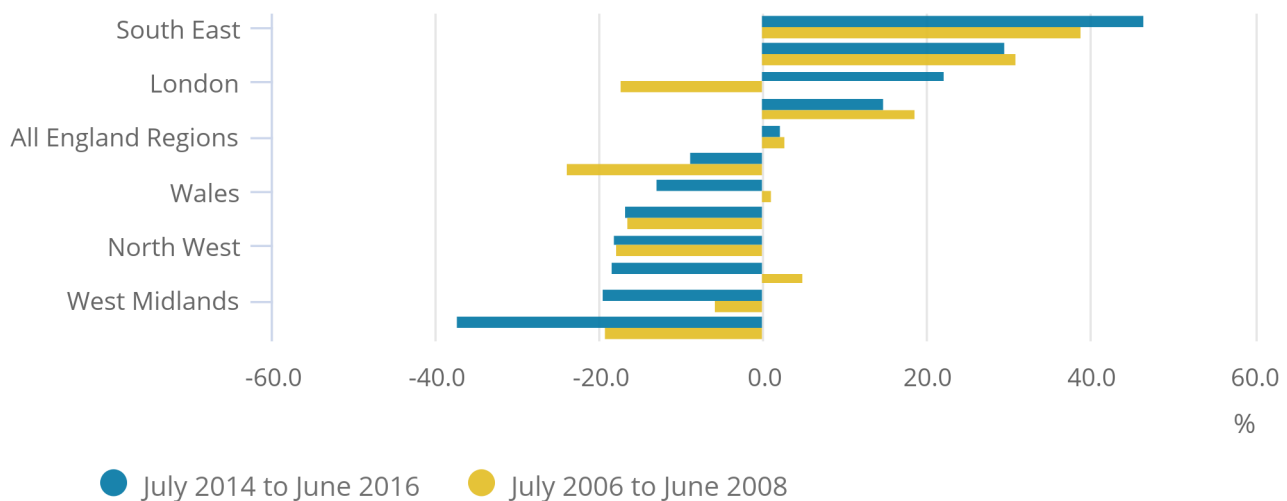
Income gives us only a partial picture of the economic resources available to support consumption. It is therefore important to also consider wealth. As is mentioned previously, considering wealth inequality can give perspectives on longer-term inequalities. According to Institute of Fiscal Studies (Bozio et al. , 2013) there is a positive relationship of wealth accumulation and lifetime household income. The median net wealth, as defined in the previous section, using the Wealth and Assets Survey is used again to explore this regionally.

Figure 7: Percentage difference between median wealth in each region/nation and Great Britain median wealth

for 2006 to June 2008 and for July 2014 to June 2016

Figure 7: Percentage difference between median wealth in each region/nation and Great Britain median wealth

for 2006 to June 2008 and for July 2014 to June 2016



Source: Wealth and Assets Survey, Office for National Statistics

Notes:

1. July 2006 to June 2008 estimates are based on half sample.

Figure 7 presents the percentages of difference between the median wealth in each region from the overall median, for July 2006 to June 2008 and for July 2014 to June 2016. There are more changes in wealth by region across the two time periods than the median income presented in the previous section and the differences to the median are much larger, such as the South East median wealth being over 40% higher than the Great Britain average for the latest period. There is still a strong correlation between higher than median wealth level before and after the downturn per region, though this is less pronounced than the median income level shown previously.

The highest change in wealth inequality was in London. London's median wealth was 17.2% lower than Great Britain's median wealth in July 2006 to June 2008, while the gap changed by 39 percentage points in July 2014 to June 2016 – at 22.1% higher than Great Britain's median wealth. This reflects the striking increase in the value of net property wealth for households in London compared with all other regions.

The majority of regions that had below-national median income in the financial year ending 2017 also had below-national median wealth for the latest time period, ending in 2016. Wales, Yorkshire and The Humber, the North West, East Midlands, West Midlands and North East differed from the UK total wealth of 13%, 16.6%, 18.2%, 18.3% 19.4% and 37.2% respectively. Only London's median wealth increased to be above the national median, while having been below national median income in 2017. Scotland, on the other hand, had below-national median wealth, while enjoying above-national median income and Northern Ireland is not captured on the source of wealth data. Apart from these exceptions, recurring below-national median income and wealth values may imply a continuation of divergence between regions.

7 . Earnings mobility

Disclaimer

These Research Outputs are NOT official statistics on earnings mobility. Instead, they are published as outputs from Office for National Statistics (ONS) feasibility research to improve its measurement of social mobility.

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According to Organisation for Economic Co-operation and Development (OECD) (2017), labour market outcomes and equal opportunities are important for inclusive growth. Wage progression of the lowest earners is a good indicator of earnings mobility as it can reflect the opportunity of adults to move upwards on the earnings distribution. For this analysis, newly-available administrative data from the Pay As You Earn (PAYE) system and benefits data from Department for Work and Pensions are linked to 2011 Census data. More details of this dataset are provided in Annex 1.

This section focuses on the earnings mobility of the lowest earners between 2011 and 2015. We measure earnings mobility as the proportion of the lowest earners (defined as those in the bottom 20% during 2011) who have experienced wage progression over the course of five years. Wage progression is defined as an increase of 20 percentiles or higher in the new earnings distribution in 2015 relative to 2011. Note, this is not the same as a 20% increase in wages, because it also takes into account the distribution of earnings and relative increase of the rest of the population.

