UKCES

Working Futures 2014-2024

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Working Futures 2014-2024

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UK Commission for Employment and Skills

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Foreword

The UK Commission for Employment and Skills (UKCES) is a publicly funded, industry-led organisation providing leadership on skills and employment issues across the UK. Together, our Commissioners comprise a social partnership of senior leaders of large and small employers from across industry, trade unions, the third sector, further and higher education and all four UK nations.

Our vision is to create, with industry, the best opportunities for the talents and skills of people to drive competitiveness, enterprise and growth in a global economy.

Our Research

Our research mobilises impartial and robust national and international business and labour market research to inform choice, practice and policy. We aim to lead the debate with industry to drive better outcomes for skills, jobs and growth.

In order to achieve this, we produce and promote robust business intelligence and insights to ensure that skills development supports choice, competitiveness and growth for local and industrial strategies.

Our programme of research includes:

- producing and updating robust **labour market intelligence**, including though our core products (the Employer Skills Survey (ESS), Employer Perspectives Survey (EPS) and Working Futures Series)

- developing an understanding of what works in policy and practice through **evaluative research**

- providing research **insight** by undertaking targeted thematic reviews which pool and synthesise a range of existing intelligence.

Our research programme is underpinned by a number of core principles, including:

- providing **business intelligence**: through our employer surveys and Commissioner leadership we provide insight on employers' most pressing priorities

- using evaluative insights to identify **what works** to improve policy and practice, which ensures that our advice and investments are **evidence based**.

- adopting a **longer term, UK-wide, holistic perspective**, which allows us focus on big issues and cross cutting policy areas, as well as assessing the relative merits of differing approaches to employer engagement in skills

- providing **high quality, authoritative and robust data**, and developing a consistent core baseline which allows comparison over time and between countries and sectors.

- being **objective, impartial, transparent and user-friendly**. We are free of any vested interest, and make our LMI as accessible as possible.

We work in strategic partnership with national and international bodies to ensure a co-ordinated approach to research, and combine robust business intelligence with Commissioner leadership and insight.

This current report presents the sixth in a series of results from *Working Futures*, the UK Commission's labour market model. The model is the most detailed and comprehensive of its kind for the UK, providing a picture of employment prospects by industry, occupation, qualification level, gender and employment status for the UK and for nations and English regions up to 2024. This report makes an important contribution to our understanding of likely trends in the labour market in the medium to longer term. The results contained in this report, together with the extensive range of supporting outputs and data that is available, offer a useful basis for reflection and debate among all those with an interest in future prospects for jobs; including individuals who are considering their careers choices, employers, education and training providers, as well as national and local policymakers.

As with all projections and forecasts, the analysis presented in Working Futures should be regarded as being indicative of likely trends and orders of magnitude, given a continuation of past patterns of behaviour and performance, rather than precise predictions of the future. The results should not be seen as definitive and should be used in conjunction with other sources of intelligence about the labour market.

Sharing the findings of our research and engaging with our audience is important to further develop the evidence on which we base our work. Evidence Reports are our chief means of reporting our detailed analytical work. All of our outputs can be accessed at www.gov.uk/government/organisations/uk-commission-for-employment-and-skills

We hope you find this report useful and informative. If you would like to provide any feedback or comments, or have any queries please e-mail info@ukces.org.uk, quoting the report title or series number. We also welcome feedback on Twitter.

Lesley Giles

Deputy Director

UK Commission for Employment and Skills

Preface and Acknowledgements

The opinions expressed in this report are those of the authors and do not necessarily reflect the views of the UK Commission. The projections should be regarded as indicative of likely developments for the economy and the labour market given a gradual recovery from recession and re-establishment of longer term trends, rather than precise forecasts of what will inevitably happen. Many of the trends presented are very robust and are not sensitive to modest unanticipated shocks. They present a view of medium to longer term trends for the UK economy and labour market (5-10 years ahead). The results should be regarded as a robust benchmark for debate and used in conjunction with a variety of other sources of Labour Market Information.

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Executive Summary

Working Futures 2014-2024 is the latest in a series of quantitative assessments of the employment prospects in the UK labour market over a 10 year horizon. It presents historical trends and future prospects by sector for the UK and its constituent nations and the English regions. The prime focus of *Working Futures* is on the demand for skills as measured by employment by occupation and qualification, although the supply side is also considered. Its prime objective is to provide 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. 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. This includes individuals, employers, education and training providers, as well as the various agencies and departments of government.

Sectoral change is one of the key drivers of the changing demand for skills. The main analysis focuses on broad sectors, but this is built up from a much more detailed picture of change by industry. The projections are based on the use of a multi-sectoral, regional macroeconomic model, combined with occupational, replacement demand and qualification modules. The results take account of the latest official data published by the Office for National Statistics. These data are used to paint a comprehensive and detailed picture of the changing face of the UK economy and labour market. A separate *Technical Report* (Wilson *et al.* 2016) provides full details of sources and methods used to produce the results, including information about even more detailed sub-national / sub-regional results.

The future cannot be predicted with precision or certainty. But all the participants in the labour market make plans for the future. The rationale behind *Working Futures* is that a comprehensive, systematic, consistent and transparent set of projections can help to inform everyone about the world they are likely to face.

It is important to emphasise that the view presented here is not the only possible future. It represents a benchmark for debate and reflection that can be used to inform policy development and other choices and decisions. The detailed projections present a carefully considered view of what the future might look like, assuming that past patterns of behaviour and performance are continued over the longer term. The results should be regarded as indicative of general trends and orders of magnitude and are not intended to be prescriptive. If policies and patterns of behaviour are changed then alternative futures can result.

Key findings

Working Futures 2014-2024 provides a comprehensive and detailed picture of the UK labour market, focusing on employment prospects for up to 75 industries, 369 occupations, 6 broad qualification levels, gender and employment status.

The latest results indicate:

- Significant increases in the size of the working age population and the economically active workforce but with a slight decline in overall labour market participation rates, reflecting the aging of the population.

- Slow but steady output growth, generating around 1.8 million additional jobs by 2024 compared with 2014.

- Replacement needs mean that the number of new job openings will be substantially higher (by a factor of around 7 times) than this "expansion demand".

- Some rebalancing of the economy is expected as a direct consequence of fiscal retrenchment, with a shift away from employment in public sector activities, and a projected declining share of public administration, health and education in total employment between 2014 and 2024.

- The manufacturing sector is projected to experience a further decline in its share of total employment as well as its overall level.

- The main increases in employment levels are expected to continue to be focused in the private (marketed) part of the service sector. Business and other services are the area where employment is expected to grow most rapidly.

- Employment status projections show the percentage of workers who are expected to be part-time, full-time, or self-employed by gender is expected to remain broadly stable over the decade to 2024. These patterns are driven principally by the mix of industry sectors in which jobs are forecast to be created or lost.

- Focussing on skills, as measured by occupation and formal qualifications held, the results suggest a continued trend in favour of more highly skilled, white collar occupations, but with some growth in employment for a number of less skilled occupations too.

- Job losses are projected for administrative & secretarial occupations; skilled trade occupations; and process, plant & machine operatives.

- It it is important not to focus just on projected changes in employment levels. Even in occupations where employment is expected to decline there will often be many new job openings and a need to recruit and train new entrants to replace those leaving the workforce for retirement or other reasons.

- Focussing on the other key measure of skills used in *Working Futures*, the supply of people holding higher level qualifications such as degrees is projected to grow steadily to 2024, despite the rising costs of attending university. The proportion of the labour force remaining unqualified is expected to represent only a small minority by 2024.

- Measuring the demand for formal qualifications is more difficult. The number of jobs in occupations typically requiring a high level qualification is expected to continue to grow, albeit more slowly than over the previous decade.

- It is projected that the supply of high qualified people will grow more quickly than demand for such qualifications, as implied by projections of the patterns of employment by qualification level within industries and occupations. This results in be an increase in qualification intensity within most occupations, especially those that have not previously employed many people with higher level qualifications. This is where there is more scope for increase (rather than in those occupations in which the workforce is already highly qualified, such as professionals).

- This does not necessarily indicate an of excess supply of such qualifications. The nature of jobs may be changing to make higher qualifications a necessary requirement for those jobs.

- The overall outlook for changing employment levels and patterns by sector, occupation and qualification show many similarities to those set out in the previous set of *Working Futures* projections.

- In 2024 the labour force (the economically active age 16+) is set to increase from 32½ million in 2014 to 34¼ million by 2024 alongside increases in the wider population. This is presented alongside a very slight decline in overall labour market participation rates (of age 16+) from 61.9 to 61.4 per cent, reflecting the aging of the population.

- *Working Futures* (2014-2024) shows that the number of jobs is projected to rise by 1.8 million over the next decade and an additional 13.1 million job openings will come about from replacing workers leaving the labour force.

1   Introduction and Background

Summary

- *Working Futures 2014-2024* is the sixth in a series of assessments of UK labour market prospects carried out every 2-3 years since 2002.

- The rationale for carrying out such work is to inform participants in the UK labour market about the world they may face and to stimulate reflection and debate.

- The approach to developing a quantitative view of the future labour market involves the use of a detailed multisectoral, multiregional econometric model, based on official data.

- The results paint a comprehensive, consistent and very detailed picture of employment prospects in the UK, covering industries, occupations, qualifications, gender and employment status, including results for the devolved nations and the English regions.

1.1   Background

Since the previous *Working Futures* report (Wilson *et al.* 2014) the world and UK economies have gradually recovered from the worst recession in recent times. While considerable uncertainty remains, the latest evidence suggests that the crisis in the Eurozone has been averted and economies such as the US are beginning to lead a more substantial upturn in terms of both output and employment. The benchmark view presented here is one of a gradual upturn, but with no quick return to long term trends as observed following previous recessions.

Chapter 2 explores the remaining uncertainties and sets out the assumptions underlying this new set of projections for the UK.

The report focuses on three main questions:

i.   Where will the jobs of the future be concentrated in the UK?

ii. What are the implications of this for skill demand, as measured by occupation and qualification?

iii. How does this compare with developments on the supply of skills?

Chapter 3 focuses on prospects for the different sectors within the UK economy, considering the contributions they are likely to make in generating growth and employment. It also considers the supply side, developing projections of labour supply by age and gender.

The projections take account of the latest official employment data, including the results from the Labour Force Survey and the emerging findings from the 2011 Census. The latest stance of government policy is taken into account by factoring in the consequences of the various government public spending measures and other official policy statements. The projections are based on the Cambridge Econometric (CE) macroeconomic forecasts, produced in the summer of 2015 (produced using MDM - CE's detailed multi-sectoral dynamic macroeconomic model (MDM-E3), MDM C152REG (revision 12956), conducted in January 2016). Based on this analysis, the projections indicate what may happen to the structure of employment in the UK – disaggregated by sector, gender, occupation, etc.

1.2   Rationale for the *Working Futures* projections

The case for a regular and systematic assessment of future skills needs has been set out in previous *Working Futures* reports as summarised in Box 1.1.

The results presented provide a benchmark for debate and thinking about the future. They should not be regarded as precise forecasts of what will necessarily happen. Rather, they indicate a likely future, given a continuation of past patterns of behaviour and performance[1]. If policies and patterns of behaviour are changed then alternative futures might be achieved. The present results provide a consistent and systematic benchmark view across the whole economy and labour market. They are indicative of general trends and orders of magnitude, given the assumptions made, which are summarised below.

They are not necessarily a substitute for projections produced by/for individual sectors or other interest groups (defined by say spatial area or occupational group). However, the *Working Futures* results show how the more detailed results for particular sectors, occupations or regions fit into a broader macroeconomic context, covering all these in a consistent, systematic and comparable manner.

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[1] For more discussion see Wilson (2001a).

Box 1.1: The rationale for *Working Futures* projections

The European Council has concluded that "Anticipating and matching labour market needs" is a key responsibility of Member States. Comprehensive assessments of future skills requirements can make a key contribution to the identification of labour market trends and skills shortages, helping to contribute to a better matching between labour market needs and skills supply developments.

More effective anticipation and matching of labour market needs, it is argued, can contribute to the promotion of better labour utilisation and higher labour productivity, and therefore to growth and jobs, helping to reduce both frictional and structural unemployment. The *Working Futures* series is a key element in the UK's response to this request.

There is on-going interest amongst policy makers to ensure that the UK has the appropriate skills base to sustain economic growth and compete internationally. However, such information is potentially of interest not just to policy makers but for all those having to make decisions about education and training, including individuals making careers choices, as well as education and training providers.

The main rationale for producing these kinds of projections is no longer that policy makers will engage in any kind of detailed, top down, planning (or anticipation) of the labour market. It is more about providing information to allow individual actors throughout the system (individuals making career choices, educational and training establishments and employers generally) to make better informed decisions (Kriechel *et al*, 2016).

Of course, nobody can predict the future with certainty. Most people can and do make plans and try to prepare for it. In doing so they adopt assumptions about what the future might be like, even if it is simply that the future will be the same as the past. There are also advantages of providing such projections centrally, as a public good, rather than relying on organisations and individuals to develop their own views independently. These advantages include the fact that this approach can provide a comprehensive, methodical, consistent and transparent set of results. It also benefits from economies of scale.

A key advantage of the *Working Futures* forecasts is that they provide a common and consistent economy wide overview of skill needs, allowing detailed comparisons across sectors. This is based on a transparent, specific set of macroeconomic assumptions and economic relationships, affecting the whole economy and its structure. As such, the analysis is grounded in an understanding of the key drivers impinging upon the economy. It serves to act as an objective, economy-wide, explanatory tool to facilitate the examination of the changing pattern of skills demand.

1.3   Aims and objectives

Government policy has placed increasing emphasis on the need for labour market information to be made freely available at a more detailed spatial and sectoral level to assist in policy and planning for the provision of education and training, as well as helping to guide individual career choices and decisions. *Working Futures* 2014-2024 addresses these requirements, exploiting available official information in such a manner as to produce a more detailed, comprehensive and consistent picture of employment patterns than is available from any other source, while recognising the technical challenges that this imposes, and setting out transparently how these have been addressed.

The historical database and the related projections focus on employment by occupation, cross-classified by sector and a spatial dimension down to individual countries within the UK, and regions within England. Summary results for employment are reported by:

- gender;

- employment status (full-time/part-time/self-employed);

- occupation (one, two and four digit occupational groups);

- expansion and replacement demand, as well as net requirements; and

- qualifications (6 broad RQF levels).

The more detailed results are available in the *Working Futures* workbooks distributed by UKCES.

The analysis also considers the labour and skills supply. Consistent projections of labour supply have been generated by:

- gender; and

- age (7 broad age groups: 0-15, 16-24, 25-34, 35-44, 45-59,60-64, 65+).

The labour supply projections are also developed distinguishing the highest qualifications held by the working age population and those economically active. These are consistent with results produced by Bosworth (2013a, b and c) and more recently by Bosworth and Leach (2015). By making assumptions about the distribution of unemployment between qualification categories, projections of employment by highest qualification held have also been developed.

1.4   General methodological approach and data sources

The general methodological approach to developing the *Working Futures* projections has been discussed in previous reports (Wilson *et al*, 2014) and is set out in detail in the accompanying *Technical Report* (Wilson *et al.* (2016). It focuses on sectoral and occupational employment structures, qualifications, and general workforce trends (including replacement demand). The approach exploits existing official data, including the Labour Force Survey (LFS), generating more detailed estimates than are available from official sources. Since *Working Futures 2012-2022* the results have included the full set of SOC 2010 4 digit occupational categories.

The complete *Working Futures* database presents a range of historical data and projections that meet the needs of the UK Commission (and those of its partners) for detailed information and intelligence on likely sectoral developments and their implications for skill requirements.

The approach involves the detailed examination of sectoral as well as occupational employment change and their implications for skill requirements at both a micro and macro level. This is based upon the use of a variety of research methods, ranging from complex econometric modelling, to other more qualitative approaches, depending upon the objectives of the work and the nature of the basic data available. For example, the analysis of trends in occupational structure is based on more qualitative approaches in contrast to the more sophisticated econometric analysis possible in other parts of the model where better time series data are available.

At the heart of the projections is the latest CE multi-sectoral multi-regional macroeconomic forecast. This is used to produce detailed 75 industry projections, for the period 2014-2024, covering all the English regions and the devolved nations of the UK (as well as custom results for Scotland and Wales in separate workbooks). The 75 industries are classified using the Standard Industrial Classification (SIC2007) (Office for National Statistics, 2009). Official ONS data on output and various other economic indicators as well as employment are used.

Data from the Labour Force Survey and other sources (including the 2011 Census) are used to develop historical measures of the occupational and qualification structure of employment within industries. A combination of simple econometric methods and judgement is then used to generate projections of these patterns forward to 2024. This is done using the Standard Occupational Classification (SOC2010) (Office for National Statistics, 2010).

Analysis of labour supply by age and gender is carried out using econometric methods. These are then further disaggregated by formal qualifications held to obtain measures of the supply of skills by highest qualification held as defined by the Regulated Qualifications Framework.

Full details of the approach are set out in the separate *Technical Report* (Wilson *et al.* 2016). A brief summary presented in a separate annex covers information on the main data sources and methods, econometric analysis and model structure and content.

1.5   Outline and structure of the report

Chapter 2 presents an overview of macroeconomic prospects for the global and UK economies, and the prospects for the UK labour market.[2] Chapter 3 assesses the prospects for broad sectors in more detail. Chapter 4 draws out the implications for occupations, including replacement demands. Chapter 5 considers the implications for qualifications, covering both supply and demand.

