

Article

Productivity development plan: 2018 to 2020

This development plan builds on recent improvements to Office for National Statistics (ONS) productivity statistics and looks at introducing new outputs, further improving our productivity statistics and consolidating our improvements to date.

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1 . Executive summary

This development plan builds on recent improvements to productivity statistics. In line with external recommendations we intend to keep up the pace of developments over the next two years. We have set out a plan for introducing new outputs, further improving our productivity statistics and consolidating our improvements to date.

2 . Background

The UK's recent productivity performance has been strikingly weak. Average annual UK labour productivity growth has slowed from around 2.0% per year in the decade leading up to the economic downturn, to around 0.3% per year over the 2008 to 2017 period – in perhaps the most persistent slowdown of output per hour growth since the start of the 19th Century. Citing this marked change in behaviour and the measurement challenges which confront national statisticians in a developed, modern and increasingly digital economy, [Bean \(2016\)](#) noted:

“The [Bean] Review was prompted by the growing difficulty of measuring output and productivity accurately in a modern, dynamic and increasingly diverse and digital economy. In addition, there was a perception that ONS was not making full use of new data sources and the continuously expanding 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.” (Para 1.2)

To meet these growing empirical challenges, Bean (2016) argued that Office for National Statistics (ONS) needed to develop the suite of statistics that it publishes on productivity, that we should make greater use of the existing survey data to better understand the underlying movements in official statistics and that we should develop and analyse new, administrative data to make in-roads in this area. This message was supported by the ONS-commissioned [Review of international best practice in the production of productivity statistics](#), which pointed to a number of potential improvements to the ONS offering. Our productivity plan aligns with [Economic Statistics Analysis Strategy:2019](#) which highlights productivity and the supply of labour and capital as one of the six priority themes.

3 . Development progress

3.1 Labour productivity

We responded to these messages with a concise [development plan](#) in July 2016, much of which has now been delivered. The greatest progress has arguably been made in our labour productivity statistics. Where previously headline UK labour productivity was published with a lag of around 90 days after the period to which it pertains, aggregate output per worker and per hour are now [available after just 45 days](#). The level of industrial granularity available – previously a mix of section and division level estimates numbering around 24 industries – has also increased, [rising to around 80 industries](#), comprising a mix of predominantly division level estimates from the Standard Industrial Classification (SIC). The labour productivity team are also publishing experimental [industry by region estimates](#) in both current and constant price terms which are consistent with the UK's headline metrics: a first for the UK, and a considerable support for the proposed industrial and regional strategies.

3.2 Growth accounting

Growth accounting splits growth in output into the contribution from labour inputs, the contributions from capital inputs and the residual. We previously highlighted growth accounting in our international review as an topic for considerable improvement. We have since made a substantial investment. Results from our growth accounting model – which divides the growth of value added into that which is attributable to changes in the application of factor inputs and that due to the manner in which these factors are combined – known as multi-factor productivity (MFP) – were previously available on an annual basis, for a breakdown of around ten industries, more than a year after the period to which they pertained. Over the last two years, the inputs for this growth accounting model have been subject to several waves of development. [Quality adjusted labour input](#) (QALI) – which accounts for changes in both hours worked and the composition of the workforce – has been moved from an annual to a quarterly publication basis, and now benefits from the application of an annual benchmark to deliver more robust estimates for a more detailed breakdown of industries, on a more precise sectoral mix. We published [quarterly estimates of capital services](#) for 57 industries in February 2018, the first fruits of an intense development exercise to transform our measurement of produced capital. This involved a fundamental review of the source data as well as investment in new systems which deliver more flexible and efficient production processes.

These improvements enabled us to publish the first [experimental quarterly MFP estimates](#) in April 2018 for the UK market sector and 10 sub-industries. These estimates covered the period Quarter 1 (Jan to Mar) 1994 to Quarter 2 (Apr to Jun) 2017, just two quarters behind the Quarterly National Accounts and Labour Productivity. We aim to close this gap progressively in October 2018 and January 2019. We also published annual MFP estimates for 19 industries up to 2016. This represents almost twice as much industry detail as the previous MFP release in 2017.