Earnings mobility feasibility analysis

Comparing earnings for the lowest 20% of the earnings distribution from 2011 to 2015 gives us several categorisations. An individual can be identified as:

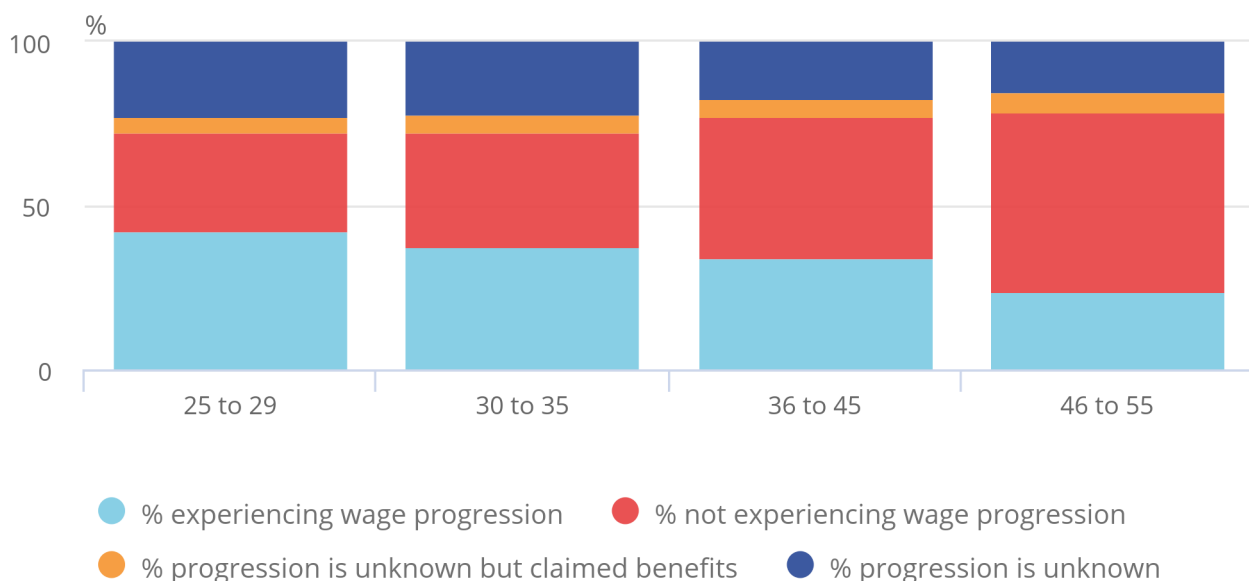
- experiencing wage progression (defined by at least a 20-percentile increase in the 2015 earnings distribution relative to 2011)
- not experiencing wage progression (defined by a less than 20-percentile increase, or even a decrease in the 2015 earnings distribution relative to 2011)
- unknown earnings progression, when those who start off in the bottom quintile have no earnings recorded in 2015 on the PAYE system; this could be for many reasons, including a switch to self-employment, unemployment, inactivity, migration, or death
- unknown progression but claiming benefits; this is a subset of the unknown progression, where some of these individuals have instead received benefits such as Jobseeker's Allowance, Universal Credit and long-term disability benefits

Figure 8: Earnings progression of the lowest earners by age band

UK, from 2011 to 2015

Figure 8: Earnings progression of the lowest earners by age band

UK, from 2011 to 2015



Source: Office for National Statistics and Department for Work and Pensions

Notes:

1. Percentages represent the number in a group's wage categorisation divided by the total number of individuals in the age groups.
2. Ages and earning distribution have been calculated from the 2011 data.
3. Progression has been calculated from the 2015 earnings data distributed by percentiles.
4. Lowest earners defined as those in the bottom 20% of the earnings distribution during 2011.

Figure 8 presents the earnings progression of the lowest earners by age group. The 25- to 29-years-old age group had the highest proportion of individuals experiencing earnings progression between 2011 and 2015, compared with the other age groups, as 42.6% of individuals in the sample experienced wage progression of 20 percentiles or above. Also, this age group had the lowest percentage of people not experiencing wage progression, accounting for 29.9% of the age group.

Figure 8 also presents the declining proportion of people who experience wage progression as the age of individuals increases. Specifically, the proportion of people who experience earnings progression in the age group of 30 to 35 years, 36 to 45 years and 46 to 55 years was 5.1, 8.5 and 18.9 percentage points lower than the 25- to 29-years-old age group, respectively. At this stage, we cannot infer if this decline is due to different characteristics of jobs or hours worked for younger age groups allowing higher wage progression, or if it is a general effect of differing wage progression throughout a person's lifetime. If it is the former, it may be that higher wage progression is expected to continue as the younger age groups age, while if it is the latter, then it would be more expected for the younger age groups to start experiencing decreasing levels of progression as they age.

We should mention that the percentage of people with unknown progression for the 25- to 29-years-old age group is 27.4%, which is the number of people who had earnings for 2011 but did not have earnings recorded for 2015, of which 4.9 percentage points can be explained from the benefits data that our dataset includes. The unexplained proportion (22.5%) is lower than the one produced [from previous analysis](#) on the indicator by using the Annual Survey on Hours and Earnings. This may be because of the difference in coverage, sample size, and the time period of the analysis.

The rest of the analysis will subsequently focus on the 25- to 29-years-old age group, exploring their characteristics and potential reasons for progression.