Separate annexes provide technical information about sources and methods, describing how the projections have been produced, as well as how these new projections compare to previous ones. These Annexes also cover the development of the 4-digit occupational results and the spatial results for the devolved nations of Scotland, Northern Ireland and Wales, and the 9 English regions.

A separate *Technical Report* (Wilson *et al.* 2016) goes into the methodological approach and data sources and limitations in much greater detail. This includes a detailed description of the macroeconomic and other models used to generate the projected demand for skills as well as the treatment of skills supply.

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[2] Results have also been produced for the devolved nations and the regions of England that together make up the UK.

2 Macroeconomic and General Labour Market Context

Key messages

- Following a protracted and sluggish recovery, UK GDP growth gained momentum in 2014 and 2015. In the near term GDP growth is expected to moderate, and to average around 2¼ per cent each year over the next decade.

- Overall, the number of jobs in the UK is projected to rise by around 1.8 million over the next decade – more of these jobs are expected to be taken by female workers (1m) than male (0.8m). The unemployment rate is expected to fall to below 5 per cent.

- The expansion of the UK's labour supply is forecast to slow over the next decade, curbed by slower population growth (than during 2004-14) and an aging population. The female labour force is expected to increase faster than the male labour force, reflecting the increasing participation of women in the labour market and the gradually increasing pension age for women.

2.1 Introduction

The macroeconomic prospects for the UK provide the context for the detailed forecasts of employment and the labour market examined in more detail in subsequent sections of this report. The analyses of the prospects for individual sectors in Section 3 can be seen in the context of the general projections for the UK economy as a whole outlined in this section. These projections are produced using CE's detailed multi-sectoral dynamic macroeconomic model (MDM-E3).

Section 2.2 begins with a brief overview of the key exogenous assumptions underlying the projections. The current situation is assessed in Section 2.3, drawing out general macroeconomic prospects for the UK over the next 5-10 years. The sensitivity of the results to key assumptions, and the macroeconomic uncertainties, are discussed in Section 2.4. The general prospects for the labour market are then summarised in Section 2.5. Comparisons with the previous set of *Working Futures* results are presented in the separate Annex B.

2.2   Global prospects

Global growth prospects have improved in recent years but remain uncertain in the wake of the last recession. World GDP is estimated to grow by around 3 per cent in 2015. Global GDP growth is set to accelerate over 2015-19 to reach 3.8 per cent p.a., and remain steady for the rest of the forecast period. This is in line with the long-term rate of global growth before the global recession. The fastest growth is expected in emerging economies. Growth in the developed economies such as the US and the Eurozone, having picked up since the global recession, is projected to stabilise at around 2-2½ per cent p.a., leaving the emerging economies as the main drivers of global growth in the foreseeable future.

In the US, growth is expected to pick up in the short term, increasing from 2.4 per cent in 2015 to 3 per cent by 2017, amid growing household consumption, increasing private investment and falling unemployment rates. Interest rates in the US are expected to rise progressively over 2014-24, to reach 3 per cent by 2024. However, as the economy exits its quantitative easing program there is a long-term question over whether the return to 'normal' interest rates can successfully be achieved alongside sustainable growth rates. For the moment, we expect US GDP growth to peak in 2017, and stabilise at 2.5 per cent p.a. from 2021 onwards. The US holds an advantage over other developed economies in its demographic profile, which is favourable towards long-term growth. But for such growth to be achieved the US will have to solve problems related to productivity and competitiveness. These might see a relative improvement due to rising wages in China and other developing economies. They are expected to be accompanied by low labour force participation rates and rising inequality.

The Eurozone also faces uncertainty over the long term effects of its quantitative easing program. Growth in the Eurozone has been sluggish in recent years, with many countries facing persistent high unemployment and low productivity, which has impacted on wage growth and household spending. However, prospects have begun to improve over the last year. A weak euro has provided a boost to exports (from which some countries have benefitted more than others), and consumer purchasing power has benefitted from low commodity prices. But, in the face of increasing competition from developing economies, a key long-term challenge will be to lift productivity, especially in the southern members of the Eurozone, and boost competitiveness. In the long term it is expected that, due to persistent lower productivity levels and unemployment, the Eurozone will experience a 'new normal' of slow but steady growth. It is assumed here that growth will increase steadily from 1.4 per cent in 2015 to around 2 per cent p.a. by 2024 (compared to an average of 2.5 per cent p.a. over 1999-2007). However, the Eurozone also faces the challenge of an ageing population and so as well as raising productivity, sustained economic growth will depend on the Eurozone's ability to widen its labour force by increasing participation among women and the elderly.

China, is undergoing a significant transition as growth slows from the relatively high rates of growth of the 2000s. Nonetheless, emerging economies are expected to be the driving force of global economic growth over the forecast period. In China, the effects of an ageing population are likely to weigh down on growth over 2014-24, with the repeal of the one child law not expected to have an impact on the supply of labour until the late 2030s. Nonetheless, it is assumed that China will experience stable and robust growth over the long term, at around 6 per cent p.a. up to 2024. Meanwhile, India's economic growth rate is expected to average 6.8 per cent p.a. over 2014-24, with Mexico and Brazil also growing strongly amongst other emerging economies. A range of factors, such as favourable demographics, competitive currencies, growing disposable incomes and their move up the global value chain, make these economies well positioned to fuel global growth over the long term.

2.3   UK macroeconomic prospects

UK GDP has grown in each consecutive year since 2010, but 2014 was the first year since 2007 that it exceeded 2 per cent - something which looks like being repeated in 2015. This seems to suggest the UK is on a sustained growth path (albeit modest and below the long-term historical average). The recent growth has been driven by strong growth in household spending, which has been underpinned (in 2015) by growth in real incomes (owing mainly to low inflation) and falling unemployment, along with improved credit conditions and consumer confidence; and has outpaced income growth as a result. Household expenditure grew by 2½ per cent in 2014 (see Table 2.1 below) and is expected to average 2-2½ per cent p.a. over 2014-24, which is considerably stronger than over 2004-14.

The Bank of England is widely expected to follow the Federal Reserve's lead on the timing of an interest rate rise. The current debate over raising interest rates is centred on the UK's currently low inflation rates, with CPI falling to zero and turning slightly negative during 2015. On the other hand, advocates of an interest rate rise point out the role of low commodity prices in the UK's inflation statistics – a phenomenon that is beneficial for consumers and some businesses. Interest rates are assumed to begin to rise in 2016, reaching 4 per cent from 2022-24, while inflation will pick-up to around the 2 per cent p.a. target in the long-term.

Household expenditure and business investment are expected to be the main drivers of growth over the forecast period. Household expenditure in the UK is expected to grow at 2½ per cent p.a. over 2014-19 and then slow to just over 2 per cent p.a. over 2019-24. Households are expected to save a greater proportion of their incomes as employment growth slows and interest rates and inflation rates return to levels seen before the 2008-09 recession. In the medium term, investment spending of financial services and non-financial business services is expected to grow particularly strongly. In the longer term, strong investment growth is projected for the information and communications sector. The information and communications sector is also expected to lead the UK in terms of output growth, projected at around 3½ per cent p.a. on average over the forecast period.

Although net trade has acted as a drag on GDP growth in recent years, 2015 saw a positive contribution to growth driven by an acceleration in export growth and weak import growth. However, net trade is forecast to make a negligible contribution to growth up to 2020, as import growth picks up once again and export growth holds steady. UK exports have been dented by weak global GDP growth since the recession, especially in the Eurozone – its main trading partner. Furthermore, the strong appreciation of sterling against the euro will have an effect on UK export competitiveness in the short to medium term. Net trade is expected to make a very modest positive contribution to GDP growth by 2024 as rising incomes in emerging economies may boost UK exports, particularly exports of services. With the current government focus on balancing the budget, public-sector cuts are due to have an impact on growth in the short-to-medium term. Government consumption (spending on goods and services) is expected to decelerate in 2016 and remain subdued in 2017, before picking up a little thereafter when fiscal constraints are expected to be relaxed in the face of strong demand for public services, though there will remain significant constraints beyond 2017 considering the government's commitment to eliminating the budget deficit by 2019/20.

On balance, total GDP growth for the UK is expected to be amongst the strongest of the major developed economies over the forecast period. Over this period, we expect UK GDP growth to peak at 2.7 per cent in 2016, and average 2.2-2.5 per cent p.a. for the rest of the forecast period. This will be driven by consumption growth and service-led investment growth, and suggests little rebalancing will be achieved over the forecast period.

Table 2.1: Macroeconomic indicators for the UK

	Historical trends		Recent trends			Projections	
	2004-09	**2009-14**	**2012-13**	**2013-14**	**2014-15**	**2014-19**	**2019-24**
GDP at Market Prices (% pa)	0.7	1.8	1.7	3.0	2.6	2.4	2.3
GVA at Basic Prices (% pa)	0.8	1.8	1.5	3.0	2.6	2.3	2.1
excl. Extra-Regio (% pa)	1.0	2.0	1.6	3.0	2.6	2.3	2.2
GVA per capita (% pa)	0.3	0.7	0.9	-1.1	1.3	1.6	1.7
Manufacturing Output (% pa)	-1.6	1.0	-0.6	2.8	0.6	2.0	1.5
Household Expenditure (% pa)	0.8	1.1	1.6	2.5	3.0	2.5	2.1
Employment (jobs, millions)	31.5	33.3	32.0	33.3	33.8	34.4	35.1
Unemployment (claimants, millions)	1.5	1.0	1.4	1.0	0.8	0.8	0.7
CPI Inflation (% pa)	2.5	2.9	2.5	1.5	0.1	1.3	2.1
BP/GDP (%)	-2.8	-2.4	-4.5	-2.4	-3.4	-2.7	-1.6
PSNCR/GDP (%)	5.6	12.3	-2.0	12.3	12.5	10.5	9.0

Source: Cambridge Econometrics, MDM revision 12956.
Notes:
GDP = Gross Domestic Product
GVA = Gross Value Added
CPI = Consumer Price Index
The balance of payment (BP) and the public sector net cash requirement (PSNCR) are expressed as a percentage of GDP at current prices.
Employment, unemployment, CPI, BP/GDP and PSNCR/GDP refer to the last year of the period concerned.
Employment is total workplace employment (jobs) and includes HM Forces.

2.4 Macroeconomic uncertainties

There are a number of risks and uncertainties surrounding the baseline macroeconomic forecast presented above; these are discussed below.

2.4.1   Emerging markets

While the outlook for developing economies looks strong, some uncertainties remain. China's future is highly uncertain, as the economy is transitioning from an export-led growth model to a consumption-led growth model. China's long-term success depends on whether it can achieve a 'soft landing' – an adjustment to lower but sustainable rates of growth without causing a crisis of expectations and a subsequent economic slowdown. A 'hard landing' is the major risk for the Chinese and global economies. More generally, there is some concern over the level of corporate debt that has built up in emerging markets since the global economic crisis. This has occurred largely due to recent low bond yields in developed markets, which led investors to look further afield in search of higher investment returns. With many emerging markets facing current difficulties from factors including low commodity prices and a strong dollar, there is uncertainty over the implications of such high debt levels for emerging markets and the wider global economy. The risk is that developing countries' positions turn sour and growth falters, weighing down on demand for UK exports and, more generally, global growth. This would curb jobs growth in UK manufacturing and traded services, and also investment-related sectors (such as construction) if household and business sentiment were severely dampened.

2.4.2   The strength of the Eurozone recovery

Though growth in the Eurozone has picked up over the last two years, it has been relatively weak and it is still uncertain whether the Eurozone is on a sustainable long-term growth path, considering that recent improvements in the Eurozone economy have been driven in part by quantitative easing and low commodity prices, both of which are temporary. If longer term growth in the Eurozone is more sluggish than expected, this would result in lower demand from the Eurozone for UK exports while the sustained weakness of the euro would undermine the competitiveness of UK exports to the Eurozone, thereby denting UK growth prospects and curbing jobs growth in UK traded goods and services sectors.

2.4.3   Persistent low productivity

UK productivity has stalled since the recession, puzzling economists and policymakers. Productivity is crucial for future economic growth, particularly as the UK employment and unemployment rates reach pre-recession levels. There have been some promising improvements in 2015, with output per worker growing by 0.9 per cent from the first to second quarter. Yet it is uncertain to what extent productivity will continue to improve in the future, particularly as there is little consensus on why productivity growth has been so weak since the recession. The baseline forecast is of a modest recovery in productivity; faster than anticipated productivity growth could support a faster pick-up of average earnings growth with potential boosts to labour supply and to household incomes and spending.

2.4.4   UK deficit reduction measures

There is uncertainty concerning planned UK deficit reduction measures that are still to come into effect and the impact that these will have on any economic recovery.[3] This could hit confidence and increase unemployment. There is also a degree of uncertainty regarding the extent to which the private sector can compensate for cuts in public sector jobs and investment.

2.4.5   UK house prices

House price inflation started to pick up early in 2013 and has continued at a rapid pace, with house price inflation at 6 per cent in the year to September 2015. While activity in the housing market can boost GDP growth, there is also a potential risk that this could lead to a house price bubble, especially as price rises have been highly concentrated in London and the South East. Prices are expected to rise further as the Government's Help to Buy scheme increases demand. A lack of affordable housing can pose long-term structural problems for the UK economy, for example, by restricting the mobility of labour to high-priced areas. If the bubble were to burst, we would expect to see widespread impacts across the UK economy – an initial slowdown of household spending as consumer sentiment is dented, curbed investment in housebuilding and then knock-on effects to the wider economy as confidence is eroded.

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[3] It is also worth noting that the devolved nations have to some extent pursued somewhat different policies from the UK government, and may continue to do so.

2.4.6   Change in the UK's relationship with the EU

The forecast assumes that the UK will remain a member of the EU. This will depend on the outcome of the forthcoming EU referendum. The forecast also assumes that a period of uncertainty over the outcome will drag on investment. A vote to leave the EU might extend that period of uncertainty as the terms of the exit are negotiated, and it would potentially limit the growth of UK labour supply if tighter controls over migration are imposed.

2.5   UK labour market prospects

2.5.1   Population and the labour force

Over the period 2004-14, the UK total resident population increased by 4.6 million (7.7 per cent) to 64.6 million (see Figure 2.1). This was reflected in a 9.2 per cent increase in the labour force, which rose by 2.7m to 32.5 million by 2014.

Over 2014-24, the UK population is expected to grow by 0.6 per cent per annum and so experience a slightly smaller increase (6.6 per cent) compared to 2004-14. The population aged over 16 is also expected to grow at a slower rate over 2014-24 than over 2004-14 (see Table 2.2). The ageing population means that the working age population (16-64)[4] is expected to increase by only around 900 thousand (2.2 per cent) over 2014-2024.

The number of children in the population declined in the early part of the 2004-2014 period, alongside a continuing steady rise in the number of pensioners. However, the number of children (aged less than 16 years) in the population has actually risen in the last few years to reach 12.2 million in 2014. By 2024 the number of children is projected to be around 8 per cent (around 1 million) higher than the 2014 level.

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[4] See Box 2.1 for definitions of employment and related labour market indicators.

Figure 2.1: UK population, labour force and unemployment profiles, 1981-2024 (000s)
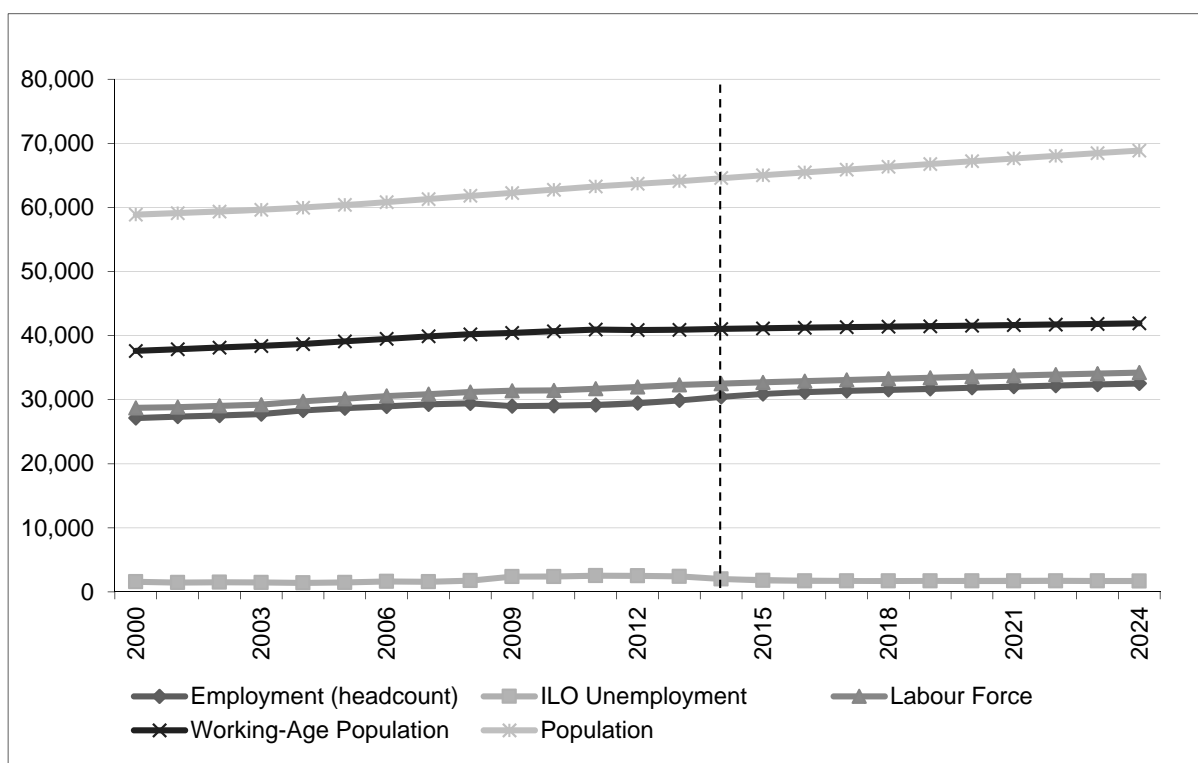
Source: Cambridge Econometrics, MDM revision 12956.