3.3 Regional productivity

There has been considerable work undertaken on developing ONS' regional economic output data during the past couple of years, and these improvements are now beginning to feed through into extended [regional and sub-regional productivity](#) outputs. As mentioned above we now publish experimental [industry by region labour productivity estimates](#). Additionally, [articles](#) to examine sources of regional productivity including for [city regions](#) and for [rural and urban areas](#) using microdata from the Annual Business Survey have been published. Finally, an article providing [European sub-regional productivity comparisons](#) has also been produced.

3.4 Public service productivity

Estimates for productivity of the public services have also been the subject of considerable development work over the last two years. Compared with the previous annual publication cycle – in which the first estimates of productivity for the public services became available around 24 months after the period to which they pertain on an annual basis only, our current schedule has a set of early, [quarterly estimates](#) produced around 97 days after the period to which they correspond. These more timely metrics have been accompanied by improvements in the information content of these data as well: including the [first new quality adjustment for public service output](#) to be introduced since the Atkinson Review.

3.5 Infrastructure and intangibles

Alongside these aggregate productivity statistics, we have made considerable progress in the production of several new, related indicators. In 2017 we took over responsibility for producing measures of a broad set of intangible assets and carried out work to update these estimates with the latest available data. This is part of a wider piece of work to examine current coverage and measurement of intangible assets and identify where improvements could be made. In February 2018 we published new [estimates of Intangible investment in the UK for 2015](#), building on work previously commissioned by the IPO and methodology developed by Goodridge, Haskel and Wallis of Imperial College London and Bank of England. In producing these estimates, we reviewed the current estimation methods and identified future development work that could be carried out to inform future estimates. These statistics and the accompanying methods work makes a considerable contribution to the debate on future national accounting regulations and was recommended in the Bean Review.

We have begun a programme of development work on infrastructure statistics. The aim of this work is to develop measures of the value of infrastructure investment, stocks and services, to better understand how infrastructure influences productivity and growth. In July 2017 we published our first article on [developing new measures of infrastructure investment](#). This presented our findings from a review of existing approaches to defining and measuring infrastructure as well as new experimental data on infrastructure investment for the public and private sectors. Our analysis to date has focused on economic infrastructure (transport, energy, water, communications, waste, and flood defences); the scope of this work could be extended in future to include housing and social infrastructure. In the context of the ongoing debate about the role of policy and the importance of infrastructure assets to support productivity, these data can be used to help support user understanding and policy-making.

3.6 Microdata analysis and management practices

Finally, responding to the Bean Review's call for ONS to make greater use of the micro-data to which we have access, the Productivity Group have produced no fewer than ten micro-data analysis articles over the last two years. These have variously examined labour productivity metrics which can be calculated using the [Annual Business Survey](#); the characteristics of businesses at the [bottom of the labour productivity distribution](#) and the levels of productivity at businesses [with and without Foreign Direct Investment links](#). Evidence on the link between firm level productivity and trader status – which uses administrative data from HMRC – is at an advanced stage. A new version of the Annual Respondents Database (ARDx) has been developed – bringing in new data from a range of different surveys to support external research, and the UK has started to contribute to international ventures in the micro-data area – including the Organisation for Economic Co-operation and Development's [\(OECD\) MultiProd project](#). Each of these articles has helped to sharpen our understanding of UK labour productivity, has built expertise and understanding of the UK's official data estate, and has brought a larger portion of this to bear on the productivity puzzle.

In addition to these efforts, the team has also run two new surveys of management practices – first in the [manufacturing industries](#) in 2016, and then of a [wider group of businesses in 2018](#). Working in collaboration with the Economic Statistics Centre of Excellence (ESCoE) and academic partners at the Economic and Social Research Council (ESRC), Stanford, MIT, Nottingham and Queen Mary, these efforts put the UK close to the measurement frontier in this area, and point to a link between business management practices and productivity.

All of these new outputs and activities have been brought together within a new publishing model with an [overarching commentary](#), and have come alongside a growing national and international exposure for the Productivity Group. Building on the new statistical and analytical outputs it has generated, the group have presented at the Royal Economic Society's Annual Conference, at the Empirical Management Conference, the International Monetary Fund Global Productivity Forum, and the recent Economic Statistics Centre of Excellence Conference. We have an active and ongoing research programme with the OECD. The group has contributed to invited specialist seminars on intangible assets and capital stocks and services estimates, and has established expert user groups on the measurement of infrastructure investment. Several of the group attended the Royal Economic Society's Easter School in 2018 – which was focussed on productivity.