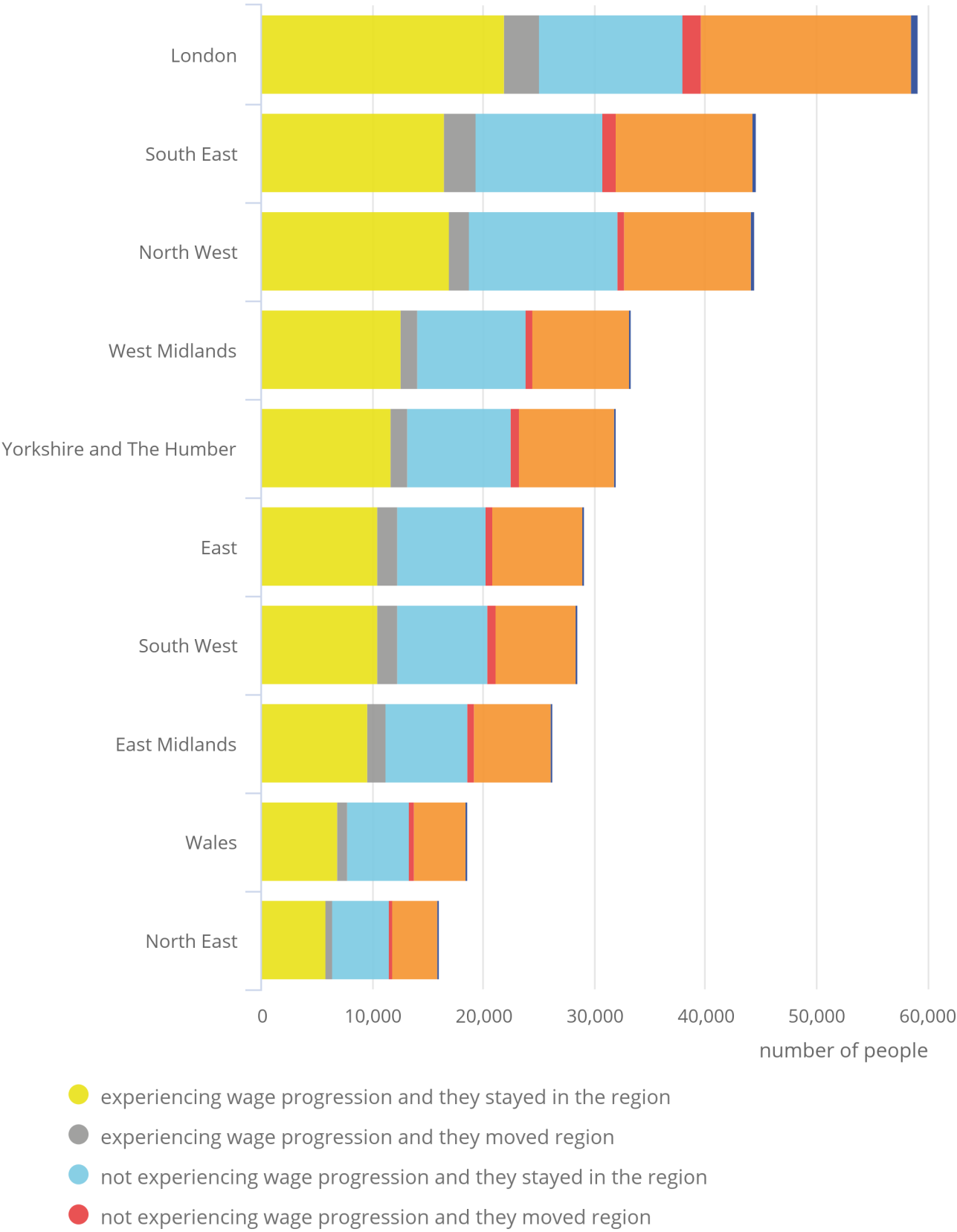
Firstly, as Social Mobility Commission (2017) mentions, it is important to consider earnings mobility by the geographical divide of opportunities. It also allows analysis of whether people experiencing earnings mobility stay in the same region or move to improve their earnings. For this reason, Figure 9 presents the number of lowest earners per region during 2011 and their earnings progression by 2015. This is the same population as low earners nationally as presented in the previous graph, identified by region, rather than taking account of regional earnings distributions in identifying lower earners. It also includes information on if the lowest earners stayed or moved region between 2011 and 2015.

Figure 9: Earnings progression of the lowest earners for 25- to 29-years-old group by resident region as captured in 2011

England and Wales, from 2011 to 2015

Figure 9: Earnings progression of the lowest earners for 25- to 29-years-old group by resident region as captured in 2011

England and Wales, from 2011 to 2015



Notes:

1. Regions, distribution of earnings and age have been calculated on 2011 data.
2. Movers and progression have been calculated on 2015 data. Movers are the people that they live in different region between 2011 and 2015. The 2015 region is based on unique identifier created by DWP specifically for our purposes. The identifier allows for the linking of the income and benefits data to each other and to the DWP Customer Information System (CIS). The address and demographic characteristics of individuals included in the income and benefits datasets are obtained through linking to the CIS.
3. The CIS contains basic information (including name, address and date of birth) on all individuals who have ever had a national insurance number. For more information on the CIS see [DWP Customer Information System](#).
4. Percentages are calculated based on the number of individuals in the progression category divided by the number of lowest earners in its region.

Figure 9 reveals that the geographical divide, which was seen in the previous section exists on the earnings opportunities as well. People that live in north England and Wales, such as the North East, North West, Yorkshire and The Humber, and Wales had the highest probabilities of not progressing compared with people living in London and south England. This result is in line with Social Mobility Commission report (2017), which stated that areas in the north of England face poor working lives outcomes, while on the other hand London and South East have better working lives outcomes.

The percentage of people that improved their earnings while moving regions from 2011 to 2015 was 5.3% for the total sample in England and Wales. The areas that had the highest proportions were the South East and East of England. However, people that moved regions were almost 2.5 times more likely to experience wage progression rather than not; 70% of people who moved experience wage progression. The main destination of people who moved was to London, the South East and South West, which attracted more than half of the movers and these were the destinations for more than half of movers that experience wage progression. As described previously, London and the south of England have better working opportunities, which helped the movers to experience wage progression.

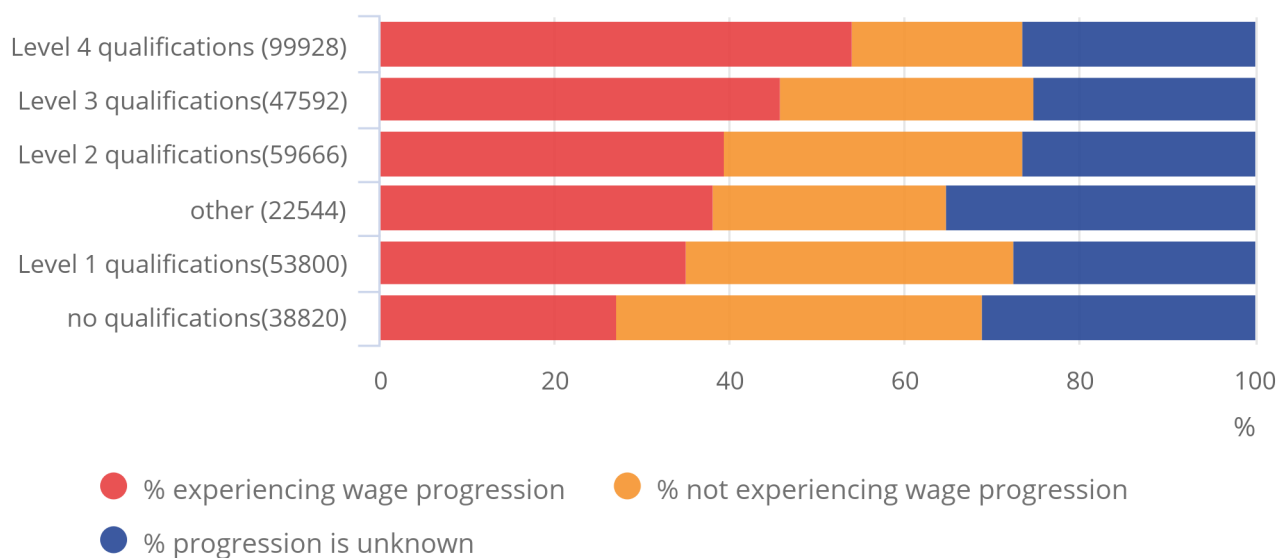
According to OECD (2017), another important factor for social and earnings mobility is the education level. Figure 10 presents the education level of lowest earners during 2011 and categorises them into the earnings progression groups between 2011 and 2015. It is worth bearing in mind that the education level of individuals has been based on highest qualifications obtained by 2011 as we do not have any evidence for their education progress for further years. This is less problematic for individuals whose highest qualification level is degree or higher, as we do not identify post-graduate degrees separately.