Table 2.2: Population and labour force in the UK

	2004	2009	2014	2019	2024	Percentage change over period			
						2004-2009	2009-2014	2014-2019	2019-2024
Male									
Population	29,297	30,532	31,794	32,987	34,111	4.2	4.1	3.8	3.4
Population 16+	23,299	24,510	25,571	26,444	27,386	5.2	4.3	3.4	3.6
Labour Force	16,175	16,912	17,351	17,648	18,018	4.6	2.6	1.7	2.1
Activity Rate	69.4	69.0	67.9	66.7	65.8	-0.6	-1.7	-1.6	-1.4
ILO Unemployment	834	1,442	1,127	928	1,000	72.9	-21.8	-17.7	7.8
Employment (headcount)	15,341	15,470	16,224	16,721	17,018	0.8	4.9	3.1	1.8
Labour Market Residual (2)	952	1,296	1,327	1,396	1,326				
Jobs = headcount + residual	16,293	16,766	17,551	18,117	18,344	2.9	4.7	3.2	1.3
Female									
Population	30,653	31,728	32,803	33,802	34,773	3.5	3.4	3.0	2.9
Population 16+	24,940	25,990	26,873	27,570	28,371	4.2	3.4	2.6	2.9
Labour Force	13,575	14,481	15,130	15,767	16,219	6.7	4.5	4.2	2.9
Activity Rate	54.4	55.7	56.3	57.2	57.2	2.4	1.0	1.6	0.0
ILO Unemployment	585	956	900	799	698	63.4	-5.9	-11.2	-12.7
Employment (headcount)	12,990	13,525	14,231	14,968	15,521	4.1	5.2	5.2	3.7
Labour Market Residual (2)	1,531	1,233	1,550	1,328	1,276				
Jobs = headcount + residual	14,521	14,758	15,780	16,297	16,797	1.6	6.9	3.3	3.1
Total									
Population	59,950	62,260	64,597	66,789	68,884	3.9	3.8	3.4	3.1
Population 16+	48,239	50,500	52,443	54,014	55,757	4.7	3.8	3.0	3.2
Labour Force	29,750	31,393	32,481	33,415	34,237	5.5	3.5	2.9	2.5
Activity Rate	61.7	62.2	61.9	61.9	61.4	0.8	-0.4	-0.1	-0.7
ILO Unemployment	1,419	2,398	2,027	1,727	1,698	69.0	-15.5	-14.8	-1.7
Employment (headcount)	28,330	28,995	3,0454	31,689	32,539	2.3	5.0	4.1	2.7
Labour Market Residual (2)	2,484	2,529	2,877	2,725	2,602				
Jobs = headcount + residual	30,814	31,524	33,331	34,413	35,141	2.3	5.7	3.2	2.1

Source: Cambridge Econometrics, MDM revision 12956.
Notes:
> *a. Levels are in thousands except for the activity rate, which is in percentages. Changes are percentage difference over the period except for the activity rate which are percentage points.*
> *b. Labour Market Residual is the difference between workplace employment (number of jobs) and head count employment.*

Overall, labour market participation, or activity rates, over the decade to 2014 increased slightly, but this was the result of a rising activity rate for women (by around 1.9 percentage points) and a falling activity rate for men (by 1.5 percentage points). However, by 2014 the activity rate for women was still about 12 percentage points lower than the activity rate for men. Overall participation rates, which are affected by the age and gender profile of the population, are expected to increase very slightly over 2014-19, but then to fall slightly, such that the rate in 2024 will be just below the rate in 2014. The trends by gender are set to continue in the decade to 2024 – the female activity rate is forecast to increase and male activity to decline.

Figure 2.2: Changes in key labour market indicators for the UK, 2014-24 (000s)
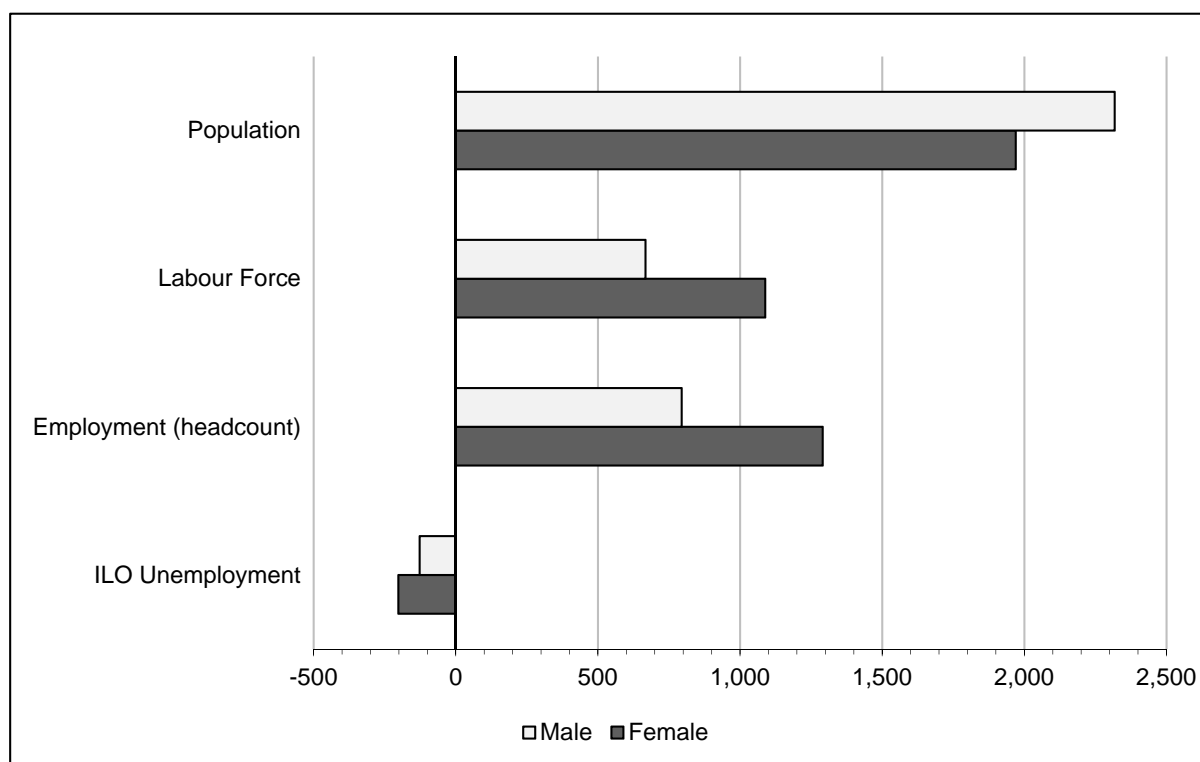
Source: Cambridge Econometrics, MDM revision 12956.

Both population and working age population are forecast to rise faster for males than for females, but the labour force for females is expected to increase faster than the male labour force (continuing recent trends). This reflects the increasing participation of women in the labour market and, over the period 2014-2024, the gradually increasing pension age for women to 66.

The economically active labour force depends on the size of the population and the labour market participation rate. The latter varies considerably by age and gender. Women are still not as likely to take part in the formal economy as males, although trends in participation rates for women are rising.[5] This trend is projected to continue throughout the forecast period, with the female activity rate increasing by 1 percentage point between 2014 and 2019 and 0.2 percentage points over 2019-2024.

2.5.2   Employment

Employment can be defined and measured in a variety of ways (see Box 2.1 for details, and 5.2 for further discussion):

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[5] Many more females work in part time jobs than is the case for males.

- numbers of jobs;

- numbers of people in employment (heads);

- by area of workplace; and

- by area of residence.

In most of *Working Futures 2014-2024*, the term employment is used to refer to the number of jobs located in a particular area (generally where the workplace is located). Box 2.1 provides the alternative definitions of employment and other labour market indicators. Unless indicated otherwise, data on employment in tables and charts show the number of workplace jobs rather than numbers of people or place of residence.

2.5.3 Employment by gender and status

In 2014, employment (workplace jobs) in the UK increased by just over 4 per cent. The steepest growth was in self-employment, especially among females (see Figures 2.3 & 2.4). Female self-employment increased by 14¾ per cent in 2014 and male self-employment rose by 6½ per cent. There was also a substantial growth of around 3½ per cent in both male and female full-time employment. Female part-time employment also grew strongly in 2014 at 3¼ per cent, while male part-time employment rose by 2½ per cent.

The result is that around 58 per cent (19.5 million) of all jobs in the UK in 2014 were full-time, while around 28 per cent (9.3 million) were part-time. The remaining 14 per cent (4.5 million) were self-employed (see Table 2.3).

Among men, full-time employee (jobs) was the dominant status, accounting for around 69 per cent (12.0 million) of all jobs held by men. Around 2.5 million jobs held by men were part-time, representing 14 per cent of all jobs held by men. Self-employment accounted for around 17 per cent of jobs held by men. Amongst women, full-time employment accounted for just 47 per cent of all jobs held by women in the UK in 2014, while around 43 per cent were part-time jobs.

It is possible that the large increases in self-employment rather than full-time employee work are a sign that there is under-employment in the labour market. That is, there are many workers who would like to have a full-time job, but are unable to find one. Therefore, they choose the second-best option which is self-employment or part-time employment.

Box 2.1: Definitions of employment and related labour market indicators

Alternative definitions

There are various ways of looking at **employment**. For example, a distinction can be made between the number of people in employment (head count) and the number of jobs. These two concepts represent different things, as one person may hold more than one job. In addition, a further distinction can be made between area of residence and area of workplace.

Similarly there are various different definitions of unemployment, the labour force, workforce and population. In *Working Futures 2014-2024* the following definitions are used:

Residence basis: measured at place of residence, as in the Labour Force Survey (LFS).

Workplace basis: measured at place of work, as in the Annual Business Inquiry (ABI) and Business Register and Employment Survey (BRES).

Workplace employment (number of jobs): these are typically estimated using surveys of employers, such as the ABI and BRES, focusing upon the numbers of jobs in their establishments. In this report references to employment relate to the number of jobs unless otherwise stated.

Employed residents (head count): the number of people in employment. These estimates are based primarily on data collected in household surveys, e.g. the LFS. People are classified according to their main job. Some have more than one job.

ILO unemployment: covers people who are out of work, want a job, have actively sought work in the previous four weeks and are available to start work within the next fortnight (or out of work and have accepted a job that they are waiting to start in the next fortnight).

Claimant Unemployed: measures people claiming Job Seeker's Allowance benefits.

Workforce: the size of the workforce is obtained by summing workplace employment (employee jobs and self-employment jobs), HM Forces, government-supported trainees and claimant unemployment.

Labour Force: economically active (employed residents plus ILO unemployed) age 16+.

Labour market participation or **Economic activity rate**: the number of people who are in employment or (ILO) unemployed as a percentage of the total population aged 16 and over.

Labour Market Accounts Residual: workplace employment minus Residence employment. The main cause of the residual at national level is "double jobbing". At a more disaggregated spatial level, net commuting across geographical boundaries is also very significant. The difference will also reflect data errors and other minor differences in data collection methods in the various sources.

Total Population: the total number of people resident in an area (residence basis).

> **Population 16+**: the total number of people aged 16 and above (residence basis).
>
> **Working-age population:** the total number of people aged 16-64 (males) or 16-64 (females), (residence basis). The State Pension age of females will increase from 60 in 2011 to 65 in 2018. From 2018 the State Pension age for all (both males and females) will start to increase to reach 66 by 2020.

At 1¼ per cent in 2015, employment growth is estimated to have been much weaker than it was in 2014. The weaker growth is estimated to be across gender and employment type, and after the surge in 2014, overall self-employment is estimated to have grown by only 1 per cent in 2015.

At ¾ per cent, employment growth in 2016 is forecast to be weaker still than in 2015, as the government's deficit reduction measures continue to impact on employment, particularly in public administration. The greatest *increase* is expected to be in part-time employment, driven by an increase in male part-time employment of 2¼ per cent. Growth in male and female full-time employment is expected to be modest, and in self-employment is expected to be very slow.

Overall, the number of jobs in the UK is projected to rise by around 1.8 million over the next decade, that is average annual growth of around ½ per cent. More of these jobs are expected to be taken by female workers (1m) than male (0.8m). Female full-time employment is projected to grow at a faster pace (¾ per cent p.a.) than male full-time employment (¼ per cent p.a.). Male part-time employment is projected to see the fastest growth (1¾ percent p.a.). These patterns are driven principally by the mix of industry sectors in which jobs are forecast to be created or lost (see Chapter 3). In addition, the recent pace of expansion of self-employment (indicative of under-employment) is not expected to be sustained over the longer term so that male self-employment is projected to fall slightly (-¼ per cent p.a.) and female self-employment to remain fairly static.

Table 2.3: Employment status, 2014-2024

Level	Employment by Gender	Full-time	Part-time	Self-employed	Total 000s
2014	Male	12,096	2,487	2,968	17,551
	Female	7,377	6,827	1,576	15,780
	Total	19,473	9,314	4,544	33,331
2019	Male	12,407	2,729	2,980	18,117
	Female	7,649	7,061	1,586	16,297
	Total	20,056	9,791	4,566	34,413
2024	Male	12,443	2,979	2,922	18,344
	Female	7,908	7,310	1,579	16,797
	Total	20,351	10,289	4,501	35,141
% of total	**Employment by Gender**	**Full-time**	**Part-time**	**Self-employed**	**Total %**
2014	Male	36.3	7.5	8.9	52.7
	Female	22.1	20.5	4.7	47.3
	Total	58.4	27.9	13.6	100.0
2019	Male	36.1	7.9	8.7	52.6
	Female	22.2	20.5	4.6	47.4
	Total	58.3	28.4	13.3	100.0
2024	Male	35.4	8.5	8.3	52.2
	Female	22.5	20.8	4.5	47.8
	Total	57.9	29.3	12.8	100.0
Change	**Employment by Gender**	**Full-time**	**Part-time**	**Self-employed**	**Total 000s**
2014-2019	Male	310.7	242.3	12.7	565.7
	Female	272.3	234.4	9.7	516.4
	Total	583.0	476.7	22.4	1082.1
2019-2024	Male	36.2	249.7	-58.8	227.1
	Female	258.7	249.0	-6.9	500.8
	Total	294.9	498.7	-65.7	727.9
2014-2024	Male	346.9	492.0	-46.1	792.8
	Female	531.0	483.4	2.8	1017.2
	Total	877.9	975.4	-43.3	1810.0

Source: Cambridge Econometrics, MDM revision 12956.

Figure 2.3: Employment status in the UK, 2014 (000s)
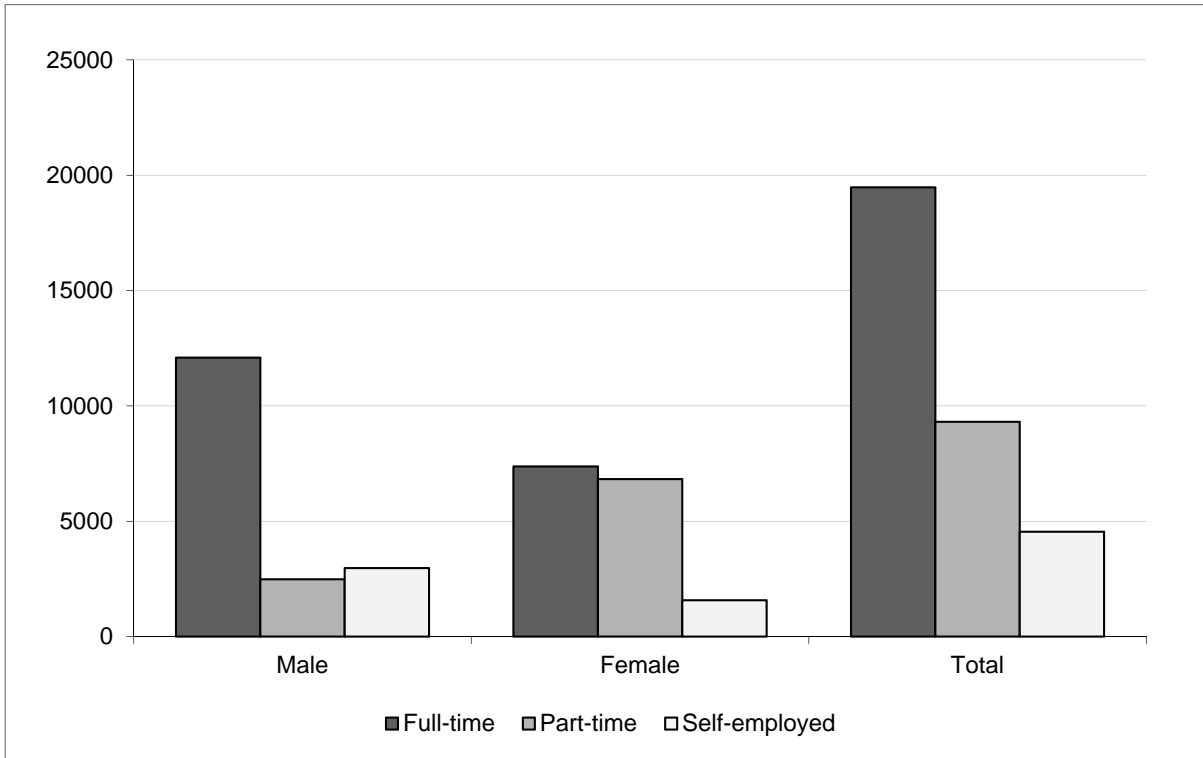
Source: Cambridge Econometrics, MDM revision 12956.