4 . Development priorities 2018 to 2020

While all this new activity and these new outputs all reflect the rapid pace of development over the last two years, there remains considerable work to be done. A large proportion of these new outputs remain badged as “experimental” – rather than official statistics. A number of our development projects on intangible and infrastructure assets are still in development, and we plan to make the final switch to a quarterly growth accounting model on a similar lag to ONS' labour productivity statistics by the end of 2018 – not the beginning, as originally planned. Finally, while the evidence is mounting up, an explanation for the UK's recent productivity performance remains elusive: the new data and analysis we have produced has improved the quality of debate, identified and ruled out drivers, but is yet to provide a full account for the productivity puzzle.

The following sections identify new outputs and statistics which we could produce, or improvements to existing statistics that could be made over the next two years. Given the nature of progress over the last two years, the growing raft of experimental outputs and the planned resource profile of the Productivity Group, this reflects a mixture of further development and new activities, and consolidation.

At present, these are in draft form and are submitted for your consideration. We would welcome your views on whether these are the correct priorities, or whether there are things which lie outside the scope of the projects considered here which we should bring into our planning. The final section contains details on how to contact us with your views.

4.1 Labour productivity

Progress in labour productivity statistics has been particularly rapid over the last two years, with both systems improvements and new datasets being brought online to meet growing user needs in this area. Reflecting the resource profile for the group, the expectation is that the improvements made over the next two-year window will be more incremental, focussed on consolidating recent gains and ensuring the sustainability of the current position.

Key aims

LP1: Complete systems improvements arising from development work

The Labour Productivity team plan to implement a number of systems changes and improvements which have been identified in the course of their development programme in recent years. A set of mostly minor changes to our National Statistics [LP1.1] are planned for implementation towards the end of 2018 to 2019, depending on progress assessing their impact. The most significant of these is a possible change in the SIC92 to SIC07 industry mapping from a modal map to a proportional mapping. This will give us a better match of workers to SIC07 industries in the pre-2008 period, resulting in stronger consistency over the time-series, and will also have a bearing on our estimates of labour input in our growth accounting suite. The timing of the processing of these labour metrics within the quarter will also be brought forward, to provide some cross-Productivity Group efficiencies.

We also plan to improve our methodology for estimating workers by industry – currently supplied to EuroStat each quarter – to make greater use of microdata, and to make the process more succinct [LP1.2]. This has taken a lower profile, and is planned for completion by the end of 2019.

LP2: New labour productivity data

Five new labour productivity datasets are proposed over the next two-year window, although these are more incremental than the substantial changes of the past two years. Firstly, by the end of 2018 to 2019 we plan to publish a regular set of labour productivity data for the real estate industry excluding imputed rental [LP2.1], reflecting user demand and the important impact that imputed rentals appear to have on industry-level contributions to productivity growth.

Secondly, by early 2019 to 2020 we plan to have completed feasibility work to explore whether we can include a broad, 10-industry breakdown to the whole economy estimates in our flash estimate of labour productivity [LP2.2]. Over a similar period, we plan to examine the feasibility of publishing a more complete set of market sector labour productivity metrics at the industry level, to support the modelling work of key external stakeholders [LP2.3]. We also plan to extend our existing industry-level contributions to productivity growth from a high-level industry breakdown, to the more granular, division level estimates [LP2.4].

Also in 2019 to 2020, coinciding with the introduction of regional short-term output indicators, we plan to introduce quarterly regional labour productivity estimates [LP2.5 and RP2]. These data should enable users to trace the productivity of regions in a more timely fashion. We will explore whether it is possible to produce a region-by-industry series from these data, providing a more timely set of these data than is available at present.

LP3: Extending historical data

Two pieces of development work are planned to extend the historical data available for labour productivity. Towards the middle of 2019 we plan to examine the possibility of providing historical series of output per hour by industry, extending our existing series back to the 1970s. These data will use proportional industry mappings, and the same interpolation methodology used to generate historical Labour Market Statistics, to estimate experimental output per hour [LP3.1].

