The Skills Imperative 2035: Essential skills for tomorrow's workforce: Revised long-run labour market and skills projections for the UK

General guidelines for using the Workbooks

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Preface

The labour market projections at national and regional level form part of '*The Skills Imperative 2035: Essential skills for tomorrow's workforce*' research programme, which is being led by the National Foundation for Educational Research (NFER) – visit www.nfer.ac.uk.

This research programme is funded by the Nuffield Foundation – visit www.nuffieldfoundation.org.

The subregional analyses, which are an extension of these projections, have been funded by the Department for Education. Visit https://www.gov.uk/government/publications/labour-market-and-skills-projections-2020-to-2035.

This edition of the analysis contains revised projections. DfE previously published labour market and skills projections in 2023. These projections relied on data from the Labour Force Survey (LFS) up to 2021. Unfortunately, in July 2022 the Office for National Statistics (ONS) announced that they had made errors coding 2021 occupational data in the LFS. Subsequently, ONS published corrected data in the summer of 2023. This edition contains revised projections using the corrected data. More details about the impact of revisions can be found in a summary report produced by NFER, available at:

https://www.nfer.ac.uk/media/dvbevx0q/revised-employment-and-skills-projections-for-the-skills-imperative-2035.pdf

Acknowledgements

Contents

1. Introduction

The Skills Imperative 2035: Essential skills for tomorrow's workforce research programme

The global economy faces significant shifts in the coming decades. New technologies, coupled with major demographic and environmental change, are predicted to disrupt the economy and the labour market in various ways. This will have a significant impact in the next 10 to 15 years and beyond, both in terms of jobs and the skills needed to do them.

The impact of these drivers of change on the economy and labour market is expected to be one of the pre-eminent strategic challenges that the UK and wider global economy will face in the future. But the nature of the change in demand for jobs and skills in the future UK labour market is not currently well understood. Our research programme, The Skills Imperative 2035: Essential skills for tomorrow's workforce, aims to address this information gap.

As part of this research programme, there was a need to estimate what the future size and composition of the labour market would be in future. The Institute for Employment Research (IER) at the University of Warwick, working in collaboration with Cambridge Econometrics (CE), have produced such periodic assessments in their Working Futures series. As their most recent projections predated the pandemic and the UK's exit from the EU, the National Foundation for Educational Research (NFER), who are leading The Skills Imperative 2035 research, included an update of this assessment in the programme.

These new projections, which represent the latest in a series of quantitative assessments of the employment prospects in the UK labour market over a 10-15-year horizon, have been published under The Skills Imperative 2035 banner. The previous results were published under the Working Futures banner.

The projections present historical trends and future prospects by sector for the UK and its constituent nations and the English regions, as well as selected results for some sub-regional areas. The prime focus of The Skills Imperative 2035 projections is on the demand for skills as measured by employment by occupation and qualification, although the supply side is also considered. Their prime objective was to provide a sound quantitative foundation for the wider research programme.

They also provide an update to the labour market information (LMI) previously delivered by Working Futures. This LMI aims to inform policy development and strategy around skills, careers and employment, for both policy makers and a much wider audience. The results are intended to provide a sound statistical foundation for reflection and debate among all those with an interest in the demand for and supply of skills.

Future labour market scenarios

Due to the inherent uncertainty in predicting the future, IER and CE have produced projections for a range of scenarios. The Baseline projections assume existing technological trends and environmental transitions continue at a similar pace in the future. This represents a realistic assessment of what the labour market might look like in 2035 based on what we know now.

There are, however, other events which may become important in the future, but where the detail is not yet known. As one of the aims of The Skills Imperative 2035 research programme is to explore a range of possible futures, we have produced some Alternative scenarios that build on the Baseline projections, but which consider other possible outcomes. These include factors such as a faster adoption of technology; a greater focus on the environment; and the provision of higher-quality education, improved healthcare provision, and better care services to support the ageing population.

The prime focus of the projections is on the demand for skills as measured by employment by occupation and qualification, although the supply side is also considered. Their prime objective was to provide benchmark projections to support *The Skills Imperative 2035* programme.

However, they also represent useful labour market information that can help to inform policy development and strategy around skills, careers and employment, for both policy makers and a much wider audience, following in the tradition established by *Working Futures*.[1] The results are intended to provide a sound statistical foundation for reflection and debate among all those with an interest in the demand for and supply of skills.

The project has produced very detailed results which are made available to users in the form of a large number of Excel Workbooks. As described in more detail below, each Workbook comprises a series of worksheets containing past and forecast future employment levels from 2010-2035 inclusive, disaggregated by employment status (full-time (FT), part-time (PT) and self-employment (SE)) and gender (male, female). The different Workbooks are differentiated by their sectoral and spatial (i.e. regional and sub-regional) composition. Within each worksheet in each Workbook, employment levels are presented for each level of sectoral and/or regional decomposition, and for the 9 Standard Occupational Classification (SOC) major groups and/or the 26 SOC sub-major groups. Consistent occupational (SOC2020) and sectoral (Standard Industrial

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[1] See https://warwick.ac.uk/fac/soc/ier/researchthemesoverview/researchprojects/wf/

Classification 2007, SIC2007) classifications have been used throughout the Workbooks.[2]

In addition to the usual statistical limitations, the data and projections for the relatively short term need to be regarded alongside other sources, as they were produced at a time of considerable economic uncertainty following Brexit as well as the economic impact of the Covid19 Pandemic.

The projections underlying *The Skills Imperative 2035* were developed in 2021/22. They assume a continuation of the gradual economic recovery from the recession of 2008, and orderly departure of the UK for the EU and reflect the impact of the Pandemic.