Figure 10: Earnings progression of the lowest earners for 25- to 29-years-old group by education level

England and Wales, from 2011 to 2015

Figure 10: Earnings progression of the lowest earners for 25- to 29-years-old group by education level

England and Wales, from 2011 to 2015



Source: Office for National Statistics and Department for Work and Pensions

Notes:

1. Distribution of earnings, age and education have been calculated based on 2011 data.
2. Those with missing values for the qualification variable are not captured in the graph.
3. Wage progressions have been calculated on 2015 data.
4. Percentages are calculated based on the number of individuals in a progression category divided by the total number of lowest earners with a qualification level which is the number in parentheses.
5. Level 1 qualifications = O levels/CSEs/GCSEs (any grades), Entry Level, Foundation Diploma, NVQ Level 1, Foundation GNVQ, Basic Skills / NVQ Level 1, Foundation GNVQ, Basic/Essential Skills

Level 2 qualifications = 5+ O levels (passes)/CSEs (grade 1)/GCSEs (grades A* - C), School Certificate, 1 A level / 2 – 3 AS levels/VCEs, Higher Diploma, NVQ Level 2, Intermediate GNVQ, City and Guilds Craft, BTEC First /General Diploma, RSA Diploma

Level 3 qualifications = 2+ A levels/VCEs, 4+ AS Levels, Higher School Certificate, Progression/Advanced Diploma, NVQ Level 3, Advanced GNVQ, City and Guilds Advanced Craft, ONC, OND, BTEC National, RSA Advanced Diploma

Level 4 and above qualifications = Degree (for example BA, BSc), Higher degree (for example MA, PhD, PGCE), NVQ Level 4 -5, HNC, HND, RSA Higher Diploma, BTEC Higher Level, Professional qualifications (for example teaching, nursing, accountancy), Apprenticeship

Other qualifications = Other vocational/work-related qualifications, Foreign qualifications / Qualifications gained outside the UK

Figure 10 highlights that 28.4% of lowest earners in the 25- to 29-years-old age group during 2011 had level 4 qualifications, which includes tertiary education. More than half of them experienced wage progression between 2011 and 2015, which was the highest among the other education groups and accounts for 15.6% of overall wage progression for the whole group.

Our analysis presents the declining proportion of people who experience wage progression as the education level of individuals decreases. Specifically, the proportion of people who experience earnings progression with level 1 and level 2 qualifications was 19.2 and 14.8 percentage points lower than people with level 4 qualifications, respectively. In addition, the majority of lowest earners that had no qualifications, level 1 qualifications and level 2 qualifications did not experience wage progression. This result reveals that education is playing a significant role on earnings mobility – as according to our analysis the higher the level of education the higher the number of people experiencing earnings progression.

At this stage, we cannot infer if this increase is due to different characteristics of jobs for more-educated younger age groups allowing higher wage progression, or if it is a general effect of differing wage progression throughout a person's lifetime. Also, we are not able to measure any earnings mobility because of the change in qualifications after 2011.

8 . Conclusion

The inclusive growth agenda considers how growth has been allocated across different parts of the population. It also considers wider measures than traditional gross domestic product (GDP) growth. From the UK's perspective, overall economic growth has recovered to its pre-downturn levels. Household contributions to aggregate economy growths have dropped most starkly. In contrast, since 1998, overall UK disposable income inequality has stayed fairly constant, dropping slightly in the last 10 years.

Looking more long-term, between 1977 to 1990, economic growth per head has tended to rise with income inequality. However, income inequality since then has steadied while economic growth has picked up again. Economic growth has not been associated with a decrease in household wealth inequality, either. Between 2006 and 2016, overall inequality has stayed generally constant, between a gini coefficient of 0.61 and 0.62, and it has consistently been higher than income inequality. In fact, net financial wealth inequality has increased since the economic downturn, from a gini coefficient of 0.81 to 0.91 most recently, in 2016.

Although inequality has been steadily decreasing nationally, looking regionally, there are some persistent economic differences. Higher than average median incomes and wealth have tended to persist in the same regions before and after the downturn. Broadly, southern regions in the UK have consistently had above-average median incomes, as has Scotland. The sustained pattern does not hold as much when looking at gross household disposable income growths per person, so there may well be more pronounced changes in income inequality within regions than at national level. Employment rate growth differences have also been less sustained between regions, apart from London, which has had much larger than average employment rate growths both before and after the downturn. This may imply that employment is a less good predictor of household income for the typical household.

Considering life chances of younger people, wage progression for the lowest 20% of the distribution is more pronounced than older age groups between 2011 and 2015. However, highest qualification level is a big predictor of whether an individual experiences wage progression. Additionally, an individual is more than twice as likely to experience progression if they move region than not, with around half of those who did moving to the south of England.

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10 . Annex 1: Description of the dataset and analysis

These are the first Administrative Data Census Research Outputs on social mobility. They are the start of the research to assess if it is feasible to produce social mobility outputs from administrative data.