Finally, in early 2020, we aim to build upon our work expanding labour productivity statistics back to the late 1970s – as well as Economic Statistics Centre of Excellence (ESCoE) work to produce historical national accounts data and Bank of England research in their Millennium of Macroeconomic Data – to produce an experimental dataset of historic labour productivity dating back to the 1940s, or possibly earlier [LP3.2].

LP4: Consolidating existing outputs

Our last set of developments will improve the badging and publication of our new labour productivity statistics. In late-2019, once several of our experimental datasets have been available for user feedback for at least a year, we plan to put our new methods through the newly re-established methodological peer review function within ONS [LP4.1]. This will proceed alongside further discussions about securing the long-term status of the labour productivity system on the new ONS Data Access Platform [LP4.2].

Alongside these “behind the scenes” changes, we intend to review the existing mode of publication for Labour productivity, with a view to incorporating the many experimental outputs that we currently produce inside a single publication model [LP4.3]. While work on this will proceed in draft internally, implementation would be delayed until such time as the enlarged set of labour productivity statistics are submitted for – and receive – a renewed National Statistics status [LP4.4].

4.2 Growth accounting

We have made a considerable investment in its growth accounting model over the last two years – the benefits of which are only now becoming evident. The key inputs for this model – Quality Adjusted Labour Input (QALI) and the Volume Index of Capital Services (VICS) – have both been considerably improved. However, there remains work to be done on the timeliness of our multi-factor productivity (MFP) estimates, and on the systems supporting this highly innovative output.

Key aims

GA1: Completing the shift to a quarterly publication cycle

Over the remainder of 2018 and the start of 2019, we plan to continue work to deliver quarterly estimates of MFP on the same timetable as labour productivity [GA1.1]. This will require solutions for several ongoing methodological issues related to quarterly trends, and the construction of a system capable of delivering both the required capital inputs and the growth accounting outputs in a narrow window between the publication of the Quarterly National Accounts and the Productivity theme day – usually around seven days later. Bringing forward of the production of labour input estimates will also support this shift.

GA2: More detailed MFP estimates by industry

In late 2018 to 2019, we expect to release much more detailed MFP estimates by industry than we have published previously, at a level of detail on a par with the leading national statistical institutions (NSIs) around the world [GA2.1]. In the first instance, these may be annual rather than quarterly, as we will need to evaluate the properties of the new quarterly series.

Most of the building blocks of a more granular MFP system are already in place. However, further work is required to address issues with QALI, where the methodology is highly data intensive and where additional industry granularity stretches the labour market source data very thinly [GA2.2]. However, we are confident that we can resolve these issues satisfactorily, building on innovative work already completed to buttress information from the Labour Force Survey with additional information from the Annual Survey of Hours and Earnings. An additional short-term development area linked to QALI is to examine the feasibility of integrating the human capital aspects of QALI with other estimates of human capital, including those produced by Well-being, inequality, sustainability and environment (WISE) division [GA2.3].

We also plan to make greater analytical use of these new MFP data. In particular, we plan to add further value by, for example, constructing decompositions to show the contribution of different types of capital (IT, non-IT) and the contributions of individual industries to overall MFP movements [GA2.4].

In 2019 we plan to exploit the sectoral breakdowns developed for MFP to inform analysis of productivity in the non-market sector, including working with colleagues to improve estimates of public service productivity [GA2.5].

GA3: Further improvements to capital stocks and services

We plan a number of improvements and developments for our capital stocks and capital services estimates over the course of 2018 to 2019. These include running sensitivity analysis around key assumptions, including asset lives, deterioration profiles and retirement functions and the further development of historic source data. We also plan to analyse the impact of smoothing asset deflator movements, where the unadjusted quarterly series can give rise to implausibly large movements in real holding gains or losses, and to take account of missing assets, specifically in the first instance, land and inventories. We will explore the impact of alternative formulations of rates of return, and develop the in-house capability to generate estimates of tax adjustment factors, which are currently supplied to us by the Bank of England [GA3.1]. We also plan to investigate the scope for adjusting capital services to take account of movements in capacity utilisation [GA3.2], and will explore – likely in 2019 to 2020 – whether we can widen our capital services asset coverage to include infrastructure and intangibles that are not currently capitalised in the national accounts [GA3.3].