Changing patterns of employment by sector and occupation are largely dominated by longer-term trends rather than the cyclical position of the economy or short-term impacts. The results from the current set of projections can therefore be used as a robust guide to likely future developments in the structure of employment, even if the path of recovery to longer term trends is more or less rapid than that assumed here. The results present a plausible picture of future developments by sector and occupation.

In order to generate the many different Workbooks, *The Skills Imperative 2035* projections involve forecasting almost a million individual time series.[3] This is a very detailed database, one of the most detailed available for the UK. However, it is important to recognise that the data are not without limitations. These give rise to a number of considerations as to how the data should be used and reported. The limitations arise from two elements of the procedures which have been used to produce the projections.

First, the projections are based upon survey data that were not originally designed or developed to produce precise estimates at this level of disaggregation. Second, the survey data have been used to calibrate an econometric forecasting model and a set of disaggregation procedures. Forecasting is as much an art as a science and requires considerable judgement on the part of the forecaster, especially when the forecast horizon is 10 years or greater. Any errors in the forecasters' ability to predict the future will be amplified the further into the future that the projections are considered, due to the inter-linkages between the sectors and regions, and the feedback mechanisms which permeate the model structure. The extent that the forecast base is imprecise due to the first data limitation further exacerbates this problem.

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[2] Most of the available historical data are based on the older classifications SOC2000 and SOC2010 and SIC2003. CE/IER have used conversion maps provided by the Officer for National Statistics (ONS) to convert the data base on to a consistent SOC2020 and SIC2007 basis.

[3] At the most detailed level, these comprise: sector (75) × occupation (25) × English regions, Scotland, Wales and Northern Ireland (12) × gender (2) × status (3) x qualification (9 broad QCF levels) = 810,000 separate time series. The different Workbooks simply contain different levels of aggregation of these time series.

Thus, while the projections of employment are based on best practice, both the historic patterns of employment and the forecast projections have inbuilt uncertainties of differing kinds. These uncertainties need to be considered when utilising the Workbook data.

They apply with particular force to the more detailed estimates produced for local areas such as the individual Local Enterprise Partnerships (LEP) and other local areas. It is important to emphasise that forecasts of this kind should not be used for detailed manpower planning. Rather they should be considered as providing helpful benchmarks at the local level for consideration of likely future trends.

Above and beyond this general caution, users of the Workbooks can usefully be given some general guidelines to assist in interpreting and utilising the historic and forecast data. This document outlines the structure of the Workbooks and provides these guidelines.

The remainder of this document is structured as follows. Section 2 describes the rationale for producing employment projections at the level of detail of those in *The Skills Imperative 2035* project. Section 3 outlines the issues involved in developing the general guidelines. It discusses the limitations of the data that the Office for National Statistics (ONS) publish, and the issues that arise regarding data availability. On the basis of this discussion, it suggests some 'rules of thumb' for publication and for unpublished data analysis. The two main issues to consider when developing a set of guidelines to interpreting and using the data in the Workbooks are statistical precision and robustness and confidentiality. The first consideration is the primary concern of Section 3. The second is covered by the need for a Chancellor of the Exchequer's Notice under the *Statistics of Trade Act 1947* in order to obtain access to some of the data. This is briefly discussed in Section 4.

Sections 5 to 9 describe the content of the Workbooks in greater detail. Section 5 provides an overview of the employment database prepared for the project and how this has been used to generate the Workbook series. It also documents the likely margins of errors that are associated with different employment projections. Section 6 describes the naming conventions for the Workbooks which incorporate the number of industries/sectors used and the geographical area covered (constituent countries of the UK, English regions and LEPs and other local areas in England).

Section 7 provides further detail on the content and structure of the worksheets containing the employment projections, including details of the standard tables and charts that appear in the different Workbooks. Finally, Section 8 provides some further guidance on the publication of detailed data from the Workbooks, including details of the most disaggregated industries for which publishing detailed employment projections might be problematic.

Further details of the construction of the database and the modelling procedures can be found in the various reports describing *The Skills Imperative 2035* projections.[4] More information on using the Workbooks can be found in the *User Guide.*[5]

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[4] Wilson, R. A., et al, (2022a). *The Skills Imperative 2035: Occupational Outlook - Long-run employment prospects for the UK, Baseline Projections, Working Paper 2a.* NFER and the related *Technical Report*.
[5] Wilson, R. A., (2024). *The Skills Imperative 2035: Essential skills for tomorrow's workforce: Revised Long-run labour market and skills projections for the UK. Workbook User Guide,* July 2024. Institute for Employment Research, University of Warwick / Department for Education.

2. Rationale for producing local level projections and their limitations

The changing policy environment for skills has placed renewed emphasis on the local level, resulting in demand for ever more detailed information focusing on local trends. The main aim of generating local projections is to provide a quantitative benchmark of labour market prospects for the local area concerned. This is based on the same macroeconomic scenario and assumptions as for the broader national projections. The *Skills Imperative 2035* results include a set of projections for LEP areas and other local areas in England.

It is important to emphasise that these local level projections are based solely on secondary data sources as described below. The local results are tied to the particular national and regional scenario described in *The Skills Imperative 2035* projections.[6] They do not incorporate any specific local knowledge or insight. They are intended as a starting point for further analysis rather than a projection of what is most likely to happen. They represent one possible future, based on the assumption that employment patterns in the individual LEP or other local areas continue to maintain the same relationship with the regional level as in the recent past. Sectors which have performed relatively poorly are assumed to continue to do so and *vice versa*. This is not inevitable. In particular it does not take into account any local 'surprises'. These may be welcome (such as a major inward investment) or not (as in the case of a major closure). Moreover, local agencies and organisations may be able to break away from past trends. Thus, the results should be seen as providing a starting point for debate rather than the final word.

