

Independent review of UK economic statistics:

interim report

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1 Introduction and overview

Background to the Review

1.1 On 10 July 2015, as part of the government's productivity plan,¹ the Chancellor of the Exchequer, George Osborne, announced an independent review of economic statistics. The Terms of Reference of the Review are to:

- Assess the UK's future (economic) statistics needs, in particular relating to the challenges of measuring the modern economy ('Needs');
- Assess the effectiveness of the Office for National Statistics (ONS) in delivering those statistics, including the extent to which ONS makes use of relevant data and emerging data science techniques ('Capability');
- While fully protecting the independence of UK national statistics, consider whether the current governance framework best supports the production of world-class economic statistics ('Governance').

1.2 The Review was prompted by the increasing difficulty of measuring output and productivity accurately in a modern, dynamic and increasingly technological economy. In addition, there was a perception that ONS were not making full use of the increasingly large volume of information that was becoming available about the evolution of the economy, often as a by-product of the activities of other agents in the public and private sectors. Finally, frequent revisions to past data, together with several recent instances where series have turned out to be deficient or misleading, have led to a perception by some users that official data are not as accurate and reliable as they could be.

1.3 The Review is being undertaken by Sir Charles Bean, Professor of Economics at the London School of Economics and formerly Deputy Governor for Monetary Policy at the Bank of England, with the support of a small team of officials from HM Treasury, ONS and the Bank of England.² In order to provide a suitable evidence base, the review team issued a Call for Evidence to users of economic statistics, to which there were 64 responses, and conducted more than 100 meetings with relevant organisations and stakeholders. In addition, the team also met representatives of several overseas National Statistical Institutes (NSIs) to give an international perspective on UK practice. The team also benefitted greatly from the willing assistance of many members of ONS and the UK Statistics Authority (UKSA).

1.4 The Reviewer had been asked to make interim recommendations to the Chancellor of the Exchequer and the Minister for the Cabinet Office in the autumn of 2015, with a final report published by Budget 2016. This Interim Report meets the first of those requests. It focusses on the first and second bullets of the Terms of Reference, leaving governance questions to be addressed in the Final Report. It is also the intention to expand on the particular challenges and opportunities posed by the digital economy in the Final Report.

1.5 This Review builds upon a number of previous reviews of various aspects of economic statistics, including the Pickford, Allsopp, Atkinson, Barker-Ridgeway and Johnson reviews published over the past 25 years. These are discussed in more depth in Chapter 3.

¹ HM Treasury, (2015). 'Fixing the foundations: creating a more prosperous nation'. Available [here](#).

² Nick Broadway, James Clarke, Mausmi Juthani, Will Laffan, Ivan Petrella, Mario Pisani, Britta Rinaldi and Jack Stewart.

A vision for the provision of economic statistics

1.6 Economic statistics constitute a very broad canvas. The primary organising framework for the statistical analysis of the economy is, of course, the National Accounts. These provide a set of interlocking accounts for the output, expenditures and incomes of the constituent sectors of the economy. Such statistics are a key input to analysis of the economy and the conduct of policy by the Bank of England and HM Treasury. They are also useful to businesses in making their investment decisions. But many other economic statistics are valuable too. These include data on: prices and pay; the supply and demand for labour; asset prices and financial transactions.

1.7 Furthermore, for some purposes information is needed below the level of the aggregate economy. For instance, analysis of the redistributive impact of taxes and benefits requires knowledge of the distribution of household incomes. Similarly, effective regional policies require that information be available about economic activity at the level of the corresponding regional units. For the purposes of this Review, an economic statistic is simply any piece of quantitative information that is valuable to either the public or private sector for the analysis of a relevant economic issue.

1.8 An effective National Statistical Institute therefore needs to be able to deliver this broad range of statistics, and to an acceptable degree of accuracy and in a sufficiently timely fashion. Here it is worth stressing that this task is by no means easy. Even when a variable is seemingly well-defined, such as the total number of people working at a particular time, in most cases it still has to be *estimated*, usually by sampling a fraction of the total population. Ensuring that this sample is representative is not always straightforward.

1.9 Moreover, in many cases the variable of interest is conceptually complex. Take, for instance, a variable such as real GDP – the total quantity of value added in the economy within a given period at a constant level of prices. This involves aggregating the outputs, net of inputs, across an enormous variety of individual lines of business. This is hard enough when an economy largely produces physical goods, but becomes even harder when services constitute a large fraction of the economy, as these are frequently specific to each customer. The problem becomes even harder, when the quality of the goods and services provided is changing rapidly, as is the case in some parts of the economy today. The absence of appropriate prices when goods and services are provided outside the market, or else paid for in unconventional ways, also provides a major challenge. So, even abstracting from sampling errors, there may be only a very imperfect relationship between the economic concept of interest and the corresponding statistical estimate.

1.10 The Central Statistical Office (CSO), the forerunner of ONS, was founded in 1941 with the purpose of developing a system of national accounts to aid the planning of the war effort. Both the CSO and ONS have primarily operated as a ‘factory’, generating prescribed statistics for an increasingly broad set of economic variables from a range of surveys, usually according to methodologies laid down in internationally-agreed accords, and with only modest additional interpretation. The definitions and methodologies laid down in those accords have generally evolved to reflect the changing structure of the UK and other economies, but usually only with a considerable lag.

1.11 Whether such a model remains appropriate in the twenty-first century is, however, debatable. In particular, the future provision of economic statistics should reflect the following five observations:

- Reliable economic statistics are an important *public* good: while timely and relevant economic statistics are key to effective policy making, they are also central to business planning and to the electorate’s ability to hold decision makers to account.

- No single set of statistics is likely to cover all purposes: different users have needs for statistics that are constructed or stratified by sector, industry or region in different ways.
- An ability to interrogate the underlying microeconomic data can help enormously in understanding the causes of significant economic problems, such as the 'productivity puzzle'.
- The methodologies governing the construction of economic statistics need to evolve along with the economy: what constitutes a satisfactory organising framework at one time may subsequently cease to be so.
- The volume of data – both public and private – that can be employed in principle in measuring the economy, together with the technological capacity for handling it, has exploded as a result of the digital revolution.

1.12 This points to an ONS – and an official statistics system more generally – that: makes fuller use of other sources of information in constructing economic statistics; is more aware of the deficiencies of those statistics, is more candid about them and in the vanguard of addressing them; and is more flexible and responsive to users' need to understand the data better. In short, it should become more of a service provider in the understanding of economic statistics. Fortunately, this is a vision that is very much in line with UKSA's five-year strategy for the future provision of official statistics.³

1.13 To further the achievement of this vision, this Interim Report provisionally identifies a self-reinforcing package of five strategic recommendations. The rationale behind these is outlined in brief below and developed at more length in the body of the Report. These strategic recommendations in turn need to be underpinned or complemented by specific actions, some of which are also discussed in the main body of the Report. Others will be incorporated into the Final Report, including those relating to the governance of statistics.

Interim Strategic Recommendation 1: *Refocus the culture of ONS towards better meeting user needs*

1.14 Keeping economic statistics relevant to users in both public and private sectors means that ONS, and other producers of economic statistics, need to move away from focusing largely on the production of statistics and become rather more of a service provider, helping users answer their questions about the economy. Moreover, by virtue of its access to the raw data, ONS should be in a position to be in the lead in understanding and explaining the limitations of the statistics it produces and in developing alternative indicators when required.

1.15 This will require something of a cultural shift. ONS staff need to become proactive rather than reactive in their engagement with users. They need to be curious, open and self-critical. And they need to embrace, rather than resist, change. The development of such a culture should also leave ONS better placed to shape the international protocols that presently determine so much of its output.

1.16 This strategic recommendation is underpinned by the following recommended actions:

Interim Recommended Action 1: *Encourage staff: to understand better how their statistics are used; to be more open and curious in identifying statistical issues; and to use their expertise to influence the international statistical agenda more effectively.*

³ UK Statistics Authority, (2014). 'Better Statistics Better Decisions'. Available [here](#).

Interim Recommended Action 2: *While building up the capability of its operation in Newport, ONS should also increase its London profile in order to facilitate stronger engagement with users of economic statistics, as well as expanding its engagement with users across the rest of the UK.*

Interim Recommended Action 3: *Improve user access to microdata while respecting confidentiality issues, and foster more collaboration with users and experts.*

Interim Strategic Recommendation 2: *Make the most of existing and new data sources and the technologies for dealing with them*

1.17 The evidence suggests that the UK lags other advanced economies in its exploitation of administrative data (information held within the public sector but which was obtained for purposes other than the construction of statistics). This reflects both the cumbersome nature of the present framework governing the sharing of such data and a cultural reluctance on the part of some departments or officials to data sharing.

1.18 There should be a presumption that all publicly-held data is available to ONS for the purpose of producing economic statistics, except where there is a strong reason not to, for example for reasons of national security. Where feasible, ONS should also explore further the potential value of using similar data held by the private sector, for instance on payments, as well as new techniques of gathering data, such as 'web scraping'. Greater use of these new data sources simultaneously holds out the prospect of more timely and accurate economic statistics, and a reduction in the reporting burdens on businesses and households. Better use of these new sources has the potential to transform the provision of economic statistics, though bringing ONS up to best practice in the use of such data will not happen overnight.

1.19 This strategic recommendation is underpinned by the following recommended actions:

Interim Recommended Action 4: *Remove obstacles to the greater use of public sector administrative data for statistical purposes, including through changes to the associated legal framework, while ensuring appropriate ethical safeguards are in place and privacy is protected.*

Interim Recommended Action 5: *Exploit new methods of collecting data and explore the scope for using information gathered by private sector entities in the production of economic statistics, nowcasting and one-off studies of emerging measurement issues.*

Interim Recommended Action 6: *Enhance the capacity of ONS systems and staff – including recruiting a cadre of data scientists – to develop and maintain the capability to exploit these new sources of data in the production of economic statistics.*

Interim Strategic Recommendation 3: *Become better at understanding and interrogating data*

1.20 As already noted, understanding puzzles often requires digging down below the surface into the underlying data. ONS staff need to be adept at doing this themselves, not only to be able to help users identify the shortcomings and limitations in the underlying data, but also to identify new trends and to support the production of economic statistics. An enhanced facility to interrogate the data in this way would have the significant added benefit of making ONS staff better able to sense-check statistics before their release. In so doing that would create another line of defence against the continual challenge of detecting and preventing errors and corrections.

1.21 Realising this aim will require there to be more economic and analytic expertise available within ONS. It will also be necessary to improve and rationalise the technology employed to

handle the data. Finally, improving accessibility of the microdata to external as well as internal users will need to subject to effective confidentiality controls.

1.22 This strategic recommendation is underpinned by the following recommended action:

Interim Recommended Action 7: *Increase the economic expertise available within the organisation in order to raise ONS's capability to quality-assure and sense-check statistics before release.*

Interim Strategic Recommendation 4: *Address established statistical limitations*

1.23 Chapter 2 of this Interim Report summarises some of the key challenges in the production of existing UK economic statistics. Many of these have already been stressed in previous reviews. To meet the needs of current and future users of economic statistics, it is important that ONS put in place plans to address these limitations, with a precise timeline for delivery. This should happen alongside work to address current and future de-designations of economic statistics. This will require a recognition that not all shortcomings can be addressed as quickly or as easily as each other, which in turn will involve some prioritisation of effort. This Review will revisit this recommendation at the Final Report, but an interim list of recommended actions would include:

- Addressing existing shortcomings in the production of National Accounts, including the absence of double deflated volume measures;
- Using administrative data sources to improve early estimates of GDP, including by making greater use of information from the expenditure and income measures;
- Producing detailed Flow of Fund statistics that meet user needs in terms of breadth and detail;
- Improving the measurement of the service sector, including developing more detailed deflators and volume indices to reflect the service sector better;
- Exploring how the use of administrative data might help meet the diverse and granular needs of users of regional statistics; and
- Implementing sufficient improvements to the UK Trade, Construction and CPIH statistics to warrant their re-designation as National Statistics.

Interim Strategic Recommendation 5: *Become more agile in the provision of statistics that properly reflect the changing structure and characteristics of the economy*

1.24 Ensuring statistics accurately reflect a changing economy is one of the hardest challenges an NSI faces. The basic conceptual framework underpinning the national accounts when first devised was of an economy in which most businesses were engaged in the production of reasonably homogenous goods in a single country. The reality today is rather different, with many businesses operating across national borders and producing a range of heterogeneous products and services that may be tailored to the tastes of individual consumers. Moreover, statistics have failed to keep pace with the impact of digital technology not only on product quality but also on its implications for the boundary between market and home production.

1.25 This is not a one-off challenge. As the economy evolves, so does the appropriate frame of reference for statistics: it is a constantly moving target. As a result, statistical methodologies will almost always be somewhat out-of-date or incomplete as they are bound to lag behind the changes in the economy, especially since these methodologies often are the subject of international agreements.

1.26 A progressive response to this challenge requires an NSI to be at the forefront of understanding (and explaining) the limitations of its statistics and in assessing the likely quantitative implications of doing things in a more appropriate way. ONS should therefore be constantly horizon-scanning, delving into emerging economic trends, and conducting one-off studies of the impact of these trends on its statistics. The next step would be the development of experimental statistics that capture the new phenomena better, or alter the way existing statistics are collected. Finally, experience could lead to changes in the international definitions and protocols that govern the provision of most official economic statistics. The successful pursuit of such an approach to the challenge of keeping pace with the changing structure and characteristics of the economy requires staff to have enough time away from ‘turning the handle’ to think and analyse. It would also benefit from strong links with outside experts working in relevant fields.

1.27 This strategic recommendation is underpinned by the following recommended action:

Interim Recommended Action 8: *Make more use of one-off studies – including drawing on new data sources – to investigate emerging measurement issues, collaborating with expert users in business, government and academia wherever appropriate – including through the use of institutional partnerships and fixed-term secondments into ONS.*

Content outline

1.28 Underpinning these five strategic recommendations are 63 pages of observation, analysis and assessment organised into two chapters, reflecting the first two elements of the Review’s Terms of Reference respectively.

1.29 Chapter 2 discusses the current and future needs of statistics users, as well as the known issues with some of the existing statistics and the scope for improvement. This chapter covers the measurement of: GDP, including the issue of revisions; services, and financial and public services in particular; financial interconnectedness; and the regional economy. Finally, the chapter summarises a variety of emerging issues, some of which relate to the particular challenges posed by the rapidly-evolving digital economy. These emerging issues will be covered in more detail in the Final Report, due to be published around the time of Budget 2016.

1.30 Chapter 3 covers the effectiveness of ONS in meeting users current and future statistics needs. It starts by setting the historical context and a chronology of recent reviews of ONS. It then explores various factors contributing to ONS effectiveness: resourcing; recent performance; the use survey and administrative data; analytical and data science capability; culture; technology and systems. This chapter concludes that there are some significant challenges and obstacles in respect of ONS capability to deliver the statistics users need. This chapter contains eight specific recommended actions that, taken together, would help to move ONS to frontier of best practice amongst NSIs.

1.31 A brief concluding chapter discusses next steps and brings together the various recommendations of this Interim Report.

Measuring the modern economy

2

2.1 The modern economy is a complex entity, subject to a continual process of change and development. Ensuring that economic statistics — and the methodologies used to construct them — evolve so as to capture these changes constitute one of the biggest challenges facing national statistical institutes (NSIs). This chapter seeks to identify some of the key challenges in measuring the UK economy, now and in the future.

2.2 The bulk of the chapter discusses four long-standing challenges. These are: the construction of GDP; improving the coverage of services (including financial and public services); understanding financial-interconnectedness; and the provision of regional statistics. All have been identified in previous reviews of official statistics, but dealing with them remains an issue. The concluding part of the chapter identifies several newer challenges that have been subject to rather less analysis. Although the discussion of these issues is relatively brief here, the intention is to say more in the Final Report.

Measuring GDP

2.3 First developed in the 1930s and 1940s, the National Accounts provide the basic framework for monitoring the evolution of economic activity, incomes and expenditure at the national and sectoral levels. Not only are they central to the decisions of policy makers but also frame the employment and investment decisions of businesses. In the UK, the production of timely and reliable National Accounts is a key responsibility of ONS. Their production is subject to international regulation which ensures comparability across countries.

2.4 Within the National Accounts, Gross Domestic Product (GDP) is probably the most followed indicator, with the growth rate of GDP often seen as a summary statistic for the current health of the economy. The central role of GDP, together with its limitations as a summary statistic, came out strongly in responses to the Call for Evidence and in discussions with stakeholders.

2.5 Generally speaking, GDP (at current prices) provides a monetary measure of the total value added by the market economy, together services provided, in a specific time period. Because a general rise in all prices will simply lead to an equi-proportionate rise in this current-price measure, a more useful measure for monitoring economic developments is provided by a corresponding measure with prices held constant (GDP at constant prices).

2.6 Importantly, GDP is not a measure of welfare and does not reflect economic inequality or sustainability (environmental, financial, or other), a point recently reiterated by the LSE Growth Commission.¹ Moreover, unpaid activities, home production and other non-market services (with the exception of public services) are not captured within the National Accounts.²

2.7 Because the source of all incomes lies in the flow of value added generated by production and all production must be either consumed at home or abroad or else invested, GDP can be measured in three alternative and equally valid ways:

¹ Aghion, P., Besley, T., Browne, J., Caselli, F., Lambert, R., Lomax, R., Pissarides, C., Stern, N., and Van Reenen, J., (2013). 'Investing for Prosperity: Skills, Infrastructure and Innovation – Report of the LSE Growth Commission'. Available [here](#).

² Note that ONS produce a household satellite account, separate to the National Accounts, which attempts to account for a number of elements of unpaid home production (e.g. laundry, transport, cooking, childcare). Available [here](#).

- Production or output (GDP(O)) - The value of the output of goods and services produced less the intermediate inputs used in their production (known as Gross Value Added or GVA), plus any taxes (net of subsidies) on those products.
- Income (GDP(I)) - The income earned by households and businesses in the production of goods and services, plus any taxes (net of subsidies) on production and products.
- Expenditure (GDP(E)) - The value of the final expenditure by households, businesses (capital formation and inventory accumulation) and the government, plus net exports (exports less imports) of goods and services.

2.8 Although conceptually equivalent, the three approaches in practice regularly yield different estimates. Each measure is estimated from different sources and samples and are subject to both sampling and non-sampling errors.³ But because the three GDP measures are conceptually identical, it makes sense to combine all three estimates into a single measure, placing more weight on the more reliable sources of information. Even so, the final estimates will be exactly that: estimates, not the 'truth'. This uncertainty surrounding official measures of GDP is inadequately recognised in public discourse, with commentators frequently attributing spurious precision to the estimates.

2.9 In bringing the three alternative estimates of GDP together, ONS employs the so-called Supply and Use Tables, which provide a detailed picture of inputs and outputs together with associated final product demands and supplies. However, these tables are only available around 18 months after the end of the year in question. So, for periods after the latest Supply and Use Tables, GDP is estimated by simply grossing up the most recent balanced estimate of GDP by the subsequent growth rates implied by the GDP(O) measure alone as this is thought to provide the most accurate short-term indicator.⁴

2.10 The balancing process combines the three estimates of economic activity into a single estimate of GDP. However, it is important to recognise that the compilation of the National Accounts produces a comprehensive picture of activity, income and expenditure at the sectoral level. Different elements within the National Accounts will be useful for different purposes. For instance, a breakdown of production can be used to identify which industries are contributing most to the growth of aggregate output or productivity. By the same token, the expenditure accounts can be used to identify the main sources of demand growth in the economy.

2.11 Cross-checking consistency across the National Accounts can improve the accuracy of the various statistics. In particular, the balancing process is paramount in reconciling the different statistics of the National Accounts into a single overarching view of the economy. It is in the balancing process that expert judgement and sense-checking of the numbers takes place. However, as discussed later, the current reliance on GDP(O) may be a weakness of the UK's approach, given the lack of up-to-date information on intermediate consumption and in the absence of so-called 'double deflation'.

Revisions and the trade-off between timeliness and accuracy

2.12 Users want economic statistics, including estimates of GDP, which are both timely and accurate. But because the information used in estimation typically increases over time, there is a trade-off between the two. (The scope for improving *both* timeliness and accuracy through the better exploitation of administrative and private big data is a major theme of Chapter 3.) Early estimates based on incomplete information will be less reliable than later ones based on more

³ For a discussion, see Manski, C., (2014). 'Communicating Uncertainty in Official Economic Statistics,' *NBER Working Papers*, No. 20098

⁴ ONS, 'A guide to the supply and use process'. Available [here](#). It is worth noting that this practice is not universal. For instance, headline US GDP figures are based on the expenditure approach, although the US Bureau of Economic Analysis also reports the income approach.

complete information. But the longer a decision maker has to wait for the statistics, the less useful are they likely to be. The obvious solution to this problem is to provide users with a sequence of estimates, based on increasingly richer underlying information. Revisions may arise not only as a result of acquiring more data but also through the correction of errors, changes in seasonal adjustment, reweighting to a new base year and the implementation of methodological changes.

2.13 Although revisions are a natural consequence of more information becoming available with the passage of time, many respondents to the Call for Evidence expressed frustration with frequent revisions to GDP and related statistics. Sometimes these revisions can be large enough to result in fundamentally different pictures of the economy being provided by the initial and mature estimates. A risk is that such revisions threaten public confidence in the accuracy of the statistics. The remainder of this sub-section looks at two particular issues: the timing of the initial estimate of GDP, which provides the benchmark against which subsequent estimates will be judged; and the subsequent revision history from a comparative perspective.

Timing of the preliminary estimate of quarterly GDP

2.14 In 1993, the publication of the preliminary estimate of quarterly GDP was brought forward from seven weeks after the end of the reference quarter to 25 days (T+25) to make use of new data sources. T+25 remains the timing of the first estimate of quarterly GDP. Table 2.A shows that the UK presently publishes its preliminary estimate faster than any other G7 country.

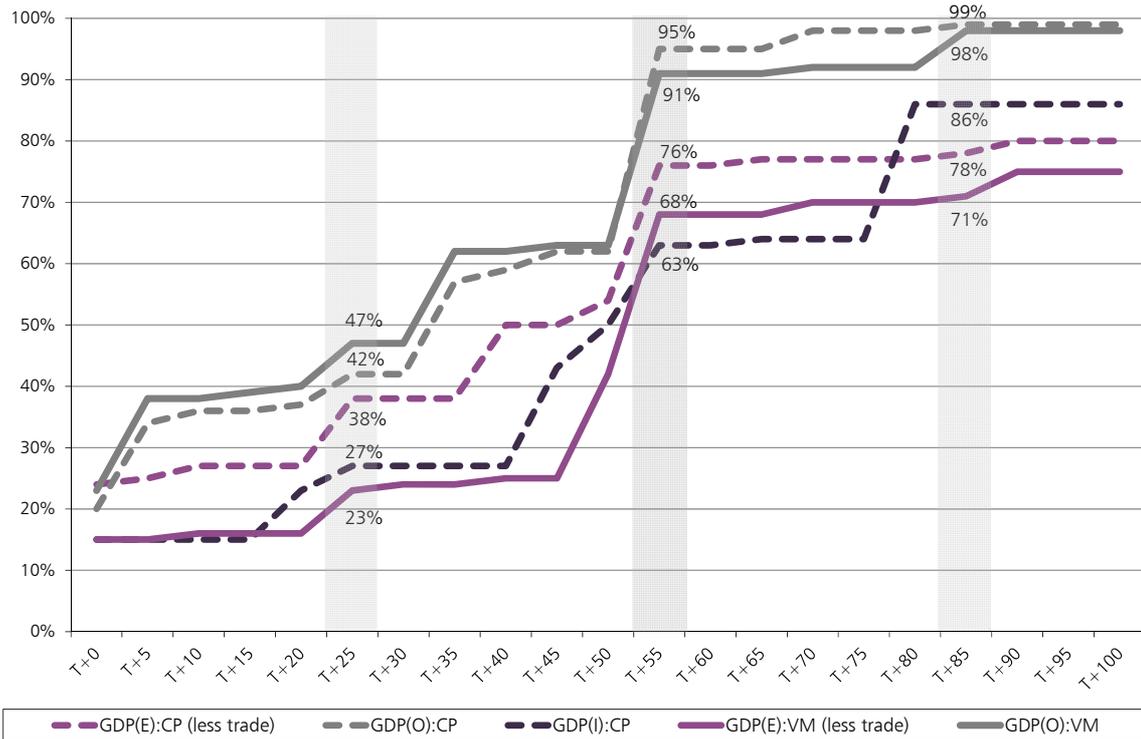
Table 2.A: Timing of preliminary quarterly GDP estimate (days after end of reference quarter)

Canada	France	Germany	Italy	Japan	UK	US
60	44	44	44	45	25	30

Source: see annex A

2.15 Chart 2.A shows how the quantity of information available for each measure of GDP increases following the end of the reference quarter. The preliminary estimate, derived entirely through the output measure, includes roughly 47% of output data for the quarter. Delaying publication from T+25 to T+35, for instance, would increase the amount of information available from 47% to around 62%. By the time the third estimate is published, 89 days after the end of the reference quarter (T+89), well over 90% of the data is available. It is worth noting, however, that it is not the additional fraction of data that a delay would make available that matters, but rather its information content. The information that presently goes into the preliminary estimate reflects predominantly just the first two months of the quarter. The extra 15% of information made available by waiting another 10 days is largely for the third month of the quarter and so would be particularly valuable if there is a sharp change in the overall growth rate of the economy between the second and third months, e.g. following the collapse of Lehman Brothers in September 2008.

Chart 2.A: Availability of data for each GDP measure from the end of the reference quarter



Source: Office for National Statistics calculations. Note: CP refers to current prices, VM refers to volume measures.

2.16 Could a slightly later publication of the preliminary estimate lead to a material reduction in the magnitude of subsequent revisions? European regulations presently would not prevent that, though they do require ONS to submit the second and third estimates by two and three months after the end of the quarter.⁵ There is a proposal to require the submission of preliminary estimates around a month after the end of the quarter, though that is likely only to be for the purposes of calculating an EU-wide GDP estimate. But in any case, ONS argues that delaying the first estimate by even one or two months would not lead to a substantial improvement as revisions between the preliminary estimate and third estimate are typically just 0.1 or 0.2 percentage points in either direction, with no statistically significant evidence of bias.⁶

2.17 Using current data sources, a delay from, say, T+25 to T+35 would yield little additional expenditure or income data. However, if — as discussed in Chapter 3 — greater use is made of alternative data sources, such as HM Revenue & Customs (HMRC) administrative data, that might no longer be the case. So new data sources could also change the optimum date for publishing the initial estimate of GDP.

International Comparisons of GDP revisions

2.18 As noted earlier, several users voiced concern about the size of revisions to UK GDP estimates. And in some quarters, there appears to be a perception that ONS's track record has deteriorated and is poor relative to its peers in other jurisdictions.