GA4: A wider measure of multi-factor productivity

Finally, in 2019 to 2020, we will start to build on work in national accounts to compile supply and use tables in previous year's prices, we plan to compile estimates that will allow us to explore the impact on productivity of accounting for changes in (real) intermediate inputs as well as changes in labour and capital [GA4.1]. These models – widely known as KLEMS models – provide a more holistic explanation of output growth than the ONS' existing, value-added based growth accounting model.

4.3 Regional productivity

We will continue to extend the range of productivity analysis at a regional level. A number of teams across ONS collaborate to provide the regional productivity estimates, ensuring the work fits into the overall productivity development plan whilst also allowing a focus on specific regional policy themes.

Key aims

RP1: Fully integrate balanced regional gross value added (GVA) data into the regional productivity outputs

In December 2017, balanced regional gross value added (GVA) data, balancing data from the income and production methods, was published as an improvement over the previous national statistic GVA(I). Over the coming year we will complete the process of moving regional productivity data, including the relevant Nomenclature of Units for Territorial Statistics (NUTS) 1 national statistics, over to using this new balanced GVA measure.

RP2: Investigate providing quarterly regional productivity data

In late 2018, we are seeking to produce initial estimates of quarterly regional short-term indicators. We will investigate the suitability of using these to provide quarterly regional productivity measures, and if practical publish this data.

RP3: Investigate providing data for more industries and/or smaller geographies

With heightened interest in local economic performance, and the upcoming requirement for areas to produce their own local industrial strategies, the demand exists for additional productivity data either at smaller geographies (for example local authority) or with a greater breakdown of industrial detail (at present only NUTS 1 by Standard Industrial Classification SIC section level is published). However, the accuracy of survey data declines as disaggregation increases and therefore we need to assess the suitability of data to be published at these lower levels of disaggregation. ONS will examine whether metrics of this form are possible using new, administrative data sources.

RP4: Provide further micro-data analysis on the drivers and sources of regional productivity.

A number of articles have been published over the past 18 months using the local unit version of the Annual Business Survey (ABS) to investigate the sources of variation in regional productivity between areas. We will aim to add to this analysis in order to provide more information on the drivers of productivity differences between areas and to seek to provide insight to inform the production of local industrial strategies. The work taking place in the office to introduce new administrative data into economic statistics together with the linking together of additional datasets should add to the possibilities in this area.

4.4 Public service productivity

Following development work over the past two years, Public service productivity plan a mixture of further data development, analysis and consolidation over the next two years.

Key aims

PS1: New public service productivity data

Following considerable interest in public service productivity, we plan to extend our regular analysis of public service productivity. This will incorporate decompositions of the contribution of different types of inputs to overall public service inputs. An analytical piece will be published in July 2018, providing insight into trends in public service input expenditure, volume and implied price experience. We then plan to publish a regular set of data as part of the national statistic release, complementing other breakdowns and analysis [PS1.1].

Additionally, in 2019, co-ordinating with other related branches in the productivity teams, we plan to introduce experimental estimates of public service labour productivity [PS1.2]. These data should enable users to draw more suitable comparisons between the public and private sectors, responding to growing user demand.

PS2: Updating measures of public service output and inputs

As set out in the Atkinson Review, models of public service provision do not stay still and measures of output and inputs need to periodically be reviewed, ensuring metrics remain appropriate following changes in policy and provision. We therefore intend to further review and develop the existing methodology for Public service productivity: total public services. Work relating to this falls into two groups: the replacement of missing series and updating measures to better reflect the current situation.

Four pieces of development work are planned. We aim to carry out a review of all deflators used as part of the processing of the public service productivity national statistic. This will also include an assessment of associated methodology. Progress against this aim will be made incrementally over the remainder of the timeframe, in part dependent on progress elsewhere in ONS and opportunities to work with other government departments and non-governmental organisations [PS2.1].

Delivered against this was an analytical article — [Measuring adult social care productivity in the UK and England: 2016](#) — and dataset examining improvements to the measurement of adult social care inputs and output (as well as new quality adjustment metrics). This was accompanied by a short piece — [Incorporating changes into total UK public service productivity](#) — covering how proposed improvements to the service area's measurement are expected to impact on upcoming estimates of total UK public service productivity [PS2.2].