Key drivers of changing skill requirements at local level are similar to those at national level. These include:

- *technological change* - faster adoption of technology in the workplace, including increasing AI and automation, especially information and communications technology (ICT), which is affecting both the products and services produced, as well as the way they are produced, resulting in increased demands for IT skills across a range of sectors and occupations;
- *competition and changing patterns of consumer demand* - which have increased the emphasis on customer handling skills;
- *structural changes* - including globalisation, sub-contracting and extension of supply chains, emphasising the need for high quality managerial skills (across a greater range than previously and at a greater depth) at various levels;

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[6] For details see footnote 4.

- *working practices* - such as the introduction of team- or cell-based production in engineering, and call centres in financial services, resulting in increased demand for communication and team working skills; while more generally there has been an increase in labour market flexibility; and
- *regulatory changes* - as well as increased concern about environmental issues, which have made important skill demands upon staff for some key sectors, including construction and finance; (survey evidence suggests that regulatory/legislative change is a particularly important driver of skills change in the public sector).

The results at a local level reflect all these factors although they are not dealt with explicitly in the local case. Hence, the production of such a set of projections for a particular LEP or other local area should not be seen as the end of the process. Rather it is best regarded as part of an ongoing process of improving understanding about what is going on in the local area. This understanding can then guide local policy makers and other actors (including individual workers, students and employers) to better decisions.

The main benefits of producing a set of detailed projections can be summarised as follows:

- The aims and objectives of policy intervention can be made clearer and the ability to evaluate policy can help, hopefully, to establish a virtuous circle.
- Such projections can provide a focus for discussion and co-operation and may help to breakdown old misperceptions about local markets.
- The projections should enable those involved to take more strategic actions, rather than a fire-fighting approach to problems, as the implications of current trends and outcomes for the future are explicitly explored.

Finally, the projections can also provide guidance to individual actors (including employers, workers and future employees) enabling them to make better decisions about their own futures.

3. Recommended general guidelines for using data from the Workbooks

Problems and issues

ONS do not publish consistent time series information on employment cross-classified by region (let alone by local area) at the level of industry detail which is the basic requirement for the macroeconomic model on which the projections are based. Detailed information on self-employment is even less reliable, being based on the Labour Force Survey (LFS), the sample size of which is inadequate to provide the kind of detail required here. Because of differences in the way data are collected for Northern Ireland, information for the whole of the UK is not available on a consistent basis. Therefore, strictly speaking, obtaining *consistent, statistically reliable and robust* employment estimates at the level of detail required *is not possible*.

Nevertheless, it is possible to generate *estimates* at this level of detail, which are informative, and of use to labour market analysts. These can be constructed by using the information ONS publish, including the raw Business Register Employment Survey (BRES)/Annual Business Inquiry (ABI) data. This involves various procedures of interpolation and adjustment to fill in gaps and to ensure consistency with published headline figures. Such procedures lie at the heart of CE's [Local Economy Forecasting Model](#) (LEFM) service, which has been supplying such detailed data to Training and Enterprise Councils (TECs), Local Enterprise Companies (LECs), LEPs and other organisations for many years. While not strictly precise in a statistical sense, such estimates can provide useful information and intelligence to users about detailed employment trends. However, the use of such data needs to be handled with care and, as noted below, there are strict limitations on what can be published due to concerns about confidentiality. The latter are discussed in more detail in the next section.

The *Skills Imperative 2035* employment estimates reflect the latest BRES data and related revisions available at the time the projections were made (early 2022). The time-series data currently made available by ONS for Great Britain are adequate to provide most, but not quite all, of the 2-digit SIC2007 industry categories. Aggregation to 75 categories as defined below enables robust data series to be constructed. At a regional level, the problems are more acute. ONS do not release detailed data at an industrial sectoral level when cross-classified by region. Apart from construction, the categories normally separated out by ONS all form part of the service sector. Only broad aggregates are made available for the other sectors.

These problems are even more severe at a local level. For LEP and other local areas, a very large number of the 75 detailed industries fall far short of the normal statistical criterion in terms of sample size. Even at a regional level, estimates for a number of the detailed industries are problematic. In many cases, this is because there simply is no employment in that category. In others the numbers are too small to satisfy ONS's

concerns about confidentiality. In particular, many of the 75 detailed industry categories would fall foul of the terms of *Statistics of Trade Act* at a local level, even if the estimates were statistically robust.

Solutions

The above discussion highlights that there are real problems in developing reliable data at the levels of detail that analysts and policy makers within DfE and its partners would ideally like to have access to.[7] One response to this would be to limit the amount of detail at which the projections work is undertaken. This would be very restrictive and would severely limit the level of detail that could be made available to those with an interest in such information, both within sectors and at a local level. Instead, a less restrictive approach has been adopted here. When generating the projections, full details have been maintained, while maintaining a strict control on the release of such data into the public domain to prevent misuse.

A clear distinction needs to be made between statistical reliability and the provision of useful labour market information (LMI) at a detailed level. If strict rules regarding statistical robustness are applied to decide what level of sectoral and occupational disaggregation can be provided at the local level, it would not be possible to provide much detailed data at all. The official surveys carried out by ONS are (with a few exceptions) not designed to provide statistically robust estimates at this level of detail. Following such rules would restrict what might be reported to very broad aggregates, which are not very helpful to most users.