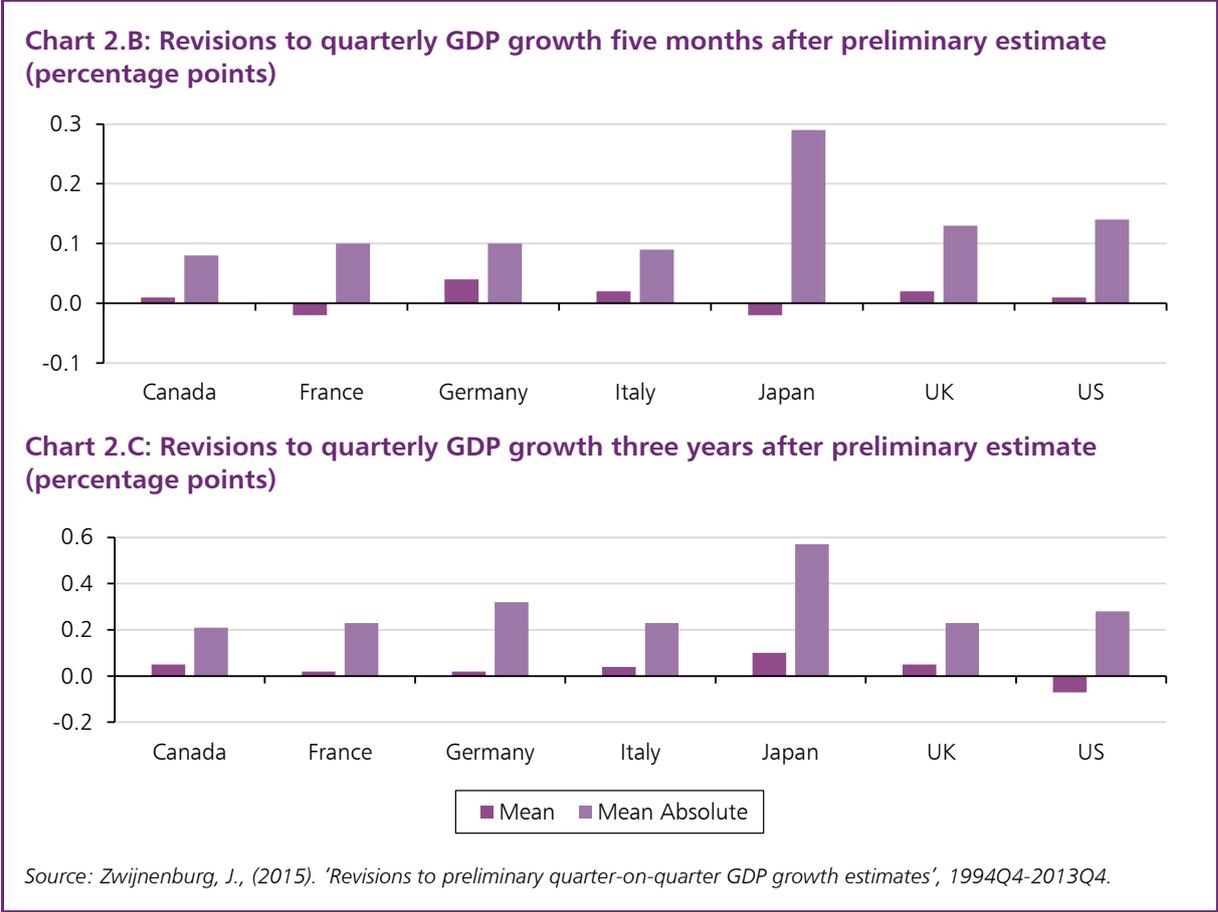
2.19 The OECD has recently examined mean revisions and mean absolute revisions to GDP (and its components) for 18 developed countries.⁷ Mean revisions — the average size of revisions to

⁵ Eurostat, (2010). 'European system of accounts - ESA 2010 - Transmission programme of data'. Available [here](#).

⁶ Walton, A., (2014). 'Revisions to GDP and components'. Available [here](#).

⁷ Zwijnenburg, J., (2015). 'Revisions of quarterly GDP in selected OECD countries,' *OECD Statistics Brief*, No. 22. Available [here](#).

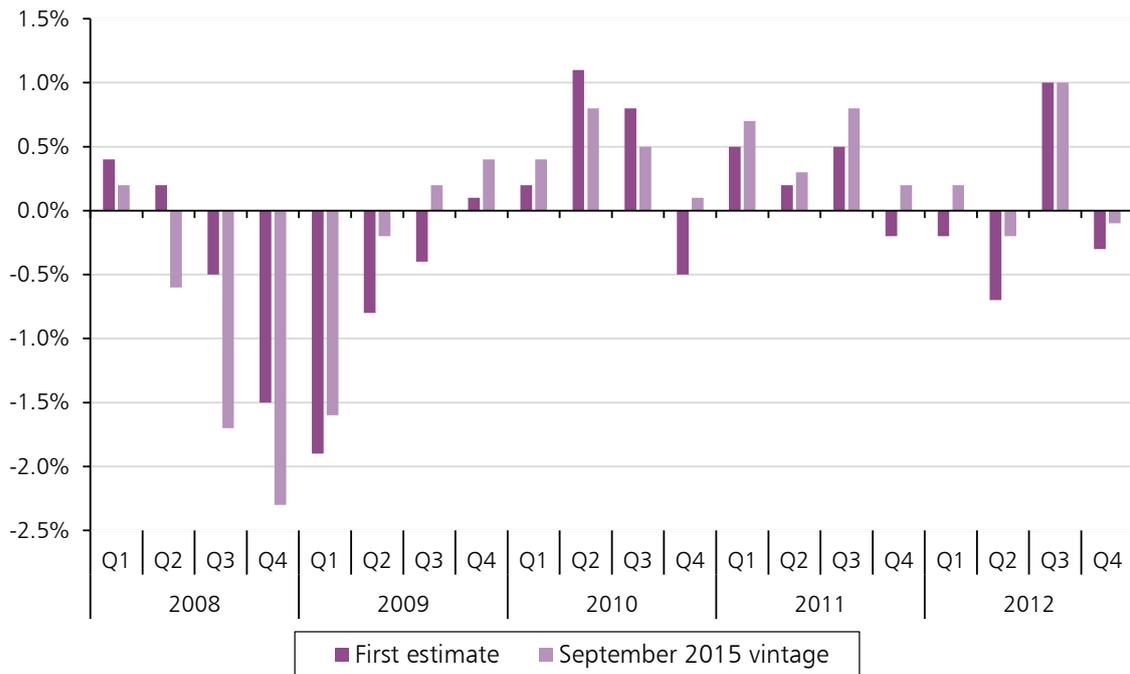
estimates within a given period after the first estimate — will reveal whether there is a tendency on average to revise the data up or down. Mean absolute revisions — the average of the revisions irrespective of sign — will then capture the overall reliability of the initial estimates. The research concluded that, for windows spanning five months to three years after the first estimate of quarterly GDP growth, the UK actually had one of the lowest mean revisions across all 18 countries, and mean revisions broadly in line with the G7 (Charts 2.B and 2.C show the results for the G7). Moreover, the mean revisions to quarterly and annual growth rates were not statistically different from zero. And as far as mean absolute revisions to quarterly growth go, the UK is again one of the best performers (see Chart 2.B and 2.C again).



2.20 These findings are somewhat at variance with the perception that ONS performance has been unusually poor. This could just be the result of users being unaware of the experience in other countries. Or it could reflect frustration with revisions at times of particular economic importance.⁸ For instance, Chart 2.D shows how estimates of GDP growth during the Great Recession have been revised, including large revisions around the turning points between 2008 and 2009 and the elimination of the 2012 ‘double-dip’ recession. Revisions to such isolated but important events are likely to colour users’ perception of the reliability of the statistics but would not be well captured by the mean revisions used in the OECD analysis.

⁸ Taylor, C., and Wales, P., (2014). ‘Economic Review, August 2014’. Available [here](#). Figure 6 illustrates that GDP revisions are larger when output is also more volatile.

Chart 2.D: Revisions to quarter-on-quarter GDP growth, 2008 to 2012



Source: Office for National Statistics

2.21 Alternatively, a belief that UK data are particularly prone to revision may reflect revisions that take place beyond the three-year window. As little new information accrues so long after the quarter ends, such revisions are likely to be the result of methodological changes. And there is indeed evidence that UK revisions are larger than in other countries when later estimates are involved. Bank of England analysis comparing average revisions between the UK T+89 estimate of quarterly GDP growth and the estimate five years later found that early estimates tended to be revised up on average.⁹ And European Central Bank analysis comparing the first estimate of quarterly GDP growth to the latest estimate over the period 1999 to 2006 found evidence that estimates were revised up on average, and that the mean revision was larger in the UK than in a number of other developed countries.¹⁰ Finally, Citi Research has examined revisions to annual GDP growth between the first and latest estimates over 1999 to 2012.¹¹ Again, the authors find that the UK is subject to both the largest mean revision and largest absolute mean revision in the G7.

2.22 It is not altogether surprising that methodological changes on average lead to upward revisions to GDP growth. It will frequently be the case that new industries or business models are poorly captured by the extant statistical methodology. But over time, as the new industries become better appreciated, so the methodology will be updated to capture them, resulting in an increase in measured activity. In this sense, GDP is a constantly moving target.

2.23 But why might revisions due to methodological changes be greater here than elsewhere? One can think of at least a couple of possibilities:

- A larger proportion of UK output, relative to other countries, is driven by new and innovative activities that are gradually being captured by methodological improvements

⁹ Cunningham, A., and Jeffery, C., (2007). 'Extracting a better signal from uncertain data,' *Bank of England Quarterly Bulletin 2007 Q3*. Available [here](#).

¹⁰ Branchi, M., Dieden, H., Haine, W., Horvath, A., Kanutin, A., and Kezber L., (2007). 'Analysis of revisions to general economic statistics,' *European Central Bank Occasional Paper Series*, No 74. Available [here](#).

¹¹ Saunders, M., Fordham, T., and O'Kelly, A., (2015). 'UK Economics Weekly: Balancing Economic and Political Uncertainties,' Citi Research

(e.g. the UK has a large financial sector and some recent methodological changes have been designed to capture better value added in financial services).

- The UK has been slower than some other countries to implement the legislated European statistical standards, European System of Accounts (ESA) 1995 and 2010, with the result that recent revisions include a 'catch-up' element.

Box 2.A: Facilitating a historical perspective

Access to historical time series of economic statistics is important to contextualise economic developments and learn from past policy mistakes. Historical data helps users to understand how the structure of the economy has evolved, the relationships between key variables, and the impact of policy. However, methodological improvements and changes to the availability of data sources mean that there are typically structural breaks in historical time series of any length. For example, the update to the latest industrial classification, which introduced much-needed improvements to the measurement of services, also created obstacles to extending a number of time series back prior to 1997. The limited back series is a limitation on looking at more than just one recession and recovery period.

While some progress has been made in reinstating consistent historical time series, user feedback suggests further efforts are necessary. But methodological changes need to be applied to the past with caution to ensure the revised time series remain consistent with other economic indicators at the time. Given this, it is important that ONS ensures that older vintages of data constructed according to earlier methodologies remain available to users, together with appropriate commentary about the nature of the structural breaks. Moreover, such earlier vintages also provide the basis for studying statistical revisions and the context in which historical policy decisions were made.

Where consistent historical series are not yet available, ONS should also respond to user demand by providing data series that splice data from either side of the structural break, together with appropriate commentary. Though methodologically not entirely satisfactory, many users employ similar methods themselves and provision of spliced data series would help to standardise series across users and avoid duplication of effort.

The production of GDP estimates

2.24 The Barker-Ridgeway Review lays out the process underlying the production of the GDP figures in some detail. The preliminary estimate of GDP is based entirely on the output approach, using turnover data as a proxy for value added. A key reason for this is the limited information on expenditure and income available at the time of release. After the preliminary GDP estimate, some of this information becomes available, which is then used to inform subsequent releases.

2.25 The output measure remains the dominant driver of the early estimates of GDP. Information about expenditure and income have almost no influence on the reported path of GDP until the Supply and Use Table balancing exercise that takes place during the preparation of the Blue Book some 18 months after the end of the year in question.⁴

2.26 There are three particular issues relating to the construction of the output measure that warrant discussion. The first is that the measures of intermediate consumption used within the balancing process are no longer reliable. The second relates to the prices used to construct the measure of real intermediate consumption. The third relates to the dominance of the output information in the construction of early estimates of GDP.

The measurement of intermediate consumption

2.27 The Purchases Inquiry gathers the data required for the Supply and Use Table matrix that shows industries' intermediate consumption broken down by product. Such data needs to be updated fairly regularly in order to reflect the changing structure of production. However, the Purchases Inquiry was abandoned in 2007 in order to reduce costs. For subsequent years, intermediate consumption is calculated by carrying forward appropriate input/output ratios from the last Purchases Inquiry in 2004, supplemented by information from the Annual Business Survey which contains some more timely data on businesses' intermediate consumption. The corresponding product values may also be adjusted in the light of other production, expenditure and income information. Estimates of industries' intermediate consumption consequently fall short of EU best practice of updating the supply-use information at least every five years.

2.28 The use of outdated information on the flows of products between sectors is a major concern when substantial changes are taking place in the production structure, and the past decade has hardly been one where that structure has stood still. Advances in information and communications technology have led to the emergence of wholly new industries. It has also changed the way existing businesses are organised, including the facilitation of outsourcing.¹² Moreover, the financial crisis also might have prompted substantial changes in the way businesses operate.¹³ Finally, there have been significant movements in commodity prices and the value of sterling which are likely to have affected businesses' production decisions.

2.29 The Barker-Ridgeway Review recommended that ONS reinstate the Purchases Inquiry or else use some alternative source of information on inputs that captures the most significant changes. And in its assessment of the National Accounts, UKSA noted that ONS could go further in tackling this issue.¹⁴ ONS is currently developing a new Purchases Inquiry in order to provide updated data on product use. Under current plans, the first returns will be requested in 2016 so the new data will not be incorporated until Blue Book 2018. It is crucial that this does not slip. ONS could also usefully investigate whether alternative data sources, such as firm turnover and purchases information from HMRC VAT data, could provide additional information.

Double vs single deflation

2.30 The correct method of calculating value added in volume terms (recognised by European regulation) is by 'double deflation'.¹⁵ Under double deflation, real value added is estimated as the nominal value of output deflated by a price index for output less the value of inputs deflated by a corresponding input price index.¹⁶ But because it lacks reliable data on input prices, in particular for corporate services, ONS presently uses double deflation only in the estimation of output for the agriculture and electricity industries. Elsewhere it applies single deflation, deflating both the nominal values of inputs and outputs by indices of output prices. By contrast, some other countries, such as the US, produce industry accounts that are fully double-deflated.

2.31 It is acknowledged that current ONS practice may give rise to potential distortions in estimating both aggregate real GDP and the relative contribution of each industry to that

¹² See e.g. Abramovsky, L., and Griffith, R., (2006). 'Outsourcing and Offshoring of Business Services: How Important is ICT?' *Journal of the European Economic Association*, MIT Press, vol. 4(2-3), p.594-601, 04-05

¹³ Gulati, R., Nohria, N., and Wohlgezog, F., (2010). 'Roaring Out of Recession,' *Harvard Business Review*, March. Available [here](#).

¹⁴ UKSA, (2015). 'Assessment of Compliance with the Code of Practice for Official Statistics –the UK Annual and Quarterly National Accounts,' assessment report 299. Available [here](#).

¹⁵ European System of Accounts 2010. Available [here](#). The term "double deflation" might be better expressed as "double indicator method", since it also encompasses methods that are based on volume extrapolation. The essential point of double indicator methods is that separate, independent, estimates for the volume of output and intermediate consumption of an industry are made

¹⁶ Except where direct volume indicators can be used, avoiding the need for deflation.

aggregate.¹⁷ Single deflation implicitly assumes that prices for intermediate consumption rise at the same rate as for output. Single and double deflation estimates will therefore differ whenever this assumption is not fulfilled.¹⁸ When the change in the input price index is greater than the change in the output price index, the growth in real value added measured by double deflation will be greater than that obtained by using single deflation (and vice versa). For instance, the rise of China as a goods producer has resulted in downward pressure on the prices of goods relative to services.¹⁹ Single deflation in the goods sector will deflate inputs only by the prices of goods, and neglect the relative prices of services. Since the majority of the inputs are services, single deflation is likely to lead to an overstatement in real intermediate consumption and an understatement of real value added in the goods sector.

2.32 Furthermore, differences in real value added using double deflation instead of single deflation are more striking when data become more disaggregated. Within a single industry, differences in the inflation rates of input and output prices are larger than in the aggregate. Therefore single deflation potentially results in biased estimates of output and productivity at the industry level.

2.33 Recent work by ONS explores the use of double deflation utilising data from the Annual Business Survey.²⁰ This study revealed large differences compared to measures provided in the National Accounts. In particular, double deflation tends to produce more volatile estimates of gross value added than single deflation.²¹

2.34 The difference between double and single deflated volume measures can be substantial. For instance, a study by the US Bureau of Economic Analysis shows that single deflation gives misleading results when substantial changes in prices for intermediate inputs are not passed through to output prices.²² This can happen when growth is changing sharply or there are large movements in exchange rates or commodity prices. For instance, the US Bureau of Economic Analysis study finds that single deflated measures would have yielded markedly stronger growth in the US in the last quarter of 2008. The study also shows that, for particular industries, the impact of different inflation rates for input and output prices can be substantial. For instance, in computer manufacturing, the downward bias from single deflation in the quarterly rate of growth was larger than ten percentage points in some quarters.

2.35 Developing input price measures that would allow ONS to adopt the double deflation methodology should improve the measurement of real GDP and, since the bias arising from single deflation is different in each industry, the relative contribution of industries to the UK total. The Barker-Ridgeway Review attached high priority to developing double deflation estimates. The National Accounts Medium-Term Work Plan 2015–18 recognises that the development of annual volume-based balanced Supply and Use Tables is a key long-term objective for the UK National Accounts.²³ ONS aims to have integrated Supply and Use Tables at

¹⁷ See e.g. [here](#). Also note that in presence of single deflation, the growth of real GDP measured from the output side will not equal the same growth rate measured from the expenditure side, even in the absence of errors and omissions (see Oulton, N., (2004). 'A statistical framework for the analysis of productivity and sustainable development'. Paper prepared for the Allsopp Review of Statistics for Economic Policymaking).

¹⁸ See e.g. Stoneman, P., and Francis, N., (1994). 'Double Deflation and the Measurement of Output and Productivity in UK Manufacturing 1979-89,' *International Journal of the Economics of Business*, vol. 1(3), p.423-437 and Cassing, S., (1996). 'Correctly Measuring Real Value Added,' *Review of Income and Wealth*, Series 42, Number 2, June.

¹⁹ See e.g. Carney, M., (2015). Remarks at the Economic Policy Symposium hosted by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming. Available [here](#).

²⁰ Franklin, M., and Murphy, J., (2014). 'Labour Productivity Measures from the ABS, 2008-2012,' ONS. Available [here](#). Note that this article measures approximate value added (turnover less non-employment business costs) from business accounts which is conceptually different that gross value added as defined in the National Accounts along various dimensions.

²¹ This phenomenon is identified in OECD, (2001). 'Measuring Productivity – OECD Manual' as a likely consequence of double deflation and in part reflects the higher volatility in intermediate input prices.

²² Robbins, C., Howells, T., and Li, W., (2010). 'Experimental Quarterly U.S. Gross Domestic Product by Industry Statistics,' *BEA Briefing*. Available [here](#).

²³ ONS, (2015). 'National Accounts Mid-Term Work Plan 2015-2018'. Available [here](#).

previous year's prices into the production process by Blue Book 2018.²⁴ This will signify forward progress towards the production of double deflated volume measures, even though Supply and Use Tables at previous year's prices will be produced under single deflation at first. ONS is still considering the best approach to transition to double deflation and systems limitations mean that implementation is not planned before 2020.

²⁴ Note that the next development of Supply and Use Tables in previous year's prices are constrained to yearly balancing process so as to fulfil the mandated requirement of ESA 2010. However, quarterly balancing process is feasible subject to modelling assumptions.

Box 2.B: Bias from double deflation – some simple arithmetic

This box illustrates the source of the bias that might arise from the measurement of GDP under single deflation. To do so, a relationship between single and double deflation under simplifying assumptions is derived first for a basic two industry economy and then generalised to a more realistic environment. In what follows it is assumed that the difference between one industry's purchasers' and input prices is negligible and without chain-linking. For simplification, it is also assumed that each industry produces a single good which is either used as intermediate or final consumption.

Two industry economy

Consider a simple economy with two industries A and B and focus on industry A's value added. Define:

- Nominal gross output in industry A with $GO_{A,t}^N$,
- Intermediate input supplied from industry A to industry A with $IC_{A \rightarrow A,t}^N$
- Intermediate input supplied from industry B to industry A with $IC_{B \rightarrow A,t}^N$

Nominal value added in industry A is:

$$GVA_{A,t}^N = GO_{A,t}^N - IC_{A \rightarrow A,t}^N - IC_{B \rightarrow A,t}^N$$

Single deflated value added for industry A is then defined as:

$$GVA_{A,t}^{R:SD} = \frac{GVA_{A,t}^N}{P_{A,t}}$$

Whereas double deflated value added is defined as:

$$GVA_{A,t}^{R:DD} = \frac{GO_{A,t}^N}{P_{A,t}} - \frac{IC_{A \rightarrow A,t}^N}{P_{A,t}} - \frac{IC_{B \rightarrow A,t}^N}{P_{B,t}}$$

With some simple algebra one can get an expression for the bias arising from single deflation:

$$\frac{GVA_{A,t}^{R:SD}}{GVA_{A,t}^{R:DD}} - 1 = - \left(\frac{P_{B,t}}{P_{A,t}} - 1 \right) \frac{IC_{B \rightarrow A,t}^R}{GVA_{A,t}^{R:DD}}$$

where $IC_{B \rightarrow A,t}^R = IC_{B \rightarrow A,t}^N / P_{B,t}$. Therefore the bias depends on the relative price between the two industries and is proportional to the importance of industry B as input supplier to industry A. In order to gauge how important this bias is in practice, it is useful to make some additional simplifying assumptions. Specifically, assume that in the short run the input-output shares are constant (or that their variation is small compared to the variability of output growth and the relative prices). This would be the case if the elasticity of substitution between the input from two different industries is very low, which is likely to be the case in practice. Taking a first-order approximation of the relationship above, it is then possible to derive a relationship between the growth rate of real value added of industry A calculated under single and double deflation ($g_{A,t}^{SD}$ and $g_{A,t}^{DD}$ respectively):

$$g_{A,t}^{DD} - g_{A,t}^{SD} = \omega_{B \rightarrow A} \frac{IC_A^N}{GVA_A^N} (\pi_{B,t} - \pi_{A,t})$$

where $IC_A^N = IC_{A \rightarrow A}^N + IC_{B \rightarrow A}^N$ and $\omega_{B \rightarrow A} = IC_{B \rightarrow A}^N / IC_A^N$ denotes the share of input material supplied from industry B over the nominal value of total input used in industry A's production and $\pi_{j,t}$ denotes inflation of industry j (therefore $\pi_{B,t} - \pi_{A,t}$ denotes the change in the relative price). This equation illustrates the single deflation bias. The growth of single deflated GDP is a downwardly biased estimate of the correct double deflated statistics whenever the inflation of the input industry is higher than that of the industry of interest.

Bias in a single industry in presence of multiple industries

It is possible to generalise the relation above to a multi-industry environment. For any industry i the bias from single deflation can be shown to be:

$$g_{i,t}^{DD} - g_{i,t}^{SD} = \frac{IC_i^N}{GVA_i^N} \sum_{j \neq i} [\omega_{j \rightarrow i} (\pi_{j,t} - \pi_{i,t})]$$

The size of the bias in each industry depends on two factors. First, the bias tends to be larger the larger is the value of intermediate input for each unit of value added. To give an order of magnitude to this multiplier it is useful to note that, on average, about three-fifths of gross output in every industry is used as intermediate consumption in other industries, which implies a multiplier equal to 1.5. Second, it depends on the input-output structure of the economy and relative inflation rates.²⁵ As a result, when looking at the rate of growth of the entire economy the overall bias can be equal to zero, if biases of different signs cancel each other out when considering the entire set of intermediate inputs into production.

The bias in the information services industry

In order to illustrate the bias it is helpful to look at a specific case. For instance Patterson highlights how one industry that has displayed relatively weaker measured productivity growth in the post-recovery period is 'Information and Communication Services'.²⁶ The fact that this apparently dynamic and innovative industry displays weaker productivity growth is quite remarkable.

Focusing on Information Services (SIC 63) in 2013,²⁷ it is possible to derive the bias associated to single deflation from the formula above. The implied GVA deflator is taken as a proxy for the prices of the industry. The prices of intermediate inputs are computed from product-level deflators.²⁸ In doing so, one can match the definition of the product to industry flow of inputs in the Supply and Use Tables. Applying the formula above to this data results in a bias for this particular industry of around five percentage points. This implies that the growth rate of double deflated value added for Information Services could be almost a half higher than the measured rate of growth under single deflation (which is roughly 11%).

The dominance of output in early estimates of GDP

2.36 The Barker-Ridgeway Review noted the limited use of information relating to expenditure and income in the early estimates of GDP and the heavy reliance on turnover data. While ONS has traditionally seen this as the most reliable source of information on movements in activity in the short term, it assumes that there is a close relationship between movements in turnover and value added. We saw above that this not be the case when growth is changing sharply or there are significant movements in relative prices. Moreover, the quality of the volume measure of activity is intrinsically linked to the quality of the price indices used to deflate turnover. As discussed below, measuring corporate services prices is especially challenging. As a result, countries such as the US put more weight on expenditure information in constructing early estimates of GDP.²⁹

2.37 In principle, one can envisage a system where the full breadth of data available feeds into aggregate GDP estimates based on their relative reliability, with the latter depending on the economic environment. The question is whether there is scope to improve the accuracy of early estimates of GDP by the utilisation of other sources of data on production, expenditure and income.

2.38 Administrative data already held in various parts of the public sector holds particular promise in this regard. For instance, monthly VAT returns to HMRC on turnover and purchases of individual businesses, matched through an improved business register, has the potential to greatly enhance the output measure of GDP, as well as the consumption component of the expenditure accounts.³⁰ Similarly, income tax data held by HMRC presents an opportunity to

²⁵ Input-output matrices tend to be sparse with relatively few input suppliers for each of the industries in the economy. See e.g. Acemoglu, D., Carvalho, V., Ozdaglar, A., and Tahbaz-Salehi, A., (2012). 'The Network Origins of Aggregate Fluctuations,' *Econometrica*, vol. 80(5), p.1977-2016, 09

²⁶ Patterson, P., (2012). 'The Productivity Conundrum, Explanations and Preliminary Analysis'. ONS. Available [here](#).

²⁷ 2013 is the last year with available data on Supply and Use Tables. We consider combined intermediate consumption matrices. Also, since 2012 is the base year, focusing on 2013 allows this simple analysis to avoid issues related to chain-linking when exploring inflation rates.

²⁸ Product level deflators were obtained from ONS and are not publicly available.

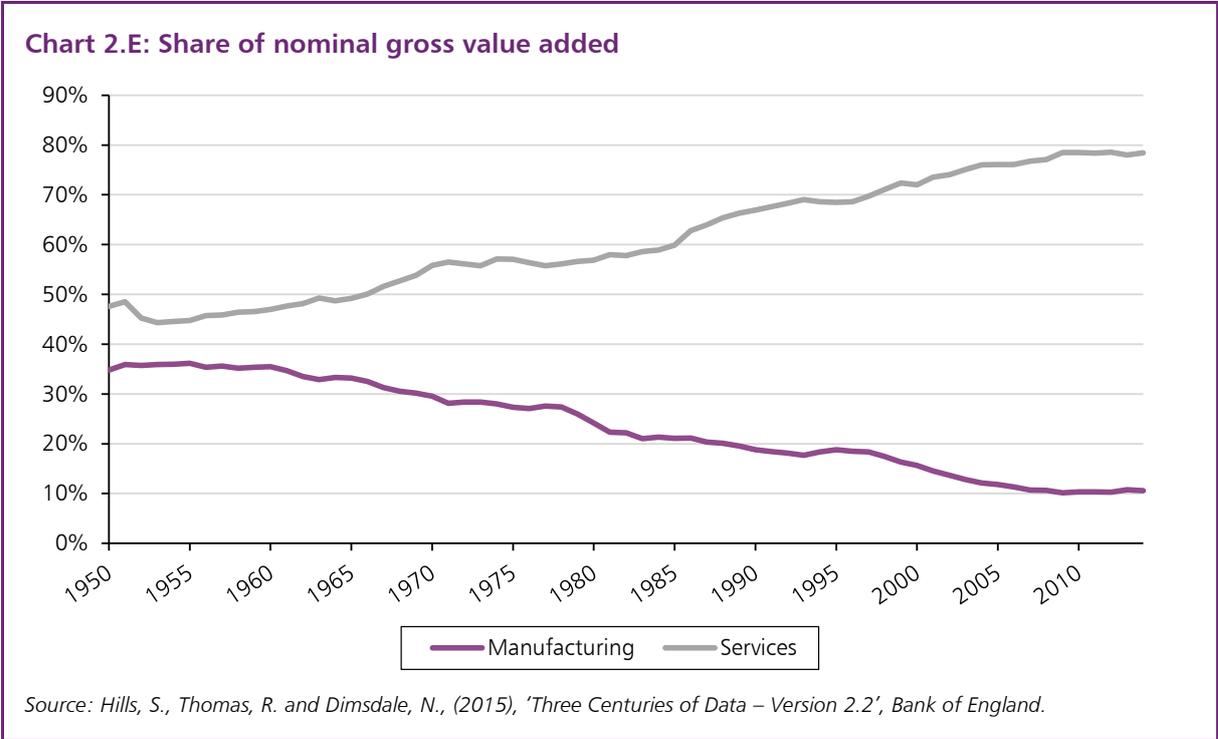
²⁹ Landefeld, J., Seskin, E., and Fraumeni, B., (2008). 'Taking the Pulse of the Economy: Measuring GDP', *Journal of Economic Perspectives*, vol. 22(2), p.193-216, Spring. In the US, headline GDP is entirely based on the expenditure approach. Furthermore, from mid-2015 the Bureau of Economic Analysis began publishing a new measure of U.S. output which averages GDP(E) and GDP(I), therefore excluding GDP(O) (see e.g. Council of Economic Advisers (2015). 'A Better Measure of Economic Growth: Gross Domestic Output (GDO),' Council of Economic Advisers Issue Brief, July. Available [here](#)).