Thirdly, in late 2018 to 2019, we aim carryout a similar exercise to improve estimates relating to Children Social Care, to produce an experimental dataset, later to be incorporated into the Public service productivity: total public services release [PS2.3].

Additionally, a significant proportion of public service output volumes are assumed to equal the volume of inputs used to create them, restricting both the usefulness of the productivity series for individual service areas, and for the public services as a whole. Therefore, throughout 2019, we will work to develop new measures, looking to take advantage of new data sources and adopting an interdepartmental approach to measuring public service productivity and efficiency [PS2.4].

Also in 2019, to maintain transparency and to remain compliant with the Code of Practise for Official Statistics, the team will be updating methodology documents, in particular “[Sources & Methods for Public Service Productivity Estimates: Total Public Services](#)” [PS2.5]

PS3: Expansion and review of quality adjustments (methodology and application)

As of the latest release, [Public service productivity estimates: total public service, UK: 2015](#), around 45% of total UK public service output was explicitly adjusted to take account of changes in quality and improvements in associated outcomes. These included long standing quality adjustments for healthcare and education services, as well as new quality adjustments applied to the output of the Criminal Justice System. The quality adjustments we apply consider changes in aspects of quality and in associated outcomes, not already captured by the simple activity measure.

We will look to review current quality adjustment metrics, assessing their robustness, the suitability of their associated methodology and how closely they fit with the objectives of the relevant public service. At the same time, we would look to produce new quality adjustments for as-yet unadjusted services area output.

Delivered against this we have published experimental methodologies and estimates of [Adult Social Care](#) (June 2018). Improved measures, incorporating a new data source and a quality adjustment, were published to assist social care policy-making and include productivity estimates for sub-sectors of the adult social care service for the first time. These changes will be implemented into total public service productivity estimates in January 2019 [PS3.1].

In late 2018 we will launch a consultation to assess the current methodology and framework used by ONS to reflect quality changes in public service output. In doing so, we will facilitate understanding and discussion of current methods and the underlying issues, as well as demonstrate awareness to related changes [PS3.2].

While other developments may present themselves, as a result of the consultation, by early-2019 to 2020 we plan to have made considerable progress on work to improve the quality adjustments applied to education services. Addressing a long-standing issue with the estimate, we will take advantage of new data, research and methods [PS3.3].

PS4: Improvements to experimental estimate

Historically, the ONS public service productivity estimates had been produced with a significant time lag. This reduced their usefulness to track the impact of policy changes and efficiency measures in the short-term. In response to calls for this to be addressed, we have (since April 2015) published experimental, quarterly and annual estimates in line with the Quarterly National Accounts (QNA).

This output, as well as the data and methods behind it, are undergoing continuous refinement to better reflect current events and address user's needs. Work is underway to address weaknesses observed at the link point between it and the lagged, national statistic, as well as improve the coherence of these different approaches to ensure that they are placed on the same footing. To inform on this, we will deliver an analytical piece in July 2018 reporting on the frequency and impact of revisions due to data and methodology changes (the piece will also provide some insight into the series suitability as a nowcast of the lagged national statistic). Other work will be undertaken through the remainder of 2018 and early 2019. [PS4.1].

By late 2019, given suitable development and user feedback, we plan to put the related methodology through the methodology peer review function within ONS [PS4.2].

PS5: Systems redevelopment

Further work is planned over the next two years to improve the system for calculating estimates of public service productivity, which is heavily reliant on Excel. This will include improving the use of Excel in processing (reduced number of workbooks, higher levels of automation), and building and bringing in resource in terms of "R" software capability. Future developments, some of which are currently underway, include the staged migrating of isolated systems and statistical tools (that is Spline and Forecast) into "R". [PS4.3]

4.5 Micro-data analysis

The micro-data analysis and co-ordination branch have produced a steady stream of articles over the last two years, reflecting their growing expertise in the ONS survey data estate, the potential of administrative data, and their interaction with academic partners. Over the next two years, the micro-data unit will develop a broader remit, but will continue to focus considerable energy of the analysis of firm-level productivity.