However, in providing such detailed information it is important that users are aware of its limitations (as well as avoiding any problems arising over confidentiality). Nevertheless, it is arguable that this is more useful than suppressing the detail. In particular, the reliability of both the historical and forecast data will fall with greater sectoral and spatial disaggregation. Accordingly, it has been necessary to agree precisely at what level of aggregation public access should be made available and what restrictions need to be placed upon the use of the Workbooks and the further dissemination of information based on this material. These considerations need not inhibit the presentation of the most detailed information, complete with the appropriate caveats, to groups of users within LEPs and other local areas for example. However, such users will need to be made aware of the limitations of these data and of the legal constraints on their use.

IER/CE have addressed this issue for a number of years in providing results based on their Local Economy Forecasting Model (LEFM) methodology. This is based on the

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[7] Note also that this discussion refers to total employment, across all occupations. Adding an occupational dimension exacerbates the problem enormously.

notion of providing 'benchmark' estimates and projections, using the most detailed data where they are available for the local level, in combination with broader national and regional trends where they are not. While not subject to the normal tests of statistical precision, such estimates can provide useful and informative LMI for those operating at the local level. Other consultants have adopted similar solutions.

In providing such information it is important that users are aware of its limitations (as well as avoiding any problems of confidentiality). Nevertheless, IER/CE would argue that this is more useful than suppressing the detail at an early stage. This solution requires that such detailed information is only made available to a restricted audience. It is therefore necessary to restrict access to the more detailed results.

Presenting detailed historical and projected data in a 'free access' public website or other media also raise other important issues apart from the confidentiality ones. The reliability of historical and projected data will inevitably fall with greater sectoral and spatial disaggregation, and will certainly be less reliable in levels terms for output data than for employment data. Accordingly it has been necessary to agree precisely at what level of aggregation public access should be made available and what restrictions need to be placed upon its use and dissemination. These considerations need not inhibit the presentation of the most detailed information, complete with the appropriate caveats, to groups of users within LEPs and other local areas and the sectors that the DfE is concerned to primarily inform.

Rules adopted for publication and release of detailed data

In order to stay within the terms of *the Statistics of Trade Act,* limits have had to be imposed on how far to go in placing the most detailed data into the public domain. As far as published documents, and what is generally available on public websites are concerned, the 75 industries (as they are defined in *The Skills Imperative 2035* projections) set the limits at a UK level. This is consistent with the limits set by ONS for the LFS, given the requirement to report on occupational detail *within* sectors.

Any data to be published at an LEP or other local area level should, in principle, be even more aggregated. In practice how far one can go will vary considerably from one case to another.

As far as making data available at LEP or other local area levels is concerned, users can gain access to the fullest level of detail through gov.uk. Access to the more original data on which these estimates are based is limited to those in possession of a Chancellor of the Exchequer's Notice.

First, it should be emphasised that any recommended guidelines for use of the data can only ever be 'rules of thumb', rather than based on robust statistical analysis. Given the nature of the Workbooks, which have been constructed from a variety of different sources, it is not possible to attach precise margins of error to the historic estimates. For

example, while the full-time/part-time status information comes from the BRES/ABI, the self-employment statistics are derived from the LFS which is a considerably smaller database. They therefore have larger margins of error. Moreover, given the complexity of the forecasting model, and the subsequent RAS-based disaggregation and rebalancing methodology, it is not possible to generate 'forecast errors' such as those that would be available from a single equation forecasting methodology.

However, some general 'rules of thumb' can be recommended for using the Workbooks. These are based on the statistical rules adopted by ONS when publishing employment estimates using LFS data. ONS recommend using minimum cell sizes of 10,000 (grossed up), when presenting data based on the LFS. This therefore seems to be a sensible 'rule of thumb' to adopt when reporting data from the Workbooks. Given that there are 26 SOC sub-major group occupations to be distinguished in each sector, this suggests a minimum size for a sector of at least 250,000. The sectors chosen as the basis for reporting in *The Skills Imperative 2035* projections[8] all meet this criterion.

However, users of the Workbooks have access to estimates of employment at a much greater level of detail than this criterion would permit. These have been constructed by using the information that ONS publish, including the raw ABI data (which are subject to frequent revision). Such estimates can provide useful information and intelligence to users about detailed employment levels and trends. However, some caution is required when using such data and there are strict limitations on what can be published by the user due to concerns about confidentiality.

In order to stay within the terms of *the Statistics of Trade Act,* care has been taken in placing the more detailed data into the public domain. For *published* documents and information generally available on public websites, the 75 industries defined in *The Skills Imperative 2035* projections [9] set the limits at a UK level. Any data to be published at a local level should be more aggregated.

In developing these rules, three possibilities were explored:

- The first was to adopt a set of categories that ensure that all the data provided were both statistically robust and did not fall foul of the confidentiality constraints, regardless of the level of spatial detail. This would ensure that comparable data are available for all areas. However, it would have implied quite draconian criteria in order to ensure that the smallest areas meet the constraints, especially when breakdowns by gender, employment status and occupation are included.

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[8] See footnote 4.

[9] See footnote 4

- The second alternative was to develop a general set of rules regarding dis-aggregation based on individual cases. This would allow for more detail in some local areas than in others but would make comparison across areas more problematic. However, it would be incredibly time-consuming to develop such a piecemeal scheme and for this reason it was not adopted.
- The third possibility was to allow users to access different levels of sectoral and other detail, depending upon the geographical area covered and the size of employment in the cells concerned. Using the rules adopted by ONS for publication of LFS and other data as a guide, rules of thumb have been developed to guide users as to what is publishable and what is not. The basic rule adopted is that individual cells should not contain fewer than 10,000 people. In most cases, the broader categories adopted in *The Skills Imperative 2035* projections[10] meet this criterion (as long as the data are not cross-classified by another major dimension such as occupation). For example, the 22-fold industry breakdown used in the published reports is certainly feasible for most of the regions and countries of the UK, if occupation is not also used. However, including occupation as well poses serious risks of problems of statistical imprecision.