³⁰ ONS, (2015). 'Feasibility study into the use of HMRC turnover data within Short-term Output Indicators and National Accounts'. Available [here](#).

derive monthly estimates of compensation of employees.³¹ HMRC tax data also offers the potential to capture activities that fall below the threshold to be included in many sampling frameworks, e.g. sole traders. And investment and export statistics currently relying on survey data could potentially be improved by exploiting HMRC data on investment allowances and exports of services by UK firms to the European Union (EU). The steps needed to make this feasible are discussed further in Chapter 3.

Measuring services

2.39 Economic statistics are always likely to lag behind changes in the structure of the real economy. It was ever this – Diane Coyle notes that, “at the height of the industrial revolution, official statistics provided scant information about the dynamic manufacturing economy.”³² When the National Accounts were first developed, manufacturing accounted for a large share of UK economic activity. Since then, the provision of services has become increasingly important, so that by 2014 services accounted for over three-quarters of gross value added and over four-fifths of employment (see Chart 2.E). Expenditure on services also accounts for about half of households’ share of consumption. It is usually the case that official statistics adapt to such changes in the economy with some delay.



2.40 Services encompasses a wide range of activities, including people-focused services (such as healthcare and education), the handling of goods (such as retail and transport services) and the provision of advice (such as financial and legal services). Its sheer size makes the proper measurement of services critical to understanding UK economic performance. But measuring the output and prices of services is inherently more difficult than for goods as, in contrast to goods, the basic unit of production for services is often hard to define. Services are frequently tailored to a particular consumer’s requirement and such customisation makes it hard to compare like with like and thus to construct an appropriate price index. This affects not only the

³¹ The introduction of Pay As You Earn (PAYE) Real Time Information represents a fundamental reform, requiring (from April 2013) all UK employers to notify HMRC of their liability to PAYE at the time or before they make payment to their employees.

³² Coyle, D., (2015). 'Modernising Economic Statistics: Why It Matters', *National Institute Economic Review* No. 234

measurement of consumer services, but also business services and thus the construction of intermediate consumption.

2.41 The 2004 Allsopp Review accorded high priority to better measurement of services.³³ There has been considerable progress since then, and ONS is closer to international best practice than most other NSIs in the measurement of services. For example, ONS was a pioneer in developing a monthly indicator of services activity (the Index of Services), akin to the long-standing Index of Production.³⁴ Even so, the recent Barker-Ridgeway Review noted that significant challenges remain.

Challenges in measuring services

2.42 To begin with, the breakdown of services is much less rich than for the production of goods. On the one hand, manufacturing is broken down into 24 industries. On the other hand, services is broken down into just 52 industries despite accounting for almost eight times the total output of manufacturing. Moreover, the separation between services and manufacturing is at best imprecise given that output is classified under the primary activity of the firm. Many businesses that are classified as goods producers also provide a service, such as after-sales care. In some cases, these are a significant source of revenues.³⁵

2.43 The absence of a detailed survey of services prices, analogous to the PRODCOM survey for manufacturing, is also a weakness. Inadequate detail in prices means that the corresponding output trends may be obscured. Indeed, the absence of good price indices for business-to-business services is one of the impediments to the volume balancing of the National Accounts (see earlier section on GDP).

2.44 These challenges in measuring services activity are likely to intensify as the economy evolves. New digital technologies, such as increasingly powerful and portable electronic devices, represent powerful enablers for the provision of services, e.g. the streaming of entertainment services.³⁶ Moreover technological innovation also increases the scope for mass customisation to fit specific consumer preferences, leading to greater variety across services.

2.45 Advances in information technology also facilitate increased international trade in services and even quite specialised services can now be supplied over the internet from anywhere in the world.³⁷ This poses particular problems for NSIs as it becomes harder to track the destination of trade flows. For trade in goods, customs controls generates data that can be used to inform estimates of trade volumes and values. At present, ONS mainly relies on the International Trade in Services Survey in estimating services trade, but the coverage is not as comprehensive as for trade in goods. However, exports of services by UK firms to the EU also require an HMRC return. There is potential to exploit this data to improve estimates of exports of services to the EU, as well as to improve the sample frame for existing surveys.

2.46 The size and growing importance of the services sector provides a compelling case for devoting more resources to improving its measurement. In addition, ONS should press the case for the next industrial classification system to provide a richer picture of services activity.

Measuring financial services

2.47 The UK has a particularly large financial services sector, accounting for 7.6% of total value added. However, the measurement of financial services poses particular issues. The financial

³³ Recommendation 60 of Allsopp, C., (2004). 'Review of Statistics for Economic Policymaking: Final Report'. Available [here](#).

³⁴ The first publication of the monthly statistics was in 2000 as an experimental series. Available [here](#).

³⁵ Lord Sainsbury of Turville, (2007). *The Race to the Top: a review of Government's science and innovation policies*. The Stationery Office: London.

³⁶ As argued in a recent report by the Royal Society (2014). 'Hidden Wealth: the contribution of science to service sector innovation'. Available [here](#).

³⁷ Coyle, D., (1997). *The Weightless World: Strategies for Managing the Digital Economy*. Massachusetts Institute of Technology Press and Friedman, T. (2007). *The world is flat, 3.0: a brief history of the twenty-first century*. Picador, London

industry intermediates funds from lenders to borrowers and produces, trades and settles financial contracts. However, unlike many other services providers, banks and other financial intermediaries generally do not rely on direct fees to generate revenues but rather on the margin between what they pay for funds and what they earn on their use (the spread).

2.48 The 1993 System of National Accounts reform recognised this by introducing a concept of 'financial intermediation services indirectly measured' (FISIM), subsequently incorporated into the UK National Accounts with the 2008 Blue Book. Broadly speaking, FISIM is imputed as the interest rate margin between the lending (deposit) rate and a short-term risk-free reference rate, multiplied by the value of the stock of loans (deposits).³⁸ The chained volume measure of FISIM is then the interest rate margin in the base year multiplied by the nominal stock of loans or deposits deflated by the GDP deflator.

2.49 An allied issue is whether to treat value added in financial services as final or intermediate consumption. In line with European regulations, activity is counted as intermediate consumption (and therefore a cost of production) when the services are attributed to domestic businesses and government. But it is treated as final output (thereby adding to GDP) when provided to households and non-residents.³⁹

Challenges in measuring financial services

2.50 An important limitation of FISIM lies in its inadequate treatment of risk. The margin a bank charges on its loans over what it can earn by investing instead in a risk-free asset is meant to cover not just any costs of administering the loan but also the risk of default. The loan spread will therefore be higher if the perceived risk of default rises. But the existing approach nonsensically treats this as an increase in the value of intermediation services provided. Several studies have shown the consequence of allowing for risk can be substantial. For instance, one study showed that the current methodology overstates imputed bank output in US by almost a half, equivalent to 0.3% of US GDP.⁴⁰ A similar exercise for the euro area obtained comparable figures.⁴¹

2.51 Movements in the interest rates used in FISIM calculations can also generate counterintuitive effects on estimates of banking-sector output. For instance, the UK financial sector recorded its fastest growth on record in the final quarter of 2008, the period just after Lehman Brothers went bankrupt!⁴² But this was merely an artefact of the spike in short-term market interest rates that occurred as risk premia exploded.⁴³ As a consequence, FISIM measures as presently calculated are in general likely to be unreliable during episodes of financial stress. Recognising this, in 2013 the US Bureau of Economic Analysis introduced an adjustment for risk into its calculation of FISIM.⁴⁴ There are strong grounds for exploring the implications of making a similar adjustment to UK data.

2.52 Another limitation of FISIM is that the *quality* of service (i.e. banks' screening and monitoring processes) remains completely unaccounted for. The post-crisis tightening in loan

³⁸ This is an application of the theory of the user cost of money. See e.g. Diewert, W., (1974). 'Intertemporal Consumer Theory and the Demand for Durables,' *Econometrica* 42, May, p.497-516

³⁹ Akritidis, L., (2007). 'Improving the measurement of banking services in the UK National Accounts' *ONS Economic & Labour Market Review*, Vol 1, No 5. Available [here](#).

⁴⁰ Basu, S., Inklaar, R. and Wang, J., (2011). 'The Value of Risk: Measuring the Service Income of U.S. Commercial Banks,' *Economic Inquiry*, vol. 49(1), pages 226-245

⁴¹ Colangelo, A., and Inklaar, R., (2010). 'Banking sector output measurement in the euro area - a modified approach,' Working Paper Series 1204, European Central Bank

⁴² For example, see Coyle, D., (2014). *GDP: A Brief but Affectionate History*, Princeton, NJ: Princeton University Press

⁴³ See e.g. Brunnermeier, M. (2009). 'Deciphering the Liquidity and Credit Crunch 2007-2008,' *Journal of Economic Perspectives*, vol. 23(1), p77-100, Winter

⁴⁴ Hood, K., (2013). 'Measuring the Services of Commercial Banks in the National Income and Product Accounts: Changes in Concepts and Methods in the 2013 Comprehensive Revision,' *Survey of Current Business*, 93, No. 2 (February), 8-19

standards alongside the tightening in regulation should reduce the risk of financial instability. It is thus akin to a 'quality improvement' in intermediation, but this is not recognised in the calculation (the point is equally valid for the insurance industry).

2.53 While the current treatment of financial services is governed by European standards,⁴⁵ it appears that the current practice is an area that is likely to come under scrutiny when the international standards are next revised. Until then, there is scope for ONS to investigate alternative approaches to remedying the deficiencies inherent in the present calculation of FISIM, with a view to playing a leading role in shaping the next generation of international standards.

Measuring public sector services

2.54 The effective provision of public services is a major responsibility of government and accounts for around a fifth of GDP. But NSIs face a particularly difficult problem in measuring value added by the public sector. While the 'price' of financial services is often only implicit, most public services are provided free or with only a token charge. Hence there is usually no price, either explicit or implicit. Moreover, there is no measure of final expenditure on such services, although there is information on costs. So the conventional approach to constructing a measure of real value added — deflating nominal output and inputs by suitable price indices and then netting off the latter — is infeasible.

2.55 Before discussing ways of dealing with this, it is worth noting in passing that the right approach depends on what the question is. If the interest lies in the welfare consequences of government policies or whether services are delivering value for money, then one wants a measure that looks at outputs net of the cost of generating them, i.e. a value added measure. However, if one is concerned about, say, inflationary pressures, then the value added in public services is of relatively little interest; what matters instead is the claim that the public sector makes on the economy's resources.⁴⁶ Indeed, this is an illustration of the more general point that how best to measure a variable often depends on how that measure will be used.

2.56 Historically, ONS, like most NSIs, solved the problem of a lack of both prices and final expenditure by assuming that the value of the output of public services was the same as the value of the inputs used to produce them — the 'inputs=outputs' approach. Clearly this was unsatisfactory but it was not until 1998, with the introduction of ESA 1995, that ONS began to employ proxies for the output of some parts of the public sector — specifically health, education, and social security administration — with the 'inputs=outputs' approach used for the remainder. For instance, indicators such as the number of patients seen and the number of completed medical procedures were used for measuring health output. Over the subsequent decade, the approach was extended to cover nearly two-thirds of General Government Consumption. However, the proxies employed were open to criticism and there was limited progress to take account of changes in the quality of services provided.

2.57 In 2003, Sir Tony Atkinson was commissioned by the National Statistician to undertake a review of these methods and propose improvements. The reviewer made 54 specific recommendations and led to the creation of the UK Centre for the Measurement of Government Activity in order to pursue Atkinson's vision.⁴⁷ This resulted in significant improvements in the quantity measures of individual public services, as well as the development of quality measures

⁴⁵ ONS is legally compliant with European legislation 549/2013 (European System of Accounts 2010, chapter 14) with respect to the calculation and allocation of FISIM.

⁴⁶ Bank of England, (2004). 'Inflation Report – May (2004)'. Available [here](#). Hills, B., and Thomas, R., (2005). 'The impact of government spending on demand pressure,' *Bank of England Quarterly Bulletin 2005 Q1*. Available [here](#).

⁴⁷ Atkinson, T., (2005). 'Atkinson Review: Final Report - Measurement of Government Output and Productivity for the National Accounts,' Palgrave MacMillan

for health and education. Scoping work on the measurement of the output of communal public services, such as military defence and the criminal justice system, was also carried out. By 2008, the UK was seen as the world leader in this field.⁴⁸ However, budgetary constraints, a loss of expertise and a perception that the low-hanging fruit had all been picked meant that subsequent progress has been limited (see box 3.C), while practice in many other NSIs has caught up.

Challenges in measuring public services

2.58 Despite the progress made immediately following the Atkinson Review, there is still scope for further improvement in measuring outputs and inputs in some parts of the public sector. Moreover the increased focus on efficiency in the delivery of public services has raised the need for reliable measures of public sector productivity. And, as in the market economy, the digital revolution is changing the ways in which public services are delivered and consumed.⁴⁹ This represents another area where more effective utilisation of data already held by other public sector bodies could pay dividends.

2.59 Users raised two particular areas where they thought progress was desirable:

- While adjustment for quality improvements is challenging even in the market sector, it is even more difficult in the public sector. For instance, in the health sector, it is not activity-type indicators, such as the number of consultations or operations, which matter; rather it is the effect of these activities on health outcomes on expected longevity or quality of life. However, it is possible to make progress in this area while also ensuring existing methods remain suitable. Even though ESA 2010 does not currently permit many elements of quality adjustments in the preparation of the National Accounts, there is scope outside of them to develop such adjustments. Some ONS work already available suggests that they can materially affect the productivity picture.⁵⁰
- Measures of public services output as part of the National Accounts are published on the same regular quarterly timetable as the expenditure measure of GDP. However, annual measures of public sector productivity, which reflect quality adjustments to health and education, appear roughly two years after the end of the reference year. Such a long lag reduces the value of the information in public-sector planning. While the lags are in part a consequence of lags in the acquisition of the underlying information, there is perhaps scope for investigating whether other data within the public sector could be used to construct more timely preliminary estimates.

Measuring financial inter-connectedness

2.60 As already noted earlier, the UK financial system is unusually large. It has grown rapidly over the past. In particular, in terms of balance sheet size, the UK financial system is now more than five times larger than at the end of the 1970s and considerably larger, relative to GDP, than other advanced economies (see Chart 2.F).⁵¹ The special position of London as a global financial hub is a key factor behind not only its size, but also its complexity.

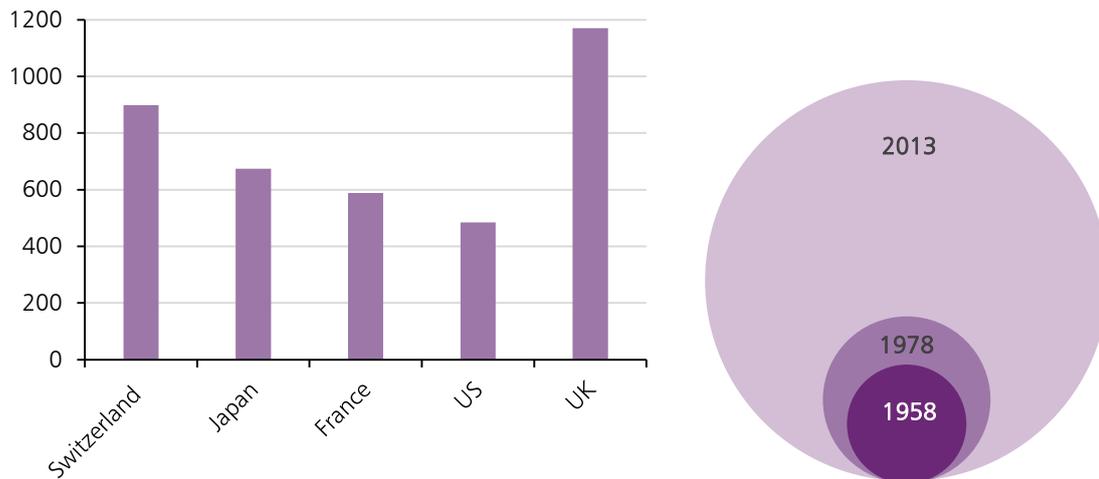
⁴⁸ Statistics New Zealand, (2010). 'Measuring government sector productivity in New Zealand: a feasibility study'. Available [here](#).

⁴⁹ See e.g. the work of the Government Digital Service. Available [here](#).

⁵⁰ ONS, (2015). 'Public Service Productivity Estimates: Total Public Services, 2012'. Available [here](#).

⁵¹ The number would be different, without changing the qualitative picture, if we exclude derivatives from the calculation. See Chart 4 in Carney, M., (2015) 'The European Union, monetary and financial stability, and the Bank of England'. Available [here](#).

Chart 2.F: Size of financial systems as a % of GDP ^a



Source: Bank of England Quarterly Bulletin, vol. 55(2), p. 114-129.

^a Financial system is defined as total assets of the financial corporations sector (measured on an unconsolidated basis, including derivatives) as a percentage of GDP. Data on the left panel are for 2013 for all countries but Switzerland for which data are as of 2012.

The right hand side panel reflects the relative size of the UK financial system.

2.61 The 2007 to 2008 financial crisis underscored the costs of financial instability. Financial stress in a few, or even a single, institution can quickly spread like a virus to the rest of the economy through the nexus of inter-institutional linkages.⁵² Preventing such systemic crisis requires policy makers to have a good view of the risks and how they might cascade through the financial system.

2.62 The financial accounts that accompany the National Accounts present stock positions and flows of assets and liabilities for the constituent sectors of the economy. The 'Flow of Funds' represents a significant enhancement to these accounts by exposing the bilateral debtor/creditor relationships between pairs of sectors (including with the rest of the world). This is sometimes referred to as a 'from-whom-to-whom' presentation of the accounts. The statistics are organised and presented in a format designed to show financial flows among the sectors of an economy (as purchasers or issuers of financial assets) and corresponding financial transactions according to their type.⁵³ Information about financing flows is central to understanding the evolution of assets and liabilities and thus the nature of the financial vulnerabilities.⁵⁴

2.63 The UK, despite the size of its financial sector, presently possesses only an incomplete picture of the bilateral financial relationships between sectors, with an incomplete breakdown of the bilateral 'from-whom-to-whom' transactions and only limited detail on different subsectors within the financial sector.

2.64 The development of financial accounts statistics at the sectoral level has long been a requirement of international statistical regulations. Although not a legal requirement, NSIs are also encouraged to produce 'from-whom-to-whom' matrices for financial transactions, including details of counterparties sufficient to identify the exposure of each sector to the risks in other sectors.⁵⁵ Moreover, the development of these data has been further encouraged by global

⁵² See e.g. Acemoglu, D. Ozdaglar, A., and Tahbaz-Salehi, A., (2015). "Networks, Shocks, and Systemic Risk," NBER Working Papers 20931, National Bureau of Economic Research, Inc.

⁵³ See e.g. International Monetary Fund, 'Overview of the Monetary and Financial Statistics Framework'. Available [here](#).

⁵⁴ See e.g. Bê Duc, L., and Le Breton, G. (2009) "Flow-of-funds analysis at the ECB Framework and applications" European Central Bank Occasional Paper Series No 105. Available [here](#).

⁵⁵ See European System of Accounts 2010, Chapter 5. Available [here](#).

data initiatives, such as the International Monetary Fund's Special Data Dissemination Standard Plus and the G20 Data Gaps Initiative.

UK Flow of Funds: progress to date

2.65 Both the Bank of England and HM Treasury responses to the Call for Evidence reiterated the need for the development of Flow of Funds statistics below sectoral aggregates. This priority has also been recognised by a recent report from UKSA.⁵⁶ Acknowledging the significant work required in extending and improving the quality of the financial accounts, the Barker-Ridgeway Review recommended that an ONS-Bank of England working group be established to set out priorities and develop a work-plan. It also highlighted that new protocols may be required to facilitate the necessary exchanges of information between organisations.

2.66 Progress to date was set out in a joint report by ONS and the Bank of England.⁵⁷ Work has focused on identifying current data availability based on existing data sources used in the compilation of the financial accounts. As a result, a first set of experimental Flow of Funds matrices has been produced (with time-series estimates going back to 1997).⁵⁸ However, the lack of a single firm identifier, as well as the limited access to the full range of administrative data available for regulatory purposes (see Chapter 3), are among the limitations to making full use of the data in matching financial flows to the agents involved. ONS and the Bank of England are currently investigating alternative data sources that could be used to improve these estimates or to fill the gaps in the sectoral matrices. Plans to deliver a full set of matrices alongside the publication of Blue Book 2019 has been identified as a priority by ONS, subject to resources being available.

A forward looking vision

2.67 The access to a detailed breakdown of the institutional sectors with fine detail on assets and liabilities by specific financial instruments, including counterparty information, is essential for the effective evaluation of the risks to financial stability. This information allows a better understanding of the interconnectedness between key players in the financial system, as well as the shadow banking system,⁵⁹ when conducting stress tests.⁶⁰ Moreover, risks tend to build up in the tails of distributions and are thus rarely visible at the aggregate sectoral level. Therefore the ideal Flow of Funds statistics should be constructed bottom-up, with data collected at firm level.⁶¹

2.68 Enabling data to be flexibly interrogated, to reflect country-specific circumstances as well as unforeseen future questions, is critical to enabling regulators to identify new risks promptly. Therefore, a system based on data at the finest level of disaggregation is also a way of 'future-proofing' the financial accounts. The complexity of the system of financial linkages is in constant evolution and in a way that is also often hard to predict. As such, it provides a challenge for the production of useful statistics.

2.69 For example, peer-to-peer (P2P) lending and crowdfunding were virtually non-existent just three years ago, whereas today they are well-established and growing rapidly in importance. The

⁵⁶ UKSA, (2014). 'The Use of Official Statistics by the Financial Services Industry'. Monitoring Review. Available [here](#).

⁵⁷ ONS, (2015). 'The UK Flow of Funds Project: introduction, progress and future work'. Available [here](#).

⁵⁸ ONS, (2015). 'The UK Flow of Funds Project: Comprehensive review of the UK Financial Accounts'. Available [here](#).

⁵⁹ See e.g. Adrian, T., and Shin, H., (2010). 'The Changing Nature of Financial Intermediation and the Financial Crisis of 2007–2009,' *Annual Review of Economics*, vol. 2(1), p.603-618, 09

⁶⁰ See e.g. Battiston, S., Delli Gatti, D., Gallegati, M., Greenwald, B., and Stiglitz, J., (2012). 'Liaisons dangereuses: Increasing connectivity, risk sharing, and systemic risk,' *Journal of Economic Dynamics and Control*, vol. 36(8), p.1121-1141

⁶¹ See e.g. Burrows, O., Low, K., and Cumming, F., (2015). 'Mapping the UK financial system,' *Bank of England Quarterly Bulletin*, vol. 55(2), p.114-129 Available [here](#).

UK alternative finance market (P2P consumer lending) accounted for approximately 3% of UK consumer credit gross lending in 2014. And while UK equity crowdfunding only represented 5% of the alternative finance raised last year, it has been growing rapidly.⁶² Alternative sources of funding are a growing source of finance for firms and individuals, with the development of online technology facilitating the raising of equity or debt finance without relying on banks.⁶³

2.70 The usefulness of aggregate statistics is distinctly limited if the object is to identify misallocation of resources and the accumulation of risk. Instead what is required is an ability to view the elements of the economy with the precision of a microscope. And the benefits of granular financial Flow of Funds data would be greatly magnified if they can be linked to other similarly granular data sources, such as on spending or other financial information. For instance, one explanation of the UK's weak productivity performance since the financial crisis is that the allocation of capital has been impaired.⁶⁴ Being able to link up information on funding conditions, investment and profitability at the level of the firm would allow fuller investigation of this hypothesis.⁶⁵

2.71 Despite having one of the largest and most complex financial systems in the world, the UK's data on the financial sector and financial flows are compiled from less comprehensive sources than in many other advanced economies.⁶⁶ Because of this, most European countries are at a more advanced stage in producing Flow of Funds statistics from granular level data, which equips them to produce higher quality data and respond flexibly to new reporting requirements. While Portugal has a substantially less complex financial system than the UK, the Flow of Funds system constructed by the Bank of Portugal offers an example of how a detailed bottom-up approach to financial accounts statistics can be developed. A key ingredient is a legally-mandated unique tax identification number for each household and business, allowing a wealth of information to be linked.

2.72 Obtaining a high degree of granularity in Flow of Funds statistics requires significant investment in generating new data sources to complement the administrative data that is already collected for private commercial and regulatory purposes.⁶⁷ The data sharing agreements between ONS and the Bank of England also need to be developed so that ONS can access this administrative data easily. Moreover, the Bank of England needs to be granted access to the underlying data, including additional metadata, required to serve all of its statutory functions. Additionally, development of the Inter-Departmental Business Register (IDBR) to include a unique identifier for businesses, fit for all administrative and statistical purposes, would support the success of a detailed Flow of Funds project in particular, as well as to the more general joining-up of business-related information presently scattered across isolated data sets (see Chapter 3).

Regional statistics

2.73 A frequent issue raised in the consultation with users was the need for timelier and more detailed statistics at a finer level of geographical disaggregation.⁶⁸ This is a long-standing need, but one that has become more pressing with the increased emphasis on the devolution of

⁶² NESTA, (2014). 'Understanding Alternative Finance: The UK Alternative Finance Industry Report 2014'. Available [here](#).

⁶³ See e.g. Goldman Sachs (2015) 'The Future of Finance (part 1): The rise of the new Shadow Bank'. Goldman Sachs Equity Research

⁶⁴ See e.g. Caballero, R. J., Hoshi, T. and Kashyap, A., (2008). 'Zombie Lending and Depressed Restructuring in Japan,' *American Economic Review*, vol. 98(5), pages 1943-77, December

⁶⁵ Broadbent, B., (2012). 'Productivity and the allocation of resources'. Available [here](#).

⁶⁶ ONS, (2015). 'The UK Flow of Funds Project: introduction, progress and future work'. Available [here](#).

⁶⁷ To understand the scope of the data collection it might be useful to refer to the Portuguese example. Despite the relatively smaller complexity of the Portuguese financial system with respect to the UK one, The Bank of Portugal note that their systems record monthly information from 204 institutions and with more than 285 thousand non-financial corporations and around 5.8 million private individuals registered as borrowers in the database and 23 million records on credit data are reported, on average, every month. See e.g. Bank of Portugal, (2013) 'A flexible approach to credit statistics: The use of the Portuguese Central Credit Register for statistical compilation'. Available [here](#).

⁶⁸ For simplicity, this section regularly uses "regional" to refer to a number of spatial areas below the UK-wide level – including at the country, regional, city and local levels.

decision-making power to the nations, regions and cities of the UK. The lack of information to diagnose the specific economic challenges facing geographic units below the level of the UK as a whole represents a handicap for policy and business decisions.