Figure 2.4: UK employment profiles by gender and status, 1981-2024 (000s)
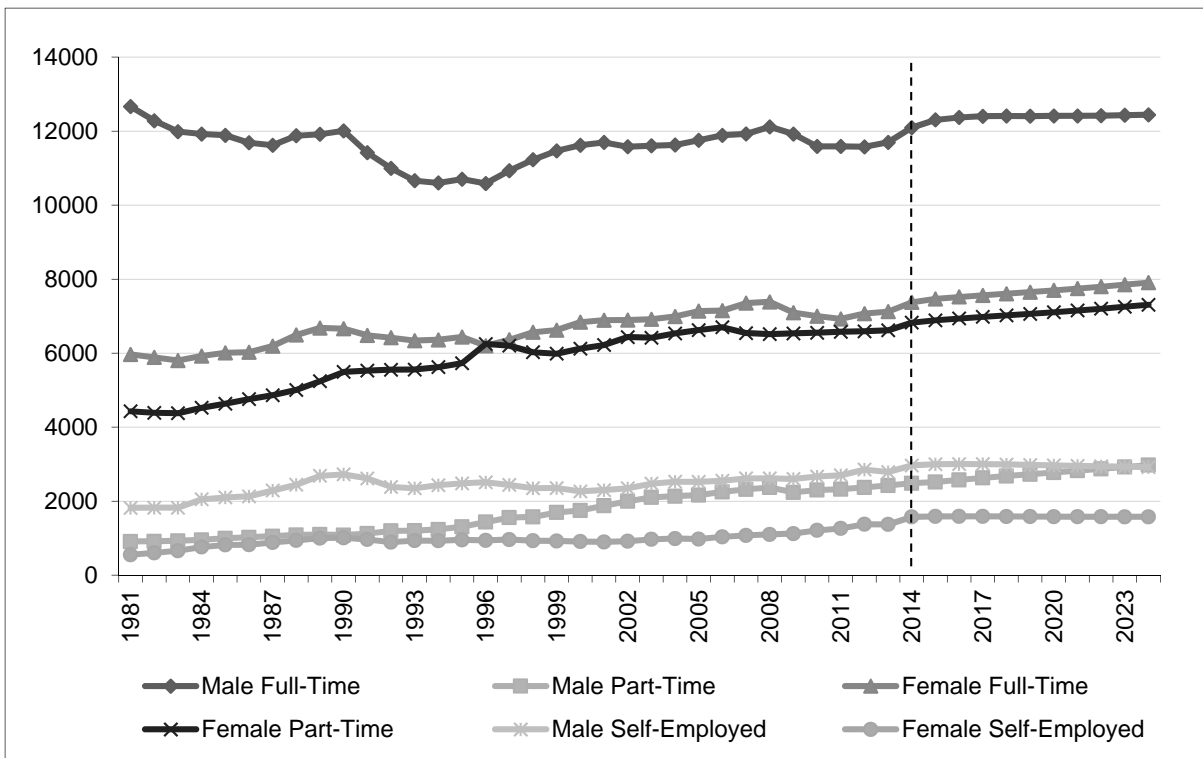
Source: Cambridge Econometrics, MDM revision 12956.

Figure 2.5: Changes in employment in the UK by status, 2014-24 (000s)
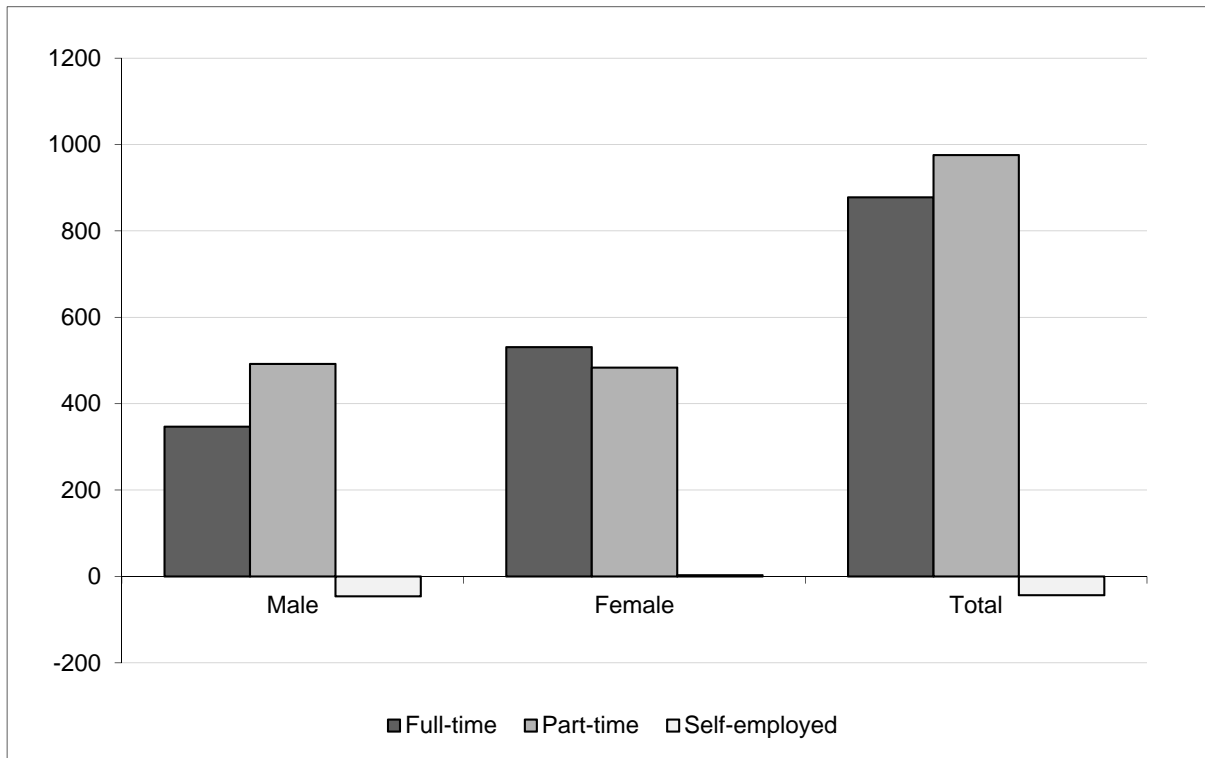
Source: Cambridge Econometrics, MDM revision 12956.

Figure 2.6: Employment status in the UK, 2014 (% shares)
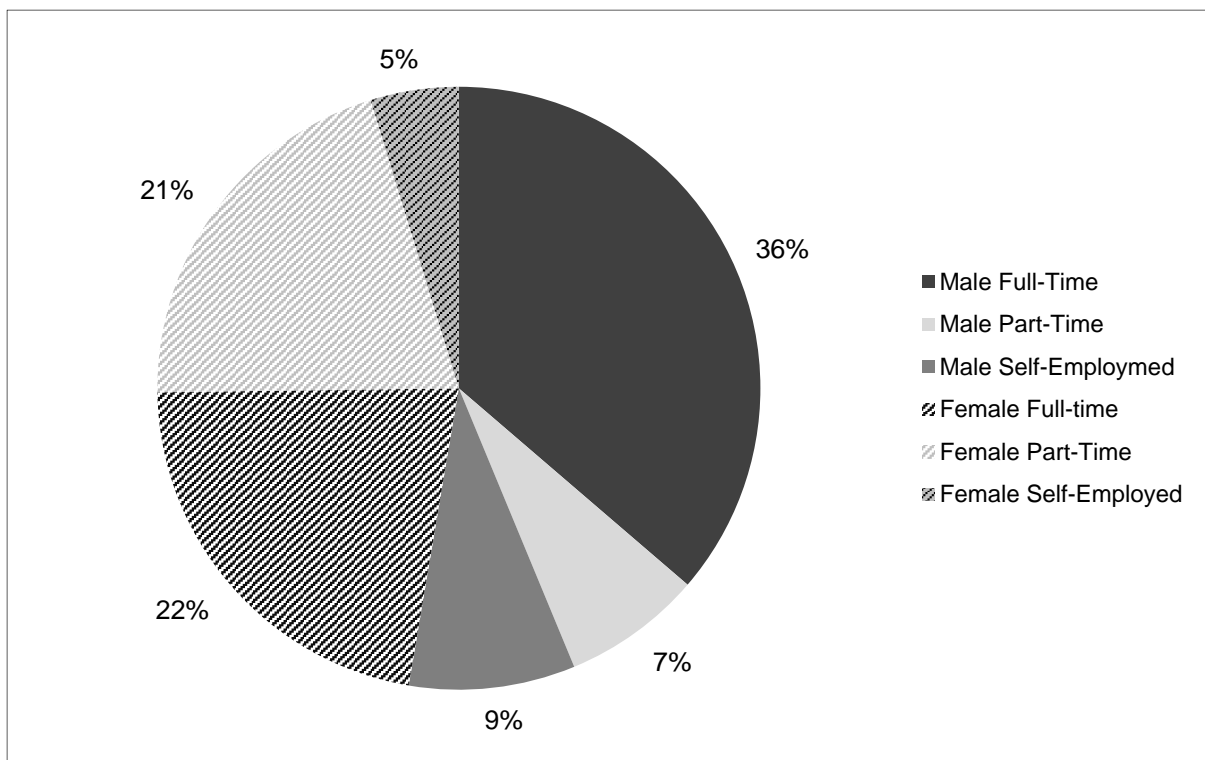
Source: Cambridge Econometrics, MDM revision 12956.

2.5.4   Claimant Count and ILO Unemployment

There are two commonly used measures of unemployment: the count of claimants and the ILO definition based on those actively searching for work. Again, Box 2.1 provides more detailed definitions of the terms.

The claimant count recorded a fall in unemployment from 0.96m in September 2014 to 0.79m in September 2015, its lowest level since March 2008. It is worth noting that this is a less accurate measure of unemployment than the ILO definition, since it only counts people who claim jobseeker's allowance (JSA). Not everybody who is unemployed claims this benefit. Nevertheless, it is a clear signal that the labour market is improving strongly.

The Labour Force Survey (LFS) paints a similar picture of robust improvement in the UK labour market in 2014 and 2015. The LFS measure of unemployment, which is consistent with the International Labour Organisation's definition (ILO), fell during 2014 and 2015. The unemployment rate, at around 5.4 per cent in 2015Q3, is now comparable to pre-recession levels.

The LFS also reveals the shift in employment from the public to the private sector. Between 2014Q2 and 2015Q2, the number employed in the public sector fell by 60,000 while the number employed in the private sector increased by 470,000. This is in line with the government's hope that increases in private-sector employment will offset job losses in the public sector. However, it is not clear that those jobs lost are being replaced by jobs of equal or better quality or that displaced public sector workers are taking up the jobs created in the private sector.

ILO unemployment is forecast to fall slightly in the period to 2019, as the expansion of the labour force is outpaced by growth of employment. By 2024 unemployment is expected to have fallen to around 1.65 million. Over 2014-19, continued growth of activity rates among females will mean that the female labour force will grow slightly faster than employment. Consequently, there will be a rise in unemployment over 2014-19 for females. Male unemployment is expected to fall strongly over 2014-19, as the overall male activity rate falls slightly. During 2019-24, the growth of female employment is forecast to remain fairly strong, in part because of the end to cuts in spending on public services, which typically employ a larger proportion of female workers. As a consequence, female unemployment is forecast to fall once again to 2024.

3   Sectoral Output and Employment Prospects

Key messages

- This section presents the projections for six broad sectors, defined using the Standard Industrial Classification [divisions] as follows:

    o Primary sector & utilities [01-09,35-39]

    o Manufacturing [10-33]

    o Construction [41-43]

    o Trade, accommodation & transport [45-56]

    o Business & other services [58-82,90-99]

    o Public administration, education and health (or non-marketed services) [84-88]

- Modest output growth is forecast over 2014 and 2024: with the exception of business & other services, all broad sectors are forecast to grow faster per annum than in the ten years leading up to 2014, the period which included the global recession.

- The sectors for which output is forecast to grow the fastest are: construction, which will be boosted by major public infrastructure projects; and business & other services, which despite slower growth than in the previous decade, will continue as a leading contributor to economy-wide growth.

- Consistent with current trends, manufacturing's share of UK output is expected to decline, driven by increasing competition from overseas manufacturers. However, manufacturing output is still forecast to grow, albeit at a slightly slower pace than the economy as a whole.

- Growth is forecast to be weak in the medium-term in public administration, health and education; this is mostly driven by the anticipated decrease in public spending as the government aims for budgetary balance.

- Employment will mostly reflect the trends observed in output across the six broad sectors; strongest growth is forecast in construction, business & other services, and trade, accommodation & transport services.

- Employment is anticipated to decrease in primary sector & utilities and manufacturing, in line with only modest output growth and anticipated productivity growth.

3.1   General prospects

This section focuses on the output and employment prospects for six broad sectors: primary sector & utilities; manufacturing; construction; trade, accommodation & transport; business & other services; and non-marketed services (public administration, education and health)[6].

Output

An overview of the main output results across the six broad sectors is presented in the figures below. Figure 3.1 provides a graphical presentation of historical and forecast profiles of output[7] by sector, and Figure 3.2 provides a breakdown of historical growth rates, as well as the average forecast growth rates across the six sectors.

Figure 3.1: UK output profiles by broad sector (£2011 millions)
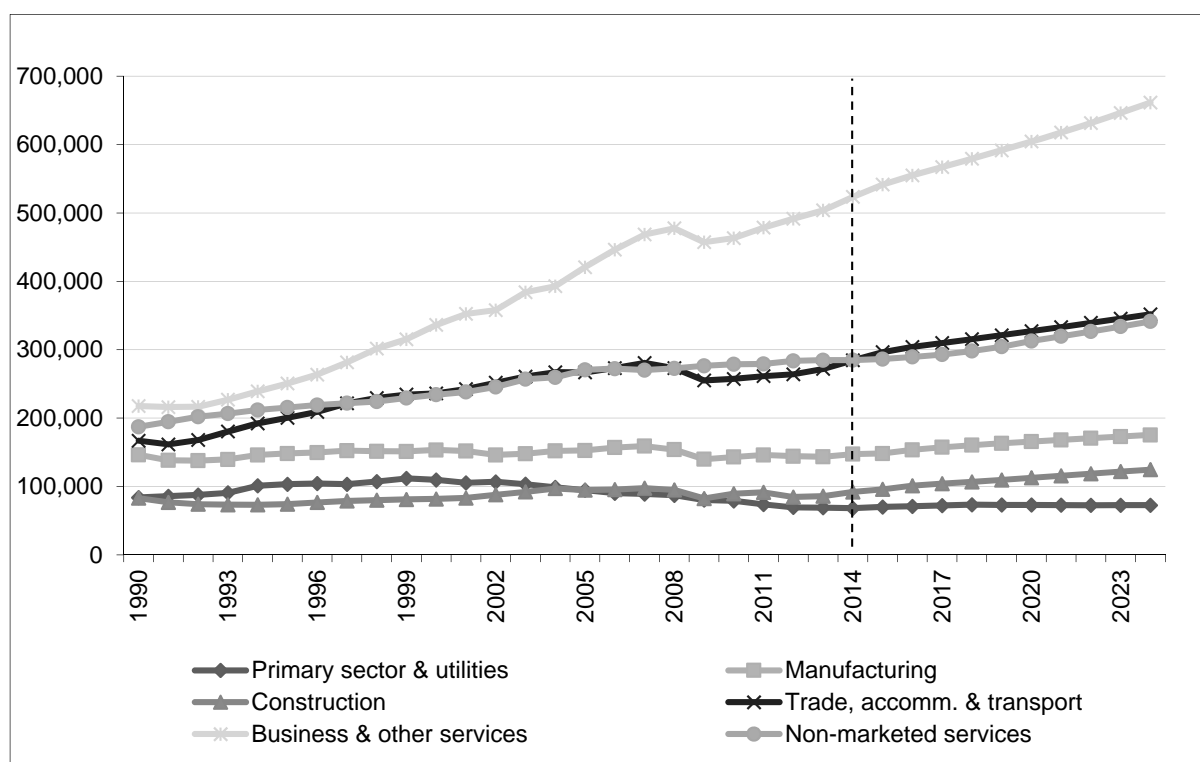
Source: Cambridge Econometrics, MDM revision 12956.

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[6] This sector comprises services that are principally provide by the public (non-marketed) sector. Some elements of the services are provided by the private sector.
[7] Output is measured by GVA – gross value added.