Thus for reporting data, it is recommended that a general rule of a minimum of 10,000 individuals per cell be adopted. While the ABI would technically permit a smaller minimum for the historic series on industrial employment estimates, the projections also use LFS data to supply self-employed statistics as well as breaks by occupation. There is also the issue of forecast errors in any analysis involving future projections. Using a single criterion provides a simpler rule than having different criteria according to whether historic or future projections are being analysed. However, this is a general guideline and occasionally, it may be breached for some cross-classifications of the data.

For any more detailed analyses of the projections, then a more lenient criterion can be adopted. While essentially arbitrary (given that we cannot assign forecast errors), a sensible absolute minimum cut-off could be 1,000 individuals. Figures are rounded within *The Skills Imperative 2035* projections[11] to the nearest 1,000, and thus it would be inappropriate to consider changes which are less than this. However, some degree of decision making on the part of the user needs to be made, since for disaggregated sectors, a *change* of 1,000 may be, proportionately, very large, and therefore probably less robust.

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[10] See footnote 4

[11] See footnote 4

Summary of guidelines

The projections presented in this Workbook are calculated from a number of different data sources, using a variety of econometric and statistical techniques. As a result, precise margins of error cannot be assigned to the estimates. For further details, see *The Skills Imperative 2035 Technical Report*.[12]

However, as a general rule of thumb, it is not advisable to report any statistics or analyses which are not derived from at least 10,000 individuals. This should provide a reasonable degree of statistical robustness to the estimates whether historic or forecast.

For more detailed analyses, a more lenient criterion can be used. However, the uncertainties associated with projections involving less than 1,000 individuals are probably too great to make such estimates useful. However, there is inevitably some degree of judgement required on the part of the researcher.

For cases in between 1,000 and 10,000 individuals, it is difficult to prescribe general rules, and an element of judgement by the user is needed. At an industry level, and focusing just on employees, the limits set by ONS in publishing ABI data can be used as a general guide. If ONS do not regard estimates as publishable then the equivalent figures in the workbooks **should not be published**. Where the focus is on self-employment or on occupations, a more stringent cut-off should be applied.

Further guidance on the use and publication of the Workbook data is given in Section 7 below.

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[12] Wilson, R. A., *et al*, (2023). *The Skills Imperative 2035: Occupational Outlook – Long-run employment prospects for the UK. Working Paper 2c: Technical report on sources and methods.* NFER

4. Overview of the main employment database and Workbooks

Developing the employment projections

Full details of the development of the employment projections contained in the Workbooks are described in *The Skills Imperative 2035 Technical Report.*[13] Figure 4.1 shows in general terms how the workbooks relate to the detailed employment projections. Thus, the UK workbooks effectively constitute 'templates' from which all other geographical areas are derived.

Figure 4.1: The detailed employment projections and the Workbooks
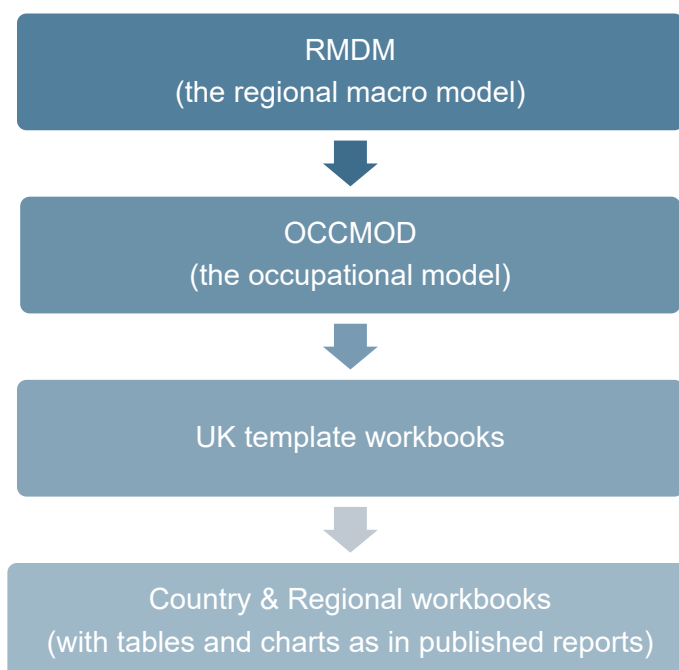
Forecasting accuracy and margins of error

The employment estimates make use of a wide variety of sources. As a consequence, it is not possible to calculate precise margins of error even for the historical estimates. From an analysis of previous projections it is clear that the differences between projected employment levels and observed outcomes can be quite large.

Industry employment levels are typically projected within ±10 per cent over a 5-10 year horizon. The directions of change are projected correctly in around 90 per cent of cases.

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[13] See footnote 4.

The errors in terms of annual percentage growth rates are usually of the same order of magnitude as the observed changes.

Occupational employment levels are typically projected with ± 7 per cent over a 5-10 year horizon. The direction of change is correctly projected in about 80 per cent of all cases. Occupational shares are usually projected within ± 2 percentage points. (The typical share is around 4 percentage points).

Historical revisions to the data account for a very large part of the forecast errors. It is also important to recognise that making predictions in the social sciences is not the same as in science or engineering. A key objective of such projections is often to influence and change behaviour and therefore outcomes. Forecasting accuracy is in this sense a chimera. It is important to appreciate that the purpose of the projections is not to make precise forecasts of employment **levels**. Rather, the aim is to provide policy analysts and other interested parties with useful information about the general nature of **changing employment patterns** and their possible implications for skill requirements.