2.74 The Allsopp Review was commissioned, in part, to improve the statistical information required to support the government's objective of improving economic growth and convergence in the regions and countries of the UK. It concluded that, "the pressing need for better regional data should be satisfied," and made a number of recommendations including a better quality and more timely measure of regional GVA and expanding the range of economic data available at the regional and local levels.³³

2.75 Only partial progress has been made in implementing those recommendations, often owing to their resource intensity and competing demands.⁶⁹ In June 2010, the government announced the abolition of the Government Offices of the Regions and the Regional Development Agencies in England. The Department for Communities and Local Government then took the decision to cease publication of statistics at the regional level from October 2012 onwards.⁷⁰

2.76 Different users often want data broken down spatially in very different ways, which may change over time. Where possible, the collection and provision of statistics should be sufficiently flexible to satisfy these varied needs. For example, official regional statistics have traditionally been broken down by the Nomenclature of Units for Territorial Statistics (NUTS), a standardised EU framework for geographical units. However, 2011 saw the creation of Local Enterprise Partnerships (LEPs) to shape local economic priorities and drive growth and job creation. These are voluntary partnerships between local authorities and businesses whose boundaries are subject to change and do not align naturally with the NUTS regions traditionally used to compile regional data.

Constructing regional GVA

2.77 There is a consequent need for fuller provision of granular data by location which can then be flexibly aggregated up to the particular geographical units that are of interest. However, there are serious obstacles to realising this objective. Because of the costs of collecting data at the regional level, regional estimates of National Accounts concepts, such as GVA, are currently estimated via a top-down approach that uses regional indicators to allocate the national totals geographically. This approach is unlikely to be reliable for small geographic areas. Data from surveys of low-level spatial areas can be aggregated up to yield statistics for larger geographic areas of interest, but the sample sizes are usually too small to provide reliable measures for small areas.

2.78 This could, in principle, be addressed by greatly increasing the quantity of information collected at a very fine spatial level. However, this would be costly, not only for ONS but also for survey respondents. For example, take a company with a large number of outlets. National data only requires the collection of company-wide information, but a regional breakdown requires information to be collected by individual outlet. This does not seem very practical.

2.79 ONS produces an income-based measure of regional GVA, but the absence of suitable prices to deflate its components means that it is only available at current prices. ONS have also experimented with a production-based approach, which does allow the construction of regional real GVA, as suitable national prices are available for deflation. Allsopp concluded that

⁶⁹ Since the Allsopp Review, ONS responded by: developing regional output in real terms based on the output approach; making continuous improvements to regional output and household income measures; and refining apportionment methods by which informs how output is measured at sub-regional levels.

⁷⁰ UKSA, Letter to Department for Communities and Local Government Secretary of State, 23 April 2013. Available [here](#).

estimation of regional GVA by the expenditure measure was not worthwhile, most notably due to the high costs of measuring inter-regional trade. Regional estimates of some of the expenditure components (e.g. household final consumption expenditure or gross fixed capital formation) can, however, add colour to the understanding of differences in regional economic performance.

Improving timeliness

2.80 Many regional business and labour market statistics are relatively timely because the underlying data relies on samples at the regional level. For example, regional labour market statistics are drawn from the Labour Force Survey and are available about six weeks after the end of the period. However, the lack of timely data for regional GVA (and gross household disposable income) remains a common complaint of users: the reliance on the availability of Blue Book data means that the earliest estimate of annual GVA (the income measure) is only available almost a year after the end of the period.

2.81 Allsopp suggested that short-term indicators might be used to produce a faster estimate of regional GVA. Currently, there are quarterly indicators of constant price activity for each of the Devolved Administrations, but no counterparts for the English regions.⁷¹ A 2009 ONS feasibility study of the use of regional short-term indicators set out how this might be achieved using information from the Monthly Business Survey, augmented by surveys of large companies operating across regional boundaries.⁷²

Regional prices

2.82 Price indices can vary by region both because individual prices differ by region, e.g. because of transport costs for goods, and because expenditure shares differ. Using the same information used to compile the RPI/CPI, for a short while ONS did produce annual estimates of regional prices, but these were discontinued after 2005. In the absence of an annual series for regional prices, constant-price regional statistics are obtained using a national price index. While there is no European requirement to produce regular estimates of regional prices, their availability would permit the construction of more reliable estimates of regional activity and real incomes.

2.83 Allsopp suggested that production of regional prices should be based on the cycle of surveys and updated according to a timetable that meets user demand. There is currently a six-yearly survey of relative regional consumer price levels that partially meets this end.⁷³ User feedback suggested only limited demand for doing more than this. Paul Johnson's recent review of UK Consumer Price Statistics also concluded that the provision of regular regional price statistics would be too costly to be justified.⁷⁴

The scope for greater use of administrative data

2.84 Many of the problems encountered in producing timely and detailed regional statistics arise because the source data is primarily sampled annually from company-wide units at the national level, such as the Annual Business Survey. Allsopp recommended that new and existing surveys should be designed to take account of the need for regional statistics. However, given the potentially high costs involved in sampling at a regional level, he recognised that exactly how this should be done depended on a relative assessment of the costs and benefits.

⁷¹ Gross Domestic Product for Scotland, available [here](#); Statistics for Wales Index of Production and Construction and Index of Market Services, available [here](#) and [here](#); Northern Ireland Statistics & Research agency, Northern Ireland Composite Economic Index, available [here](#).

⁷² ONS, (2009). 'Feasibility Study – Into the Development of Regional Short-Term Indicators'. Available [here](#).

⁷³ ONS, (2011). 'UK Relative Regional Consumer Price levels for Goods and Services for 2010'. Available [here](#).

⁷⁴ Johnson, P., (2015). 'UK Consumer Price Statistics: A Review'. Available [here](#).

2.85 The Annual Business Survey samples roughly 63,000 businesses. By contrast, HMRC VAT data would provide near-census information for over 1.8 million businesses whose location can be deduced from their postal address. Many of these businesses will operate from just a single site, providing data on activity at a very fine geographical level. Use of the data is complicated, however, by some businesses operating in multiple areas and additional information might be needed to cope with this. Use of VAT data thus has considerable potential to improve both the quality and timeliness of output-based measures of regional GVA.

2.86 Regional statistics on income are at present largely reliant on using regional indicators to apportion national measures. HMRC Pay As You Earn (PAYE) income tax data contain information on the addresses of both employee and employer, though not necessarily the actual place of work. However, there may be scope to use the Business Register and Employment Survey to match employees to their workplace. Use of PAYE data could thus provide an alternative source for income-based measures of regional GVA.

2.87 Embedding administrative data into the production of regional statistics would likely take some time, and would probably still need to be augmented with specific survey information. Nonetheless, greater use of administrative data seems to be the only viable way forward to provide a sufficiently rich picture of economic developments at the regional level.

Emerging statistical challenges

2.88 As well as the long-standing measurement issues discussed above, the nature of recent economic growth has introduced new challenges and revealed new limitations of existing economic statistics. The final section of this Chapter sketches out some of these issues, with the intention of exploring the most significant of them in greater depth in the Final Report.

Innovation and technical change

2.89 Innovation and technological change are the wellspring of economic advancement. The sustained exponential improvement in computing power as a result of Moore's Law⁷⁵ and the digitisation of many activities has in particular radically altered the way people conduct their lives, both at work and at play.⁷⁶ Advances in genetic engineering and materials science also hold out the promise of further major advances. Statistical frameworks and the methodologies used to measure key economic variables, such as GDP, are almost bound to struggle to keep pace with such changes. At the current juncture, three particular consequences of the digital revolution stand out.

Technologically-induced disintermediation and unconventional business models

2.90 Leaving public services to one side, GDP and its constituent components are estimated by focusing exclusively on activities carried out in the market economy, and assuming that market prices reflect values. Moreover, labour market data typically assumes a clean distinction between work and leisure. The digital economy and the internet have made these assumptions less tenable by blurring boundaries between work, domestic activity ('home production') and leisure. It has also led to business models where it is harder for the statistician to observe both transactions and a corresponding price.

2.91 First, widespread access to the internet through high-speed broadband, coupled with easy access through portable devices such as smartphones, has greatly reduced the (marginal) costs of undertaking many information-intensive activities. As a result, activities that might previously

⁷⁵ The doubling of computer processing capability roughly every two years.

⁷⁶ Brynjolfsson, E., and McAfee, A., (2014). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*, W. W. Norton & Company

have needed the services of a dedicated intermediary (provided at a charge) can now be undertaken directly by the consumer.

2.92 Take, for instance, the travel industry. Previously, a consumer wishing to book travel or a holiday would visit (or phone) a travel agent to do this. Instead, today, consumers can search online to find what they want and then book directly with hotels and airlines directly, or else through online portals such as Expedia. In essence, an activity that was previously undertaken through the market – the acquisition of information about travel options – has now been outsourced to the consumer. An activity that was previously undertaken in the market economy is instead now part of ‘home production’ instead. But conventionally home production activities are not counted as part of GDP.

2.93 This trend to the disintermediation of information-intensive service activities has a considerable way to run, with potentially significant implications for the interpretation of conventional measures of productive activity. In particular, it is worth noting that these new products, in displacing traditional ones, have the potential to lower GDP. An example would be falling map sales following the introduction of portable GPS devices. Another is the fall in the number of high street bank branches in response to the exponential increase in online banking.⁷⁷

2.94 Second, a key feature of the provision of many internet-based services is that, although the fixed costs of developing a suitable platform and apps may be high, the marginal costs of their subsequent use is negligible. In such markets, if entry is unrestricted, prices are apt to be driven down to zero, leaving the supplier unable to cover their fixed costs. That in turn has forced suppliers to develop alternative business models in which the consumer does not pay, at least in the conventional sense. Instead, the supplier will often finance the business by selling advertising space, with advertisers being willing to pay more for sites that are used more heavily. Conventional approaches to the measurement of economic activity will not necessarily pick this up.

Accounting for quality change

2.95 Continual innovation has undoubtedly led to great improvements in the quality of many goods and services. As long ago as 1996, the Boskin Commission noted that inadequacies in measuring quality improvements could have resulted in a significant overestimation of inflation and an underestimation of the rate of growth of real US GDP.⁷⁸ For example, it might be that the price of a standard desktop computer, relative to that of other goods and services, has remained broadly constant, yet processing capability has increased dramatically, and with it the value of the services it can support. Simply recording the price of the computer is not enough, one really wants to allow for the improvement in what is being offered (e.g. by measuring the price of a unit of processing power).

2.96 The issue of quality change is well-recognised. ONS and other NSIs already use a variety of methods – including ‘hedonic’ methods which impute prices to the characteristics of the product, rather than simply recording the price of the product itself – to control for quality change in the most-affected products. Such methods are discussed more fully in Johnson’s review of consumer prices.⁷⁹ However, the spreading tentacles of the digital revolution means that this issue is likely to grow in importance.

⁷⁷ Over 40% in the past 25 years according to a Bank of England study. Pike, T., ‘The impact of e-commerce on the consumer sector – view from a Bank of England Agent’. Available [here](#).

⁷⁸ Boskin, M., Dulberger, E., Gordon, R., Griliches, Z., and Jorgenson, D., (1996). ‘Toward a More Accurate Measure of the Cost of Living,’ Final Report to the Senate Finance Committee. Available [here](#).

⁷⁹ Johnson, P., (2015). ‘UK Consumer Price Statistics: A Review’. Available [here](#).

2.97 Moreover, the rapid pace of change creates extra obstacles. Often products exhibiting the largest quality change also have relatively short life-cycles; examples are the brief rise and fall of Mini Discs and Palm Pilots. The replacement of products in price indices, due to the birth of new products and the extinction of others, increases the difficulty of estimating movements in prices for comparable products. And measuring quality change also requires a judgement about what qualities are valued by the customer. Finally, improvements in quality that are not captured by physical characteristics, for example the accessibility of a mobile phone's user interface, are difficult to measure and create further challenges to capturing quality change.

Classifying activity

2.98 The existing scheme for classifying economic activity, the Standard Industrial Classification (SIC), is tied to a specific level of granularity by international standards. However, as noted earlier, the changing structure of the economy means that SIC will constantly lag reality, under-representing newer industries and over-representing ones that are declining in importance. Updates to the Classification have made some progress in addressing the lack of detail in the breakdown of services, yet more is needed if the structure of the UK economy today is to be adequately reflected in the statistics.

2.99 Users provided the Review team with several examples where the current Classification was insufficiently granular. For example, low-carbon economic activities are buried within several production and services industries and cannot easily be stripped out. A more granular Classification would help, but even the most granular industry classification will not always differentiate activities as demanded by users. However, if access to the underlying data is granted, then the application of new data science techniques to the microdata potentially offer users a way to stratify the information better to meet their needs.

Capital

2.100 A central element of the growth process is the accumulation of capital. This includes not only machinery and buildings (physical capital) but also skills (human capital) and shared knowledge (knowledge capital or total factor productivity). The first appears to have become less, and the last two more, important in recent years. But the last two – and especially knowledge and other 'intangible' capital – are especially hard to measure.

Physical capital

2.101 Recommendations for the improved measurement of physical capital was a feature of both the Allsopp and Barker-Ridgeway reviews.⁸⁰ A key issue is better understanding and measurement of how capital depreciates, or is 'consumed' over time. Reflecting quality concerns at the time, ONS suspended the production of capital stocks and consumption of fixed capital data between 2011 and 2014. Since then, the data has been reinstated and designated a National Statistic, also benefitting from recent improvements in business investment measures.

2.102 Currently ONS applies a linear depreciation scheme to physical capital assets although alternative depreciation schemes are under consideration. A better understanding of the service lives of assets should benefit from the work presently being undertaken on ONS's behalf by the National Institute of Economic and Social Research. Finally, accounting for richer detail of capital could be informative for explaining business cycle movements better, including second-hand or used capital and capacity utilisation.⁸¹

⁸⁰ Allsopp's recommendation 69 and Barker-Ridgeway's development recommendations 9-10.

⁸¹ Lanteri, A., (2014). 'The Market for Use Capital: Endogenous Irreversibility and Reallocation over the Business Cycle'. Available [here](#).

Intangible capital

2.103 Intangible capital denotes disembodied assets such as computerised information, R&D, design, human capital, and branding. Appropriately measuring intangible capital is a daunting task for statisticians but of central interest for policy makers. R&D expenditures have recently been sensibly reclassified as investment, rather than intermediate consumption, and account for the most visible part of intellectual property.⁸² However, it is often only the most tangible part of R&D that is captured within the National Accounts. For instance, a recent report from the Royal Society argues that service providers tend to focus on business model innovation, which is not currently counted as R&D in the National Accounts, leaving technological innovation to suppliers of technical infrastructure.⁸³

2.104 The range of assets that constitute intangible capital is considerably broader than those captured in the National Accounts – largely confined to R&D and software expenditure.⁸⁴ Assets that are unaccounted for include organisational capital and human capital. Recent research has found the former to be central to understanding productivity growth and differences in productivity levels across countries⁸⁵. And human capital, perhaps more so than in the past, is a key driver of a successful economy, as routine tasks are automated and the premium paid to creativity rises.

Flows

2.105 Capturing flows of individuals, goods and services between sectors, across borders, and between labour market states is particularly helpful in providing a dynamic picture of the evolution of the economy, rather than a static snapshot. This report already discussed the benefits of more granular data to measure financial interconnectedness. In measuring flows, two key challenges are posed by a more globalised world and capturing an increasingly dynamic labour market.

Cross-border flows

2.106 An increasing globalised world, further enabled by significant improvements in communication technology, is posing problems for a statistical framework that has traditionally been stratified by geographic boundaries. Despite the advantages associated with most of the UK being an island without land borders, it continues to face significant challenges robustly measuring flows of people across its borders and the economic activities they are engaged in. Estimates of migration, tourism, and educational exports are all largely based on surveying individuals in air, sea and tunnel ports which can be subject to measurement and sampling error.

2.107 As a small open economy, a relatively large proportion of UK economic activity is associated with trade and foreign investment. Further work could be done in exploring the price indices for imports and exports, particularly given recent significant movements in the value of sterling. While HMRC's customs activities largely capture trade in goods, trade in services are estimated through a survey. Given improvements in information and communication technology, it is easier than ever to collaborate and outsource across geographic borders. Some consumers may not even be aware when they have purchased a service from a foreign country.

⁸² This change is perhaps one of the most visible change in the ESA 2010, which increased the level of UK GDP in 2009 by 1.6%.

⁸³ The Royal Society, (2009). 'Hidden Wealth: the contribution of science to service sector innovation'. Available [here](#).

⁸⁴ See e.g. Corrado, C., and Hulten, C., (2010). 'How Do You Measure a "Technological Revolution"?' *American Economic Review*, vol. 100(2), p.99-104, May. Available [here](#).

⁸⁵ Bresnahan, T., Brynjolfsson, E., and Hitt, L., (2002). 'Information Technology, Workplace Organization, And The Demand For Skilled Labor: Firm-Level Evidence,' *The Quarterly Journal of Economics*, vol. 117(1), p.339-376, February. Available [here](#).
Bloom, N., Christos Genakos, C., Sadun, R., and Van Reenen, J., (2012). 'Management Practices Across Firms and Countries,' NBER Working Papers, no.17850. Available [here](#).

Cloud computing and integrated business systems allow different arms of the same company to operate seamlessly across national borders. Compounding these cross-border issues with the generic issues facing the measurement of services (discussed earlier in this chapter) means that accurately capturing trade in services poses significant challenges. Improvements in this area could play a role in providing a more frequent and timely breakdown of trade, including country breakdowns of origins and destinations.

2.108 Reinstating the Purchases Inquiry and better measurement of services will help support the joint initiative by the OECD and World Trade Organisation to examine how value is added along global supply chains.⁸⁶ While the trade balance has remained broadly unchanged in recent years, further efforts could be made to measure the individual factors driving the recent deterioration in the balance of payments better, including improved measurement of the economy's external balance sheet. In particular, the Balance of Payments can be significantly affected by changes in financial flows that are the consequences of changes in the domicile of multi-national corporations, often aimed at minimising their tax burden. Some recent research suggests that this may have been an important factor behind the recent deterioration in the UK current account.⁸⁷

Labour flows

2.109 Technological innovation, together with the recent recession, has drawn many workers into more flexible forms of labour market participation. For instance, some of those who were previously in full-time work with one employer now have more flexible arrangements, characterised by a mix of self-employment and part-time work, possibly for several employers.

2.110 Growth of the 'sharing economy', the individual-to-individual exchange of goods and services where participants share access to goods and services rather than establish individual ownership, has been revolutionised by online marketplaces such as Airbnb and Uber. This infrastructure reduces the costs of participating in the sale of goods and services, therefore facilitating participation without making the activity a full-time occupation. Other websites, such as Freelancer, match supply and demand for customised services. For example, individuals who participate in a job with a shift pattern in a retail store could spend their off-days driving an Uber taxi; a full-time accountant could sell jewellery designed and produced over weeknights and the weekend as a hobby.

2.111 However, the current sampling framework for measuring employment and business activity may fail to capture some of this activity owing to its scale. Small businesses with turnover below the threshold to register for VAT and/or PAYE income tax will not be captured by the Annual and Monthly Business Surveys. And users continue to call for improvements in estimates of self-employment and self-employed income, which is omitted in the standard measure of average weekly earnings. Although the impact of these non-standard activities on aggregate output is currently likely to be modest, better measurement of the self-employed and 'micro businesses' could become more important in the future.⁸⁸

Other statistical issues raised by users

Alternative economic indicators

2.112 GDP, primarily a measure of market activity, has notable limitations as a measure of well-being. On the one hand, fixation on a single indicator, such as GDP, can lead to bad policy. On

⁸⁶ OECD and World Trade Organisation, Measuring Trade in Value Added. Available [here](#).

⁸⁷ Lane, P., (2015). 'A financial perspective on the UK current account deficit,' *National Institute Economic Review*, No.234, November. Available [here](#).

⁸⁸ See e.g. BIS, (2015). 'Small Business Survey 2014: SME employers,' BIS research paper number 214. Available [here](#).

the other hand, simplicity can aid in communication and accessibility for users, while drowning users in the full panoply of available statistics would not necessarily lead to a better outcome. Recent research has examined this issue.⁸⁹ The 2009 Commission on the Measurement of Economic Performance and Social Progress set out a number of recommendations to improve the measurement and profile of broader alternative statistics reflecting environmental sustainability, distribution and indicators of well-being.⁹⁰ ONS now produce a quarterly economic well-being publication that captures some elements of these recommendations.⁹¹ Nevertheless, alternative economic measures, for example median household income, fail to attract the same level of public interest as GDP.

Environmental sustainability

2.113 ONS produces an annual set of Environmental Accounts, some elements of which are required by European regulation. The Environmental Accounts are distinct from the National Accounts, and set out how the environment contributes to output (e.g. extraction), the impact of output on the environment (e.g. air pollution), and the taxes and spending reflecting environmental protection. Separating the two in this way may inhibit public understanding of the interaction between them, however, and incorporating the depletion of natural resources and the degradation of the environment into an adjusted measure of GDP is a way to bring them together. ONS has set out a strategy to reflect fully the value of natural resource stocks in the Environmental Accounts by 2020.⁹² This will provide a framework for aligning the treatment of natural resources stocks with stocks of physical capital, such as roads or machines, such that a depreciation in stocks is reflected in a reduction in measured economic activity.

Land data

2.114 UK house building completions have been on a downward trend since 1970 and currently stand just under 150,000 a year,⁹³ well below the estimated 240,000-plus additional houses needed in England alone to keep pace with growing demand.⁹⁴ A lack of land market statistics could be playing a role in hindering a public and private supply response to the housing shortage. Data on land ownership and land prices are held by the Land Registry and Valuation Office Agency, respectively. While these are public sector organisations, the information is available at a cost that can prohibit access and the data does not always reflect the needs of users. For example, existing land price data produced by the Department for Communities and Local Government and the Valuation Office Agency is available by the hectare.⁹⁵ This scale may be more appropriate for rural houses, rather than city dwellings, for example, which would benefit from a price per square foot. Existing statistics for land ownership could be developed to describe land use, and therefore availability, more accurately.

⁸⁹ See e.g. New Economic Foundation, (2015). 'Five headline indicators of *national success: A clearer picture of how the UK is performing.*' Available [here](#).

⁹⁰ Stiglitz, J., Sen, A., and Fitoussi, J., (2015). 'Report by the Commission on the Measurement of Economic Performance and Social Progress'. Available [here](#).

⁹¹ ONS, (2015). 'Economic Well-being, Quarter 2 Apr to June 2015'. Available [here](#).

⁹² ONS, (2015). 'Natural capital accounting 2020 roadmap – Interim review and forward look.' Available [here](#).

⁹³ ONS, (2014). 'Trends in United Kingdom Housing Market, 2014.' Available [here](#).

⁹⁴ Town & Country Planning, (2013). 'New estimates of housing demand and need in England, 2011 to 2031,' Tomorrow Series Paper 16. Available [here](#).

⁹⁵ Department for Communities and Local Government, (2015). 'Land value estimates for policy appraisals'. Available [here](#).

3 Effectiveness of ONS

3.1 Economic statistics are an important public good, critical to policy development, business decisions and democratic accountability. As we saw in the previous chapter, the rapid pace of change in today's economy makes it even more challenging for national statistical institutes (NSIs) to keep economic statistics relevant, accurate and timely. This chapter provides an initial assessment of the effectiveness of ONS in the provision of economic statistics, taking on board the perspectives of users, experts and previous reviews of ONS.

3.2 After documenting the recent history of ONS and the resources allocated to the production of statistics, the discussion considers some of its key data sources, including both surveys and administrative information. This chapter also looks at various aspects of ONS's underlying capabilities, including analytical capacity and the readiness to deploy new data science techniques. The Final Report is expected to cover the full statistical process from data collection to dissemination, as well as further exploring issues such as the effectiveness of ONS change and staff management and further comparisons with other NSIs.

Recent history of ONS

3.3 ONS is the primary source of economic statistics in the UK, having been formed in 1996 by the merger of the Central Statistical Office and the Office for Population Censuses and Surveys. The Statistics and Registration Service Act 2007 reformed the governance of ONS by creating the UK Statistics Authority (UKSA) as an independent body with the statutory objective to promote and safeguard the production and publication of official statistics that serve the public good. The Act meant ONS became the executive office of UKSA. It also resulted in the creation of a regulatory function, which was tasked with producing a Code of Practice for Official Statistics, and assessing compliance against it.

3.4 As a result of successive mergers, the main UK economic statistics are produced almost exclusively by ONS. The wider UK statistical system, however, is more decentralised and devolved than that of most other countries. Current responsibilities for statistical releases partly reflect the structure and evolution of government in the UK. For example, statistics on tax receipts, agriculture and transport are all published by the relevant government departments. The Terms of Reference for this Review focus on ONS, because of its central role in the production of UK economic statistics. But ultimately the effective functioning of the statistical system relies on there being good cooperation between departments. This inter-dependence can be expected to increase if greater statistical use is made of data derived from the administration of public services. The relationship between ONS and the Government Statistical Service (GSS)¹ is an issue that will be explored further in the Final Report.

3.5 The UK statistical system has already been the subject of a number of earlier reviews. Many of these reviews have focused on particular statistical outputs, and a number have had a significant impact at an organisational level. A list of the most significant reviews is set out in Table 3.A. A consequence of these frequent reviews, together with the fluctuations in resourcing documented below, has been to generate almost continual changes of emphasis, direction and operation for the organisation.

¹ The Government Statistical Service is the community for all civil servants working in the collection, production and communication of official statistics. It is spread across ONS as well as most UK government departments and devolved administrations.

Table 3.A: Timeline of significant reviews of ONS and predecessors

1966	<i>Fourth Report of the Estimates Committee on the Government Statistical Service</i>
1980	<i>Review of Government Statistical Services</i> , led by Sir Derek Rayner
1989	<i>Government Economic Statistics – A Scrutiny Report</i> , led by Stephen Pickford
2004	<i>Review of Statistics for Economic Policymaking</i> , led by Christopher Allsopp <i>Independent Review of Public Sector Efficiency</i> , led by Sir Peter Gershon <i>Independent Review of Public Sector Relocation</i> , led by Sir Michael Lyons
2005	<i>Measurement of Government Output and Productivity for the National Accounts</i> , led by Sir Tony Atkinson
2014	<i>National Statistics Quality Review: National Accounts and Balance of Payments</i> , led by Dame Kate Barker and Art Ridgeway
2015	<i>Consumer Price Statistics: A Review</i> , led by Paul Johnson

3.6 The 1966 Estimates Committee Report and 1980 Rayner Review² set the stage for the changes to the UK statistical system in the following decades. The Rayner Review was principally concerned with identifying the scope for financial savings. While the review included a prescient call for the greater use of computers, it also gave rise to the misguided 'Rayner doctrine' that official statistics should only be collected if needed to meet the needs of government and were not seen as being a wider public good.

3.7 Concerns about the quality of National Accounts statistics led to the 1989 review by Stephen Pickford³. That review recommended a consolidation of the statistical system, realised by the absorption in 1991 of the Business Statistics Office and other statistical functions within government departments into an enlarged Central Statistical Office. This was shortly followed by packages of additional resources for statistics which marked an end to the Rayner doctrine.⁴

3.8 In 1999, the government published the White Paper 'Building trust in statistics',⁵ directed at improving public confidence in statistics. This led to the first designations of key outputs as National Statistics. In 2000, ONS launched its first series of National Statistics Quality Reviews (NSQRs), aimed at assessing and improving the quality of those National Statistics. A year later, ONS began an extensive modernisation programme to update its data processing systems and tools – the Statistical Modernisation Programme (see the section on technology below). Like many IT modernisation projects, this lasted longer than expected, did not deliver the anticipated efficiencies, and ultimately fell short of achieving its excessively ambitious goals.⁶

3.9 In 2004, Christopher Allsopp delivered the first broad review⁷ of ONS since Pickford. A key theme of that review was the need for better regional statistics, as well as a broader need for economic statistics to reflect the changing economic structure of the UK. At the same time, Sir Peter Gershon and Sir Michael Lyons carried out reviews into public sector efficiency and relocation, respectively. Neither review was ONS-specific, but together they resulted in an effort to reduce costs, in particular by moving most ONS functions out of the capital and the consolidation of economic statistics in Newport. Many staff members were, however, unwilling to move and instead left the organisation. The resultant loss of expertise is widely believed to

² Rayner, D., (1980). 'Review of Government Statistical Services'

³ Pickford S., (1989). 'Government Economic Statistics – A Scrutiny Report'

⁴ Jenkinson G. and Brand, M. (2000). 'A decade of improvements to economic statistics,' *Economic Trends*. Available [here](#).