We have produced regional level earnings mobility indicators for England and Wales from personal level [income and benefits data](#). At this stage the Research Outputs are limited to income from the Pay As You Earn (PAYE) system and benefits (which include tax credits). Therefore, a number of components of income are missing, for example, income from self-employment and investments taxed via Self-Assessment.

The analysis has been based on more than 6.2 million individuals who had positive earnings for 2011 who were in the bottom 20% of the earnings distribution, whether they are full-time or part-time employees; of which 450,000 were in the 25- to 29-years-old cohort.

In total the dataset consists of between 36 and 41 million unique records per tax year with a single row per person per tax year. The total amount of PAYE pay is made up of the total amount earned per person during the tax year from employment or through pensions and it excludes any income from self-employment. Most records show a positive value for income, however, income can be negative if a person is due a tax rebate or zero if a person is receiving statutory sick pay or statutory maternity pay. The dataset will include people who are resident abroad, but get paid or receive their occupational pension from the UK, as well as people who may now be dead.

We focus on the 25- to 29-years-old cohort because looking at people aged 25 to 29 years gives a less distorted picture of whether someone has been able to progress relative to their peers than looking at those aged 18 to 24 years. For younger people just starting off in the labour market, wage progression can be very volatile, as they are more likely to be working in jobs that don't closely match their skills or education, as well as being more likely to leave the workforce to enter further and higher education.

A movement of 20 or more percentiles represents a substantial movement up the earnings distribution so individuals have experienced a notable improvement in their relative position.

A five-year period is the longest time series that the dataset can provide at the moment. We believe this gives sufficient time to assess the earnings progression of individuals. We are working to improve the time series in order for us to be able to provide more long-term results in the future.

Over time the earnings mobility research project can be expanded in coverage and geographical breakdown to produce multivariate outputs, such as mobility by ethnicity, by local authority and further characteristics.

Estimating the impact urban green space has on property price

The value of cultural services provided by nature in urban areas using the hedonic pricing method.

Contact:

Hamish Anderson, Vahe Nafilyan
Hamish.Anderson@ons.gov.uk,
Vahe.Nafilyan@ons.gov.uk
+44 (0)1633 455046

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1 . Introduction

Over 1.7 million hectares of urban area exist in Great Britain, defined by high population density and built infrastructure. However, urban areas can also encompass a variety of natural landscapes and biodiversity. Recently published [urban ecosystem accounts estimate](#) almost one-third of urban area in Great Britain consists of natural land and green space.

Urban green spaces are a type of natural asset that provide society with a range of benefits. Office for National Statistics (ONS), together with the Department for Environment, Food and Rural Affairs (Defra), are developing natural capital accounts for the UK to offer a comprehensive and consistent framework to organise environmental information so that the benefits of nature are better recognised.

The urban ecosystem accounts contain information about the extent of green and blue space in urban areas, information about the condition of these areas and estimates the quantity and value of seven ecosystem services supplied by urban nature.

This article focuses on two of those services only, the use on the hedonic pricing method (HPM) to value the cultural services provided by nature in urban areas, including such as including recreation and aesthetic views. For information about others, please see the [urban ecosystem account](#) publication.

What is the hedonic pricing method?

The hedonic pricing method (HPM) assumes that a class of differentiated products can be broken down into several characteristics. A combination of these characteristics and the external factors that affect the product determines its price. The most common example of this is property values, where the market price of a property is determined by a combination of structural characteristics (floor area, number of bedrooms, garden, garage and so on) and the socio-economic and environmental characteristics of the surrounding area (quality of schools, access to retail, transport, levels of water or air pollution, proximity to green space and so on).

HPM can be used to estimate the extent to which characteristics affect price by modelling house prices as a set of explanatory variables, including the structural, socio-economic and environmental characteristics. Assuming proximity to nature has an impact on property price, this methodology can be used to extract the value of environmental amenities implicit in market-based transactions.

2 . Model specification

The specific form of the regression we estimate is described along with a more detailed analysis of the structural, neighbourhood, environmental and socio-economic variables that we use.

Previous literature explains the hedonic pricing method does not have a pre-defined functional form. However, Rosen (1974) suggests that there are many reasons to believe that the relationship between property price and the environmental variable is non-linear in nature. Non-linearity is expected as “purchasers cannot treat individual housing attributes as discrete items from which they can pick and mix until the desired combination of characteristics is found” (Kong, 2007). This has led to many previous studies either using semi-logarithmic or double-logarithmic models as the log transformation generates the desired linearity in parameters.

Taking this into account and mitigating high variation in property prices by taking the log of property prices, a semi-logarithmic model is chosen.

The semi-logarithmic model takes the following form:

$$\ln(\text{price}_{i,t}) = \text{env}_i\beta + \text{hc}_{i,t}\gamma + \text{n}_i\delta + \text{year}_{i,t}\lambda + \varepsilon_i$$

Where the dependent variable $\ln(\text{price}_{i,t})$ is the log of sale price for each property transaction "i" at time "t". env_i is a vector of environmental characteristics, and in our main specification includes area of natural cover, blue spaces and functional green spaces within 200 metres radius of the property¹.

The vector $\text{hc}_{i,t}$ contains structural characteristic variables, which have been shown in previous studies to have the greatest influence on property price. It includes usual housing attributes such as number of bedrooms, property and garden area (square feet) and property type. It also includes a set of attributes retrieved from the description, such as period of the house (for example, Georgian, Victorian, Edwardian), and features that are expected to influence property prices (for example, garage, presence of original features, whether the property has been renovated recently).

The neighbourhood and geographical variables in vector n_i include distance to amenities other than green and blue spaces such as transport infrastructures (for example, bus station, train station), retail area and workplace centroid. The socio-economic characteristics of the local area are captured by including dummies for each local area (middle layer super output area (MSOA)) and for the socio-economic "type" of neighbourhood based on a well-established socio-economic segmentation tool of the UK derived by ACORN. This segments postcodes by analysing significant social factors and population characteristics, such as country of birth, family structure and health, among other things.

Our primary focus is on the estimation of β , a vector of coefficients indicating how areas of green and blue spaces are associated with the log of house prices. The coefficients can be interpreted as semi-elasticities and represent the percentage change in property prices associated with the presence of green space, natural land cover or blue space within a certain radius of the property and its size.