The results provide a useful benchmark for debate and policy deliberations about underlying employment trends. However, they should not be regarded as more precise than the general statements in the text. Many years of international research have demonstrated that detailed manpower planning is not a practicable proposition. The results presented in the workbooks should be regarded as indicative of general trends and orders of magnitude, given the assumptions adopted, rather than precise forecasts of what will necessarily happen.

Finally, it is important to recognise that, without enormous resources, it is not possible to monitor and quality-assure every one of the almost a million series projected. CE/IER have checked to ensure that the basic trends and structural features of the data are sound but it is impossible to check and validate every series, especially at local level. The detailed projections are therefore provided on a *caveat emptor* basis. As emphasised above, the aim is to provide a useful benchmark for consideration rather than a fully thought-out, local-level forecast for each area.

5. Naming convention for the Workbooks

Spatial coverage

The main set of Workbooks is labelled with the area name, and for spatial areas below region a suffix denoting that spatial area:

- LEP refers to Local Enterprise Partnership;
- LSIP refers to Local Skills Improvement Plan areas;
- MCA refers to Mayoral Combined Authorities.

The contents of the main set of 15 Workbooks at National and Regional level for the Baseline and each of the scenarios is detailed in Tables 6.1 and 6.2.

Industries/Sectors

The UK and other spatial areas distinguish 75 industries (SIC2007 2-digit categories except where these are too small to provide reliable data (in which case they have been aggregated together)). There are 6 main sectoral aggregations adopted within the workbooks:

- All Industries/Sectors combined;
- 6 Broad Sectors;
- 22 Industries (as used for general reporting);
- 75 Detailed Industries.

The workbooks all adopt a standard format, with the same tables and charts for all geographical areas. The main emphasis has been made on preparing the UK files. These include analogous tables and charts to those used in *The Skills Imperative 2035* projections main report[14].

There are 15 main geographical areas (9 English Regions, 3 devolved administrations (countries), plus England, GB and UK totals and subtotals.

Similar workbooks are developed for the LEP areas within England. The LEP workbooks adopt a more aggregate picture for industry going down to just 22 sectors.

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[14] See footnote 4.

6. Content and structure of the employment projections worksheets

Structure of the Workbooks

The Workbooks all follow a similar structure in terms of their basic data content, with the exception of the UK SOC 4-digit and alternative scenarios workbook. This workbook contains a more limited selection of tables, as detailed in the Contents sheet of the workbook.

As adopted for *Working Futures 2017-2027* the detailed data are contained in a **Database** Workbook. These databases have not been published. The Tables and Figures are all contained in the **Main Tables** Workbooks, which have been published. These all have a common structure and contain similar tables and figures to those used in the main reports. The contents of these workbooks are summarised in Tables 6.1, 6.2 and 6.3.

More information about the structure and contents of the workbooks is available in the workbooks themselves, within the Information and Contents sheets. Some worksheets available in the pre-revised version of this publication are not included in this version. These worksheets contained graphs of data already available elsewhere in the workbook and have been removed for simplicity.

Table 6.1: Main Tables Workbook contents

Sheet name	Description
Warning	Warning on who is entitled to access the data as shown in Section 1 above. By default, each Workbook opens with this worksheet.
Information	An overview of the data, description of the workbook coverage, definitions of metrics available within the workbook and links to further information.
Contents	A list of sheets available in the workbook with details of the metrics, breakdowns and time periods available in each sheet.
Various worksheets	See Table 6.1 below, and the Contents sheet within the workbooks, for details of the various worksheets available.
Industry Aggregation	Details of the industry aggregation used in this workbook.

Table 6.2: Contents of Workbooks, Tables and Figures

Sheet name	Contents
Ind T1	Employment by Industry Sector (6 industries)
Ind T2	Employment by Industry Group (22 industries)
Ind T4	Employment by Industry Group in Sector (6 + 22 industries)
Ind T5	Employment Status by Industry Group and Gender (22 industries)
Ind T6	Employment Status by Industry and Gender (22 industries)
Ind F2	Line Chart Employment by Industry (6 + 22 industries)
IndOcc T1	Occupation Composition by Gender (9 occupations by 22 industries)
IndOcc T2	Occupation Composition by Employment Status (9 occupations by 22 industries)
Occ T1	Employment Change by Occupation Group and Gender and Replacement Demand (9 occupations)
Occ T2	Employment Change by Occupation and Replacement Demand (26 occupations)
Occ T3	Employment Change by Occupation in Occupation Group (9 + 26 occupations)
Occ T4	Occupation Composition by Gender (26 occupations)
Occ T5	Employment Change by Occupation Group, Status and Gender (9 occupations)
Occ F2	Line Chart Employment by Occupation (9 + 26 occupations)
Qual T1	Employment by Qualification (9 qualifications)
Qual F1	Line chart Employment by Qualification (9 qualifications)
ShiftShare T1	Shift-Share by Occupation (26 occupations)
RD T1	Replacement Demand by Occupation and Qualification (26 occupations by 9 qualifications)
RD F1	Replacement Demand by Occupation Group (9 + 26 occupations)
Basic T1	Employment by Industry Sector, Occupation Group and Qualification (9 occupations by 6 industries by 9 qualifications)
Basic T2	Employment Change by Occupation and Replacement Demand (26 occupations by 9 qualifications)
Basic T3	Occupation by Qualification (26 occupations by 9 qualifications)