Figure 3.2: UK output growth by broad sector, 1994-2024 (per cent per annum)
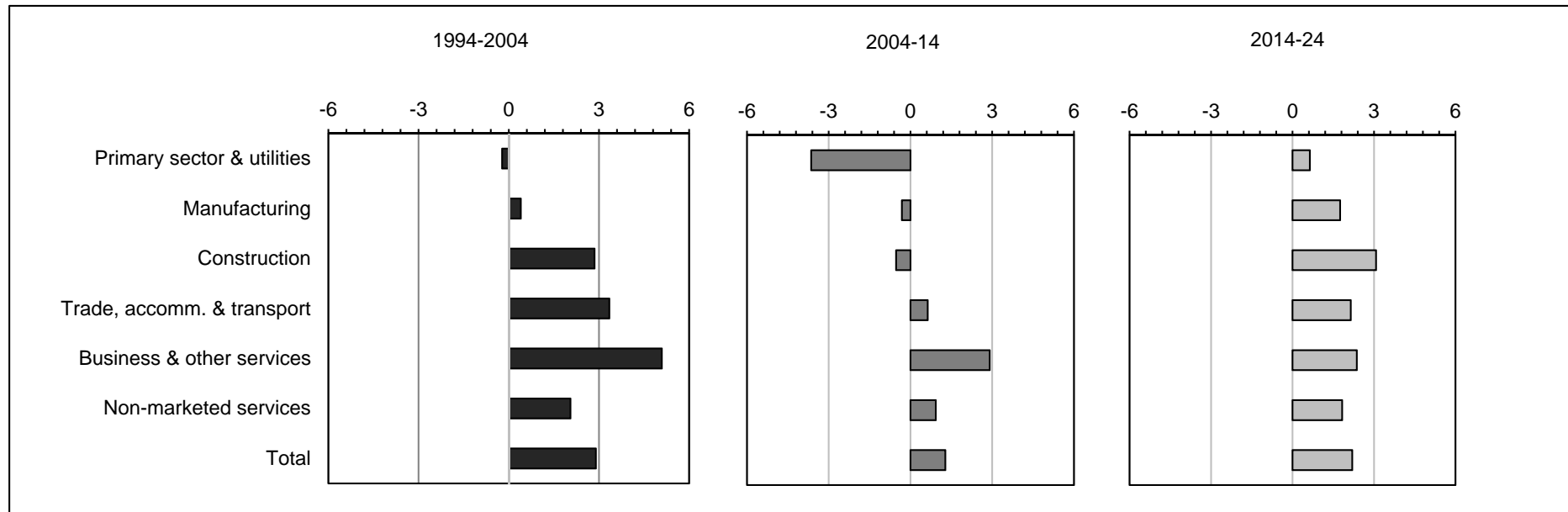
Source: Cambridge Econometrics, MDM revision 12956.

Table 3.1: UK output by broad sector, 1994-2024

GVA levels (£2011 millions)	1994	2004	2014	2019	2024
Primary sector & utilities	101,165	98,955	68,253	73,098	72,730
Manufacturing	146,239	152,175	147,439	163,146	175,430
Construction	73,331	97,169	92,139	109,688	124,734
Trade, accomm. & transport	192,340	267,219	284,662	321,136	351,880
Business & other services	239,180	392,953	523,570	591,429	661,595
Non-marketed services	211,943	259,690	284,910	304,527	341,469
Total	1,004,533	1,336,401	1,517,366	1,696,340	1,885,547
GVA share (per cent of total)	**1994**	**2004**	**2014**	**2019**	**2024**
Primary sector & utilities	10.1	7.4	4.5	4.3	3.9
Manufacturing	14.6	11.4	9.7	9.6	9.3
Construction	7.3	7.3	6.1	6.5	6.6
Trade, accomm. & transport	19.1	20.0	18.8	18.9	18.7
Business & other services	23.8	29.4	34.5	34.9	35.1
Non-marketed services	21.1	19.4	18.8	18.0	18.1
Total	100.0	100.0	100.0	100.0	100.0
GVA growth (per cent per annum)	**1994-04**	**2004-14**	**2014-19**	**2019-24**	**2014-24**
Primary sector & utilities	-0.2	-3.6	1.4	-0.1	0.6
Manufacturing	0.4	-0.3	2.0	1.5	1.8
Construction	2.9	-0.5	3.5	2.6	3.1
Trade, accomm. & transport	3.3	0.6	2.4	1.8	2.1
Business & other services	5.1	2.9	2.5	2.3	2.4
Non-marketed services	2.1	0.9	1.3	2.3	1.8
Total	2.9	1.3	2.3	2.1	2.2
GVA growth (per cent)	**1994-04**	**2004-14**	**2014-19**	**2019-24**	**2014-24**
Primary sector & utilities	-2.2	-31.0	7.1	-0.5	6.6
Manufacturing	4.1	-3.1	10.7	7.5	19.0
Construction	32.5	-5.2	19.0	13.7	35.4
Trade, accomm. & transport	38.9	6.5	12.8	9.6	23.6
Business & other services	64.3	33.2	13.0	11.9	26.4
Non-marketed services	22.5	9.7	6.9	12.1	19.9
Total	33.0	13.5	11.8	11.2	24.3

Source: Cambridge Econometrics, MDM revision 12956.
Notes:
a). The six broad sectors are defined in the technical annexes and in the separate Technical Report.
b). Total output of the six broad sectors differs from total GVA; the latter includes ownership of dwellings.

Table 3.1 shows the past and forecast patterns of output by broad sector. The top two panels show how the structure of the economy changes: the top panel shows the levels of output; and the second panel shows the (output) shares of each sector in the overall economy. The bottom two panels show historical and forecast patterns of growth; the third panel presents annual growth rates, while the last panel shows the total percentage change over the period covered.

Over the decade 2014-24, steady economic growth is expected, with total UK output forecast to grow at an average of 2.2 per cent p.a. With the exception of business & other services, all sectors are forecast to grow faster on average than during the ten years up to 2014, the period which included the global recession. The fastest growth is forecast in construction and business & other services. Trade, accommodation & transport is forecast to grow at a similar pace to the economy average, whilst growth will be below-average in primary sectors & utilities, manufacturing and non-marketed services. Growth in non-marketed services is expected to pick up later in this period, as we expect deficit reduction measures to be relaxed.

Demographic trends, increasing household incomes and global demand, as well as strong investment prospects, are expected to be the main factors driving long-term growth. Domestic population growth and other demographic trends (such as an aging population) will likely increase demand, particularly in infrastructure and non-marketed services. Global demand for domestic output is likely to stimulate robust growth in export sectors (both manufacturing and services) in which the UK is relatively competitive.

The composition of the UK economy split by the broad six sectors is expected to largely remain stable over the long-term. One exception is primary sectors & utilities; consistent with historical trends, its share of total activity is expected to decline. Manufacturing is also following a similar trend, although the decline in the share of total activity is slower.

Employment

An overview of the main results for employment across the six broad sectors is presented in the charts below. Figure 3.3 provides a graphical representation of historical and forecast profiles of employment by sector, whilst Figure 3.4 and Figure 3.5 provide a breakdown of historical and forecast employment growth across the six sectors, as average per cent change per annum (Figure 3.4) and as changes in levels (Figure 3.5).

Figure 3.3: UK employment profiles by broad sector (000s)
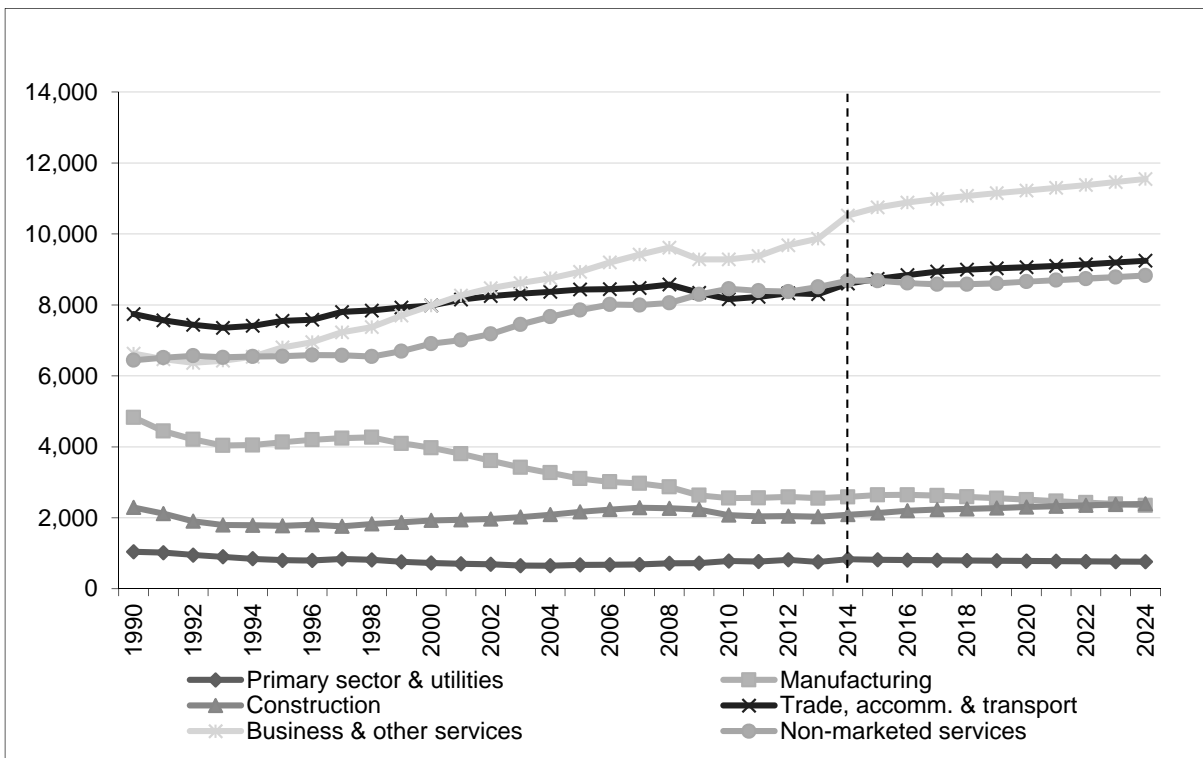
Source: Cambridge Econometrics, MDM revision 12956.

Figure 3.4: UK Employment growth by broad sector (per cent per annum)
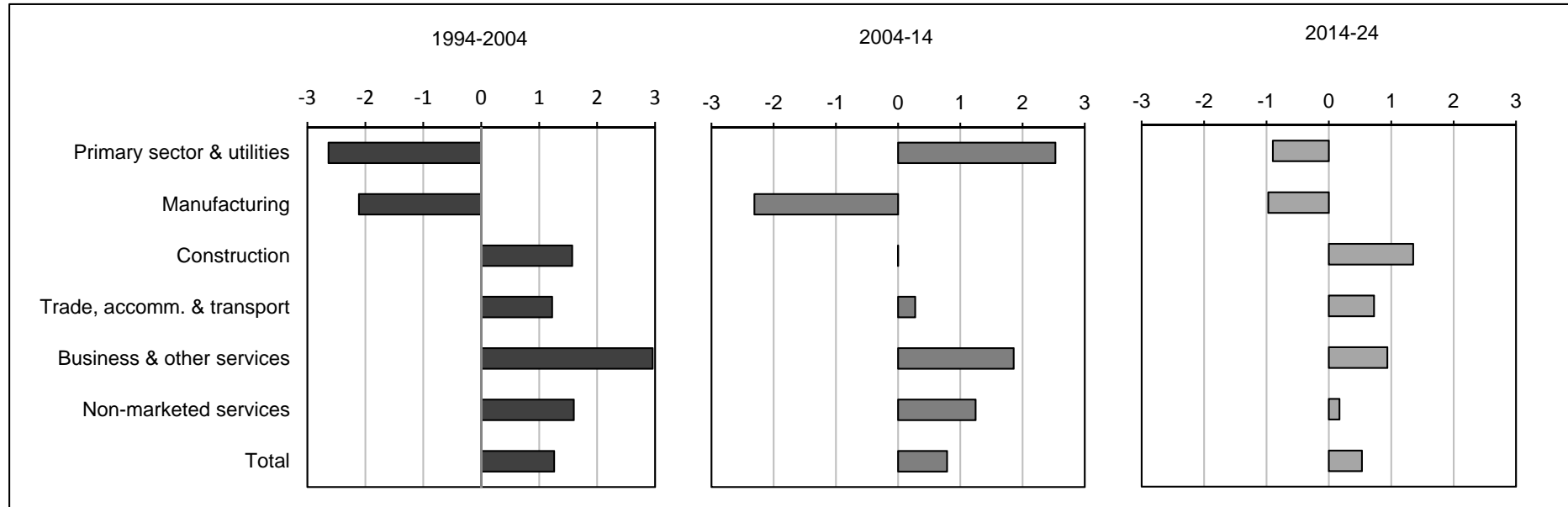
Source: Cambridge Econometrics, MDM revision 12956.

Figure 3.5: UK employment growth by broad sector (000s)
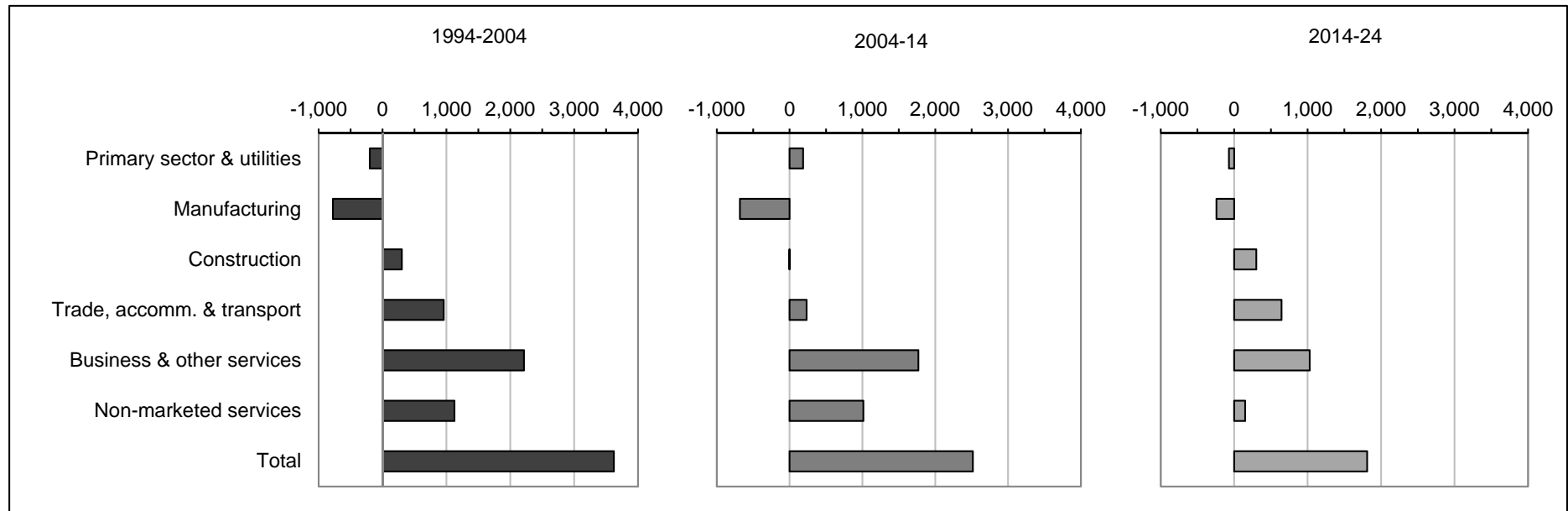
Table 3.2 shows the past and forecast patterns of employment by broad sector. The top two panels show how the structure of the economy changes: the top panel shows the levels of employment; and the second panel shows the (employment) shares of each sector in the overall economy. The bottom two panels show historical and forecast patterns of growth; the third panel presents annual growth rates, while the last panel shows the change in the numbers of jobs over the period covered.

Employment is forecast to grow modestly, at an average of 0.5 per cent (or 180,000 jobs) p.a. over the forecast horizon. Total employment growth is likely to be lower than historical averages, as productivity picks up gradually. Most notably, employment is expected to decrease at an average of around 1 per cent p.a. in the primary sectors & utilities and manufacturing sectors over the forecast horizon. Cost pressures and technology improvements will likely decrease labour demand in traditional roles within these sectors.

The number of jobs in primary sectors & utilities is expected to decrease by just over 72,000 between 2014 and 2024, whilst the number of jobs in manufacturing is expected to decrease by over 240,000 over the same period. The number of jobs in non-marketed sectors is expected to also decrease over 2014-2019, but, in line with the pick-up in sectoral activity and relaxing of austerity measures, employment is expected to increase in the long-term from 2019 to 2024, growing at 0.5 per cent p.a. and more than offsetting the loss of jobs in the earlier period.

The modest economy-wide employment growth over 2014-2024 is expected to be driven mainly by relatively stronger growth in jobs in construction, trade, accommodation & transport and business & other services sectors, growing on average at 1.4 per cent, 0.7 per cent and 0.9 per cent p.a. respectively. The modest growth rates reflect anticipated productivity growth that will constrain increases in labour demand in these sectors.