⁵ HM Treasury, (1999). 'Building trust in statistics'. Available [here](#).

⁶ Penneck S., ONS, (2009) 'The Office for National Statistics Statistical Modernisation Programme: What went right? What went wrong?'

⁷ Allsopp, C., (2004). 'Review of Statistics for Economic Policymaking'. Available [here](#).

have had a significant adverse impact on the subsequent production and development of UK economic statistics and the National Accounts in particular.

3.10 Since the establishment of UKSA in 2008, National Statistics, produced by ONS and others, have been subject to UKSA's programme of assessment against the 'Code of Practice for Official Statistics'.⁸ By 2012 each statistic designated as a National Statistic had been assessed and necessary improvements identified. ONS has also instigated a new programme of NSQRs. The first statistics to be scrutinised as part of the programme were those associated with the Labour Force Survey, followed by the National Accounts and Balance of Payments. The latter, led by Dame Kate Barker and Art Ridgeway, made several recommendations on ONS capability which are still to be implemented, including establishing a small expert economics team to provide quality assurance and fresh thinking, as well as establishing a formal external advisory panel, including international experts, to consult on methods and processes. More recently, Paul Johnson has carried out an external review of consumer price indices⁹, published in 2015.

ONS resources

3.11 As can be seen from Chart 3.A, the resources provided to ONS, as a share of GDP, have fluctuated significantly, in part reflecting the recommendations of the various reviews and programmes mentioned above, as well as the state of the public finances. So the effectiveness of ONS needs to be assessed in the context of the resources that were available at the time. It should also be remembered that statistical methodologies and outputs have changed considerably since 1980; for example, the 1995 and 2010 European Systems of Accounts (ESA) have been introduced and the Labour Force Survey has changed from a biennial survey to a rolling quarterly survey.

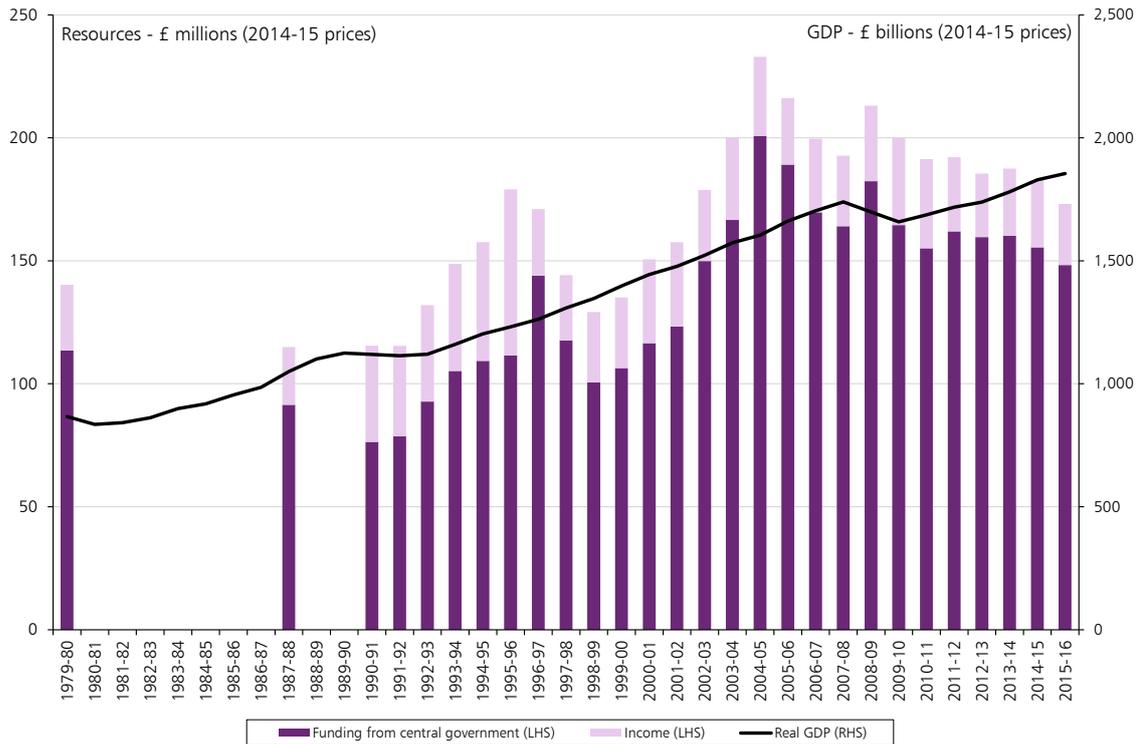
3.12 In the 1970s the statistical system was relatively large and well-funded, although exact comparisons are complicated by the fact that many functions carried out by ONS today were split between several departments or not carried out at all. The 1980 Rayner Review led to reductions in the resource available across the GSS, proposing cuts of a third in the Central Statistical Office.² By 1989, when concerns about the quality of economic statistics had led to the commissioning of the Pickford Review, resources for statistics were starting to rise again and rose further with packages of extra funding in 1990 and 1991.⁴

3.13 Steady funding increases up to the establishment of ONS in 1996 were followed by cuts in the late 1990s, only for funding then to increase again in the early 2000s. Greater pressure for efficiencies across the public sector began in 2004, resulting in ONS's relocation from London, though some of the savings were then invested in its Statistical Modernisation Programme. Funding increased temporarily in 2008-09 with the establishment of UKSA. However, the broad trend since then has been one of a steady decline in real resources, bringing it back – as a share of GDP – to the sorts of level seen in the early 1990s before the impact of the Pickford Review had been felt.

⁸ UKSA, (2009). 'Code of Practice for Official Statistics'. Available [here](#).

⁹ Johnson, P., (2015). 'UK Consumer Price Statistics: A Review'. Available [here](#).

Chart 3.A: Approximate deflated core ONS resources against real GDP



Source: Review calculations, further information in Box 3.A.

Box 3.A: Estimating core ONS resources over time

There is no readily-available time series of the financial resources available to ONS. This Review has estimated the resources allocated to what is now ONS from a range of different sources. Doing so has required a number of judgements. Chart 3.A shows a best estimate for the resources used by ONS on a reasonably consistent basis over time. In recent years that has been based on Total DEL (that is the departmental expenditure limit on resources and on capital, less depreciation) plus income, as published in UKSA and ONS Annual Reports and Accounts. Spending on census, regulation and (prior to 2008) the General Register Office has been removed, as has the one-off cost of relocation. Numerous changes in ONS outputs over the period have not been adjusted for. For earlier years, particularly before the creation of ONS, estimates have been made from available sources including Appropriation Acts and the Pickford and Rayner reviews. Figures have been deflated using the GDP deflator.

3.14 In the 2015 Spending Review, the Chancellor of the Exchequer announced the UKSA’s spending settlement for the period 2016-17 to 2019-20. Excluding funding for the Census, resource funding is set to increase from £145 million in 2015-16 to an average of £162 million per year over the four-year period to 2019-20. As part of the settlement, ONS has committed to deliver on all its programme and known legislative demands which, when combined with other pressures, will in reality mean a heavier level of efficiencies than the headline figures might appear to imply. On top of that, ONS has agreed to take forward key initiatives on:

- Workforce transformation, including re-skilling the workforce to meet the existing and future needs of the user community;

- Digital transformation, through the development and implementation of new technology platforms, to improve statistical methods, processes and capabilities;
- Data collection transformation, through wider and more integrated use of administrative data sources, to reduce the reliance on large surveys; and
- New statistical outputs, including Flow of Funds development.

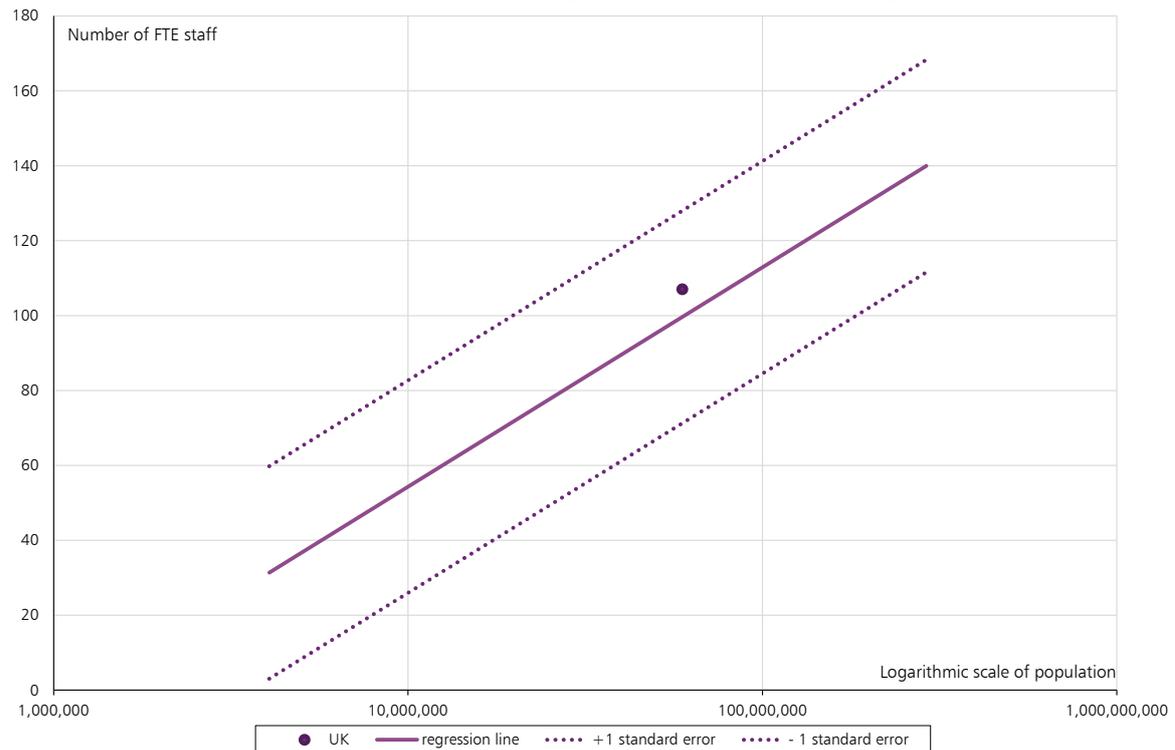
Comparing ONS resources internationally

3.15 Comprehensive statistics on the resourcing of the statistical systems of different countries are virtually impossible to obtain. Even if such information were available, comparisons would not be very meaningful because the breadth of statistics collected and produced varies so much across countries. But one area where some comparative analysis is possible is for the compilation of the national accounts, given that these must be produced to a common agreed international standard.

3.16 In 2006, the OECD's National Accounts Working Party organised a survey of national accounts resourcing in 27 of its member countries. The key variable collected was the number of full-time equivalent (FTE) staff producing the national accounts, split between 'core' tables and activities and 'additional' activities; no information on expenditure was collected though. As larger countries tend to have more staff involved in this activity, a straight comparison of ONS with its peers would be inappropriate. Chart 3.B shows the regression line (and one standard error band) relating the number of staff working on the national accounts to the corresponding (logarithm of) population size. Iceland, Luxembourg and China have been excluded from the sample because the very small/large size of their populations mean that they would otherwise have an undue influence on the regression results. The observation for the UK is identified separately¹⁰ and lies very close to the regression line, well within one standard error. A comparison of just the G7 economies shows that UK national accounts resourcing, relative to population size, was also close to the median for this smaller group of countries.

¹⁰ Observations for other countries are not marked, as the information collected for the survey was not put into the public domain.

Chart 3.B: Full-time equivalent staff working on National Accounts by population, 2006



Source: Calculations based on Organisation for Economic Co-operation and Development data.

3.17 The 2006 OECD survey also asked some general questions about countries’ national accounts resourcing over the previous ten years. The majority of countries said they had maintained broadly constant or increasing resourcing levels over the period 1996-2006, while the UK was one of only two countries reporting a decrease in staff numbers. At the time of completing the survey, ONS was also in the midst of relocating the bulk of national accounts operations from London to Newport.

3.18 This survey is almost a decade old, so the relative position of ONS may have changed since then. Chart 3.A suggests that the current resourcing of ONS is similar to its level in 2006. However, on the narrower issue of national accounts staffing, there has been a significant increase at ONS since 2006 in order to develop the systems and methods needed to implement ESA 2010, as well as to make some other improvements. It is hoped that more comparative evidence on the resourcing of economic statistics will be available for the Final Report.

Financial management capability

3.19 As part of the Review’s engagement with stakeholders, concerns were raised about the past effectiveness of the finance function at ONS. This is relevant because any progress made on reducing costs or finding efficiencies, across the whole of ONS, would release resources that could, in part, be directed into the production and development of economic statistics. The scope for such reallocation could be considerable, given that the core functions of National Accounts and Economic Statistics only account for direct gross expenditure of £24 million out of a total of £180 million for the whole organisation – in other words, just 13%.¹¹ The scope for ONS to reallocate funding may, though, be constrained by several factors, including legal requirements to meet EU regulations.

¹¹ Figures for 2014-15, based on the reportable segments included in the UKSA Annual Report and Accounts 2014-15; other reportable segments of ONS also contribute to the production of economic statistics, for example Data Collection, which accounts for £44m.

3.20 In 2013, the Chartered Institute of Public Finance and Accountancy (CIPFA) were asked by ONS to undertake an assessment of ONS financial management. It found significant failings, including: a lack of appropriate financial management capability, ownership and accountability beyond the central finance team; an absence of basic financial discipline in programme management; inadequate medium-term financial planning; limited integration between financial and business planning; insufficient focus on securing value for money; and a culture that militated against the finance function supporting transformational change.

3.21 Stakeholders supported the view of CIPFA but noted that improvements were being made. Since the assessment, ONS has taken steps to improve its financial management, including restructuring its finance function, greater engagement with HM Treasury, and the development of medium-term financial plans. CIPFA are expected to review progress in 2016-17.

Programme and project management

3.22 In June 2014, ONS commissioned the consultancy Atkins to conduct an internal review of ONS's project and programme management (PPM) capability and capacity to deliver the current and future project portfolio, including the 2021 Census. In their conclusions, Atkins raised some general concerns about the state of ONS PPM capability, in particular its ability to deliver on time and within budget. The study recommended raising understanding of ONS's PPM standards, improving governance structures including clearer management of dependencies, as well as implementation of a better planning and resource allocation tool.

3.23 The need to improve ONS PPM skills was also raised during engagement with stakeholders and in response to the Call for Evidence. Some stakeholders thought that ONS could go a long way to meeting most of their goals with the resources already available through better project management.

3.24 Historically, ONS has been slow to recognise PPM as a profession and until recently recruitment was not managed centrally. Since the Atkins review ONS has sought to strengthen the capability within its Portfolio Management Division. ONS has created a resourcing tool which records the supply and demand of PPM requirements. ONS has also recruited two professional planners tasked with embedding a newly created planning and dependency management standard across its project portfolio. ONS are also now providing project management expertise to a European statistical initiative.

Recent ONS performance

3.25 For users to have confidence in ONS economic statistics, those statistics both need to be of high quality and seen to be of high quality — a proven track record as an institution is needed. However, it is not just mistakes that can damage the reputation of ONS; when inadequately explained, revisions resulting from new data or methodological changes can also do harm. This Review has sought the views of a wide range of users, stakeholders and experts on ONS's recent performance. Several users noted that this Review would not have been commissioned if all had been well.

Public confidence

3.26 UKSA has commissioned two surveys of Public Confidence in Official Statistics, carried out by Natcen Social Research in 2009¹² and 2014¹³ respectively. There are also similar surveys for earlier years. The 2014 survey found that a relatively low proportion of respondents were aware of ONS, but of those who expressed an opinion, 88% either trusted ONS a great deal or tended

¹² Bailey R., Rofique J. and Humphrey A., Natcen Social Research, (2010). 'Public Confidence in Official Statistics 2009'. Available [here](#).

¹³ Simpson I., Beninger K. and Ormston R., Natcen Social Research, (2015). 'Public Confidence in Official Statistics'. Available [here](#).

to trust it, a higher proportion than some other major institutions including the courts and the police. The survey found that those who had used official statistics were more likely to trust them than those who had not used them.

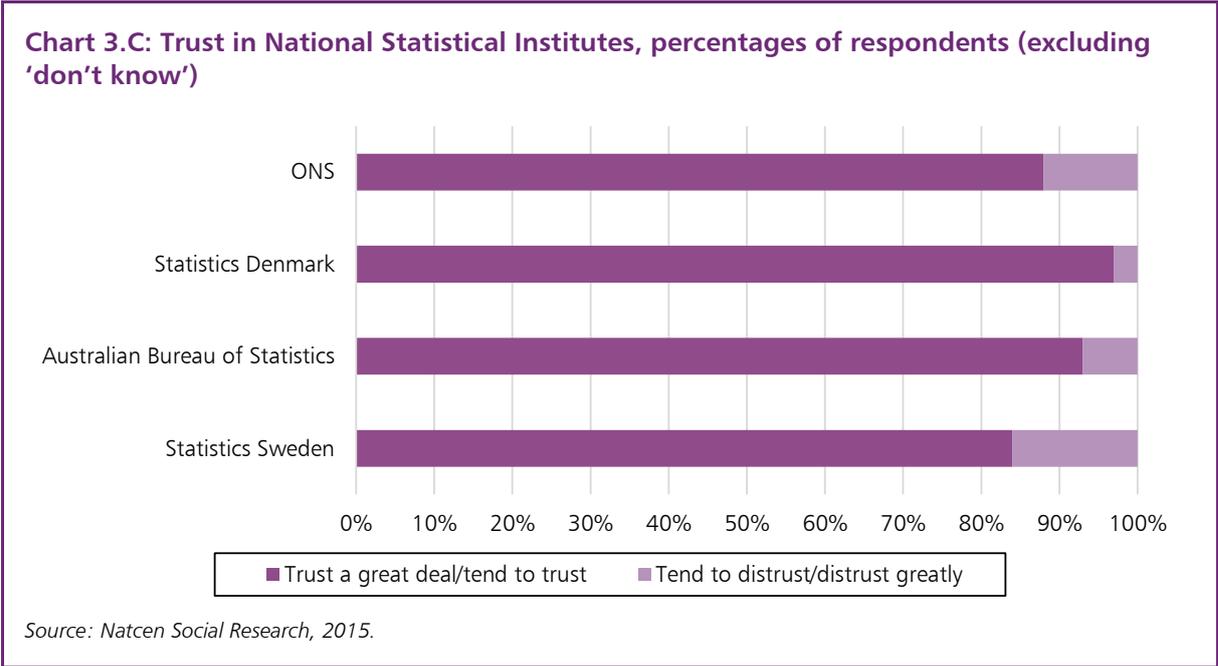
3.27 The survey also asked respondents whether 'official figures are generally accurate', to which 59% agreed. The results from 2014 and similar questions in previous surveys are shown in Table 3.B. The omission of a 'neither-agree-nor-disagree' option in 2014 makes comparisons difficult, but if anything it appears that accuracy is perceived to have improved since 2004.

Table 3.B: 'Official figures are generally accurate', percentages of respondents.

	2004	2005	2007	2009	2014
Strongly agree	2	2	2	1	7
Tend to agree	32	35	34	31	52
Neither agree nor disagree	27	28	27	26	option not offered
Tend to disagree	28	25	25	32	17
Strongly disagree	7	6	8	8	5
Not sure or don't know	3	4	4	1	19

Source: Natcen Social Research, 2010 and 2015.

3.28 The 2014 survey was based on an OECD questionnaire, but only Australia, Sweden and Denmark have so far carried out similar surveys to the UK. In these countries, awareness of the NSI was higher. Trust in the NSI was higher in Australia and Denmark, though lower in Sweden (see Chart 3.C below).



User perspectives

3.29 Almost everyone who responded to the Call for Evidence or who engaged with the Review team, wanted ONS to do more in one area or another, though many also acknowledged that a greater focus in one area would necessitate doing less in others. Many respondents also welcomed the direction charted by ONS's new senior management team, led by the National Statistician, John Pullinger, believing that it represented an opportunity for strategic reform and cultural change.

3.30 Some respondents were quite critical. Some referred to its sluggishness in embracing new developments. ONS had fallen behind in adapting and improving its methodologies to reflect changes in the economy and was insufficiently strategic when deciding its statistical priorities. Many argued that more use should be made of administrative data, though current legislation was recognised as being a barrier. There was also scepticism as to whether ONS had grasped the transformational opportunities of big data more generally and had sufficient ability in data science techniques to exploit them. Some also noted ONS data collection methods were out-dated.

3.31 There was also some criticism of ONS behaviours and capabilities. Many respondents said ONS needed to do more to engage with users, both within and outside government. A number of users commented on the failure to sense-check some statistics before release, arguing that greater use of economic expertise could help prevent embarrassing errors. Some respondents saw a need to invest in improving systems and skills, while ONS was also criticised for operating in silos.

Box 3.B: ONS Website

The ONS website is the principal channel through which users access ONS economic statistics. An effective website is therefore a pre-requisite for an effectively functioning ONS. There was a lot of criticism of the current website, however, with one user describing it as “almost unusable”. Others commented that it was too difficult to find statistics. In sum, using the website was both laborious and frustrating. Such criticism of the ONS website is by no means new. It was, for example, raised on numerous occasions during the last parliament by the (as was) Public Administration Select Committee.

There were also wider comments on the poor accessibility of some statistics: key data was not prioritised ahead of less important series as well as difficult to find and access. Several users also wanted easier access to the underlying microdata, as well as better access to real-time data sets.

ONS intends to replace its current website with a new website, currently under development – the ‘beta’ version is available at beta.ons.gov.uk. The programme to develop the prototype website has undergone regular reviews and prior to launching as a public beta was assessed internally against the Government Digital Service (GDS) Digital by Default Service Standard¹⁴. User feedback from testing, shared with this Review by ONS, included very favourable comparisons to the existing website: “everyone I’ve spoken to thinks this is much better”; and showed that ONS are addressing some of the specific concerns raised by respondents: “so much easier to get to things”.

These are encouraging signs that this longstanding problem is now being addressed. The Final Report will take a more detailed look at the website and other aspects of the dissemination of economic statistics.

Recent failings and criticism

3.32 In recent years ONS has been the subject of much public criticism regarding the quality of some of its statistics. There have been several media reports citing doubts about some of the core economic series produced by ONS. As but one example, in discussing investment statistics, the Governor of the Bank of England, Mark Carney, told the Treasury Select Committee in 2013

¹⁴ Government Digital Service, (2015). ‘Office for National Statistics Website - Self Certification’. Available [here](#).

that the Bank of England “are not putting full weight on that [ONS] data, and it has to be said that it does not entirely feel right that investment is measured falling at a time when we see continued strengthening in investment intentions”.¹⁵ Similarly critical views were voiced in several responses to the Call for Evidence and it is fair to say that many users lack confidence in the quality control surrounding ONS statistics.

3.33 UKSA, as the statistics regulator, assesses the production of statistics against its Code of Practice for Official Statistics. The Code has eight principles, the first of which is the need to “meet the requirements of informed decision-making by government, public services, business, researchers and the public”.¹⁶ Statistics that meet the standards set out in the Code are designated with the quality mark ‘National Statistics’. No fewer than seven ONS outputs have had the National Statistics designation removed since the start of 2014, six of them in economic statistics. (Of course, to the extent that an increase in de-designations itself reflects a more rigorous and open application of controls that should be seen as a good, rather than bad, thing.)

Table 3.C: List of de-designated national statistics produced by ONS

List of de-designations	Date of de-designation	Current Status
Retail Prices Index	14 Mar '13	de-designated
Police Recorded Crime Statistics for England and Wales	15 Jan '14	de-designated
UK Trade Statistics for April 2014	18 Jun '14	re-designated 25 Jun '15
Consumer Prices Index including Owner-Occupiers' Housing Costs (CPIH)	14 Aug '14	de-designated
UK Trade Statistics	14 Nov '14	de-designated
Statistics on Overseas Travel and Tourism	14 Nov '14	re-designated 15 May '15
Statistics on Construction Output and New Orders	11 Dec '14	de-designated
Statistics on Claimant Count	10 Jun '15	de-designated

Source: UK Statistics Authority.

3.34 It is important that ONS produces statistics that are of high quality and error-free if users are to have confidence in them. Since March 2012, ONS has issued on average close to two corrections a month to its data and has also been criticised for its handling of erroneous statistics.¹⁷ In 2014 alone there were two particularly notable cases where ONS had to respond following processing errors in the production of National Statistics.

3.35 First, in July 2014 when the first quarter UK Trade Statistics were published, estimates of tourism expenditure were much lower than expected. This issue had already been queried by many users since preliminary tourism figures were published in March. In November, ONS found that the underestimate resulted from a processing error on an updated questionnaire introduced in January 2014 into the International Passenger Survey (IPS), a key source of data. The mistake was not identified during the regular quality assurance phase, but rather during a review of IPS processes, raising serious doubts over whether sufficient measures were in place to assure the quality of many other ONS statistics. The following day the National Statistician wrote to UKSA, who de-designated both UK Trade Statistics and the underlying UK Travel and Tourism figures as National Statistics.¹⁸ An internal review highlighted areas of concern, including a lack of contextual awareness by staff, as the figures were completely at odds with others that were

¹⁵ Treasury Select Committee on 26 November 2013. Available [here](#).

¹⁶ UKSA, (2009). 'Code of Practice for Official Statistics,' p.5. Available [here](#).

¹⁷ ONS Website. Available [here](#).

¹⁸ UKSA, (2014). Correspondence from Sir Andrew Dilnot to John Pullinger on expenditure estimates for UK residents' visits abroad and overseas residents' visits to the UK. Available [here](#).

publically available. While UKSA restored the National Statistics designation to the Overseas Travel and Tourism statistics in May 2015, it concluded that “confidence in the UK trade statistics has been diminished by the errors”.¹⁹

3.36 Second, also during 2014, concerns were raised regarding another National Statistic produced by ONS. Developing a measure of consumer price inflation including a proper measure of housing costs had long been a government priority²⁰²¹ and the Consumer Prices Index Including Owner-Occupiers’ Housing costs (CPIH) was duly introduced in March 2013 and designated a National Statistic shortly thereafter.²² But within a year, users were already querying the housing costs component. In particular, statistics published by the Valuation Office Agency (VOA) and ONS, while based on the same underlying data, gave a starkly different picture, leading to doubts about the validity of the methodology used to calculate CPIH.²³

3.37 After initially defending the series, ONS subsequently wrote to the regulator explaining that analytical errors had been found in the methodology used to calculate CPIH. Estimates of the CPIH annual growth rate were up to 0.2 percentage points higher than those originally published by ONS. This prompted the subsequent de-designation of CPIH as a National Statistic.²⁴ It appears that the error was caused by the combination of a dependence on VOA data, where the underlying administrative microdata was not accessible to ONS, and a lack of proper understanding regarding how to use the data in calculating the statistic. An UKSA review into administrative data suggested this may be a common issue, stating that there was a need for “critical judgment of the underlying data from administrative systems before the data are extracted for supply into the statistical production process.”²⁵

3.38 As well as these two particularly notable instances, 2014 also saw the de-designation of ONS statistics on construction output and new orders. The fact that so many errors and de-designations took place in such a short period and were not picked up by quality-assurance procedures suggests that there are deeper issues involved rather than just simple oversight. Subsequent reviews and assessments of other statistics have produced similar explanations, such as a lack of contextual awareness regarding the statistics and a lack of engagement with users of the statistics to understand potential shortcomings.

3.39 Another criticism of ONS has been that a lack of expertise has led to the publication of erroneous data, particularly in the wake of relocation to Newport. An example of this occurred in 2011, when ONS published construction statistics which quoted quarter-on-quarter growth as 2.3%, rather than the correct figure of 0.5%²⁶. This resulted in an incorrect revision to GDP. The error was identified by a journalist during a press lock-in briefing and was described by ONS as the most fundamental and basic of errors, whereby a mistake had occurred while copying and pasting figures from different columns in a spreadsheet. Media response to this issue was not surprisingly wholly negative and a subsequent review found that a lack of experience was the underlying root cause. It also cited two occasions where the error should have been picked up, firstly through the completion of more rigorous checks and secondly, if critical thinking had been applied by staff when considering the scale of the revisions. In response to this error, ONS

¹⁹ UKSA, (2015). 'Statistics on UK Trade (Office for National Statistics)' Assessment Report 304 p.2. Available [here](#).