Table 6.3: Metrics available within workbooks

Metric	Definition
Employment levels (000s)	The estimated number of employees required. Data up to 2020 are based on historical estimates. Data from 2021 onwards are projections.
Employment shares (%)	The estimated number of employees required, as a percentage of the total number of employees required.
Employment growth per annum / net change growth per annum (%)	The percentage growth in the estimated number of employees relative to the previous year. Where the time period for this metric spans multiple years the figure presented is the estimated average percentage growth per annum during this time period.
Employment change / net change (000s)	The difference between the estimated number of employees required in two given years.
Net change shares (%)	The difference between the estimated number of employees required in two given years, as a percentage of the number of employees required at the beginning of the period.
Replacement demand (000s)	The estimated number of employees required to replace those who leave the labour force on a permanent or semi-permanent basis during the given time period, because of retirement, family formation, mortality or other reasons.
Replacement demand rate / growth per annum (%)	The rate at which the labour force would need to grow each year in order to replace those who leave the labour force on a permanent or semi-permanent basis (for reasons as above). This is labelled as replacement demand rate in RD_T1 and as replacement demand growth per annum in Basic_T2.
Replacement demand shares (%)	Replacement demand as a percentage of the number of employees required at the beginning of the period.
Employment total requirement (000s)	The estimated additional number of employees required between two given years, as a result of both employment growth and replacement demand.
Employment total requirement shares (%)	Employment total requirement as a percentage of the estimated number of employees required at the beginning of the period.
Employment total requirement growth per annum (%)	The rate at which the labour force would need to grow each year in order to meet the total requirement for new workers as a result of both employment growth and replacement demand.

Shift-share analysis: scale effect (000s and %)	Shift-share analysis estimates the contribution of different components to the change in employment levels between two time periods. Scale effect is the estimated contribution of the total employment change within the geographic area.
Shift-share analysis: industry mix effect (000s and %)	Shift-share analysis estimates the contribution of different components to the change in employment levels between two time periods. Industry mix effect is the estimated contribution of changes in the industrial mix within the geographic area.
Shift-share analysis: occupation effect (000s and %)	Shift-share analysis estimates the contribution of different components to the change in employment levels between two time periods. Occupation effect is the estimated contribution of changes in occupational structure within industries due to organisational and technological change. This is calculated as the residual change after accounting for scale effect and industry mix effect.
Qualification levels (000s)	The estimated number of people in the labour force with different qualification levels.
Qualification shares (%)	The estimated number of people in the labour force with different qualification levels, as a percentage of all people in the labour force or all qualifications.

Most figures are available for the years 2015, 2019, 2020, 2025 and 2035, or a selection of these years, in line with analysis published by NFER. Some headline figures are available for all years from 2010 to 2035 inclusive.

In all Workbooks, the data are provided on consistent occupational and industrial classification bases for all years. For The Skills Imperative 2035 projections these use the latest Standard Occupational Classification 2020 (SOC2020) and the Standard Industrial Classification 2007 (SIC2007) respectively. The basic dataset by industry and employment status is constrained by the BRES/ABI sectoral information, so it is 'workplace-based'.[15]

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[15] Note that no account is taken of BRES/ABI inconsistencies from one year to the next (e.g. categorising the retailer Boots as 'pharmaceuticals' in one year and then 'retailing' in another, or the recoding of the same employer to different geographical areas. Users should therefore be aware of 'surprising' results at a detailed local or sectoral level and refer back to the base data order to see if the explanation lies therein.

In contrast, the occupational information relates to responses from households (from the LFS or Census of Population) and is therefore 'residence-based'. However, the LFS/Census information is converted to occupational shares within the industry of employment. These shares are then applied to the BRES/ABI-based sectoral data. The final occupational employment estimates are therefore effectively also workplace based. There is little or no information on how occupational structures within industries vary between residence and workplace, but the differences are probably generally small.

The estimates take account of the latest BRES/ABI as well as the most recent data published by ONS based on the LFS. The LFS information has been used to constrain the estimates of occupational structure, both at a sectoral and spatial level. The LFS data are only used to determine occupational shares rather than employment levels (which are based on BRES/ABI).

7. Use of detailed data from the Workbooks

As noted in Sections 3, the data in the Workbooks are based on confidential information drawn from ABI/BRES data. The data are also subject to statistical and other errors, and thus care needs to be used in deciding what level of detail to reveal. They should be regarded as indicative of general trends and not precise estimates of historical fact or future outcomes.

In the main *The Skills Imperative 2035: Technical Report,*[16] Table 12 presented employment data at the 75 detailed industry classification, for full-time and part-time workers in Great Britain. This provides some indication of the sample sizes involved.

Self-employment is not collected by the ABI/BRES and is derived from the LFS (see the *Technical Report* for further information).

Most restrictions on publication arise because there are very few establishments in any particular industry in the LEP. This means that such establishments could potentially be identified.

This is not just a function of employment size. Some of these categories are relatively large in employment terms. In such instances the small number of establishments involved means that even though they employ quite a large number of people, they can be identified and publication is therefore restricted. In other cases, confidentiality poses no restriction, despite the fact that only a relatively small number are employed, because there are so many tiny establishments involved that this would not identify any particular one.

As a test for the Previous *Working Futures 2020-27* estimates, CE downloaded 22-sector employees data from BRES, for 2009-12, for the 39 English LEPs (i.e. similar to what is in the LEP workbooks), and the only cells that were marked by ONS as being disclosive were for Mining & Quarrying in the Black Country, Coventry & Warwick, Tees Valley and Thames Valley Berkshire LEPs in some years. Surprisingly, the figures in Tees Valley and Thames Valley Berkshire were some way over 1,000, but that is presumably because there is only one (or a few employer(s) in that sector in those LEPs). Of course this does not consider earlier data (i.e. ABI) or the subareas in the other nations, but it is indicative.