Whilst we include a range of neighbourhood characteristics in addition to local areas fixed effects, there are likely unobserved variables that affect property prices. For instance, the presence of an outstanding school may increase prices of all properties in a neighbourhood. Omitting important determinants that affect all properties in a given neighbourhood would generate spatial autocorrelation, that is, the residuals for properties in the same area would be correlated. The spatial autocorrelation would threaten traditional inference on the parameters β , as the p-value assume independence. In addition, if these unobserved factors affecting price are also correlated with the area of green and blue space, the estimated coefficients β would be biased. The direction of the bias would depend on the direction of the correlation between unobserved determinants of prices and area of green and blue space.

To mitigate spatial dependence, we include local area (MSOAs) fixed-effects in our models and cluster standard errors at the MSOA level. Therefore, we rely on the variation within MSOAs to estimate the relationship between area of green and blue spaces and property prices.

Several models are estimated where additional explanatory variables are introduced progressively to assess the robustness of our results. For example, the first model we estimate will only include environmental variables. A full list of independent variables included in the regressions are presented in Annex 1.

Notes for: What is the hedonic pricing method?

1. We use areas within 200 metres radius because the average distance to green spaces is about 200 metres. We show in Annex 1 that similar results are obtained using alternative radii (100 and 500 metres).

3 . Data sources

A large amount of data are needed to conduct hedonic regression analysis and for the purposes of the UK natural capital accounts, they also need to be available on a national scale. The following datasets listed in this section were used.

ACORN classification

A dataset that provides a well-established geographic segmentation of the UK. Produced and licensed by CACI Ltd, it segments UK neighbourhoods and postcodes into 6 categories, 18 groups and 62 types by analysing significant behavioural and social factors. For more information, see [the ACORN user guide on "The consumer classification"](#). ACORN is currently an important determinant in the hedonic regression and is also used in the production of the ONS Land and Property Services House Price Index and ONS House Price Index.

Zoopla

A UK-based property website. The dataset was provided by Zoopla Limited to the [Urban Big Data Centre](#) (UBDC) and includes information about over 1 million properties sold in Great Britain between 2009 and 2016. Information includes location, number of bedrooms, number of reception rooms, property type, for sale or rent, asking price, sale price and so on. The Zoopla data also provide a description of the property, which we use to extract additional characteristics of the property, for example, whether it has a garage or has been recently renovated. The description is also used to fill in missing information about property type.

Ordnance Survey

We have been fortunate to be able to collaborate with the Ordnance Survey (OS) who have created a wide range of variables influencing residential property prices for the purposes of the hedonic pricing method (HPM). These variables have been derived through the geospatial analysis of multiple OS datasets, both open data and premium data available through the Public-Sector Mapping Agreement (PSMA), as well as other third-party datasets, all government published data, from Office for National Statistics, Land Registry, Natural England and Natural Resources Wales.

4 . Summary statistics

The mean, minimum and maximum of the numeric variables are presented in Table 1, along with a number of observations with no missing values and standard deviation. The mean price of a property in Great Britain is approximately £250,000 and the distribution is log-normal. The average distance from a property in an urban area in Great Britain to the nearest functional green space is approximately 258 metres and the average distance to a blue space site is 365 metres.

Different definitions of green space are used throughout this article, the definitions are as follows:

- natural land cover – any land cover classified as being natural in type, for example, grassland, heath, scrub, orchards, coniferous trees and so on; it does not include inland water bodies and can range from large woodland areas to small grass verges
- functional green space (FGS) – any green space that has a specific function in its use, for example, public parks or gardens, playing fields, golf courses, allotments and so on; these spaces contain natural land cover and can also include some blue space, for example, a park that has a lake within it
- blue space – all inland water bodies, for example, rivers, lakes, ponds, canals and so on

The mean area of natural land cover in a 200-metre radius of a UK property is 46,156 metres squared and the equivalent for FGS is 42,969 metres squared. Not all properties are situated within proximity to blue and green space. All properties in the sample are located within 500 metres of natural land cover, but only 55% are located within 200 metres of functional green space and 32% within 200 metres of blue space.

Table 1: Summary statistics of numeric variables**Distance presented in metres and area presented in metres squared**

Statistic		N	Mean	St. Dev.	Min	Max
Price (£)		2,634,013	249,802	643,947	1	650,001,312
Distance to nearest functional green space (FGS)		2,624,460	259	185	0	4,163
Distance to nearest blue space site		2,609,165	365	279	0	3,605
Area of natural land cover within	100 metres	2,634,013	15,530	26,129	0	1,023,637
	200 metres	2,634,013	46,156	48,564	0	1,349,563
	500 metres	2,634,013	212,895	148,478	2,033	2,042,351
Area of FGS within	100 metres	2,634,013	18,756	146,518	0	12,382,576
	200 metres	2,634,013	42,969	212,132	0	12,562,617
	500 metres	2,634,013	139,899	369,515	0	12,909,019
Area of blue space within	100 metres	2,634,013	10,501	336,722	0	14,849,290
	200 metres	2,634,013	18,858	444,265	0	15,036,901
	500 metres	2,634,013	48,820	689,707	0	15,150,068
Distance to nearest workplace zone centroid		2,562,431	315	246	0	12,792
Distance to nearest retail cluster		2,501,504	369	337	0	6,978
Distance to nearest transport infrastructure node		2,405,243	550	546	5	9,720
Distance to nearest railway station		2,155,373	1,668	1,344	0	14,588
Size of building		2,634,013	105	254	1	41,543
Residential garden area of property		2,633,073	273	1,201	0	165,144

Source: Office for National Statistics

Regression results: the effect of green or blue space on property prices within 200 metres radius

Regression results, estimating the effect blue and green space have on property price, are presented in Figure 1 and Table 2. Results are based on blue and green spaces within 200 metres of property, because average distance to functional green space is 258 metres.

The coefficients are interpreted as the elasticity of price with respect to the presence and area of green and blue spaces. The price elasticity indicates by how much property price will change when one of the categorical variables, for example, a small functional green space within 200 metres, is present in comparison to if it was not. For example, small functional green space within 200 metres has a coefficient of 0.01, this would indicate that the presence of small FGS site is associated with a 1% increase in property price, if it were compared to a similar property with no functional green space within 200 metres.