²⁰ Cabinet Office, (2010). 'The Coalition: Our Programme for Government'. Available [here](#).

²¹ HM Treasury, (2010). Correspondence from Chancellor of the Exchequer to Governor of the Bank of England on CPI Inflation. Available [here](#).

²² UKSA, (2013). 'Statistics on Consumer Price Inflation' Assessment Report 257. Available [here](#).

²³ Campbell, R., ONS, (2014). 'CPIH Announcement 14 August 2014 - Explanatory Note'. Available [here](#).

²⁴ UKSA, (2015). Correspondence from Sir Andrew Dilnot to John Pullinger on Consumer Price Indices including Housing Costs (CPIH) Indicator. Available [here](#).

²⁵ UKSA, (2015). 'Quality Assurance of Administrative Data: Setting the Standard' p.4. Available [here](#).

²⁶ UKSA, (2011). 'Statement on the release of Output in Construction estimates'. Available [here](#).

is trying to minimise the use of spreadsheets and manual copying and pasting wherever possible.

3.40 A lack of critical evaluation and the failure of quality assurance procedures, specifically after changes in methodology, are other issues that have surfaced on several occasions. For example, in 2013 the measurement of Gross Fixed Capital Formation was subject to a methodological change, which led to the data exhibiting both greater volatility and an apparently implausible change in trend.²⁷ Doubts about the new series then led ONS to revert to the earlier methodology.

3.41 As set out in the discussion in Chapter 2 regarding the measurement of GDP, ONS has sometimes been slower than its peers to introduce methodological improvements. This became an issue of considerable significance when, in 2010, ONS made some routine changes in the way the basic data for clothing prices were collected. This led to a widening of the wedge (or 'formula effect') between the CPI and the RPI. It eventually transpired that this was due to ONS using an inappropriate formula ('Carli') to aggregate individual price quotes in the calculation of RPI. The deficiencies of this formula had been well known to statisticians since at least the 1970s. Indeed almost all other countries have long since stopped using it.⁹ This shows that while keeping up with international best practice seems optional, departing from it over a period of time can incur considerable costs.

3.42 While it is an unrealistic aim to completely eradicate errors within ONS, much greater effort is needed to quality assure the production of statistics. It is the role of ONS to present the most accurate and reliable picture possible of the economy. Failing to do so raises serious challenges for decision makers. As well as effective and rigorous quality assurance procedures, there also needs to be sufficient expertise embedded across the organisation to identify rogue data before it is released into the public domain. Closer engagement with experienced users can also help to ensure that significant errors that do slip through get picked up quickly.

International comparison of performance

3.43 In early 2015, the UK was reviewed on its compliance with the European Statistics Code of Practice by a team from other European NSIs.²⁸ The peer review's findings were largely positive, praising ONS for its transparency and openness. The review's report went on to mention ONS efforts to develop stronger relationships with users; it noted ONS's growing ties with academia and the role this served in developing methodology. It also acknowledged ONS's focus on improving the quality of its work.

3.44 The review did find some areas of weakness and made a number of recommendations, several of which are echoed in this Review. One particular finding is, though, worth recording in full. This was to seek greater use of administrative data for statistical purposes, subject to appropriate safeguards. The peer review noted that:

"In recent years, many European countries have purposefully increased their use of administrative data. As a result, the availability of source data has increased and the NSIs have succeeded in augmenting their existing survey data or even replacing their own surveys with the use of administrative data. The combined effects have been increased data supplies for statistical purposes, reductions in response burden and cost by businesses and household and cost reductions and increased efficiencies for the NSIs. Such developments have only taken place to a limited extent in the UK where there are

²⁷ Barker, K. and Ridgeway, A., (2014). 'National Statistics Quality Review: National Accounts and Balance of Payments'. Available [here](#).

²⁸ Snorrason H., Byfuglien J. and Vihavainen H., (2015). 'Peer Review Report on compliance with the Code of Practice and the coordination role of the National Statistical Institute: United Kingdom'. Available [here](#).

substantial cultural and legislative obstacles to utilising administrative microdata for statistical purposes.” (p14-15)

3.45 The peer review had other recommendations on ONS’s capability, increasing the efficiency of the statistical system and making UK statistics more accessible. The recommendations included the need for changes to ONS’s tools and systems, modernisation of data collection, coordination with European counterparts, an updated website and improved access to microdata for researchers.

3.46 In June 2014, ONS also conducted their own survey to improve their understanding of other countries’ national accounts operations and processes and to identify common challenges and opportunities for cooperation and sharing of best practice. The survey received responses from 16 NSIs with comparably mature national accounts operations, activities and structures (covering the range of GDP, Balance of Payments, financial accounts and public sector finances).

3.47 ONS asked questions about NSIs’ systems and data sources, as well as staff retention and reporting processes. The survey concluded ONS was one of the weakest performers in all of these areas, though this was in part due to the relative complexity of ONS’s systems compared to the less integrated systems used in some other countries. ONS’s choice of technology was largely consistent with that used by other NSIs, but it was the only statistical institute that reported major concerns about systems performance. The UK scored lowest on overall self-evaluation of the agility and flexibility of its systems. ONS was also one of only two countries with major concerns about the coherence of internal data sources and data quality. Twelve NSIs reported a tightening of their budgetary restraints, with only four stating no concerns in this area.

3.48 While ONS has been criticised for making mistakes in recent years, it is by no means the only NSI that has had to correct errors in published statistics. One example is that of Statistics Sweden, which in 2008 reported an error in its CPI, meaning that the inflation rate was overestimated by 0.3 percentage points and which had significant consequences for the Riksbank’s monetary policy as well as benefit payments.^{29,30} Another example is that of Statistics Canada, who faced widespread criticism for an imputation error which significantly understated employment in its July 2014 Labour Force Survey results.³¹

Culture, capability and collaboration

Culture

3.49 Successive errors and other shortcomings in the production of economic statistics have put the focus on analytical capability within ONS. Most regular users of economic statistics – including HM Treasury, OBR and the Bank of England – have raised concerns about quality assurance and the need for greater economic expertise in sense-checking releases. There is widespread agreement that ONS needs to be more inquiring and self-critical about the statistics it produces, and not just in the narrow process of quality assurance. ONS should know more about its statistics and their sources than anyone else, so it should be in the vanguard of understanding the limitations of its data and explaining those limitations to users, rather than instinctively defending its statistics when users raise questions about them.

3.50 Providing economic statistics that are relevant, timely, accessible and of high quality not only requires the right skills, methods and systems – it also requires a pro-active, open and

²⁹ United Nations Statistical Commission and Economic Commission for Europe, (2009). ‘The shoe problem – and what we are doing to prevent it’. Available [here](#).

³⁰ United Nations Statistical Commission and Economic Commission for Europe, (2010). ‘Corrections at Statistics Sweden’. Available [here](#).

³¹ Statistics Canada, (2015). ‘Review of the July 2014 Labour force Survey release’. Available [here](#).

creative approach that keeps pace with developments in the modern economy and understands and responds to the changing needs of statistics users. The need to maintain ‘continual curiosity’ was explicitly identified in the 2014 Barker-Ridgeway Report: “ONS will need to foster an organisational culture that respects the historical record of the UK economy while at the same time maintaining continual curiosity about the ever changing world that will assure sound information for current users and a historical record the next generation can build upon”.²⁷

3.51 One of the key themes emerging from this Review’s Call for Evidence was the need for ONS to move beyond focusing largely on the production of statistics (the ‘factory’), and instead embrace a role as a service-provider, supporting users with confidence, curiosity and enthusiasm. While many respondents recognised that the new senior leadership team was moving ONS in the right direction, some respondents thought more was needed by way of fostering a change of culture and working practices.

3.52 Three inter-linked ingredients are needed to help meet this objective of building a ‘curious’ ONS that is more responsive to changes in the economic environment and better meets evolving user needs:

- **Improved understanding of the ways and context in which its economic statistics are used.** This could be facilitated by building up the economics capability of existing staff through training, shadowing and secondment opportunities at HM Treasury, the Bank of England and other relevant organisations, and by the recruitment of more economic analysts. ONS should also seek to strengthen its engagement with the economic statistics user community, through regular events such as the recently-launched ‘Economic Forum’, and by identifying issues where collaboration with outsiders would be valuable.
- **Raising staff knowledge of the systems, methods and data sources for the production of economic statistics.** An environment of continual improvement requires a good knowledge of the limitations of existing approaches and the opportunities presented by new developments and technologies. It appears that while some training is offered, it takes place within directorates. Broader training and career paths that move across directorates would both help. This could be complemented through more interchange of staff with other NSIs and relevant organisations. Rationalising the complex and aging range of systems used by ONS would also make it easier for staff, especially new recruits, to get a fuller understanding of processes. Such in-depth knowledge would also make it easier to ‘sense-check’ outputs by comparing them to information available from other sources.
- **Strengthening ONS’s quality-assurance processes and analytical capacity to spot mistakes and inconsistencies, including building in sufficient time for meaningful and rigorous internal challenge.** Several stakeholders who spoke to the Review team thought that current quality-assurance processes were too formulaic and noted that relatively simple checks could have prevented many of the recent errors. There was a strong feeling that ONS staff also needed to be more sceptical of their statistics and have a greater ability to apply a ‘smell-test’. This requires that time be set aside for critically evaluating outputs in the production process. Management has recently launched a range of initiatives under its ‘curiosity agenda’ to raise staff’s ability and confidence to question methods and outputs. This includes workshops to share examples of the successful application of curiosity, as well as a programme of external speakers focused on how other organisations have instilled a more questioning culture.

Analytical capability

3.53 ONS needs to move beyond focusing largely on the production of a standard set of statistics according to internationally-agreed templates and seek also to be a more responsive service provider, using their data and statistical expertise to help users address their questions about the economy. Moreover, ONS ought to know more about the strengths and limitations of its statistics than anyone else, and should be in the vanguard of understanding and explaining them and how they relate to indicators produced by other organisations. In short, it should be *the* UK centre of expertise in economic statistics. But this is only an achievable goal if sufficient analytical capability is available. The next section considers how ONS can engage with and draw on expertise outside the department to augment its own capability.

Professional analysts

3.54 There is a range of analytical professions in the Civil Service, including economics, statistics and social research, as well as new disciplines such as data science. All of these have a role to play in ONS, as does the development of wider analytical expertise. ONS should seek to embed an analytical culture throughout the organisation, with strong representation from all these professions.

3.55 These analysts need to be open to exchanging ideas with colleagues across ONS and to engaging more actively with the external analytical community. Review team discussions with staff below Senior Civil Service level at Newport highlighted a number of management issues - including career planning, progression prospects and lack of transparency in internal recruitment - that could be hampering ONS's ability to recruit and retain staff. Similar concerns were raised by ONS members of the various Civil Service Fast-Stream programmes. This may be explored further in the Final Report.

3.56 In order to put ONS in context, it is worth looking at the growth in the Government Economics Service and the Government Statistician Group.³² The number of professional analysts in government as a whole has risen substantially since ONS was created and, although the comparison is not perfect, it provides a benchmark against which to measure how ONS analytical capability has evolved. Across the Civil Service, the headcount of both economists and statisticians has increased by over 150% since 1996 (see Table 3.D). Combined with a decrease in the size of the wider Civil Service over that period, that has meant statisticians and economists rose from making up approximately one in every 480 posts, to making up one in every 150 posts.

3.57 Those two professions naturally make up a much larger proportion of the workforce in an analytical organisation such as ONS than in the wider civil service. However, while the overall number of statisticians within ONS has also grown, it has not grown by the same rate as elsewhere in the Civil Service. One should not conclude, however, that this indicates a shortage of statistical expertise relative to other government departments. It may well be that a historical tendency of ONS to employ statisticians in a wide range of roles, such as project management, is giving way to greater specialisation.

3.58 It seems plausible that the increase in the number of economists across government departments represents greater appetite for economic analysis for policy and operational reasons. The number of economists at ONS has increased to over 40 in 2015 which represents a very high rate of increase, but from a very low base. However, ONS still has far fewer than many other departments such as HM Treasury or even the Ministry of Justice. It is also a long way behind other analytical institutions like the Bank of England or the OECD. It seems clear that

³² The Government Statistician Group is the professional statistician group within the Government Statistical Service.

ONS is not only much less dominant as a centre of statistical expertise than it once was, but that it is also lagging as a centre of economic expertise.

Table 3.D: Statisticians and economists, for ONS and Civil Service in 1996 and 2015

Headcount	1996	2015
Civil Service	538,000	431,000
ONS	2,725 ^a	2,332 ^b
All economists	515	1,386
ONS economists	— ^c	41
All statisticians	595	1,535
ONS statisticians	172	210

Source: *Public Sector Employment Statistics, Office for National Statistics, Government Economic Service and Government Statistical Service*

^a Figure in table excludes General Register Office staff; published Civil Service statistics give a headcount of 3,500 in 1996

^b Figure in table excludes field interviewers re-classified as Civil Servants in 2008; published Public Sector Employment Statistics give a headcount of 3,740 in 2015.

^c No reliable data, on some estimates this could be as low as two. However, the Government Economics Service Directory for 1996 implies the number could be as high as ten.

Impact of scarce resources

3.59 As with any organisation, ONS must choose priorities in order to make the best use of its resources. As noted earlier, the resources available to ONS have fluctuated noticeably. Not unreasonably, when resources are tight the obligation on ONS to collect and publish particular sets of statistics results in these activities being protected at the expense of interpretive or innovative projects that may help to raise analytical capability and support core functions in the longer term.

3.60 Boxes 3.C and 3.D in this section provide examples where ONS responded to limited resources by cutting back on such investment-like activities. In both examples, this meant halting work that had been recommended by major reviews. Both initiatives also relate to statistical outputs identified in the previous chapter of this Interim Report as still representing important measurement challenges in the modern economy.

Box 3.C: UK Centre for the Measurement of Government Activity (UKCeMGA)

The UK Centre for the Measurement of Government Activity was launched within ONS in 2005, in response to increasing demand for improved measures of public service output, and in particular to implement the recommendations of a review led by Sir Tony Atkinson. Guided by an expert advisory board, the centre operated as a collaborative hub, working with the departments delivering public services to develop a framework of measures for government output. The progress made by the centre, which was at the cutting edge internationally, is set out in the earlier chapter on public sector services.

At its peak in 2007-08 the centre had a budget of £1.6 million and was made up of 35 staff (five of whom were working on a related, but separately-funded project). However, from 2009 onwards, with much of its original agenda fulfilled, changing priorities and user demands led ONS to divert its resources elsewhere. The centre was merged with related National Accounts work on the public sector, and the combined functions are now supported by just twelve staff. When National Accounts activities relocated from London to Newport, many staff with relevant expertise moved to fill vacancies left by those who did not relocate.

As a result, work to measure public sector activity was reduced to a minimum and the development of methodology ceased. ONS reported to this Review that the methods in use to measure public services remain largely as they were in 2008. The chair of the cross-Whitehall Public Sector Efficiency Group told the Review that “ONS remains a world leader in producing public sector productivity statistics”. However, he also pointed to the scaling back of resources in recent years and listed a number of areas for improvement including timeliness and quality adjustment. Further detail on the potential for improvements in these areas can be found in Chapter 2 of this report.

3.61 Some prioritisation should be welcomed as ONS must respond to changing user needs. But the experiences of the Atkinson and Allsopp reviews show that a continuing resource commitment is needed to maintain expertise. Furthermore, it is inefficient to invest in building cutting-edge expertise in one area, only to let it run down shortly afterwards. ONS cannot afford to chase each topical question as it arises. Rather, it needs to make greater use of one-off exploratory and horizon-scanning projects, informed by policy needs and carried out in collaboration with experts in academia and other entities, to identify areas that warrant a sustained commitment to build-up expertise or the development of new regular statistical outputs.

Box 3.D: ONS Regional Statisticians

The Review of Statistics for Economic Policymaking in 2004 by Christopher Allsopp recommended a significant statistical presence in each English region, as a source of regional expertise and as a link to regional bodies.⁷

ONS Regional Statisticians were established in April 2007, with the initial funding provided by the Regional Development Agencies. However, only four years later funding for the Regional Development Agencies was withdrawn along with funding for the Regional Statisticians.³³ As a result the small locally-based teams of statisticians were stopped, except in London where the Greater London Authority maintained its funding.

Location

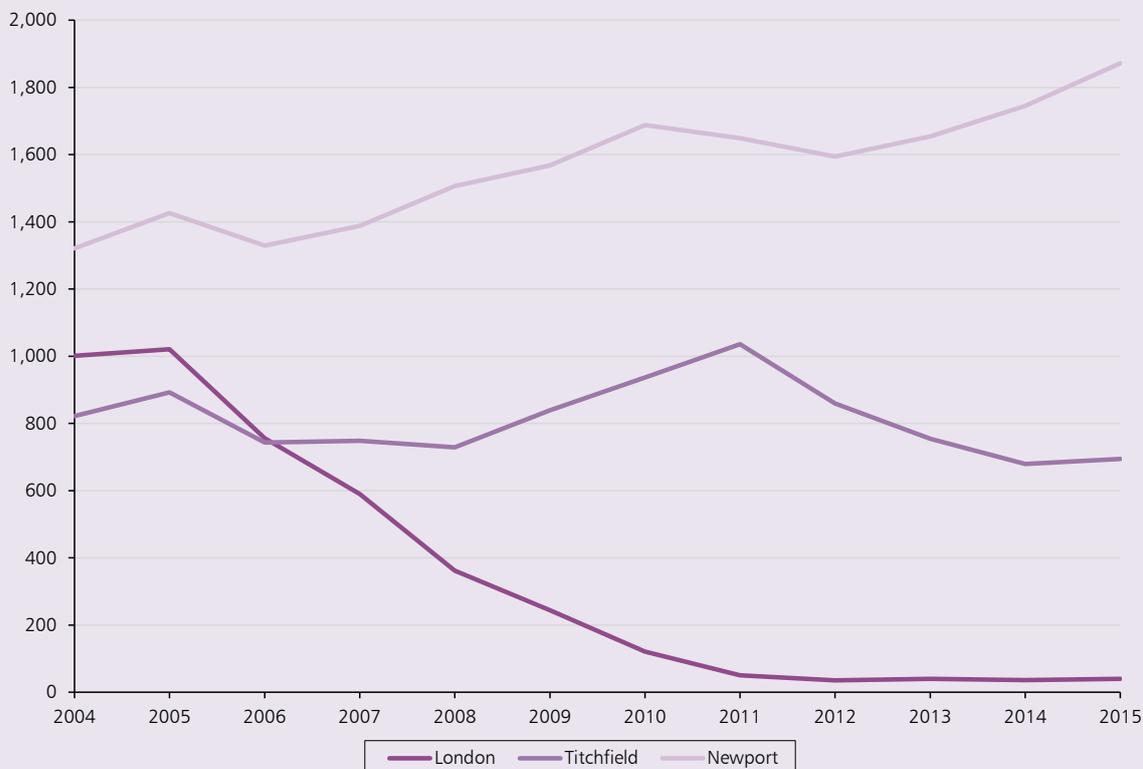
3.62 Responding to the Call for Evidence, many users argued that the weaknesses in ONS's analytical capability were linked to the relocation of functions previously based in London to Newport, which resulted in a significant loss of experienced staff. In particular the National Accounts coordination role. Box 3.E gives further details on the impact of the relocation. It is the judgement of this Review that the loss of statistical expertise which resulted from the relocation decision has had a significant – though not necessarily permanent – detrimental effect on the capability of ONS and the quality of its outputs over the past decade.

³³ UKSA, (2011). 'Annual Report 2010/11' Available [here](#).

Box 3.E: Relocation from London

The move out of London began in 2005-06. Over the following years, ONS presence in London fell to just 50 staff. Although some functions and staff moved to ONS's Titchfield site, economic statistics production was consolidated at the Newport site, which has steadily expanded as a result.

Chart 3.D: Headcount at ONS sites, 2004 to 2015



Source: Office for National Statistics.

Prior to the relocation, in April 2005, ONS employed just over 1,000 staff in London. Over the course of the relocation, only 101 staff opted to move to either Newport or Titchfield, of whom seven were Senior Civil Servants. In other words, close to 90% of the London-based staff left ONS in just a few years, a far higher proportion than might be expected to depart under normal circumstances.

3.63 National accounts skills are highly specialised and, to a large degree, acquired on the job. It was unrealistic to expect that the loss of knowledge and experience could be replaced overnight. However, new recruits and less experienced staff will over time acquire the required skills and expertise. Having now brought the production of economic statistics together in Newport and begun to develop skills and experience there, it would make little sense to contemplate reversing the original move, as that would just be likely to create new transitional costs with the loss of staff who do not wish to relocate to London.

3.64 Moreover, because the production of economic statistics is so specialised, it is likely that wherever an NSI is located it will become a regional hub for statistics. Consequently, there is considerable potential for the current site to become the centre of a 'hot spot' in economic statistics and data-related professions. ONS should concentrate on building up the long-term capability of its Newport site. That can be furthered by developing strong links with universities and government agencies in South Wales and the West of England.

Collaboration and user engagement

3.65 The need for better engagement by ONS with users of economic statistics was raised by several respondents to the Call for Evidence. However, some also recognised that the diverse, complex and at times contradictory demands of the broad statistic-user community also posed challenges for ONS's prioritisation of engagement and responsiveness. Engagement is more effective when it is a two-way process between users and producers of economic statistics. This would allow ONS teams to share their understanding of the statistics they publish, as well as their knowledge of the underlying data sources used in the production process. It would also mean ONS could make better use in the production of statistics of users' insights and expertise. UKSA regulatory staff suggested to this Review that the more experienced and senior staff have been engaging more actively with users, but that ONS frequently forgoes opportunities to assimilate intelligence from external parties into improving the quality of statistics.

3.66 User engagement is explicitly recognised in the Code of Practice for Official Statistics and an area that UKSA has looked into closely across the statistical system. In June 2010, it published a monitoring report on the need to strengthen user engagement. That report concluded that, while there was already plenty of engagement, there needed to be: "(i) better understanding of the use currently made of official statistics and the value to society that flows from that use; (ii) better communication with a wide range of users; and (iii) better exploitation of the existing consultation structures and technologies to ensure that user engagement is effective."³⁴

3.67 This Review's own analysis of returns to ONS's annual customer satisfaction study over recent years suggests that key stakeholders are broadly satisfied with their engagement with ONS. Criticism tended to focus on the quality of economic data, the handling of statistical errors, and the inaccessibility of the website. The letter accompanying HM Treasury's return to the 2014-15 customer satisfaction survey noted: "we recognise recent ONS efforts to become more proactive in flagging issues of mutual interest and helping [HM Treasury] understand where publications have wider strategic significance. We note however this has some way to go before becoming systemic and embedded."³⁵ The Bank of England's most recent submission also noted ONS's improved performance on the previous year and welcomed in particular the successful delivery of methodology changes in its Blue Book.³⁶

3.68 ONS should not constrain itself to just its own in-house expertise in trying to understand and address emerging statistical challenges. In a welcome development, ONS has recently made greater use of external experts in the quality assurance of major statistical releases. The Royal Statistical Society (RSS) has suggested that the greater use of advisory committee structures represents a cost-efficient way for ONS to strengthen its engagement with users. In discussions with the Review team, both the Economic and Social Research Council (ESRC) and the Council of Royal Economic Society (RES) were open to the idea of an external body of experts to engage with ONS regarding economic statistics, methods and processes.

3.69 In 2014 the Barker-Ridgeway Review suggested the formation of a formal external advisory team, including international experts, to supplement the work of the existing Methodological Advisory Committee. This would complement the review's other proposal for a separate team of economists providing an extra source of expertise. The report also welcomed the establishment of the ONS Economic Forum and encouraged ONS to engage with a wider range of users of economic statistics instead of just its traditional key customers: HM Treasury, Bank of England and the Department for Business, Innovation and Skills.

³⁴ UKSA, (2010). 'Strengthening User Engagement' p10. Available [here](#).

³⁵ HM Treasury, (2015). Response to ONS customer satisfaction survey 2014-15. Available [here](#).

³⁶ Bank of England (2015). Response to ONS customer satisfaction survey 2014-15. Available [here](#).

3.70 These are all steps that should be welcomed. However, on certain issues there is a need for ONS's engagement to develop further into proactive collaboration on key measurement challenges. There is appetite in the statistical community to work collaboratively on improving economic statistics. One solution could be greater use of partnerships, between ONS on the one hand and academia, businesses and other analytically-minded entities on the other. Furthermore, such partnerships would not only allow ONS to draw on the input of specialists and experts, they would also increase knowledge and capability within the organisation too.

3.71 A further point raised by respondents to the Call for Evidence was that ONS was at times overly cautious when it came to sharing work-in-progress, testing new methods, and drawing on data from elsewhere. An important part of developing a space for collaboration with other users of economic statistics is to enable ONS to be more experimental in its approach. This requires a different approach to dissemination, which allows ONS to be open with the user community when discussing experimental approaches, initial results still subject to change and methods that will likely evolve as research progresses. One area that is clearly suited to such a collaborative approach is the application of data science.

3.72 Making microdata available to users outside of government (including academics, researchers, businesses, civil society and individuals), subject to appropriately stringent data confidentiality safeguards, could help foster greater collaboration between ONS and experts, and shine a collective light on how the economy is changing. Given the importance of the government's ambitious open data plans, opening up government administrative microdata to the wider world, with appropriate protection of ethics and confidentiality, could be an important next step.

3.73 A barrier to greater use of partnerships by ONS is likely to be the lack of facilities in London, where a number of key users are located. While core activities should remain in Newport, an increased presence in London would help to strengthen links between ONS, HM Treasury, the Bank of England and many private-sector users. It would also facilitate staff interchanges and secondments.

3.74 In 2014 the Barker-Ridgeway Report suggested that expertise in commenting on data should be retained in the ONS economics team, but was also open to establishing "a small team of economists, possibly based in London where there is a wider labour market for economists and possibly including some part-timers from outside the ONS".²⁷ Several respondents to the Call for Evidence agreed with the idea of a greater ONS presence in London, alongside continuing to build skills and expertise in Newport, in order to facilitate more effective engagement and collaboration with users.

3.75 Interim Recommended Action 1: *Encourage staff: to understand better how their statistics are used; to be more open and curious in identifying statistical issues; and to use their expertise to influence the international statistical agenda more effectively.*

3.76 Interim Recommended Action 2: *While building up the capability of its operation in Newport, ONS should also increase its London profile in order to facilitate stronger engagement with users of economic statistics, as well as expanding its engagement with users across the rest of the UK.*

3.77 Interim Recommended Action 3: *Improve user access to microdata while respecting confidentiality issues, and foster more collaboration with users and experts.*

3.78 Interim Recommended Action 7: *Increase the economic expertise available within the organisation in order to raise ONS's capability to quality-assure and sense-check statistics before release.*

3.79 Interim Recommended Action 8: *Make more use of one-off studies – including drawing on new data sources – to investigate emerging measurement issues, collaborating with expert users in business, government and academia wherever appropriate – including through the use of institutional partnerships and fixed-term secondments into ONS.*

Survey data sources

Current ONS use

3.80 At present, ONS relies on conducting regular surveys of businesses and households as the source of the bulk of its economic statistics. The activity is industrial in scale – ONS sent out more than one and a half million survey forms in 2014 – and consumes a quarter of ONS resources.

3.81 In responding to the Call for Evidence, some users argued that surveying was an expensive and outdated method of collecting data and could be greatly reduced in scale if more use were made of administrative data and similar information that was in principle already available. Others told the Review that the reporting burden surveys placed on businesses was a concern. But some users noted that administrative data was not always well-structured or did not provide sufficiently focused information, while a well-designed sample survey was a very powerful tool.