Table 3.2: UK employment by broad sector, 1994-2024

Employment levels (000s)	1994	2004	2014	2019	2024
Primary sector & utilities	852	652	837	792	765
Manufacturing	4,051	3,273	2,591	2,553	2,350
Construction	1,791	2,092	2,092	2,276	2,393
Trade, accomm. & transport	7,413	8,371	8,604	9,032	9,248
Business & other services	6,540	8,754	10,523	11,153	11,552
Non-marketed services	6,547	7,672	8,684	8,607	8,833
Total	27,193	30,814	33,331	34,413	35,141
Employment share (per cent of total)	**1994**	**2004**	**2014**	**2019**	**2024**
Primary sector & utilities	3.1	2.1	2.5	2.3	2.2
Manufacturing	14.9	10.6	7.8	7.4	6.7
Construction	6.6	6.8	6.3	6.6	6.8
Trade, accomm. & transport	27.3	27.2	25.8	26.2	26.3
Business & other services	24.1	28.4	31.6	32.4	32.9
Non-marketed services	24.1	24.9	26.1	25.0	25.1
Total	100.0	100.0	100.0	100.0	100.0
Employment growth (per cent per annum)	**1994-04**	**2004-14**	**2014-19**	**2019-24**	**2014-24**
Primary sector & utilities	-2.6	2.5	-1.1	-0.7	-0.9
Manufacturing	-2.1	-2.3	-0.3	-1.6	-1.0
Construction	1.6	0.0	1.7	1.0	1.4
Trade, accomm. & transport	1.2	0.3	1.0	0.5	0.7
Business & other services	3.0	1.9	1.2	0.7	0.9
Non-marketed services	1.6	1.2	-0.2	0.5	0.2
Total	1.3	0.8	0.6	0.4	0.5
Employment change (000s)	**1994-04**	**2004-14**	**2014-19**	**2019-24**	**2014-24**
Primary sector & utilities	-199.6	185.0	-45.1	-27.0	-72.1
Manufacturing	-778.2	-681.9	-38.3	-202.7	-241.0
Construction	301.7	-0.2	184.4	116.4	300.8
Trade, accomm. & transport	958.1	233.1	428.0	216.2	644.2
Business & other services	2,213.8	1,768.9	629.8	399.4	1,029.2
Non-marketed services	1,125.2	1,012.2	-76.6	225.7	149.1
Total	3,621.0	2,517.0	1,082.2	728.0	1,810.2

Source: Cambridge Econometrics, MDM revision 12956.
Notes: The six broad sectors are defined in the Technical Report.
a) Total employment and employment in non-market services includes H. M. Forces.
b) Numbers may appear not to sum due to rounding.

3.2   Prospects by broad sector

3.2.1   Primary Sector & Utilities

Primary sector and utilities output is expected to grow modestly, as production responds to increasing global and national demand. However, rising cost pressures will encourage long-term efficiency savings, dampening employment growth. Anticipated productivity improvements will also decrease future labour demand. Overall, the primary sector is expected to grow at an average of ½ per cent p.a. from 2014 to 2024, with employment levels on average decreasing slightly over the same period.

The sector comprises many different sub-sectors all of which have varying growth prospects. Because of structural differences, the prospects for these industries vary greatly, as reported below.

Growth in the UK's agricultural output is expected to be modest, to meet changing domestic demand for food. Changes in consumption patterns are likely to be an important driver of changing demand for agricultural outputs, as changes in food and beverage purchases will affect food production's demands for agricultural products. One consumer trend is likely to increase agricultural demand, as domestic products are substituted for imported foods. A House of Commons paper on food security (2015) noted a growth in the number of markets which source "local produce" (p.9, House of Commons; 2015). The same paper also noted a trend of customers' "frequent" demand for UK products (p.8, ibid.). Nonetheless, and despite these trends, UK remains a net importer of food and beverages, and this is expected to continue in the future. On balance, therefore, modest growth in agricultural and fishery activity is expected to increase demand for domestically-produced foods and drinks, stimulating activity in agriculture and fishing industries.

Long-term increases in national demand for water and electricity are anticipated to stimulate utilities output. The National Audit Office (NAO) anticipate that future economic and population growth will increase electricity demand by up to 60 per cent in 2050 (p.18, DECC, 2012). Similar drivers will likely increase water demand in the future.

Energy policies and environmental legislation are likely to grow in importance for some of the primary & utilities sectors. In particular, pursuit of low-carbon energy alternatives, and waste reduction in water and minerals use may provide long-term opportunities and challenges for the sectors. Mining and quarrying activity will likely be dampened as a result of global carbon emission reduction targets, as demand for coal, oil and gas reduce. On the other hand, efforts to develop alternative energy-generating processes are likely to increase, generating increased demand for activity. A study commissioned by RenewableUK (CE et al., 2013), forecast that up to 70,000 extra direct jobs can be generated between 2013 and 2023 in the wind and marine energy sectors.

Other drivers will likely further harm the long-term prospects of mining and quarrying activities. Domestic resource depletion will be an important consideration. Consistent with current trends, lower extraction costs in other countries will increase demand for imports over domestic production.

Generally, improved productivity and efficiency savings will reduce traditional labour demand in the primary sectors. Investment, for example, into agricultural technology ("agri-tech") within the UK will likely improve productivity. Cost pressures and competition from imports will encourage efficiency savings, reducing labour demand in the mining and quarrying industry. In the aggregate, employment levels in the Primary sector and utilities are expected to fall in the long-term.

3.2.2 Manufacturing

Prospects for the manufacturing sector are mixed, as international forces provide both opportunities and competition in the long-term. Consistent with current trends, UK manufacturing is likely to grow, albeit at a slower rate than the whole economy. Manufacturing growth is forecast to average less than 2 per cent pa from 2014 to 2024, with the number of jobs expected to fall by around 1 per cent p.a. over the same period. Domestic drivers, such as long-term investment and specialisation, are expected to change the composition of manufacturing in the UK. Manufacturing as a share of total UK economic activity, therefore, is projected to decline.

International competitive forces are likely to weaken the growth of UK manufacturing sector. Manufacturing industries activities within lower-income economies have been expanding in recent years, and this trend is likely to continue. Many emerging economies are also entering high-technology sectors[8], areas in which the UK has specialised in recent years. Consistent with current trends (p.7, BIS; 2013a), domestic firms are anticipated to continue offshoring and outsourcing the manufacturing process, diverting production and employment away from the UK.

Nevertheless, UK manufacturing is still anticipated to grow modestly. Global demand for manufacturing exports is anticipated to increase, driven by growing population levels and increasing income per capita. The anticipated rise of the middle classes in developing countries will generate higher demand for goods and services. Global demand for UK manufacturing goods will be an important driver of increased manufacturing output, although the main markets to which UK exports (the European Union and the United States) are anticipated to grow at a slower rate than some developing regions.

It is likely that manufacturing growth will be driven by advanced (high-technology) manufacturing in the future. Current trends indicate that manufacturing civil and defence aerospace components, machinery and equipment, and electronic goods are leaders or emerging leaders within manufacturing. It is anticipated that advanced manufacturing sectors such as these will be show the strongest output growth within manufacturing.

The availability of skilled labour will be an essential determinant of activity. Current trends suggest that skill shortages are a sizeable concern, and will be an important factor in the long-term, as UK manufacturers will require greater human capital to meet the growth in demand. A report published by the World Economic Forum (WEF) suggested that "human capital will be the most critical resource differentiating the prosperity of countries and companies" (p.4, WEF; 2012).

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[8] Adopting the definitions of Eurostat, high-tech manufacturing encompasses manufacture of basic pharmaceutical products and pharmaceutical preparations; Manufacture of computer, electronic and optical products; and manufacture of air and spacecraft and related machinery.

Innovation will play a major role in shaping the prospects of manufacturing. Innovation, especially in the high-tech industries that dominate the UK manufacturing sector such as aerospace component parts, pharmaceuticals, and green technologies, will be a crucial driver of productivity growth and competitiveness. However, whilst technological progress will improve production efficiency in the sector, it may also reduce the number of jobs in the long-term. Anticipated future technologies in manufacturing activities such as sensors technology, advanced and autonomous robotics, and big data and knowledge-based automation (p.21, BIS; 2013a), will increase automation and improve production processes. These changes can lead to lower demand for traditional roles in the production process, which is anticipated to contribute to the ongoing decline of employment in manufacturing.

3.2.3   Construction

Long-term growth in the construction sector is expected to be robust, at an average of 3 per cent p.a. from 2014 to 2024, whilst employment is forecast to grow at an average of 1½ per cent p.a. over the same period, faster than whole economy growth. The combination of increased private sector investment and an end to cuts in public investment spending will increase capital flows into the sector, stimulating increased activity and the growth of jobs.

Increased demand will come from the need for more private housing, commercial buildings and infrastructure, spurred by national population growth, increased economic activity, and adherence to new regulatory policies.

National population levels are forecast by the ONS to reach 70 million (ONS, 2015) by mid-2027. Population is anticipated to grow faster in the future than it has done in the past; this increase in growth will generate higher demand for infrastructure and housing in the UK.

Part of this will come from long-term public spending to boost infrastructure. Major railway- and road-building projects initiated under previous administrations and continued by current and successive governments are expected to generate sustained demand for construction output. One example is the High Speed Two (HS2) Limited project, a major government-planned project that will likely continue to provide employment and business in construction during the project timespan; construction is expected to take place between 2017 and 2026, with some activity starting in 2016 (p.3, HS2; 2015). A similar example is the Crossrail project, for which work is halfway complete; as the "biggest construction project in Europe" (Crossrail, 2015), this project alone has created 10,000 extra jobs (ibid.).

Overall, regulatory policies on buildings, construction and construction processes are likely to encourage construction growth. Long-term global commitments to climate change and sustainability will continue to be key concerns, generating new opportunities and challenges for the construction sector. For example, environment policy in the built environment is anticipated to create new opportunities and areas of growth in the sector, as firms seek innovative processes and technologies to adapt to wider environmental concerns.

New business opportunities will also generate new demand for construction goods. The focus in recent years on "smart construction" and "digital design" (p.32, HM Government, 2013) will grow as initiatives to create smart cities intensify. Smart cities are where "traditional networks and services are made more efficient with the use of digital and telecommunication technologies, for the benefit of its inhabitants and businesses" (European Commission, 2015). Replacing aging energy infrastructure to meet the digital requirements, as well as creating and designing environments amenable for the implementation of ICT systems, are new types of demand that are expected to generate strong construction growth in the long-term.

3.2.4   Trade, Accommodation & Transport

The performance of the trade, accommodation & transport sector is often dependent on the amount of activity in the wider economy. Output of trade, accommodation & transport is forecast to grow at a pace similar to the economy average (just over 2 per cent p.a.) over 2014-24, whilst employment will grow a little faster than average at around ¾ per cent p.a.

Many different factors will drive this long-term trend, because the sector is formed of many structurally different industries, all of which have unique outlooks. The transport sector is expected to grow fastest, whilst retail services and wholesale activity, which are closely associated with firm activity and household income, are expected to grow much slower than the sector average over the same horizon period.

Although the growth of the air transport industry is expected to be faster than the sector average, it is anticipated to slow compared to historical trends for the industry. Air travel growth is driven partly by economic factors, such as oil prices, income and GDP growth, as well as wider societal considerations, such as carbon commitments and behavioural changes (p.6, DfT; 2013). According to the Department for Transport, air travel per passenger is forecast to slow down to grow at approximately 1.5 per cent p.a., due to factors such as market maturity and behaviour change. Growth would be constrained by existing airport capacity (p.6, ibid.), hence current considerations to undertake airport expansion projects. In particular, one focus will be on improving airport capacity in the South East, in order to maintain the country's status as a "global hub for aviation" (p.9, Airports Commission; 2015).

The expected future performance of the retail, accommodation and food industry will be an important driver of wider sectoral growth. Demand for this industry is closely tied to domestic income and spending. Household expenditure growth is forecast to be modest, similar to the expected growth of the wider economy.

There is also potential for increased demand for retail, accommodation and foods services, and transport services from growth in inbound tourism. As part of the growth strategy in the tourism market, VisitBritain (2013) estimates that, by 2020, the UK has the potential to attract an extra 9 million overseas visitors a year compared to the levels observed in 2012 (31m, see p.3, VisitBritain; 2013). Earnings from inbound tourism could subsequently increase from £18.6m to £31.5m in real terms over the same period (ibid.), driving activity and demand for domestic retail, accommodation and food services. However, current trends suggest a declining market share in tourism (p.19, ibid.). On balance, therefore, tourism growth is likely to be modest.

A key trend emerging within consumption patterns is the growth of ecommerce – the purchase of goods online. This is particularly noticeable in the UK, which has: the highest proportion of individuals who made their last purchase online in previous twelve months in 2014, out of all EU countries (ONS, 2015); and the highest proportion of online market share (Centre for Retail Research, 2015). The trend of increased digitisation is likely to continue, increasing trade, accommodation & transport sectoral activity, given extra need for warehousing, logistical services and courier services.

However, corresponding employment growth will be contingent on whether the labour supply will be able to adapt to the anticipated technological progress in the sector. As firms seek to adopt cost-saving measures, processes can become automated in the long-term. Existing technologies include automated checkouts, and current investment and research into unmanned aerial vehicles (UAVs) for delivery and automated warehouse systems for processing orders may in the future substitute labour in some of the traditional tasks in this sector.

3.2.5   Business & Other Services

Business & Other Services is now the major sector in the UK, accounting for over one-third of total UK economic activity. Consistent with current trends, the sector is expected to outpace wider-economy growth. Output in the sector is forecast to grow on average at just under 2½ per cent p.a. between 2014 and 2024, with the number of jobs expected to grow at just under 1 per cent p.a. over the same period. Overall, the comparative advantage of the UK, strong investment into the sector, and technology progress are anticipated to be major factors driving long-term growth in the sector.

Several industries are likely to be the main contributors of growth within the broad aggregate sector. Consistent with current trends, financial services, professional, scientific and technical activities, and information and communication industries are forecast to experience strong growth over the forecast period.

The expectation of sustained growth in these industries stems partly from the comparative advantage of the UK in the professional and business services industries. In a report analysing professional and business services, BIS highlighted several features behind UK's competitiveness in these industries, including the geographic advantage of the UK being between two major markets, a university system which provides high-quality graduates, and a supportive business environment (p.7, BIS; 2013b). This is anticipated to firstly attract new firms to locate into the country, bringing increased investment, activity and labour demand, and secondly increase international demand for these services from the UK, because of the industries' reputation and competitiveness.

However, new challenges may divert some of the growth in activity to countries closer to the developing markets and diminish the UK's comparative advantage in the long term. Increasing compliance costs, rising demand from emerging economies and existing initiatives to establish "financial centres of the Far East" (ibid.), could divert some growth abroad. Nonetheless, faster than average growth is forecast in professional and business service industries.

Another important factor driving long-term growth is investment. Trends in recent years suggest that private investment into technology companies within the UK is growing at a fast pace. In 2014, venture capital funding into technology start-ups in London doubled from the previous year (Financial Times, December 30, 2014), at levels 20 times higher than 2010. In the calendar year up to October 2015, venture capital investments into London had already exceeded the levels raised in 2014. Although investment growth is expected to stabilise in the long-term, the existing capital raised in this sector indicates that the industry within the UK can (and is consequently expected to continue to) attract large amounts of investment, which will likely attract further activity and drive innovation in the sector.

A related but distinct driver is productivity. Consistent with current trends, the rate of technology progress within certain sectors is forecast to increase, driving innovation and increased demand. For example, the emergence of Financial technology (or "FinTech", using software to provide financial services) underlines the impact technological innovation can have on traditional processes within high value industries. Similarly, reports on the management consultancy industry recognise the importance of technology in shaping their services to clients (p.3, Management Consultancies Association, 2015). The ability to capture and incorporate technological developments in existing processes, therefore, will likely have a significant impact on the long-term growth prospects of the sector.

Correspondingly, strong growth prospects are expected to generate robust labour demand growth in the future. The contribution of technology in this sector is likely to skew labour demand towards higher-skilled roles, and the availability of high-skilled individuals will be an important factor in determining the ability of this industry to fulfil its growth potential. In parallel, there will also be notable growth in employment in services that are considered lower skill - personal services and supporting business, such as security and cleaning.

3.2.6 Public Administration, Education & Health

Activity in public administration, health and education are dependent on political decisions, as government is a major component of this sector's demand. Activity in public administration, education and health is expected to grow at an average of just under 2 per cent p.a. from 2014 to 2024, with weak growth in the number of jobs, at around an average of 0.2 per cent p.a. over the same period.

Two different trends capture the overall performance of the sector in the forecast; relatively slow growth of 1.3 per cent p.a. between 2014 and 2019, accelerating to an average of 2.3 per cent p.a. between 2019 and 2024, which is faster than expected wider-economy growth. Given initial slow growth in output, employment levels are forecast to decrease slightly up to 2019, by an average of 0.2 per cent p.a., before increasing again at an average of 0.5 per cent p.a. from 2019 to 2024. Current commitments to reducing the deficit will constrain the sector's growth potential in the medium-term. However, as concerns for budgetary balance decrease, increasing demand is expected to accelerate growth in the sector in the long-term.

Projected reductions in public sector spending are expected to limit government demand. Future reductions in public spending that are part of the current government's pledge to return the country back to a budget surplus by 2019-2020 are likely to decrease spending in areas such as public administration. Correspondingly, labour demand for the provision of these services by the government is anticipated to decrease. The Office of Budgetary Responsibility's economic and fiscal outlook outlined that public services spending would "fall by an average of 1.5 per cent a year in real terms across this Parliament as a whole" (p.6, Office of Budgetary Responsibility; 2015). Existing policies are therefore expected to weaken the growth prospects of the sector.

Over the longer term, however, demographic trends are expected to induce increased government and consumer spending for some industries within this broad sector. The UK has an aging population; the latest projections by the Office of National Statistics estimate that the proportion of individuals over 60 will approximately be 3 percentage points higher in 2024 than it was in 2014[9]. Demand for public spending and health services are anticipated to correspondingly rise as a result, boosting wider activity in the sector. This is expected to be the overriding concern in the long-term, driving increases in output and employment.

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[9] Currently, approximately 23% of the total UK population is over 60.

Education services are expected also to be dependent on other long term-drivers. Consistent with current trends, there is anticipated to be increasing export demand. Currently, the Independent Schools Council (ISC) reports that within independent schools, 5 per cent of all students' parents live overseas, up from 4.6 per cent in 2010[10], and it is expected to rise further in the future. Similarly, the prospects for export growth in higher education institutions are strong; one study forecasts the level of higher education export earnings to approximately double between 2010 and 2025 (UniversitiesUK; 2014). The expected rise in the number of middle class households worldwide is likely to be a contributing factor in supporting the continued growth in demand for UK education services. These factors will stimulate growth over the long-term.