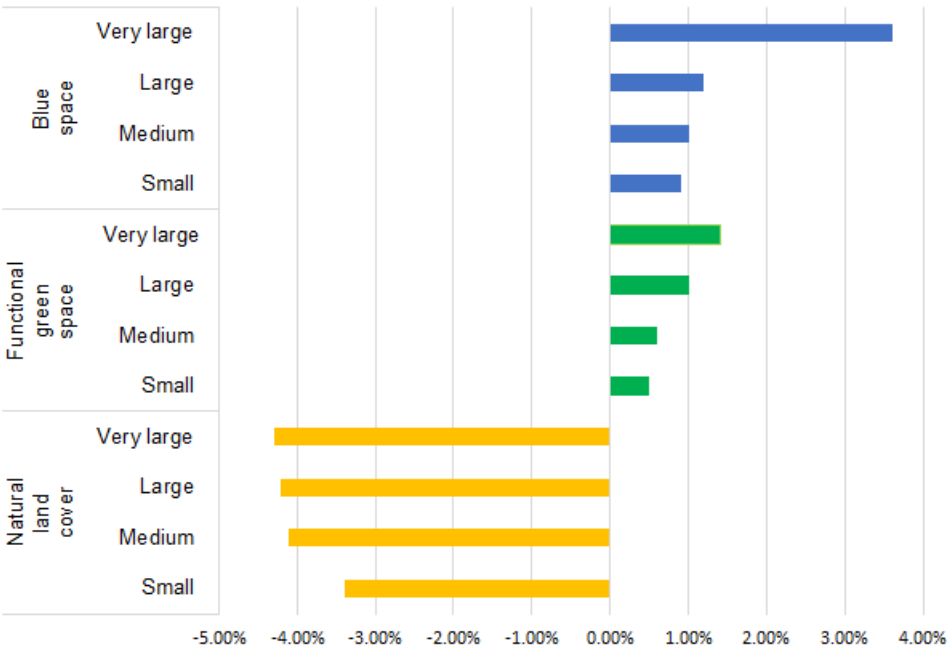
All sizes of functional green and blue space within 200 metres of property have positive and significant coefficients (see Table 2 for detail). The presence of a small functional green space within 200 metres of a property is associated with a rise in property price of 0.5%. The greater the size of the functional green space the greater the effect on property prices, for example, presence of very large functional green space is associated with a rise in property price of 1.4%. Similarly, the presence of a small blue space within 200 metres of a property is associated with a 0.9% increase in price, and a very large blue space with a 3.6% increase in price.

In contrast, proximity to natural land cover, which includes all areas of green space including small areas of vegetation such as roadside vegetation, has a negative effect on property prices. A very large area of natural land cover within 200 metres is associated with 4.3% lower property prices. A reason for this could be properties surrounded by more natural features tend to be further from city centres and there could be some characteristic variables that are currently omitted from the model.

Another explanation could be the property may be near a major road, train track or derelict area that is likely to have surrounding vegetation but these areas are not desirable for recreation or aesthetic views. It suggests the functionality of the green space is an important factor, as those sites that can be used for a specific purpose and have likely been modified are valued more highly for their cultural benefits.

Figure 1: Percentage change in property price for the presence of different natural capital assets within 200 metres of the property, 2009 to 2016

Great Britain



Source: Office for National Statistics

Full regression results are presented in table 2, results using four different model specifications are given, each including additional control variables to the model. Only coefficients and standard errors for the explanatory variables of interest are presented.

Table 2: Regression results

Great Britain

	Log(Price)			
	-1	-2	-3	-4
Small functional green space within 200m	-0.0409***	0.0059***	0.0066***	0.0053***
	-0.0024	-0.0012	-0.0012	-0.001
Medium functional green space within 200m	-0.0440***	0.0059***	0.0069***	0.0060***
	-0.0026	-0.0013	-0.0013	-0.0011
Large functional green space within 200m	-0.0335***	0.0116***	0.0127***	0.0107***
	-0.0028	-0.0014	-0.0014	-0.0011
Very large functional green space within 200m	-0.0102***	0.0161***	0.0170***	0.0145***
	-0.0034	-0.0017	-0.0017	-0.0014
Small blue space within 200m	0.0269***	0.0097***	0.0091***	0.0093***
	-0.0029	-0.0015	-0.0015	-0.0012
Medium blue space within 200m	0.0262***	0.0104***	0.0099***	0.0102***
	-0.003	-0.0016	-0.0016	-0.0013
Large blue space within 200m	0.0113***	0.0107***	0.0106***	0.0126***
	-0.0034	-0.0017	-0.0017	-0.0014
Very large blue space within 200m	-0.0069	0.0269***	0.0269***	0.0358***
	-0.0045	-0.0025	-0.0025	-0.0023
Small area of natural land cover within 200m	-0.1127***	-0.0373***	-0.0365***	-0.0335***
	-0.0176	-0.0139	-0.0137	-0.0093
Medium area of natural land cover within 200m	-0.1171***	-0.0464***	-0.0471***	-0.0411***
	-0.0177	-0.0139	-0.0138	-0.0094
Large area of natural land cover within 200m	-0.1157***	-0.0489***	-0.0498***	-0.0418***

	-0.0178	-0.0139	-0.0138	-0.0094
Very large area of natural land cover within 200m	-0.1077 ***	-0.0494 ***	-0.0506 ***	-0.0439 ***
	-0.0179	-0.014	-0.0138	-0.0094
MSOA	Yes	Yes	Yes	Yes
Acorn	No	Yes	Yes	Yes
Distance to other amenities	No	No	Yes	Yes
Property characteristics	No	No	No	Yes
Observations	2,628,660	2,628,660	2,628,660	2,626,103
Adjusted R-squared	0.3666	0.7199	0.723	0.8047

Source: Office for National Statistics

Notes:

1. *p less than 0.1
2. **p less than 0.05
3. ***p less than 0.01

In model 2 the ACORN dataset is included, which segments Great Britain into neighbourhood types at individual street level, based on demographic and social information such as income and crime rates. Including this dataset increases the R^2 from 0.366 to 0.719, indicating it has strong explanatory power. Interestingly, controlling for the socio-economic characteristics of the street changes the sign of the coefficients for all different area categories of FGS within 200 metres. The coefficient changes from negative to positive with the coefficient increasing with the area itself.