Business surveys

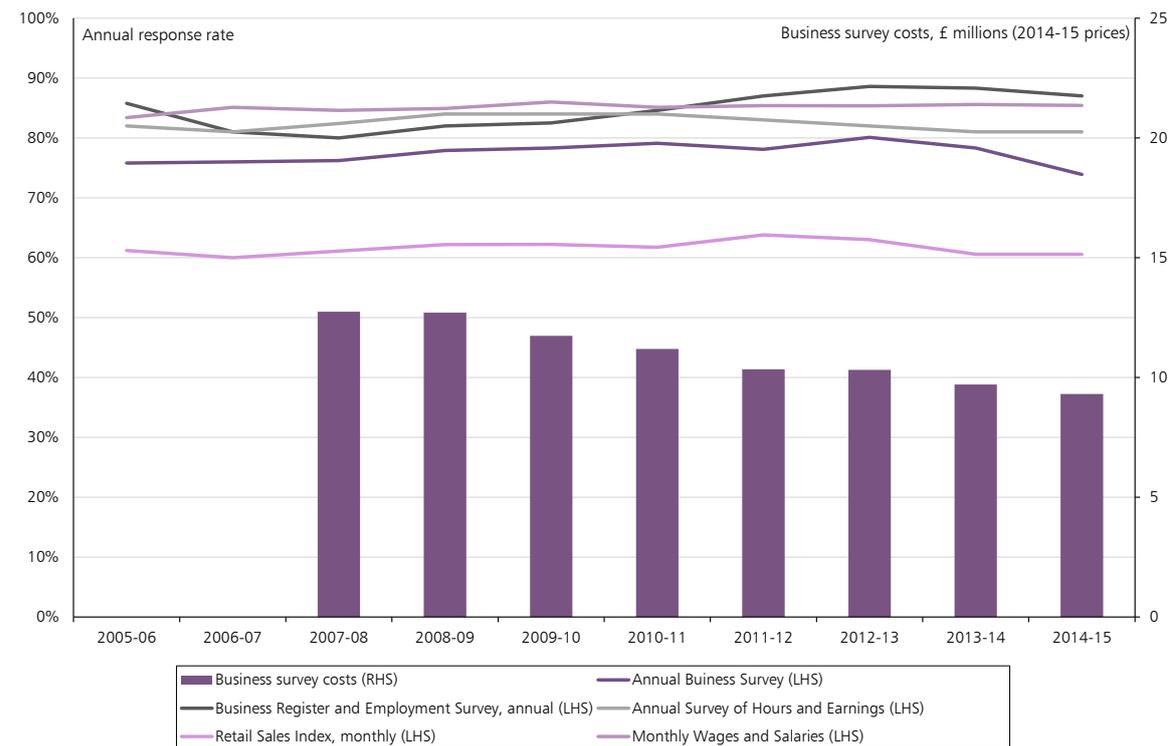
3.82 ONS conducts a total of 69 business surveys, sampling almost 350,000 businesses a year, over a third of whom will be contacted more than once.³⁷ Some surveys are very detailed while others are quite simple: for instance, the standard monthly business survey sent to many businesses contains only a single question on revenue.

3.83 Under the Statistics of Trade Act 1947 it is compulsory for businesses to complete these surveys, but there is still a cost to ONS in chasing and validating the raw data to meet deadlines. The volume of complete returns from businesses has been maintained by ONS at a stable level, despite savings being made in recent years (see Chart 3.E).

3.84 Business surveys have been collected by ONS and its predecessors in Newport since 1969, so they are a well-understood and trusted data source. In addition, because large companies make up the bulk of economic activity, a comparatively small number of responses can produce reliable headline figures. ONS relies on this fact in constructing short-term estimates of activity, but unstructured data and the application of data science techniques have the potential to provide an alternative basis for early indicators.

³⁷ Online List of Government Statistical Surveys. Available [here](#).

Chart 3.E: Business survey costs (2007-08 to 2014-15) and response rates for five business surveys (2005 to 2014)^a



Source: Office for National Statistics.

^a Response rates are for calendar years and business survey costs are for financial years.

3.85 To reduce the burden on respondents and to cut costs, a well-designed survey asks the minimum number of questions of the smallest sample of respondents necessary to achieve a representative picture of the parent population. ONS is adept at this – the Annual Business Survey, one of the most complex, asks a ‘short form’ questionnaire of most businesses, and only requests further detail in a ‘long form’ version sent to a smaller number of the surveyed businesses, as set out in Table 3.E. However, the fact that the sample is only made up of a small proportion of businesses means that it lacks sufficient granularity if the sample needs to be stratified finely by size, industry or region.

Table 3.E: Annual Business Survey 2014 sample size, by questionnaire type

	Short form	Long form
Production and construction sectors	10,340	6,415
Service sector	28,958	17,177

Source: Office for National Statistics

Household surveys

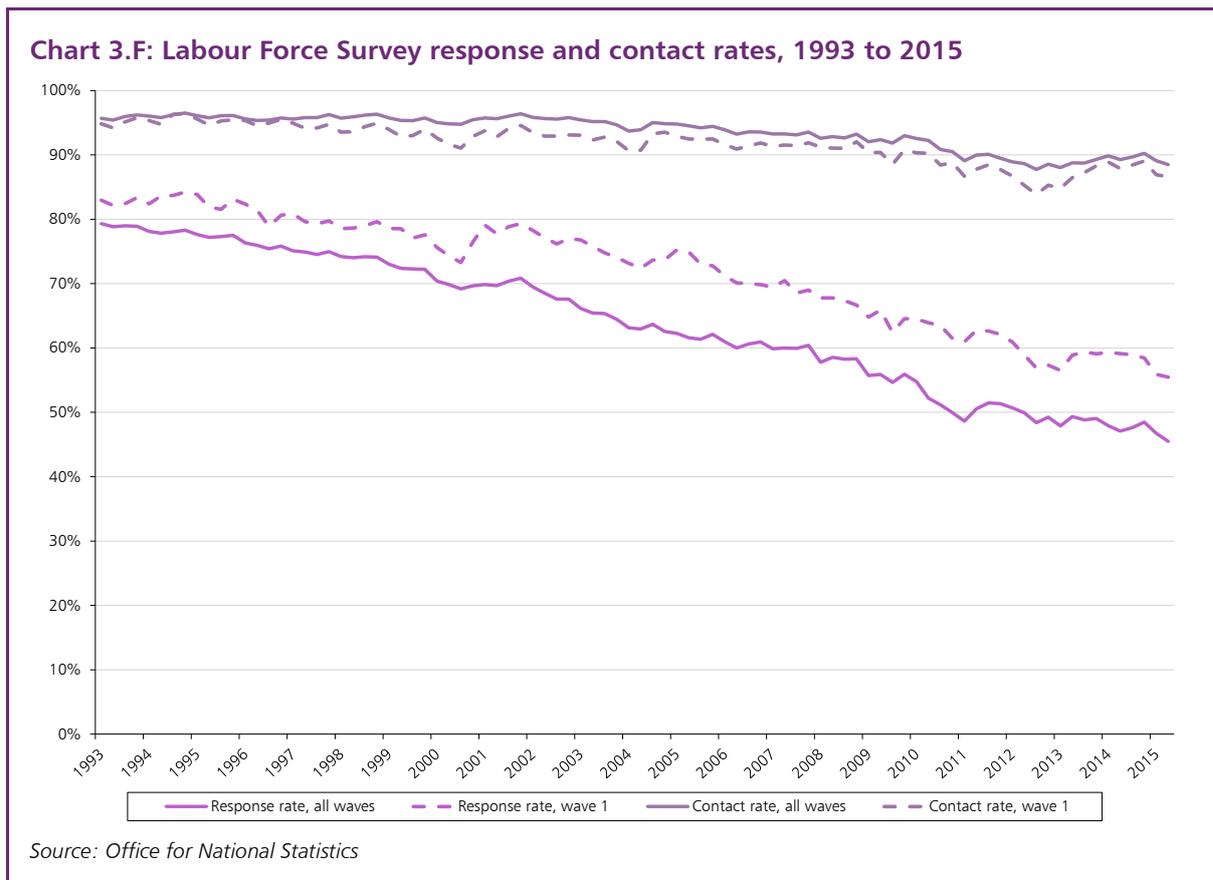
3.86 Unlike business surveys, surveys of households are voluntary (except for the census). When randomly-sampled respondents fail to complete the survey, either because they cannot be contacted or because they refuse to participate, it raises the likelihood that the respondents to the survey will be unrepresentative of the parent population. Lower response rates therefore indicate a greater risk of bias in the data collected, and response rates have generally declined steadily over the past two decades.

3.87 Declining response rates are not unique to the UK. A 2002 analysis of surveys in 16 countries showed that response rates have been declining internationally for a large variety of

official household surveys.³⁸ This is an important issue for ONS and other NSIs. ONS continually investigates the reasons for non-response, with the intention of improving its interviewing practices. The effect of this issue is illustrated here by looking at two household surveys that play a central role in the production of UK economic statistics: the Labour Force Survey (LFS) and the Living Costs and Food Survey (LCF).

Labour Force Survey

3.88 The quarterly LFS is the largest of the ONS household surveys – ONS completes 36,000 interviews each quarter and the data collected underpins UK employment statistics. The survey design involves contacting each cohort of respondents five times in successive quarters to follow patterns in the labour market. Funding for the LFS has fallen slightly in recent years, from £6.5 million in 2007-08 to £6.3 million in 2013-14.



3.89 The census provides an opportunity each decade to examine the representativeness of the LFS sample and assess the impact of falling response rates (see Chart 3.F). A recent ONS study used data from the 2011 Census to evaluate the potential size of non-response bias and concluded that it was relatively small (although there were notable differences in response rates across ethnic groups).³⁹ A subsequent NSQR, published in 2014, concluded that the LFS enabled the production of “good quality estimates” of labour market statistics.⁴⁰ However, it noted that were response rates to continue to fall it would constitute a threat to the representativeness and quality of the data.

³⁸ de Leeuw, E., and de Heer, W., (2002). ‘Trends in Household Survey Nonresponse: A Longitudinal and International Comparison,’ in Groves, R. et al. (eds.). Survey Nonresponse.

³⁹ ONS, (2013). ‘Non-response Weights for the UK Labour Force Survey? Results from the Census Non-response Link Study’. Available [here](#).

⁴⁰ ONS, (2014). ‘Review of the Labour Force Survey’, p.8. Available [here](#).

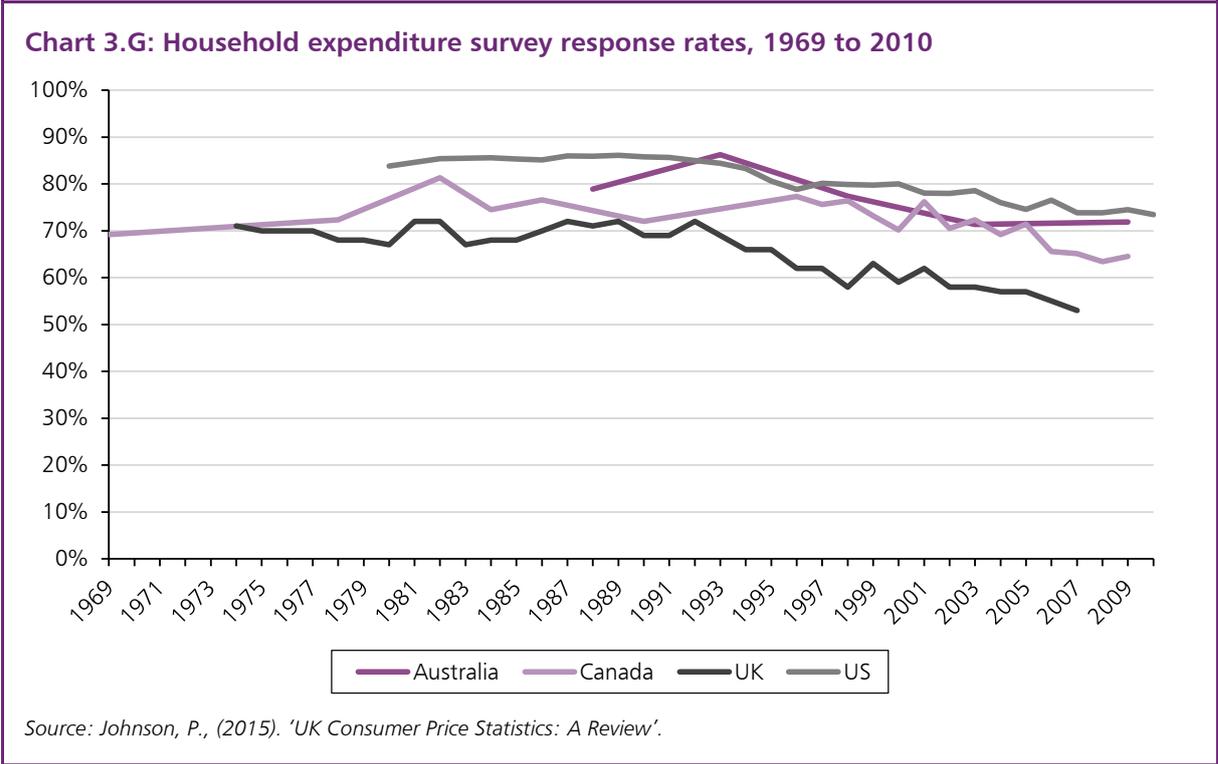
3.90 The NSQR also compared the LFS with international equivalents, which often have higher response rates. In some countries that is a consequence of participation being compulsory, but the response rate of 62% for the UK was low even compared to European countries with voluntary surveys, where the average response rate was 74%. The report suggested that stringent fieldwork rules and a lengthy questionnaire contributed to the low UK response rates. For instance, the equivalent (voluntary) survey in Ireland, has a first interview that is one-third the length of the UK survey, and achieved a response rate of almost 80%.⁴¹

3.91 The NSQR noted that the LFS lacked a standing research and development team to identify areas of concern and opportunities for development. Experimenting with survey design could yield improvements, and in the future may be important for getting the most out of a combination of surveys and administrative data.

Living Costs and Food Survey

3.92 The LCF is the UK’s principal data source on household consumption. Participants keep a diary in which each household member records their purchases over a fortnight. The data feed into the National Accounts as well as consumer price indices.

3.93 Paul Johnson, in his 2015 review of consumer price statistics, referred to the work of Barrett et al, which showed the long-term deterioration in aspects of data quality from the LCF as well as equivalent surveys overseas, including response rates (see Chart 3.G).^{9,42} The most recent ONS figures for 2013 show that response rates have continued to decline. A NSQR of the LCF is underway and will be published shortly.



⁴¹ 2011 figures.

⁴² Barrett, G., Levell, P. and Milligan, K., (2012). 'A comparison of micro and macro expenditure measures across countries using differing survey methods'. Paper prepared for "Conference on Improving the Measurement of Consumer Expenditures". Available [here](#).

Surveying prices

3.94 Surveys of prices constitute another key data source. Information on producer prices are collected through surveys of businesses, as detailed earlier, and used to construct the Producer Price Indices. Perhaps of more interest, though, is the regular survey of retail prices that underlies the construction of the Consumer Prices Index. For the majority of components of the basket of consumer goods and services that enter the index, this involves the physical collection each month of specific prices at shops across the country. Around 110,000 price quotes, from around 140 locations, are collected by contracted price collectors visiting shops and other outlets. The collection of this information is contracted out, but subject to ONS quality control.

3.95 Although the quality of price data appears to have been maintained over time, the Johnson Review concluded that the collection method was outdated and could be improved upon. He identified three alternative sources: shop scanner data, web scraping, and consumer panel data. He concluded that ONS needed to exploit these sources better if it were to catch-up with international best practice.

Survey Costs

3.96 Surveys are costly, both for ONS and for respondents. To elicit responses in household surveys, ONS employs a one-thousand strong field force interviewing people face-to-face and by telephone. Securing individuals' cooperation is a difficult and expensive process, but securing a reasonably high response rate and a representative sample are important if statistics are to be reliable.

3.97 Interviewing a first-time respondent to the LFS takes around 40 minutes, followed by somewhat shorter interviews in each of the following four quarters. Substantial effort goes to waste: broadly speaking, only three in five people agree to participate. On average, each complete LFS response costs ONS about £40. The LCF is an even more burdensome survey that absorbs about three hours of each respondents' time. Each complete LCF response costs ONS about £360.

3.98 Compulsory surveys of businesses are less costly for ONS and efficiencies have been made in recent years. But there are still costs associated with running the surveys and quality-assuring the data. In total ONS spent £9.6 million on collecting data from businesses in 2013-14.

3.99 Of course the surveys also place a burden on respondent businesses. ONS publishes estimates of these compliance costs for each business survey. The total cost to businesses of ONS surveys in 2013-14 was estimated to be £24 million.⁴³ But it is likely that this underestimates the total burden on business. For example, the calculation is based on the median cost to firms, which understates the much more significant burden reported by a minority of businesses. In addition, much of the data behind the calculation is old or imputed. ONS have launched a study to provide more up-to-date information for three of the business surveys, albeit employing the same methodology. The Review team's engagement has focused on the use of statistics, rather than the experience of responding to surveys, but nevertheless businesses groups suggested that compliance costs are a non-negligible cost for some.

Future developments

3.100 Given the ubiquity of electronic data today, it is incongruous that the production of ONS economic statistics still relies so heavily on the posting of paper forms and knocking on doors. ONS is presently developing and trialling a system for online data collection, which should reduce costs and ease the burden on respondents. Moving surveys to an online platform will

⁴³ ONS, (2015). 'Annual Report on Government Statistical Surveys for Official Statistics of Businesses and Local Authorities 2013/14'. Available [here](#).

make it easier to flexibly adapt, shorten and combine them in response to changing needs for survey data.

3.101 Improved collection will not, however, address one of the more fundamental limitations of survey data, namely a limited ability to stratify the sample into more finely defined units (e.g. by industry or region) unless the sample is very large. The costs of producing sufficiently granular data to meet all future needs with traditional surveys would be prohibitively expensive. Furthermore, while the data collected might answer one question, it might lack the flexibility to answer novel, emerging questions as the structure of the economy changes.

3.102 The next section therefore explores the scope for greater exploitation of other sources of data – particularly, but not exclusively, administrative data – that has the potential to meet these needs. Greater use of alternative data sources may allow some surveys to be discontinued or reduced in size, thus reducing costs for both ONS and respondents. But it is important to stress that surveys will necessarily remain a central ingredient of ONS’s operations. Instead, these alternative data sources constitute a presently under-utilised complement to surveys, whose exploitation would allow ONS to provide decision makers and the public with more accurate, timely and relevant economic statistics.

Administrative and alternative data sources

Current ONS use

3.103 The term ‘administrative data’ refers to information obtained by a public or private sector organisation in the course of undertaking its normal operations, rather than with a view to its use for statistical purposes. The amount of administrative data has increased exponentially since the birth of modern statistical collection two centuries ago. John Rickman, the Director of the British Census at its inception in 1801, had to start the process of collecting data on baptisms, marriages and funerals from parishes to populate the first Census. In 1801 the services provided to citizens by the state, charities and businesses were fairly basic, with correspondingly rudimentary administrative data as a result. As the provision of services increased, so did the amount of administrative data. But it was not until the 1980s that the potential for administrative data to be used for statistical purposes began to open up, largely as a function of rapid advances in IT.⁴⁴

3.104 ONS today has access to many tools and techniques for producing economic statistics that Rickman could not have even dreamt of. It is somewhat remarkable, therefore, how little use is made of such administrative data. But this problem is not new – the 1989 Pickford Review, for instance, recommended that greater use be made of administrative data, particularly information available to the tax authorities.

3.105 The 2007 Statistics and Registration Service Act (SRSA) was in part designed to facilitate increased access to departmental administrative microdata in order to support statistical production. Yet just two microdata sets have been shared with ONS for the purpose of statistics production under the Act’s provisions. The first was VOA data, used in the construction of CPIH. The second was HMRC VAT data, whose potential is presently being explored. While ONS has access to aggregate administrative data, it only has very limited access to the microdata. The aggregated information is certainly useful, but it is the richness of the underlying microdata that really carries potential. This can be used to clarify the source of puzzles in the aggregate data and, through the use of linked data sets, allow a far more detailed perspective on economic developments.

⁴⁴ Struijs, P., Braaksma, B. and Daas, P., (2014). ‘Official Statistics and Big Data’, *Big Data and Society*. Available [here](#).

International context

3.106 Many other NSIs make far more use of administrative and alternative data sources in the production of economic statistics than is the case in the UK. NSIs in Scandinavia and Canada, for instance, had already begun to embed tax microdata in statistical production in the 1980s and 1990s. In Canada, the use of microdata from tax returns allowed a 20% reduction in survey burden, cutting the costs of both processing the surveys as well as filling them in; Canadian businesses are estimated to have saved over CA\$600,000 a year in compliance costs as a result.⁴⁵

3.107 In Finland, 96% of input data in the production of statistics comes from administrative sources,⁴⁶ and in Sweden and Denmark national accounts production is based almost exclusively on the use of such administrative data.

3.108 The use of tax data in the compilation of the national accounts is not the only example of innovative use of administrative data. The NSIs of Australia, the Netherlands, New Zealand, Norway, Sweden and Switzerland all make extensive use of scanner data, using actual data on prices and volumes collected by retailers. As the Johnson Review noted, the UK lags behind international best practice in this area too.

Barriers to the use of administrative data

3.109 Why has there been so little progress in the UK, despite the early identification of the possibilities of administrative data in the Pickford Review and the passage of the SRSA almost a decade ago? The countries that do make greater use of such data generally seem to have both more permissive legal environments – the NSIs in Canada, Ireland and across Scandinavia all have a right of full access to microdata held by government departments and businesses – and a greater ambition to exploit the opportunities from new data sources. A recent peer review of ONS performance concluded that “the use of administrative microdata for statistical purposes is relatively limited in the UK, mainly due to cultural and legal obstacles.”²⁸

3.110 In particular, there seem to be three obstacles to ONS making greater use of administrative data. Each individually limits progress, but taken together they constitute a significant barrier to the effective exploitation of such information in the production and interpretation of UK economic statistics:

- **Legislative framework.** If ONS wishes to access administrative microdata, the 2007 legislation requires it first to gain the consent of the public authority holding the data. To do so, it must set out how that microdata will be used and this access agreement must then be approved by Parliament in an Information Sharing Order (ISO). In practice, this process has proved to be cumbersome and protracted. Since 2007 only two ISOs have been passed, one allowing ONS to access micro VAT data from HMRC and the other VOA data on housing costs. If legislation after 2007 creates new microdata, ONS may only have access to it if that is specified in that legislation – ISOs cannot be issued unless explicitly stated in the new legislation. Furthermore, because the legislative framework requires ONS to specify how the data will be used, it inhibits its exploratory investigation. Finally, cases of bad execution – being too prescriptive in specifying how the microdata might be used in the early ISOs – have compounded these difficulties.⁴⁷
- **Reluctance to provide access.** The legislation requires the data-holding department to be willing to grant access. However, there is often a natural resistance within Whitehall to making data freely accessible. Recent high-profile losses of data by data-holding

⁴⁵ Statistics Canada, (2006). ‘The Integrated Approach to Economic Surveys in Canada’. Available [here](#).

⁴⁶ Jeskanen-Sundstrom, H., (2008). ‘Overview and challenges in the use of administrative data in official statistics’. Available [here](#).

⁴⁷ ONS (2015), Response to UK Peer Review recommendations. Available [here](#).

departments, an aversion to risk, and the fact that the benefits of data sharing accrue not to the provider but to the recipient all make for excessive caution. It can often seem easier just to say 'No' rather than 'Yes'.

- **Insufficient ambition in exploiting new data sources.** Although there are legal and cultural obstacles, ONS also appears to have been slow to grasp the opportunities presented by administrative and other data, preferring instead to rely on trusted survey methods. The new ONS leadership team have, though, shown more appetite to exploit the new opportunities.

Future opportunities

3.111 As well as the administrative data held by government departments, vast quantities of data are also generated every day by retailers, employers, payment processors, search engines and the like. According to an IBM study in 2012, some 2.5 billion gigabytes of data is created every day.⁴⁸ Though only a small fraction of this will be useful in the production of economic statistics, its exploitation could nevertheless be transformational.

3.112 One can envisage three ways such information could be employed:

- **Directly in the production process.** Such information could replace or complement existing survey information, thereby reducing survey costs, improving accuracy or increasing timeliness. For this to happen, ONS needs to be confident that the data source will continue to be available (this will not be the case for some private data sets in particular). It could also be used in 'nowcasting' data that is presently missing; in this case it might matter less if the information subsequently ceased to be available.
- **Indirect use in the production process.** Such information can also be helpful in sense-checking statistical estimates. For instance, official data could be compared with information on internet searches for key words (such as 'unemployment benefit'); several central banks already use such approaches to derive real-time indicators of economic activity.
- **Agility and future-proofing.** Such information, when used creatively, can also offer a window on newly emerging trends in the economy, in advance of developing new, or adapting existing, surveys to measure them. It can also be employed in one-off studies into new or unaddressed issues. When used in this way, it is also clearly less important that the data continue to be available.

3.113 As the recent Peer Review of the UK concluded, "the Peer Reviewers are of the opinion that removing the current obstacles and allowing the use and linking of administrative data under proper governance and confidentiality arrangements would result in cost reductions, greatly improve operational efficiency and increase the supply of data and statistics."²⁸

3.114 Administrative data is not, however, a panacea. By its nature, it is the by-product of another activity that is not immutable. Services may change, altering the type of administrative data provided; in the private sector, entities can exit the market; and systems may change in ways that affect its usability in the statistical production process. In addition, administrative microdata may not always correspond exactly to the concept that the economist or statistician is interested in. For example, understanding the prevalence of zero-hours contracts is probably more easily achieved through an additional survey than through the use of administrative data

⁴⁸ IBM. 'Demystifying Big Data: Decoding: The Big Data Commission Report'. Available [here](#).

Making better use of administrative and alternative data a reality

3.115 Greater use of public and private administrative data has the potential to transform the provision of economic statistics in the long term. It cannot happen overnight, as it will take time to work out how best to exploit such information and to develop the necessary skills and systems. It is worth noting, for instance, that it took the Netherlands five years to embed web scraping into their consumer prices index. And the pace of change will obviously depend on the resources ONS allocate to developing that capacity. But progress in four areas would be helpful.

3.116 Better use of the existing legal framework. Although the existing framework has proved cumbersome, ONS should seek new ISOs where the gains appear substantial. Work is already underway with HMRC to develop two separate ISOs to allow access to Income Tax and Corporation Tax microdata.

3.117 Amend the legal framework to increase flexibility. Under the present framework, the onus is on the holder of public administrative microdata to decide whether or not to grant access. A more permissive framework would start from the presumption that, subject to appropriate measures being in place to preserve confidentiality, data held by public authorities should be available to ONS for the purpose of producing statistics, unless there are strong grounds (e.g. national security) for that not to be so. This represents a reversal of the burden of proof. The public may indeed already believe that this is what happens. But in any case, in order to ensure that access is not abused, an independent ombudsman (or similar) could be appointed to adjudicate difficult cases, for example to check that use is consonant with legislation, and more generally to ensure that the regime operates ethically.

3.118 Exploit new data sources, particularly in the private sector. ONS should seek to exploit new data sources from outside of the public sector that have the potential to transform economic statistics. Given that new data sources emerge all the time, it will be important for ONS to be constantly on the lookout for new data sources and techniques that it can exploit, possibly in partnership with the data owner. ONS also needs to be fully aware of the activities of businesses and other NSIs that are at the cutting edge of the exploitation of such data.

3.119 Build ONS's capacity to handle such data. Some investment in both technology and staff will be needed in order to exploit the opportunities from administrative microdata and other sources. Recent ONS errors in the use of VOA microdata and the dissemination of its web scraping research suggest there is still a long way to go. Building capacity is discussed further below.

3.120 Interim Recommended Action 4: *Remove obstacles to the greater use of public sector administrative data for statistical purposes, including through changes to the associated legal framework, while ensuring appropriate ethical safeguards are in place and privacy is protected.*

3.121 Interim Recommended Action 5: *Exploit new methods of collecting data and explore the scope for using information gathered by private sector entities in the production of economic statistics, nowcasting and one-off studies of emerging measurement issues.*

Technology, data infrastructure and data science capability

3.122 The previous section noted the transformational opportunities from better exploitation of administrative data in both public and private sectors. However, to realise the full potential of the wealth of this information will require robust IT systems, a flexible data infrastructure and appropriate skills.

Current state of ONS technology

3.123 ONS's current technology estate reflects its present focus on production. Different statistical outputs are produced in isolation and the supporting IT systems are poorly interconnected. There are hundreds of applications, on 25 different platforms. Many of these are outdated or bespoke and costly to maintain. This complexity of the technology estate has impeded improvements to the core statistical and analytical functions. The Barker-Ridgeway Review noted that "one of the pressures and strains on the staff that was evident (...) was the continued use of multiple systems."²⁷ Review team discussions with ONS staff raised similar concerns.