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[10] Independent Schools Council Census 2015 and Independent Schools Council Census 2010.

4   Changing Occupational Structure and Replacement Demands

Key messages

- Changes in occupational employment structure are driven by long-term trends, including changing sectoral employment patterns and technological and organisational trends influencing the patterns of occupational demand within sectors.

- The latest results take account of information from the 2011 Census of Population and the Labour Force Survey. These suggest that longer term trends apparent before the worldwide recession of 2008 have now been firmly re-established.

- Together, these data confirm that the occupational structure of employment is continuing to change in favour of white collar and higher skilled occupations, although there will still be many job opportunities for less skilled workers.

- The results suggest significant employment growth for higher level occupations such as managers, and most professional and associate professional and technical jobs.

- Caring, leisure and other service occupations are also projected to see significant employment growth.

- Job losses are projected for administrative & secretarial occupations; skilled trade occupations; and process, plant & machine operatives.

- Elementary occupations are projected to experience mixed fortunes with some modest growth in jobs where tasks are not so easily subject to automation (such as waiting at tables), but job losses in other areas.

- In combination these patterns suggest a continuing polarisation of demand for skills, with some growth at both high and low skill levels and a hollowing out in the middle.

- There are considerable variations in the general patterns of occupational employment by gender and status, reflecting existing patterns of 'gender segregation'.

- The need to replace those leaving the workforce for reasons of retirement and other factors will generate significant numbers of opportunities even in areas where employment is projected to fall.

> - As well as the broad patterns of change at the 1-digit, major group and 2 –digit sub-major group levels the full results also include indicative projections at the 4 digit level of the Standard Occupational Classification (some 369 categories).

4.1   Introduction and general approach

Skills in *Working Futures* are measured in two ways - Occupation and Qualification.[11] This chapter focuses on occupation. The jobs people undertake require very different skill sets. The Standard Occupation Classification (SOC) reflects this, being based around a hierarchical system of classifying jobs dependent on formal qualifications and experience typically required. All the results reflect the latest information available from the Labour Force Survey (LFS), as well as comparisons with the results from the 2011 Census. These provide information on historical employment patterns. These data are linked to the sectoral analysis described in Chapter 3 to develop projections of future employment prospects by occupation.

The projections are based on categories defined using the SOC2010 occupational classification.[12] The main focus is on the 25 sub-major occupation groups, but for presentational purposes much of the discussion here is at the broader major group level (the nine single digit major group level categories of SOC).[13] More detailed projections down to the 4 digit level have also been developed. These are reported in a separate annex.

Projections of occupational employment looking forward to 2024 are presented, covering all industry sectors.[14] The main focus here is on results at a UK level, but projections have also been developed for the four nations of the UK and the nine English regions. These are also reported in a separate annex.

Such data provide a useful indicator of changing patterns of the demand for skills. However, it is important to focus not just on projections of ***changing levels*** of employment by occupation, but also on ***replacement demands***. Projections of change in the structure of employment provide only part of the picture of how the demand for skills is changing. Estimation of replacement needs recognises the significant outflows of those retiring from the existing workforce (or leaving for other reasons such as family formation). The results show that, despite projected declines in employment for many occupations, there will be significant demand for the skills concerned to replace those leaving the current workforce.

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[11] There are of course other ways of defining and measuring skills, including various indicators of what are variously referred to as key, core and generic skills. Data are however much better established on occupation and qualification, so these remain the main focus of attention in the *Working Futures* projections.
[12] These will be described in more detail in a separate annex. This requires an extensive reclassification of historical data. This is summarised in the annex and described in more detail in the *Technical Report* (Wilson *et al.,* 2014).
[13] Full detail of these classifications is provided in the technical annex.
[14] More detailed results by sectors are available in the detailed Excel workbooks available via UKCES

The many and varied drivers of change in occupational employment structure are complex. Some of the most important factors are summarised in **Box 4.1**. One key driver is structural change in the economy, which affects the sectoral patterns of employment. As noted in Chapter 3, a complex combination of economic and technological forces is driving the fortunes of different parts of the economy. Some are expected to see rapid employment decline while others have much brighter prospects. Given that sectors have very different needs for particular occupations this has a strong impact on occupational employment prospects. The other key driver is the way that technological and organisational change affects the way work is done within each sector.

The remaining sections are structured as follows:

- Section 4.2 provides a brief summary of recent historical developments in occupational employment structure, focusing on changes between 2014 and 2024.
- Section 4.3 discusses how these patterns vary across gender and employment status.
- Section 4.4 goes on to focus on replacement demands.
- Section 4.5 presents more detailed occupational projections at the 2-digit level of SOC (the 25 sub-major groups).
- Section 4.6 presents an analysis of the main components of change using shift-share methods.
- Section 4.7 presents a summary of detailed occupational changes within industries.

These results focus on the UK as a whole. Results for the devolved administrations and English regions, as well as more detailed analyses presenting a summary of the implications for occupational employment change at the more detailed 4 digit occupational level are provided in separate technical annexes.

Box 4.1: Drivers of occupational change

Drivers of change: Skill requirements are a derived demand; they are dependent on the pattern of demand for goods and services in the economy. The focus in this section is on occupational employment patterns, as opposed to qualifications or some other measure of skill. These demands are influenced by a range of factors, which vary over time and across sectors. The key factors can be broadly categorised into two groups: those which are **external** to the organisation and those which are primarily **internal**. These are reflected in the shift-share analysis used: industry effects can be regarded as primarily external; occupational effects are mainly driven by internal influences.

External skills drivers: influence the pattern of goods and services produced and therefore the sectoral structure of employment. These drivers include: technological change; globalisation; and public policy (including legislative and regulatory frameworks). These developments are taken into account by the multi-sectoral macroeconomic model and are summarised in Section 2. Some sectors benefit from such factors while others are affected negatively. Those sectors that benefit from such changes will see employment grow. Conversely those that fail to adjust and respond will experience job losses. Occupations concentrated in the former sectors will gain employment in contrast to those concentrated in declining sectors (**industry effects)**.

Internal skills drivers: produce significant changes in the patterns of employment within particular industries, including major restructuring of the way work is organised (**occupational effects**). Skill requirements within organisations are driven by the business strategies they adopt. These reflect choices about what products or services to deliver and where and how to pitch that delivery. Some may focus on product differentiation in high value added, premium markets while others may choose a low specification product or service, where the emphasis is keeping price and costs down. The former generally require higher skills, including the use of specialised and distinctive competencies, compared with strategies that focus on low level specifications. Organisations facing technological changes, or trying to move up-market, usually need to upgrade their skills. The introduction of new products and services, major changes in equipment and in working methods or workforce organisation often require the deployment of new skills.

Both internal and external drivers are influenced by technology (especially ICT) and other general factors. A number of commentators have focused on the biased nature of technical change, which has tended to favour higher skills and to displace lower skilled jobs. For example, ICT has led to the displacement of many clerical and secretarial jobs previously concerned with information processing using paper technology (internal effect).

On the other hand, information technology has opened up many new product markets where information services (e.g: Facebook, Google) can be provided which were previously not feasible (external effect). These new businesses often require jobs of a professional, associate professional and managerial nature. The application of IT in other areas such as such as robots in motor manufacturing has led to the loss of many jobs for skilled workers.

Other factors have also been important. These include the drive for efficiency in response to global competition, increased emphasis on customer service and product quality and related changes in production methods and the management of human resources. The income elasticity of demand for different products and services, together with changes in tastes and preferences is altering the patterns of demand towards an emphasis on high value added, higher quality, high specification goods and services.

There is a major restructuring of production to meet these needs. Many of these products and services require expert knowledge as well as customer care, personal attention and

face-to-face human interaction, (for example, leisure, hospitality, travel, personal care), increasing the need for such generic skills.

Changing patterns of industrial specialisation (industry effects) have had profound implications for the demand for different occupations as well as playing a key role in determining differences across spatial areas. The decline of employment in primary and manufacturing industries has resulted in a dramatic reduction in the need for many skills associated with the production of the output of these industries. For example: the agricultural sector now requires many fewer labourers; the coal industry now employs only a handful of skilled miners; the manufacturing sector no longer requires the same number of skilled engineering and other types of specific craft skills that were the foundation of its success in the past; utilities and transport now require far fewer workers than previously.

In contrast, the growth of the service sector has led to an increase in employment in many occupations. The growth of non-market, public service, employment, for example, has (up until recently) led to substantial additional jobs for: professional, managerial and clerical workers in public administration; for doctors and nurses in health services; and for teachers in education services. Similarly, growth in marketed, private sector, services has resulted in many new jobs for: leisure and other personal service occupations (in hotels and other services); sales occupations in distribution; and for professional, associate professional, clerical and secretarial in business and financial services.

Future Influences on Occupational Change

The combination of globalisation and technological change often increases skill requirements as work organisation and the nature of competitive advantage become more complex. Increasingly, the source of competitive edge in products and in processes is information and knowledge content. The increased emphasis on higher level skills and the associated decline in demand for unskilled workers has been attributed to the expansion of international trade (especially with developing economies) and the continuing process of technological change (particularly related to ICT). On balance, the evidence seems to suggest that the latter has become increasingly important, with changes within sectors being of most significance. This is reflected in the shift-share analysis presented here, which suggests that occupational shifts within sectors are growing in importance compared to previous decades (occupational effects). Nonetheless, it seems likely that both technology and growing trade will continue to raise the demand for higher level skills and drive down the demand for lower level skills.

The projected patterns of occupational change for the next decade are expected to mirror those of the recent past. The same basic forces are expected to operate. Changes in the industrial structure of employment in favour of the service sector (industry effects) will tend to favour white collar, non-manual occupations, while the continued loss of jobs in manufacturing and primary industries will result in yet further job losses for many manual blue collar jobs.

The impacts of information technology and other related organisational changes are likely to further reduce the demand for clerical and basic secretarial skills across all industries (occupational effects). Similarly, the introduction of new technologies in manufacturing will tend to displace many skilled workers. Conversely, the management and operation of the new technologies will require greater shares in employment for managerial, professional and associate professional occupations, including technicians of various kinds.

4.2   Changes for broad occupational groups: History and projections

Latest historical developments

Table 4.1 and Figure 4.1 present historical information on employment trends for the 9 SOC2010 major groups over the past two decades, as well as projections to 2024. The historical estimates are based on combining the estimates of employment by industry from the multisectoral model with the latest information from the Labour Force Survey (LFS) and the 2011 Census on changing occupational employment patterns within industries. The historical data prior to 2011 have all been reclassified onto the new basis using convertors provided by ONS.

The historical database is based on information from Censuses of Population up to and including 2011, although the main emphasis now is on information from the LFS. Comparison between the LFS and Census data suggest a broadly similar picture although there are a few significant differences between the Census and the current Labour Force Survey estimates (and hence the *Working Futures* estimates).[15]

The recent historical trends already reflect two distinctive factors when comparing the current results with those published in earlier *Working Futures* reports.[16] Technical modifications to the system of classifying occupations resulted in some shifts in employment shares between occupational categories as SOC2010 was introduced. Secondly, there have been a number of shifts in the structure of employment in the economy by both sector and occupation as a consequence of the 2008 global financial crisis and subsequent recession.

The revision to SOC altered the employment patterns across a number of occupations. This included:

- managers, where the definition of managerial roles was tightened up berween SOC2000 and SOC 2010[17];

- nurses, who were moved from the associate professional occupational category to the professional one in reflection of the changing nature of the work involved (reflecting the move towards nursing becoming an all-graduate occupation).

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[15] In particular the Census suggest a much smaller proportion of people employed in Science, Engineering and Technology Professions category. The reasons for these differences remain unclear so the current set of results relies on the official picture as presented by ONS in the published LFS data.
[16] The first set of *Working Futures* projections were published in 2004 and covered the period 2002-2012. Subsequent series covered 2004-2014, 2007-2017 and 2010-2020. The latter adopted SOC2010 to classify occupations but the earlier series used SOC2000.
[17] Job title with manager in the title are now only included in the managerial group if the job involves substantial managerial control over people or resources.

The 2008 recession impacted on some sectors much more than others (notably in construction and also non-marketed services). This has had a direct effect on those occupations employed therein. There have also been some shifts in patterns within industries. The overall levels of employment also fell sharply following 2008 which affected all occupations (see Figure 4.2). Subsequently there has been a recovery in most parts of the economy, especially the private as opposed to public sector. Nevertheless, the broad underlying trends in occupational employment *shares* have continued more or less unabated. Figure 4.3 shows that, for most occupations, the trend over the period 2008-2014 is indiscernible from that prior to the crisis in 2008. These barely show a blip as a result of the 2008 recession.

The key features have been:

- rising employment levels and shares for higher level, white-collar groups such as:

  - managers, directors & senior officials;

  - professionals;

  - associate professional & technical occupations;

- rapid increases for caring, leisure related and other personal service occupations;

- decline in employment for administrative & secretarial occupations;

- declining employment levels and shares for most blue collar/manual occupations;

- for elementary occupations as a whole there was a slight decline in overall numbers over the decade 2004-2014 as a whole, but this disguises quite large job losses in some areas offset by growth in others (sectors and specific jobs with the overall elementary occupations umbrella).

These patterns remain broadly consistent with the idea of polarisation in the demand for skills. This hypothesis highlights the growth in demand for both high and low level skills with a hollowing out in the middle.

Projections to 2024

Table 4.1 and Figures 4.1 and 4.2 present employment projections for the 9 major occupational groups. They cover the period from 2014-2024. These are also compared with developments over the previous decades. If anything, the pace of change in occupational structure to 2024 is expected to accelerate slightly compared with the past two decades. This reflects a combination of continuing changes in sectoral employment structure, reinforced by skill-biased technical change (see Figure 4.1). The general trends are in favour of more highly skilled occupations, with some growth in less skilled employment in areas that are currently difficult to automate. They also indicate a reduction in the numbers of traditional clerical and skilled and semi-skilled manual jobs, (see Figure 4.2).

- **Managers, Professional,** and **Associate professional & technical occupations** are all expected to show significant increases in employment to 2024.

- **Caring, leisure & other service occupations**, and some parts of the **Sales & customer service occupation** group are projected to experience some positive employment prospects. These groups have exhibited employment growth since the early 1980s, reflecting positive shifts in sectoral employment structure in the sectors in which they are employed and the difficulties in replacing the non-routine manual and non-manual tasks which they undertake with machines.

- Modest job losses are projected for the **Sales & customer service occupation** group as a whole, especially for the less skilled sales occupations sub-category.

- **Administrative & secretarial occupations** have been one of the groups hardest hit by technological innovations in the office environment in recent years, albeit nowhere near as severe as first feared when the information and communications revolution first got underway in the late 1970s. These groups have seen significant job losses since the early 1990s, mainly as a consequence of the increasing use of IT systems to replace human effort. This trend is projected to accelerate over the next decade. Nevertheless, it is expected that this category will still employ well over 3 million people in 2024.

- **Skilled trades occupations**, and **Process, plant & machine operatives** are expected to experience further job losses as a whole, continuing the pattern of long term decline. For many of these traditionally manual / blue collar occupations this is largely driven by the continuing decline in the manufacturing, primary and distribution and transport sectors. There are however some exceptions (with growth for occupations such as chefs and drivers) as illustrated by the analysis at a more detailed level below.

- Some modest employment growth is expected for some parts of the **Elementary occupations** group, as many more industries, especially within the service sector, find a need for such occupations but this is offset by job losses elsewhere.[18] This pattern has been argued to be part of a process of polarisation of the demand for skills, attributed to the difficulties of automating some relatively low skill jobs that require a human response. This is especially important in some parts of the service sector. Figure 4.10 below illustrates how patterns of change vary by detailed 2-digit level occupations across industries.

Tables 4.2 - 4.3 present the details of change, including how they vary by gender. Figures 4.4 - 4.7 also illustrate this, as well as differences by employment status.

Figure 4.1: UK changes in occupational employment structure (000s), 1994-2024
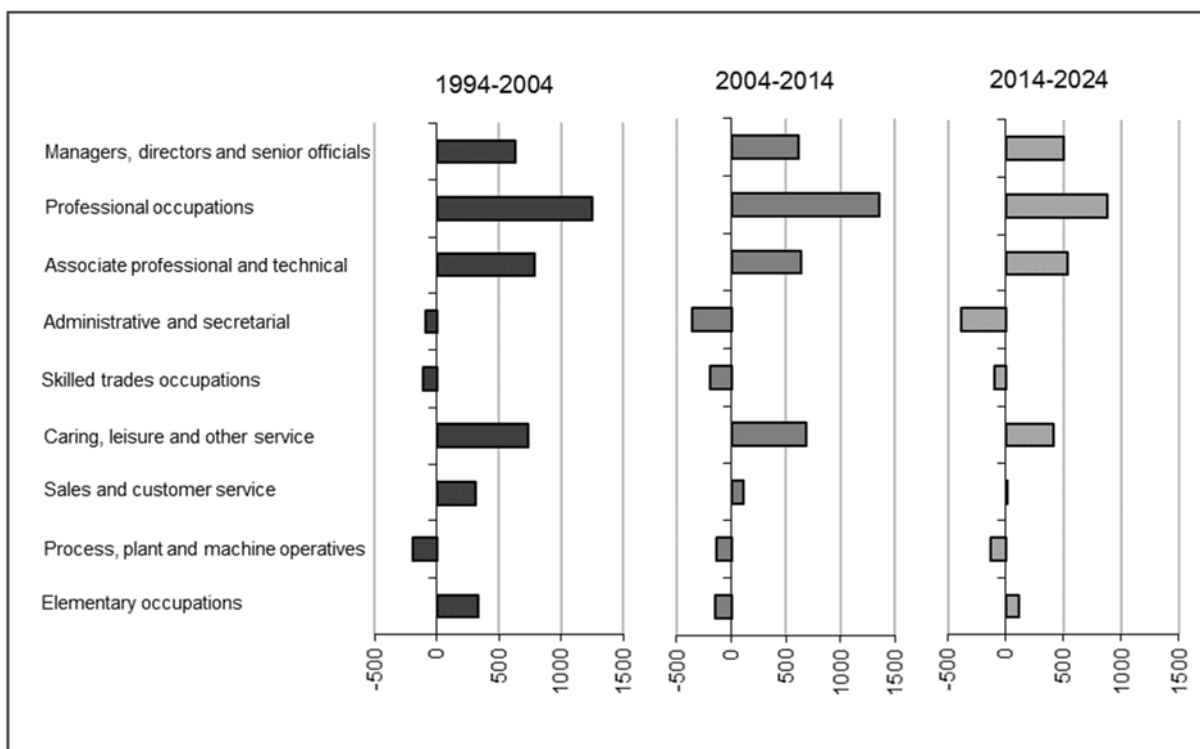
Source: IER estimates, MDM revision 12956.