In model 3 distance to local non-environmental amenities are included, such as distance to nearest retail cluster and train station. Model 4 then includes property characteristics, such as number of bedrooms, size of building and area of residential garden. This is the preferred specification as it includes the widest set of covariates.

Valuation of monetary stock

To value the ecosystem services urban nature provides, the dataset is split into a training and a test dataset, we randomly allocate 20% of our data to the training dataset and 80% to the test dataset.

The training dataset is used to estimate the model and the test dataset to assess the predictive power of the model using the root mean square error (RMSE) as a metric of predictive performance. We compute the RMSE of three different model specifications. The first specification includes all the variables used in our preferred specification (see the Model specification section) except information on green and blue spaces. The second model adds areas of blue and green spaces within a 200-metre radius. The third model further includes areas of blue and green spaces within 100, 200 and 500 metres of the properties. We find that the third model has the lowest RMSE.

Using this model, the predicted average property price in our test data is £246,010. The predicted average property price in the absence of green and blue spaces is £241,197, which is £4,813 lower than the predicted average price using the real data. We conclude that in the absence of green and blue spaces, property prices in Great Britain would be £4,813 lower and this reflects the value of services provided by green and blue spaces.

Assuming the value implicit in property price is the same in Northern Ireland as in Great Britain and the sample used is representative of the property stock, which may not be the case¹, by multiplying £4,813 by the number of residential properties (27.2 million), we obtain an estimate of £130.9 billion for the stock value of blue and green spaces.

Notes for: Summary statistics

1. For example, small starter homes sell much more frequently than other types of property and therefore will be over-represented in the data.

5 . Interpretation and application to natural capital accounting

Estimates of the association between green and blue spaces and property prices may not reflect a causal relationship. The model has controlled for a wide range of property and socio-economic characteristics, however, there is always a possibility that an important variable has been omitted. That said, high R-squared values indicate that the model explains over 80% of the variance in property prices, suggesting that many factors relevant for determining property prices have been included.

Vegetation and green and blue space in urban areas can be thought of as natural assets supplying several ecosystem services that the economy and society benefit from. For example, food, clean air or opportunity for recreation.

Values obtained through the hedonic pricing method (HPM) estimate a bundle of ecosystem services and it is not possible currently to disentangle why nature near property is important to the buyer and therefore difficult to determine which ecosystem services are captured through the HPM. It could be suggested that the buyers of properties must be aware of the services provided by natural capital for those services to be reflected in property prices. We work on the assumption that much of the value captured is that from cultural services, such as recreation and attractive views, rather than regulating services such as carbon sequestration and temperature regulation, which people are less likely to be aware of.

The results support this as functional green space, such as a park or golf course, has a positive effect on property prices, whereas natural land cover, which includes grassland, heath and scrub, has a negative effect. This suggests that it is the functionality and accessibility of the green space that is valued by property buyers, rather than aesthetics or regulating services.

Table 3 summarises the types of services that could be captured and the potential overlap with other ecosystem services already included in the accounts.

Table 3: Services potentially captured by the Hedonic Pricing Method and likelihood to overlap existing estimates

Ecosystem service	Likelihood overlap with existing accounting estimates
Physical health benefits	Dependent upon how health benefits and the associated service are defined and measured. Needs additional investigation.
Recreation	The hedonic pricing method (HPM) can potentially capture the additional value of local recreational trips not incurring cash expenses, which are not currently included in monetary accounts. There would need to be consistency between the average distance of local walked trips and the radius used in HPM.
Urban cooling	No overlap. The methodology for temperature regulation involves averaging across urban areas and focuses on savings in output and energy costs.
Carbon sequestration	No overlap.
Provisioning services, such as food and material production	No overlap. House prices will be sensitive to the size of a domestic garden but not necessarily specific uses of it such as garden produce. Gardens are excluded from the hedonic results.
Air quality regulation	Potential for overlap, although air filtration accounting estimates are not modelled at the same localised scale as HPM. Whilst air pollution levels do affect property prices, we are interested in the role of air filtration by vegetation, which is more marginal. Needs additional investigation.
Noise regulation	Potential for overlap, needs additional investigation. Whilst noise pollution clearly affects property prices, we are interested in the role of vegetation in reducing noise, which is more marginal.

Source: Office for National Statistics

6 . Next steps

The hedonic pricing method has provided experimental estimates of the value of green and blue spaces. Further work is needed to expand these results to UK estimates (currently Great Britain only) and assess how the stock value can be transformed into annual flow values. Methodologically, the use of data from the Valuation Office Agency and the Land Registry in future iterations may improve the robustness of estimates.

More work is also needs to be done to measure the extent of linear natural capital features such as hedgerows and street trees, which are major components of the urban fabric but are not currently included.

7 . Annex 1: Variables for hedonic regression

Table 4: Variables for the hedonic regression model

Characteristic Vector	Component Variables	Sources
Structural characteristics	Number of bedrooms	Zoopla
	Property area (square feet)	Ordnance Survey
	Property type: house, bungalow, flat	
	Property attributes based on description for example. garage	
Neighbourhood characteristics	Distance to train station	Ordnance Survey
		Office for National Statistics
	Distance to local labour market	
	Distance to nearest transport infrastructure	
	Distance to nearest retail cluster	
	Travel to work area	
	Middle layer super output area	
Socio-economic characteristics	ACORN	CACI
Environmental amenities	Distance to green space	Ordnance Survey
	Distance to blue space	
	Area of Natural Features in radius of property (100 metres, 200 metres, 500 metres)	
	Area of functional green space in radius of property (100m, 200m,500m)	
	Area of blue space in radius of property (11 metres, 200 metres, 500 metres)	
	Function of green space	
	Area of residential garden	

Source: Office for National Statistics

Compendium

Recent releases

An analysis of economic statistics related to the regional economy.

Contact:
Ellis Daniel
economic.advice@ons.gov.uk
+44(0)1633 455290

Release date:
26 July 2018

Next release:
11 October 2018

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