3.124 The complexity of ONS systems has probably also been a contributory factor to some of the recent statistical errors and corrections. The internal ONS review into the 2014 error in the International Passenger Survey uncovered a wider range of issues with the systems for collecting and processing that data. The review found that researchers could not directly interrogate data in the processing system and checking routines had not been incorporated because they slowed processing to an unacceptable degree.

3.125 The legacy of a fragmented technology infrastructure is fundamentally contrary to this Review's vision of a flexible and agile NSI. The technology infrastructure needs to be transformed if ONS is to get the best out of the data it collects now and the large volumes of administrative data it may have access to in the future. ONS is in the early stages of a technology transformation plan through which it plans better to meet GDS standards and reduce the number of different platforms from 25 to fewer than ten. ONS is also proposing to build modular tools on common platforms to acquire, process and publish data, using open source technology wherever possible.

3.126 These are important and much-needed developments. However, ONS must avoid repeating past mistakes, such as those that afflicted the Statistical Modernisation Programme, which sought to revolutionise the ONS technology estate in the 2000s. Looking back at that programme in 2009, Stephen Penneck, who was Director of Methodology at the time, concluded that ONS had lacked the core skills needed to deliver the modernisation programme – in project and programme management, in business analysis, in IT architecture, and in development and testing – reflecting a lack of investment in such skills over many years. He also noted a lack of accountability, an initial approach that had been far too ambitious, and poorly thought-through requirements.⁶

3.127 The pace of transformation ONS can achieve will partly depend on the resources made available to the programme. However, success will come from steady, incremental progress, within ONS's capability to deliver. ONS should also continue to work closely with GDS to ensure it draws on cross-departmental best practice.

ONS data infrastructure

3.128 Apart from a robust technology estate, ONS also requires a flexible data infrastructure that allows staff to clean data of duplicates and errors, and to compare and combine different data sources to fully exploit their analytical value. One area that forms a key part of the data infrastructure is registers: they provide the framework for sample surveys and allow statisticians to estimate national totals.

3.129 The most important of these for economic statistics is the Inter-Departmental Business Register (IDBR), a register of businesses maintained by ONS for statistical purposes. Introduced in 1994, the IDBR brings together data from a range of sources including HMRC, Companies House and commercially-acquired data. The data are compared, cleaned and classified by ONS

to provide a database of the population of businesses above a certain size. Estimates of the total business population are published by BIS. The register includes key information about businesses, including their size, location and classification. The register is used by ONS to apportion economic activity to sectors of the economy or to regions within the UK, making it vital for constructing regional statistics.

3.130 One of the challenges for digital services in government is the existence of duplicate, occasionally contradictory, data sets underpinning different services. There is a need to reconcile competing records and systems and establish an authoritative source for different records that all of government can use and trust. A unique identifier for businesses that is fit for all administrative and statistical purposes would bring great benefits to the data infrastructure for economic statistics.

3.131 Currently, linking data sources usually requires statisticians to put in place complex matching processes. The consistent use of unique identifiers, however, has the potential to simplify the process for statistical production by providing a straightforward framework to cross-reference and link large microdata sets. This would make viable the use of administrative data in a range of outputs and analyses, in a more timely fashion than is currently possible. Led by BIS, work is underway to explore what can be done to link and reconcile different sources of information on businesses held across government. ONS will need to stay closely involved with this work to realise potential benefits for the IDBR and the wider framework for economic statistics.

ONS data science capability

3.132 In 2009, Hal Varian, Google's Chief Economist, told McKinsey Quarterly: "I keep saying the sexy job in the next ten years will be statisticians. People think I am joking but who would've guessed that computer engineers would've been the sexy job of the 1990s? The ability to take data – to be able to understand it, to process it, to extract value from it, to visualize it, to communicate it – that's going to be a hugely important skill in the next decades".⁴⁹

3.133 Many responses to the Call for Evidence exhorted ONS to embrace the opportunities presented by the burgeoning field of data science through engaging with new developments and collaboration with academia and the private sector. However, there is also wide recognition that data science is a nascent field, raising tricky questions for ONS about when and how much to invest in the required IT and data infrastructure, and how to attract and retain specialist staff.

3.134 The UKSA strategy 'Better Statistics, Better Decisions' explicitly recognises the need to build greater data science capability in ONS.⁵⁰ However, only a few high-level actions were set out in its recent business plan, covering the period out to March 2018. To date, the most significant action has been the creation of an 'ONS Innovation Lab' operating across the Titchfield and Newport sites. This Lab operates as a 'sand pit', allowing stand-alone experimentation with new techniques and for staff to gain experience. But it is relatively small-scale (set-up costs were under £100,000⁵¹) and is mainly used by ONS's Big Data team, made up of around eleven FTE staff⁵² with a range of skills. Current staffing levels are thus comparable to those in the Bank of England's data science lab, which has a team of twelve FTE staff and plans to expand further.

⁴⁹ Varian, H. (2009). 'How the Web challenges managers', Mc Kinsey & Company Quarterly. Available [here](#).

⁵⁰ "We will create a coherent and cutting edge cadre of analytical staff to blend statistical methods with data science, empowering people to achieve high professional standards throughout their career," UKSA Strategy 'Better Statistics, Better Decisions', 2015-2020. Available [here](#).

⁵¹ Abbott, O. (2014), 'ONS Methodology Working Paper Series 1 – ONS Innovation Laboratories'. Available [here](#)

⁵² The team is also benefitting from a one-year student placement, and is subject of a study by a post-doctoral researcher at Goldsmith University.

3.135 In contrast, some private-sector custodians of big data have embraced the opportunities offered by data science far more enthusiastically. Bloomberg L.P., for instance, told the Review team that their employment of data scientists, coders and engineers was in the thousands. Their data scientists were drawn from varied educational backgrounds, including mathematics, statistics, information technology but also physics, chemistry, neuroscience and biology.

Partnerships and need for more greater collaboration

3.136 The ONS Big Data team appears to have made an encouraging start in building links with the data science community. For example, the team has already collaborated with academics at the universities of Southampton, Leeds, University College London and Winchester and is seeking to strengthen ties by offering seminars and guest lectures. There is regular engagement with the Royal Statistical Society as well as the Economic and Social Research Council. But more could be done to build strategic partnerships, including with the newly established Alan Turing Institute, the UK's leading data science institute.

3.137 ONS staff also participate in cross-departmental efforts to strengthen the government's data science capability, working closely with the GDS, the Cabinet Office and the Government Office for Science in particular. This includes ONS showcasing experimental work, leading on data science recruitment and developing a revised capability framework for the statistics profession that encompasses data science skills. ONS are also involved in work commissioned by the Cabinet Secretary to assess all departments' data science action plans. This assessment will look at data science practices, IT infrastructure, cross-departmental collaboration and skills, including talent retention and recruitment.

3.138 Internationally, ONS attend regular interchanges with European data science groups and contribute to Eurostat's Big Data Taskforce, including by presenting at conferences and workshops. They have also established informal bilateral links – predominantly focused on ad-hoc exchanges on current projects and reviews of technologies – with some NSIs, including those in the US, the Netherlands and Italy.

3.139 There has been some engagement with the private sector (including Google, Microsoft, IBM and mobile phone companies) but this should be intensified. Engagement has been two-fold, in some cases to acquire data and in other cases to share experiences and expertise. ONS recognise that more effort is needed to learn from the techniques used by private sector companies, as well as maintaining close links with technology providers so as to keep abreast of the tools that are being developed. The approaches and data science techniques used by other organisations, and their potential use in the production of economic statistics, will be explored further in the Final Report.

3.140 Interim Recommended Action 6: *Enhance the capacity of ONS systems and staff – including recruiting a cadre of data scientists – to develop and maintain the capability to exploit these new sources of data in the production of economic statistics.*

Box 3.F: ONS Big Data Projects (January 2014 – March 2015)

At the beginning of 2014 ONS launched the Big Data Project⁵³ to investigate the potential advantages of using big data, and to understand the analytical and technological challenges with using these alternative data sources. The initial phase was restricted to pilots using data from social media apps, smart meters and internet price data. Most of these projects were funded by the ONS Census directorate resulting in a strong focus on deriving meaningful geo-locational and socio-demographic information from the data. The project that has the biggest potential to be operationalised relatively soon is ONS's development of a web scraper. Web scrapers are software tools for extracting raw data from web pages, which can be stored and analysed. ONS's web scrapers collect prices for 35 items in the CPI basket from three leading UK supermarkets' websites. The web scrapers collect approximately 6,500 price quotes per day, which is a much larger collection of prices than gathered under the traditional approach.

ONS produced experimental consumer prices indices using web scraped data from June 2014 to June 2015, and published their findings in September 2015. The research provided chained daily, weekly, fortnightly and monthly frequencies and also included a fixed-base index which followed CPI methodology as closely as possible. However, the published web-scraped prices data contained an error and on 23 October 2015 ONS issued a correction.⁵⁴ An error had been identified in the chained daily index, illustrating the labour-intensive effort needed to carefully monitor, clean and manipulate the collected raw data.

A number of European countries are also investigating the use of web scraping for the use in their price statistics. Eurostat has supported projects in the Netherlands, Germany, Italy, Luxembourg, Norway, Sweden, Austria, Belgium, Finland and Slovenia.⁵⁵ Statistics Netherlands, in particular, are a true pioneer in this area. Their pilot of daily web scraping of air ticket and fuel prices started back in 2009.⁵⁶ In 2011 they tested web scraping of property websites to provide supplementary information on the housing market. And in 2012 work started to develop in-house their own web scraping 'robot tool', which would collect retail prices information for calculation of the Dutch CPI.⁵⁷

Current ONS data science projects

Following the initial phase of the ONS Big Data Project, a few more projects are under way or have been completed recently. One is an exploration of whether text-mining techniques can be used with Zoopla and Rightmove data to extract information regarding property details. This intelligence could be used within census or survey field operations or to enhance an address register, as well as potentially improve ONS's understanding of the private rental market. Another project is testing different graph databases to support record linkage. The work is currently focused on census applications and is still in a very early testing phase, but if scalable the matching of different data types could potentially be applicable in many different ways, including economic statistics (for example matching Flow of Funds data or business register information).

From October 2015 ONS also secured Eurostat funding to continue its web scraping work, which will be used to improve and expand the existing web scrapers to cover all grocery items from the three supermarket websites currently scraped and to add additional supermarkets to the collection. Scrapers will also be built to cover other areas of the CPI basket such as package holidays and airfares. Data cleaning techniques such as unsupervised and supervised machine learning techniques for the classification of products will also continue with the funding.

4 Interim recommendations

4.1 The five interim strategic recommendations set out in Chapter 1 and reprised below underpin the vision for economic statistics that was laid out in Chapter 1. They are supported by the eight associated interim recommended actions contained in Chapter 3. If acted on, these recommendations and actions would together constitute significant progress towards making ONS a world-class NSI. But though highly desirable, these steps alone will by no means be sufficient to put ONS at the international cutting edge in the provision of economic statistics. Effort also needs to be directed at ensuring ONS's basic function of producing statistics is conducted efficiently and with accuracy.

4.2 The five interim strategic recommendations should be seen as self-reinforcing: the whole is more than sum of the parts. Achieving some of them but falling short on others would limit ONS's ability to meet users' future statistical needs and leave it short of being a leader in the provision of economic statistics.

Interim Strategic Recommendation 1: *Refocus the culture of ONS towards better meeting user needs*

Interim Recommended Action 1: *Encourage staff: to understand better how their statistics are used; to be more open and curious in identifying statistical issues; and to use their expertise to influence the international statistical agenda more effectively.*

Interim Recommended Action 2: *While building up the capability of its operation in Newport, ONS should also increase its London profile in order to facilitate stronger engagement with users of economic statistics, as well as expanding its engagement with users across the rest of the UK.*

Interim Recommended Action 3: *Improve user access to microdata while respecting confidentiality issues, and foster more collaboration with users and experts.*

Interim Strategic Recommendation 2: *Make the most of existing and new data sources and the technologies for dealing with them*

Interim Recommended Action 4: *Remove obstacles to the greater use of public sector administrative data for statistical purposes, including through changes to the associated legal framework, while ensuring appropriate ethical safeguards are in place and privacy is protected.*

Interim Recommended Action 5: *Exploit new methods of collecting data and explore the scope for using information gathered by private sector entities in the production of economic statistics, nowcasting and one-off studies of emerging measurement issues.*

Interim Recommended Action 6: *Enhance the capacity of ONS systems and staff – including recruiting a cadre of data scientists – to develop and maintain the capability to exploit these new sources of data in the production of economic statistics.*

⁵³ Naylor, J., Swier, N., Williams S., Gask, K. and Breton, R., (2015). 'ONS Big Data Project Q1 Report'. Available [here](#).

⁵⁴ ONS, (2015). Correction note to 'Research indices using web scraped data'. Available [here](#).

⁵⁵ Boettcher, I., (2015). 'Automatic data collection on the US (web scraping)', Statistics Austria. Available [here](#).

⁵⁶ Hoekstra, R., Ten Bosch, O. and Hartevelde, F. (2010). 'Automated Data Collection from Web Sources for Official Statistics: First Experiences', Statistics Netherlands. Available [here](#).

⁵⁷ Ten Bosch, O. and Windmeijer, D., (2014). 'On the use of internet robots for official statistics', Statistics Netherlands Working Paper. Available [here](#).

Interim Strategic Recommendation 3: *Become better at understanding and interrogating data*

Interim Recommended Action 7: *Increase the economic expertise available within the organisation in order to raise ONS's capability to quality-assure and sense-check statistics before release.*

Interim Strategic Recommendation 4: *Address established statistical limitations*

This Review will revisit this recommendation at the Final Report, but an interim list of recommended actions would include:

- Addressing existing shortcomings in the production of National Accounts, including the absence of double deflated volume measures;
- Using administrative data sources to improve early estimates of GDP, including by making greater use of information from the expenditure and income measures;
- Producing detailed Flow of Fund statistics that meet user needs in terms of breadth and detail;
- Improving the measurement of the service sector, including developing more detailed deflators and volume indices to reflect the service sector better;
- Exploring how the use of administrative data might help meet the diverse and granular needs of users of regional statistics; and
- Implementing sufficient improvements to the UK Trade, Construction and CPIH statistics to warrant their re-designation as National Statistics.

Interim Strategic Recommendation 5: *Become more agile in the provision of statistics that properly reflect the changing structure and characteristics of the economy*

Interim Recommended Action 8: *Make more use of one-off studies – including drawing on new data sources – to investigate emerging measurement issues, collaborating with expert users in business, government and academia wherever appropriate – including through the use of institutional partnerships and fixed-term secondments into ONS.*

Next Steps

4.3 The Final Report will cover issues in the Terms of Reference not addressed in depth in the Interim Report, as well as refining and expanding on the interim strategic recommendations and recommended actions.

4.4 Future economic statistics needs. The concluding section of Chapter 2 identified several emerging statistical challenges in measuring the modern economy. The most substantive of these – such as the impact of the digital economy, the measurement of intangible capital and the internationalisation of production – will be covered in more depth in the Final Report.

4.5 ONS effectiveness. The Final Report will refine the existing suite of strategic recommendations and recommended actions. This will include looking at issues such as the effectiveness of ONS change and staff management and further comparisons with other NSIs, as well as exploring issues around dissemination and communications.

4.6 Governance. The Final Report will also evaluate the effectiveness of the governance arrangements surrounding the production of economic statistics, both within UKSA/ONS and in relation to external stakeholders and users.

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A.1 Sources for data in Table 2.A:

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- Germany: [here](#).
- Italy: [here](#).
- Japan: [here](#).
- UK: [here](#).
- US: [here](#).

B Acronyms

BIS	Department of Business, Innovation and Skills
CIPFA	Chartered Institute of Public Finance and Accountancy
CPI	Consumer Prices Index
CPIH	Consumer Prices Index including Owner-Occupiers' Housing Costs
CSO	Central Statistical Office
DEL	Departmental Expenditure Limit
ESA	European Systems of Accounts
ESRC	Economic and Social Research Council
EU	European Union
FCA	Financial Conduct Authority
FISIM	Financial Intermediation Services Indirectly Measured
FTE	Full-time equivalent staff
GDP	Gross Domestic Product
GDP(E)	Expenditure measure of GDP
GDP(I)	Income measure of GDP
GDP(O)	Output measure of GDP
GDS	Government Digital Service
GPS	Global Positioning System
GSS	Government Statistical Service
GVA	Gross Value Added
HMRC	HM Revenue and Customs
IDBR	Inter-Departmental Business Register
IPS	International Passenger Survey
ISO	Information Sharing Order
IT	Information Technology
LCF	Living Costs and Food Survey
LEP	Local Enterprise Partnership
LFS	Labour Force Survey
NSI	National Statistical Institute
NSQR	National Statistics Quality Review
NUTS	Nomenclature of Units for Territorial Statistics
OBR	Office for Budget Responsibility
OECD	Organisation for Economic Co-operation and Development
ONS	Office for National Statistics
P2P	Peer-to-Peer
PAYE	Pay As You Earn
PPM	Project and Programme Management
PRODCOM	Products of the European Community
R&D	Research and Development
RES	Royal Economic Society
RPI	Retail Prices Index
RSS	Royal Statistical Society
SCS	Senior Civil Service
SIC	Standard Industrial Classification
SNA	System of National Accounts
SRSA	2007 Statistics and Registration Service Act
UK	United Kingdom
UKCeMGA	UK Centre for the Measurement of Government Activity

UKSA UK Statistics Authority
VAT Value Added Tax
VOA Valuation Office Agency
WTO World Trade Organisation

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D Terms of reference

D.1 As announced in the Productivity Plan, with the support of the Chair of the UK Statistics Authority, the Chancellor of the Exchequer has commissioned Professor Sir Charles Bean to conduct an independent review of the quality, delivery and governance of UK economic statistics.

The Terms of Reference of the Review are to:

- assess the UK's future statistics needs in particular relating to the challenges of measuring the modern economy;
- assess the effectiveness of the ONS in delivering those statistics, including the extent to which the ONS makes use of relevant data and emerging data science techniques
- while fully protecting the independence of the UK national statistics, consider whether the current governance framework best supports the production of world-class economic statistics.

D.2 The Review will make interim recommendations to the Chancellor of the Exchequer and the Minister for the Cabinet Office in the autumn, with a final report published by Budget 2016.

E Call for evidence

Scope of the review

E.1 In line with the Terms of Reference this Review of economic statistics will assess the UK's future statistics needs, the capability of ONS in delivering those statistics and the most appropriate governance framework to support production of those statistics.

E.2 ONS is the executive office of the UK Statistics Authority, an independent body with the statutory objective to promote and safeguard the production and publication of official statistics that serve the public good. Although other public bodies produce statistics in the UK, the Review will principally focus on the ONS, as the primary source of economic statistics.

E.3 In assessing the needs of a modern economy, the Review will look at statistics that are used to inform economic decision-making. This includes ONS publications from national accounts to labour market statistics to family expenditure data, as well as the data sources from across the public and private sectors that are used as inputs. The Review will also consider any potential gaps in this range. Statistics not relevant to economic decision making fall outside the scope of the Review. To understand the statistics needed to measure the modern economy, the Review is seeking evidence from users of economic data.

E.4 This Review follows a number of other reviews on specific areas of statistics, most recently the National Statistics Quality Review of the National Accounts and Balance of Payments, and the Review of UK Consumer Price Statistics. The Review will carefully consider these previous studies, and seek to build on their findings to identify the UK's future statistics needs and how best to meet them. The Review will also take note of the Authority's own assessment work.

E.5 The Reviewer has been asked to make interim recommendations to the Chancellor of the Exchequer and the Minister for the Cabinet Office in the autumn, with a final report published by Budget 2016.

Call for evidence questions

E.6 The key questions of this Call for Evidence are outlined below, together with accompanying background information to assist users and create a suitably focused response. Responses are invited to all questions, but partial responses are also welcome where users feel they have little to say on particular questions.

E.7 The first part of the Terms of Reference of the Review is to *assess the UK's future statistics needs in particular relating to the challenges of measuring the modern economy.*

E.8 There are a number of difficulties in measuring the modern economy, which represent significant challenges to all national statistics offices. These can range from specific issues related to the comprehensive measurement of a constantly evolving economy – for instance, capturing the benefits of technological change through quality improvements – to broader issues related to the provision of more granular information, for example more complete Flow of Funds data, or more detailed regional statistics. The questions below seek respondents' views on the nature of those challenges and appropriate future priorities.

1. From your perspective, what are the most significant outstanding challenges in measuring the modern economy?
2. Are there features of the modern economy that you think are not well captured in the present range of UK economic statistics?

3. What do you think should be the two or three top statistical priorities for measuring the modern economy?

E.9 The second part of the Terms of Reference of the Review is to *assess the effectiveness of the ONS in delivering those statistics, including the extent to which the ONS makes use of relevant data and emerging data-science techniques.*

E.10 The ONS is the primary source of economic statistics in the UK. Delivering the UK's future statistics needs will mean ensuring that the ONS has the capability to publish timely, accurate and high quality data. That capability could be enhanced by improvements to methods of data collection, analysis or dissemination. This may require using new sources of information, as well as employing new techniques and technologies to gather and exploit those data sources. The experience of other countries or other data providers may offer helpful examples. One example of the potential use of big data is the recent trial by ONS of 'web scraping' to collect a sample of price data online. The questions below seek respondents' views on whether the ONS is well-placed to deliver timely, accurate and high quality statistics.

4. What are the strengths and weaknesses in ONS's current ability to deliver the existing range of economic statistics?
5. What steps do you think are needed for ONS to have the capability to collect, analyse and disseminate the relevant data to meet future statistics needs?
6. What scope is there for ONS to exploit emerging data-science techniques in meeting future statistics needs?

E.11 The third part of the Terms of Reference of the Review is to, *while fully protecting the independence of the UK national statistics, consider whether the current governance framework best supports the production of world-class economic statistics.*

E.12 For the interim recommendations to be published in the autumn, the immediate priority of the Review is to assess the statistics needed for a modern economy and the capability of the ONS to develop those statistics. The Review will subsequently consider what governance arrangements are most appropriate to support the development of those statistics and ensure the future needs for economic statistics are met.

E.13 The Statistics and Registration Service Act 2007 established the UK Statistics Authority as an independent body operating at arm's length from government as a non-ministerial department, directly accountable to Parliament. The Minister for the Cabinet Office undertakes the government's residual responsibilities in relation to the UK Statistics Authority. Protection for the statutory independence for statistics is set out in the Terms of Reference of the Review.

7. Do you think the current governance arrangements for economic statistics support their effective production?
8. Are there changes to those arrangements that you would advocate?

E.14 To enable the Review to make the best use of your responses, respondents are asked to respond in the formats described below. In particular, respondents are asked to describe their use of economic data in order to enable the most useful analysis of responses.

F Call for evidence respondents

F.1 Below is a list of respondents to the Call for Evidence. The full responses will be published alongside the Final Report in the spring.

Organisations

Bank of England
BMLL Technologies Ltd.
British Chambers of Commerce
British Film Institute
Chartered Institute of Personnel and Development
Confederation of British Industry
Crafts Council
Datawatch
Department for Business, Innovation and Skills
Department for Communities and Local Government
Department for Culture, Media and Sport
Department for Environment, Food and Rural Affairs
Design Council
Eurostat
Exporting Education UK
Food Standards Agency
Full Fact
GFC Economics
Greater London Authority
HM Treasury
House of Commons Library
Huxtable Associates, Mineral Industry Services
Institute of Chartered Accountants in England and Wales
Kent County Council
Kern Consulting
Manufacturing Technologies Association
Nesta
New Economics Foundation
New Economy
Northern Ireland Statistics and Research Agency
Notayesmaneeconomics
Office for Budget Responsibility
Oxford Economics
Royal Statistical Society
Scienceogram UK
Scottish Enterprise
Scottish Government
SP Energy Networks
Spilsbury Research
Spotify Ltd.
Trades Union Congress

UK Music
VisitBritain
Welsh Government

Academics

Alex Adamou
Christopher Hood
Dame Kate Barker
David Blanchflower
David Heald
Diane Coyle
James Macintosh
Ludi Simpson
Mike Holcombe
Nicholas Oulton
Paul Allin
Paul Smith
Sir John Kingman

Private individuals, including users and producers of economic statistics

Andrew Lydon
Bill Wells
John Hann
Reginald Cox
Simon Briscoe
2 anonymous responses

G Stakeholder engagement

G.1 This is a list of stakeholders that Professor Bean and the Review team have engaged with, including meetings with experts undertaken in a personal capacity rather than as representatives of their organisations.

Government Departments, agencies and public bodies

Professor Bean and the Review team have had ongoing engagement with ONS and UKSA, as the subject of the Review, as well as with HM Treasury and Cabinet Office, as the commissioning departments.

Adrian Richards, Department for Work and Pensions
Ben Broadbent and other officials, Bank of England
Derek Jones and Jonathan Price, Welsh Government
Edward Zamboni other officials, HM Revenue and Customs
Gary Gillespie, Scottish Government
Jenny Bates and other officials, Department for Business, Innovation and Skills
Maria Ottati, Health and Safety Executive
Paul Crawford and other officials, Department for Culture, Media and Sport
Robert Chote and other officials, Office for Budget Responsibility
Stephen Aldridge and other officials, Department for Communities and Local Government

National Statistical Institutes

Alfredo Cristobal, National Statistical Institute of Spain
Jorgen Elmestov, Statistics Denmark
Pádraig Dalton, Central Statistical Office of Ireland
Stefan Lundgren, Statistics Sweden
Tjark Tjin-A-Tsoi, Statistics Netherlands

Others

Anjali Samani, The ASI
Ben Jones, Confederation of British Industry
Bill Schomberg, Reuters
Chiara Criscuolo and other officials, Organisation for Economic Co-operation and Development
Chris Giles, The Financial Times
Chris Skinner, London School of Economics
Constantin Cotzias, Fergal O'Brien and Jillian Ward, Bloomberg L.P.
David Firth, University of Warwick
David Groom, VocaLink
David Smith, The Sunday Times
Deborah Davies, member of the Demographic Users Group
Diane Coyle, University of Manchester
Geoff Tily, Trade Union Congress
George Buckley, Deutsche Bank
Hal Varian and Adam Cohen, Google
Henry Overman, London School of Economics
Hetan Shah, Michael Hughes, Jill Leyland, Philip Turnbull and Anne Harris, Royal Statistical Society
Howard Archer, IHS Economics
Iain Sterland, member of the Demographic Users Group

Jane Elliot, Economic and Social Research Council
Jason Douglas, The Wall Street Journal
João Cadete de Matos and others, Banco de Portugal
Jonathan Haskel, Council of the Royal Economic Society
Kevin Daly, Goldman Sachs
Laurie Smith and Louise Pakseresht, Royal Society
Martin Barrow, China-British Business Council
Matthew Whittaker and Laura Gardiner, Resolution Foundation
Matthew Waite, Milja Keijonen and Gordon Douglass, Greater London Authority
Melanie Baker, Morgan Stanley
Michael Flood, member of the Demographic Users Group
Michael Saunders, Citi Research Economics
Mike Heiser, Local Government Association
Neville Hill, Credit Suisse
Nicholas Oulton, London School of Economics
Paul Johnson, Helen Miller and Luke Sibieta, Institute for Fiscal Studies
Peter Spence, The Telegraph
Petros Dellaportas, University College London
Philip Aldrick, The Times
Philip Rush, Nomura
Richard Alldritt, Consultant
Simon Briscoe, Consultant
Simon Kirby, National Institute of Economic and Social Research
Suren Thiru, British Chambers of Commerce
Walter Radermacher, Eurostat
Will Page, Spotify Ltd.

Conferences attended

TechUK event, 11 September 2015
Eurostat conference, 22 September 2015
Open meeting hosted by Royal Statistical Society, 28 September 2015
IP Expo Europe, 7-8 October 2015
BIS and ONS joint conference: How e-commerce is changing the shape of business, 8 October 2015
ONS Economic Forum, 15 October 2015
Government Economic Service Mini-Conference, 6 November 2015