Nevertheless, such estimates may still be suspect on the grounds of statistical reliability. This caveat becomes even more important when the data are extended to cover additional dimensions such as self-employment and occupation. These rely on data from the LFS which are subject to quite large margins of error. Together, these considerations

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[16] See footnote 12.

suggest that considerable care needs to be taken with any estimated employment level below 10,000. Moreover, all the estimates are rounded up to the nearest thousand. Any estimates of levels or changes below this level should be treated with considerable caution.

Data at the All and 6 sector levels

The employment levels and shares data at this level of sectoral/industry aggregation are normally robust, even though some cells may fall below the 10,000 minimum size advocated as a general 'rule of thumb'. However, even at this level some of the data show quite a lot of statistical 'noise' if they are plotted as time series.

The estimates are all rounded to the nearest thousand. When focusing on **changes over time** this may result in some estimates being rounded down to 0 in the tables. More detail can be viewed by clicking the increase decimal points icon on the formatting toolbar in Excel. Such changes may still be quite large as a proportion of the starting levels. However they should be treated with caution.

Data at the 22 sector level

Many more of the estimates at this level of aggregation fall below the 10,000 minimum cell size. Again in many instances this will not preclude publication since the estimates are reasonably robust but there are some cases where confidentiality rules may apply. This mainly relates to smaller industries such as water & sewerage or possibly some other categories within the primary and manufacturing sectors.

When it comes to changes, many more of the tables now have values which fall below 0 when rounded to the nearest thousand. These should be treated with caution. Occupational data, when cross-classified by the regional sectors, also tend to 'disappear' when rounded to the nearest thousand. This should be taken as an indication that the estimates are probably subject to quite wide margin of error and should only be used to make broad statements about existing structure or changes over time.

Only **All industry** estimates of occupational structure will satisfy the 10,000 minimum cell size rule for most LEP and other local areas. However, the data are probably sufficiently robust to make general statements about the occupational structure within most industries. Thus, for example, although the estimated total employment levels in agriculture may be below 10,000 in all years, the following kinds of statement can be made with reasonable confidence:

Occupational structure in Agriculture in the XXXX area follows a similar pattern to that at national level, with most employment concentrated in just 2 occupational groups:

- Almost 50 per cent are in skilled trades occupations;

- Around 40 per cent are in other (mainly unskilled) elementary occupations.

The managers & senior officials group used to employ around 1 in 10 workers but this has declined, being offset by growth in the share of personal service occupations. These patterns of change are also broadly in line with those for the UK as a whole.

Once again, actual numbers for estimated changes, etc, which are rounded down to below 1,000 should be treated with considerable caution.

Data at the level of the 75 Industries

These are the most detailed estimates available and are therefore the ones which need to be treated with the greatest care. Although there is always a desire to see changes in occupational structure in great detail, it must be borne in mind that such data are subject to quite large and uncertain margins of error. They should therefore be used as indicators of general trends and tendencies rather than precise and detailed information about the exact numbers of which skills will be required.

The individual industry information at this level could fall foul of the *Statistics of Trade Act*. As already noted, in the case of Stoke-on-Trent and Staffordshire LEP, employment levels for just 3 of the 75 detailed industries can be published without revealing confidential data. In some other cases the estimates are well below the 10,000 limit and so any information on changes over time or structure within such totals should be regarded only as indicative.

This applies to information on occupational structure as well as breaks by gender and status. In smaller industries the estimates can reveal quite erratic patterns. These may reflect errors in the basic data, as well as the methods used to fill in gaps where no official data exist, as much as reality. Occupational estimates, which relate to fewer than a thousand people, should not be regarded as precise. Where a few thousand people are employed in an industry, then the information on occupational structure can be taken as providing a general indication of current structure and ongoing trends. However, in the absence of customised data, collected from local employers, it should be regarded as no more than that. General statements, similar to those given above are valid in such circumstances, (see the discussion of the 22 sector level of aggregation above). These can draw upon similarities with the broader national picture, while recognising local distinctions.

References and referencing

When making reference to the Workbooks, you should use the following form:

"Source: *The Skills Imperative 2035* (2024), NFER/Nuffield/DfE/IER/CE, https://www.gov.uk/government/publications/labour-market-and-skills-projections-2020-to-2035."

Other relevant references describing the previous round of projections are as follows:

Wilson, R. A., S-A. Barnes, M. May-Gillings, H. Bui and S. Patel, (2019). Working Futures 2017-2027: Main report. Department for Education.

Wilson, R. A., M. May-Gillings, S. Patel and H Bui, (2019). Working Futures 2017-2027: Technical report on sources and methods. Department for Education.

Wilson, R. A., D. Owen, S-A. Barnes, M. May-Gillings, S. Patel and H. Bui, (2019). Working Futures 2017-2027: Annexes. Department for Education.

Wilson, R. A., D. Owen, D Bosworth, S-A. Barnes, M. May-Gillings and S. Patel, (2019). Working Futures 2017-2027: Headline report (presentation). Department for Education.

Wilson, R. A., D. Owen, D. Bosworth, S-A. Barnes, M. May-Gillings and S. Patel, (2019). Working Futures 2017-2027: Interim headline report. Department for Education.

Wilson, R. A., (2019). Working Futures 2017-2027: Workbook User Guide. Department for Education.

Wilson, R. A, (2019). Working Futures 2017-2027: General Guidelines for using the workbooks. Department for Education.

Wilson, R. A. and D. Bosworth (2019). Working Futures 2017-2027 - Qualifications Projections. Department for Education.

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