Key aims

MD1 Firm-level management, uncertainty and productivity

Our initial analysis of the Management and Expectations Survey (MES) examined management practices across firms in the production and services industries, and the relationship between management practices and labour productivity. We intend to take this work further by with an in-depth analysis of variations in management practices. In this respect we aim to merge the MES to the local unit version of the ABS, which better supports location level analysis. We also aim to examine the levels of decentralization of decision making among multi-site businesses and whether this impacts on business performance. These outputs will be published as research articles over the remainder of 2018 to 2019 [MD1.1]

We also plan to extend this work to consider international comparisons of management practices. In terms of labour productivity, the UK lags behind most of the group of seven most industrialised countries (G7). One reason behind this could be how businesses are managed within these countries. As the Management and Operations Survey (MOPS) in the US, the German Management and Operations Survey (GMOP) and the Management and Expectations Survey conducted in the UK drawing from a very similar question set, there is scope to compare management practices across these countries and their relationship with productivity. We plan to examine the feasibility of this work during 2018, with the aim of publishing this work during 2019 [MD1.2].

One of the unique aspects of the Management and Expectations Survey is that it collects information on firms' projected performance for 2017 and 2018 in terms of turnover, employment, expenditure and capital investment. In this period of high uncertainty, this data provides a rich source of information in understanding firms current and planned hiring and investment decisions, based on their perceived future growth prospects. This work is a collaborative project with the Economics Statistics Centre of Excellence, and will deliver the first outputs during the summer of 2018 [MD1.3].

The forward-looking nature of the data collected on the MES will also enable us to compare firm forecasts with outturns. We plan to track firms who were surveyed by the MES in subsequent waves of the ABS and possibly through administrative data, to examine their actual realisations, against their forecast. This allows us to analyse firms' forecast errors and whether firms' ability to predict future outcomes is linked to their productivity. We will aim to publish this work in early 2020, following the acquisition of the ABS data for 2018 in late-2019 [MD1.4]

MD2 More holistic measures of firm-level productivity

The team intend to complete two pieces of analysis using the Annual Respondent Database (ARD) – which is a unique, pseudo-panel dataset of UK businesses providing some longitudinal information about labour productivity at the firm level. Following breaks in this database due to changes to the sampling of the Annual Business Survey (ABS), the Business Register Employment Survey (BRES) and the update to the Standard Industrial Classification of businesses (SIC2007), we have invested resources in updating and improving the ARD. We intend to explore this dataset to examine trends in firm entry and exit prior to, during and after the Great Recession and how these have contributed to the UK's productivity performance. This will be delivered during 2018 to 2019 [MD2.1].

We also plan to develop estimates of Total Factor Productivity (TFP) at the business level. The update of the Annual Respondent Database (ARDx) provides the opportunity to update the firm-level capital stock methodology and derive new estimates of firm-level capital stock. This increases the micro-data research potential within the ONS and the wider research community, in terms of exploring the more robust TFP performance of businesses [MD2.2]. We will aim to deliver this work during late-2019.

MD3 Extending analysis of the firm-level drivers of labour productivity

Alongside these more technical measures of firm-level productivity, we plan to update and publish our analysis of labour productivity using data which is newly available from the ABS. In the past, we have used this release to explore key topical productivity issues such as the analysis of firm-level output per hour, the impact of double deflation to firm-level productivity and the distribution and characteristics of firms at the top and bottom of the productivity distribution. We aim to update this series with the latest ABS datasets and address key productivity issues based on user needs, for publication in early 2019 [MD3.1].

We also plan to continue to develop new datasets – linking them to the Inter-departmental business register (IDBR) and the ABS – to complete productivity analysis. One of the areas of our focus is to increase the use of administrative data in compiling our statistics. However, our ability to link these administrative datasets with the IDBR means that these administrative sources can also be used in unison with our surveys for research purposes. One of the areas where progress has been made is in the use of detailed Trade data from HMRC. Linked to the IDBR and the Annual Business Survey (ABS), we are able to explore trade patterns of firms by product, origin and destination. We aim to use this data to explore the productivity performance of firms taking into account more complex trading relationships than currently available in the literature. This will be of particular interest to policy makers in view of current discussions on the outcome of the EU referendum. Initial results of this work will be available in the summer of 2018, with further analysis to follow in subsequent months [MD3.2].

Finally, we have obtained detailed patent application data from the Intellectual Property Office (IPO). Linking this data to the IDBR and the ABS allows us to explore the feasibility of analysing the link between patenting and productivity by the end of this review period [MD3.3].

4.6 Intangibles and infrastructure

The intangibles and infrastructure team will continue to work on their experimental outputs over the review period: extending their current outputs as new data becomes available while continuing to push forward new methods as required.

Key aims

II1: Intangibles

During 2018 to 2019 we intend to make further improvements to the existing methodology for estimating intangible asset investment and publish updated estimates for 2016 [II1.1]. This includes research on methods and assumption for own-account estimates, investigation of wider data sources and further micro-data analysis on training. We are also committed to reviewing and updating data and methods for own-account software and artistic originals as part of the Gross national income work programme [II1.2].

We also have started an analysis to explore differences in estimates of investment in intangible assets derived using this, macro-level methodology with those arising from surveys, including findings from the previous Investment in Intangible Assets Survey. We are also exploring the potential of other ONS data sources, such as the Purchases Survey, and will collaborate with ESCoE research teams on their work to explore the possibilities for better measuring firms' investment in intangibles [II1.3]. This work will report by the end of 2019.

In addition, we intend to expand the analysis to incorporate estimates of intangible investment in a growth accounting framework [II1.4 and GA3.3]. This will enable us to analyse the impact on growth and productivity of measuring a broad range of intangible assets. This will require further research on the depreciation rates and prices of intangible assets.

II2: Infrastructure

During 2018 to 2019 we will continue our work on infrastructure statistics, looking to address some of the methodological challenges in developing measures of stocks and services. This will be especially important when exploring the impact of infrastructure on productivity. A key part of that work is the need for a price index, or multiple price indices, for infrastructure assets, to allow analysis of investment, stocks and services over time. We plan to publish an updated article on measures of infrastructure investment in August 2018 drawing on latest ONS data sources incorporating international comparisons [II2.1]. We will also explore the feasibility of analysing transport infrastructure and the infrastructure of specific industries – including the water and sewerage industries [II2.2], and their potential incorporation into the MFP framework [II2.3].

4.7 International engagement

Alongside the improvements that the Productivity Group have made to their statistical outputs over the last two years, it has also sought to increase its engagement with international statistical bodies. We expect that this will increase over the next two years, helping us to align with international best practice.

Key aims

We intend to be directly involved with two specific international projects, each of which has the potential to improve understanding of how the UK economy performs relative to other, similar economies:

IE1: Measuring labour input

Over the last six months, we have been working in partnership with the Organisation for Economic Co-operation and Development (OECD) to better understand the UK's productivity gap. This has involved a number of high-level meetings with representatives from the OECD, in Paris, London and Newport. These culminated in a secondment from the Productivity Group to the OECD in early 2018, with the aim of examining the international comparability of measures of labour input.

As a result of our engagement and involvements, OECD recently re-ran a survey of national statistical institutions (NSIs) to learn how their national accounts consistent measures of labour input are constructed: the source data, the processes applied and any adjustments which are made to the data. The results of this survey will be published in working paper form by the OECD during 2018, as well as some analysis of differences in average hours worked across countries using the EU Labour Force Survey and comparable datasets from across the OECD.

IE2: MultiProd

We also plan to make a greater contribution to the OECD's distributed micro-data analysis of productivity programme, widely known as "MultiProd". This work, which involves users in many NSIs using their privileged access to micro-data to run similar analysis, contributing their results to a single, central point.

To this point, UK involvement in the programme has been constrained – initially because of resources, but subsequently because of the parallel development of the Annual Respondent Database (ARD). Early versions of this dataset appear to have delivered some odd findings, resulting in the UK's exclusion from early versions of this work. With the maturation of this dataset, we expect to be able to make a greater contribution to the OECD's work, and to be able to provide some useful international context for the UK's recent experience.

5 . Development plan engagement

We welcome communication from users on this development plan and more widely on productivity statistics.

If you would like to provide comments you can submit them by email or post. Contact details are provided.

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