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[18] In the case of Elementary occupations there is projected to be a modest recovery in employment levels in the period to 2014-2019, flattening out thereafter.

Table 4.1: UK employment in SOC2010 occupational categories – major groups

Employment Levels (000s)	1994	2004	2014	2019	2024
Managers, directors and senior officials	2,049	2,684	3,304	3,612	3,802
Professional occupations	3,996	5,247	6,596	7,115	7,471
Associate professional and technical	3,205	3,995	4,638	4,964	5,176
Administrative and secretarial	4,016	3,926	3,565	3,315	3,176
Skilled trades occupations	3,913	3,805	3,611	3,576	3,514
Caring, leisure and other service	1,711	2,443	3,134	3,359	3,543
Sales and customer service	2,172	2,489	2,600	2,605	2,603
Process, plant and machine operatives	2,395	2,204	2,067	1,991	1,936
Elementary occupations	3,475	3,803	3,652	3,722	3,771
Total	26,931	30,596	33,167	34,259	34,992
Percentage Shares	**1994**	**2004**	**2014**	**2019**	**2024**
Managers, directors and senior officials	7.6	8.8	10.0	10.5	10.9
Professional occupations	14.8	17.1	19.9	20.8	21.4
Associate professional and technical	11.9	13.1	14.0	14.5	14.8
Administrative and secretarial	14.9	12.8	10.7	9.7	9.1
Skilled trades occupations	14.5	12.4	10.9	10.4	10.0
Caring, leisure and other service	6.4	8.0	9.4	9.8	10.1
Sales and customer service	8.1	8.1	7.8	7.6	7.4
Process, plant and machine operatives	8.9	7.2	6.2	5.8	5.5
Elementary occupations	12.9	12.4	11.0	10.9	10.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Net Changes	**1994-2004**	**2004-2014**	**2014-2019**	**2019-2024**	**2014-2024**
Managers, directors and senior officials	635	620	308	191	499
Professional occupations	1,251	1,349	519	356	875
Associate professional and technical	791	642	326	212	538
Administrative and secretarial	-89	-361	-250	-140	-389
Skilled trades occupations	-108	-194	-35	-62	-98
Caring, leisure and other service	732	691	226	183	409
Sales and customer service	317	111	5	-2	3
Process, plant and machine operatives	-191	-137	-76	-55	-131
Elementary occupations	328	-151	70	50	119
Total	3,665	2,571	1,092	734	1,825

Source: IER estimates, MDM revision 12956.

Table 4.2: UK females. occupational categories, SOC2010 – major groups

| Employment Levels (000s)	1994	2004	2014	2019	2024
Managers, directors and senior officials	502	822	1,139	1,303	1,421
Professional occupations	1,863	2,526	3,318	3,658	3,926
Associate professional and technical	1,090	1,559	1,972	2,183	2,338
Administrative and secretarial	3,269	3,130	2,740	2,484	2,342
Skilled trades occupations	556	435	402	405	409
Caring, leisure and other service	1,462	2,045	2,596	2,764	2,911
Sales and customer service	1,589	1,734	1,677	1,633	1,612
Process, plant and machine operatives	531	335	261	231	214
Elementary occupations	2,038	1,916	1,659	1,620	1,608
Total	12,900	14,502	15,765	16,281	16,780
Percentage Shares	**1994**	**2004**	**2014**	**2019**	**2024**
Managers, directors and senior officials	3.9	5.7	7.2	8.0	8.5
Professional occupations	14.4	17.4	21.0	22.5	23.4
Associate professional and technical	8.5	10.8	12.5	13.4	13.9
Administrative and secretarial	25.3	21.6	17.4	15.3	14.0
Skilled trades occupations	4.3	3.0	2.5	2.5	2.4
Caring, leisure and other service	11.3	14.1	16.5	17.0	17.3
Sales and customer service	12.3	12.0	10.6	10.0	9.6
Process, plant and machine operatives	4.1	2.3	1.7	1.4	1.3
Elementary occupations	15.8	13.2	10.5	10.0	9.6
Total	100.0	100.0	100.0	100.0	100.0
Net Changes	**1994-2004**	**2004-2014**	**2014-2019**	**2019-2024**	**2014-2024**
Managers, directors and senior officials	320	317	165	118	282
Professional occupations	662	793	340	268	608
Associate professional and technical	469	413	210	155	365
Administrative and secretarial	-139	-390	-256	-141	-398
Skilled trades occupations	-121	-34	3	4	7
Caring, leisure and other service	583	551	168	147	314
Sales and customer service	144	-57	-44	-21	-65
Process, plant and machine operatives	-196	-73	-31	-17	-47
Elementary occupations	-122	-257	-39	-12	-51
Total	1,602	1,263	516	500	1,016

Source: IER estimates, MDM revision 12956.

Table 4.3: UK males, occupational categories, SOC2010 – major groups

Employment Levels (000s)	1994	2004	2014	2019	2024
Managers, directors and senior officials	1,546	1,862	2,165	2,308	2,381
Professional occupations	2,133	2,721	3,278	3,456	3,545
Associate professional and technical	2,114	2,436	2,665	2,782	2,838
Administrative and secretarial	747	796	825	831	833
Skilled trades occupations	3,357	3,370	3,210	3,171	3,105
Caring, leisure and other service	249	398	538	596	632
Sales and customer service	582	755	923	972	991
Process, plant and machine operatives	1,864	1,869	1,806	1,760	1,722
Elementary occupations	1,437	1,887	1,993	2,102	2,163
Total	14,031	16,094	17,402	17,978	18,212
Percentage Shares	**1994**	**2004**	**2014**	**2019**	**2024**
Managers, directors and senior officials	11.0	11.6	12.4	12.8	13.1
Professional occupations	15.2	16.9	18.8	19.2	19.5
Associate professional and technical	15.1	15.1	15.3	15.5	15.6
Administrative and secretarial	5.3	4.9	4.7	4.6	4.6
Skilled trades occupations	23.9	20.9	18.4	17.6	17.0
Caring, leisure and other service	1.8	2.5	3.1	3.3	3.5
Sales and customer service	4.1	4.7	5.3	5.4	5.4
Process, plant and machine operatives	13.3	11.6	10.4	9.8	9.5
Elementary occupations	10.2	11.7	11.5	11.7	11.9
Total	100.0	100.0	100.0	100.0	100.0
Net Changes	**1994-2004**	**2004-2014**	**2014-2019**	**2019-2024**	**2014-2024**
Managers, directors and senior officials	315	303	143	73	216
Professional occupations	588	556	179	89	267
Associate professional and technical	322	229	116	57	173
Administrative and secretarial	49	29	6	2	8
Skilled trades occupations	12	-160	-38	-66	-105
Caring, leisure and other service	148	140	58	37	95
Sales and customer service	173	168	49	19	68
Process, plant and machine operatives	5	-63	-46	-38	-84
Elementary occupations	450	105	109	61	170
Total	2,063	1,308	576	234	810

Source: IER estimates, MDM revision 12956.

Figure 4.2: Occupational trends (000s), UK 1994-2024
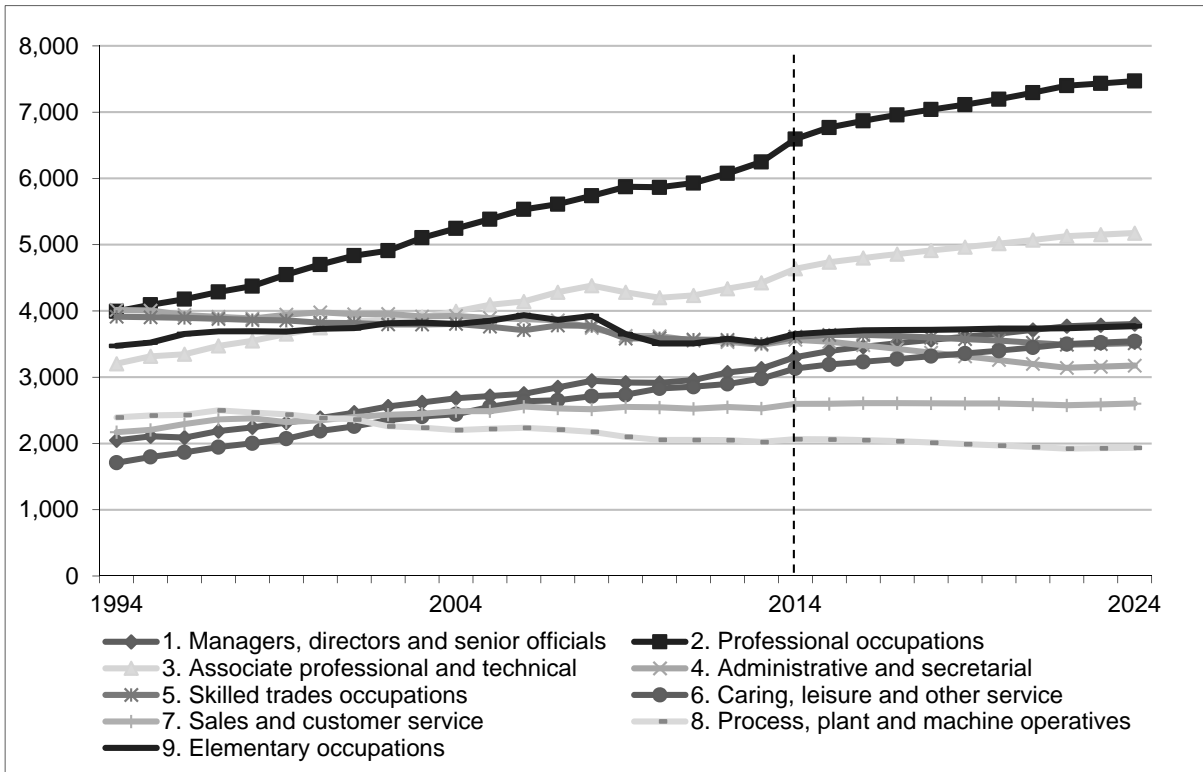
Source: IER estimates, MDM revision 12956.

Figure 4.3: Occupational trends (% shares), UK 1994-2024
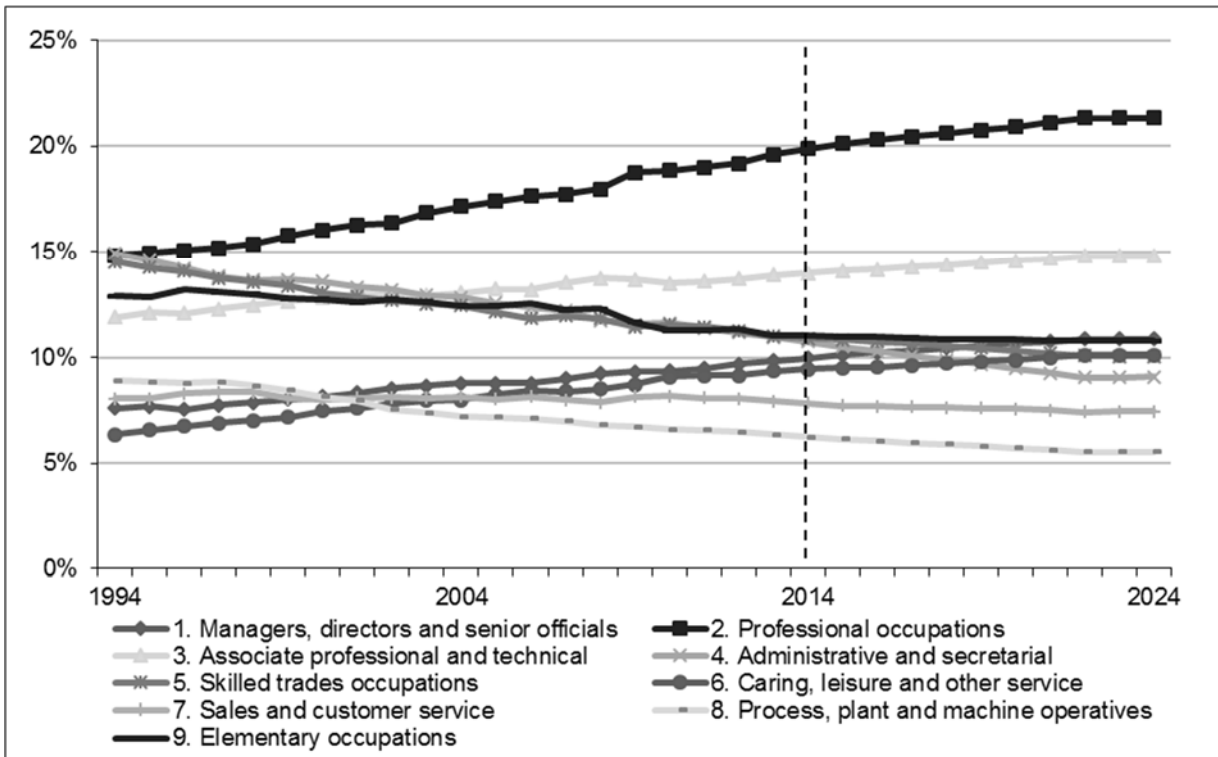
Source: IER estimates, MDM revision 12956.

Figure 4.4: Occupational change by gender, UK 2014-2024, total employment (000s)
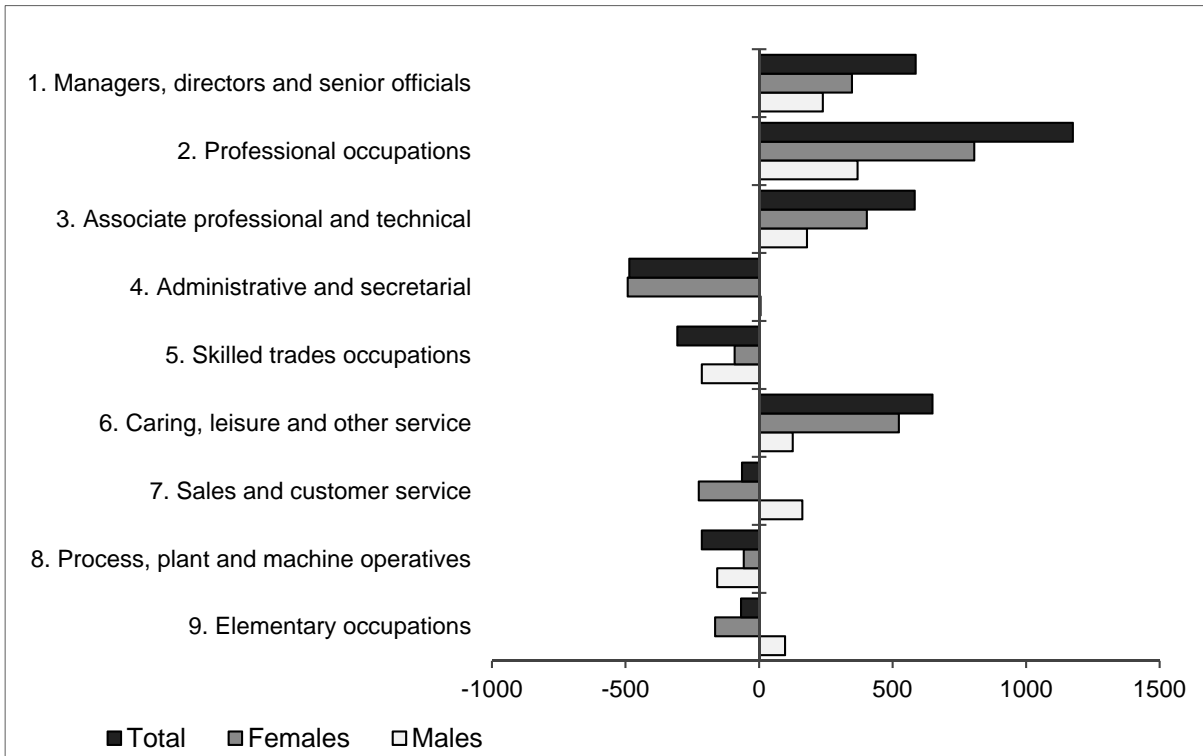
Source: IER estimates, MDM revision 12956.

Figure 4.5: Occupational change by status, UK 2014-2024, total employment (000s)

Source: IER estimates, MDM revision 12956.

Figure 4.6: Occupational change by status, males, UK 2014-2024, total employment (000s)
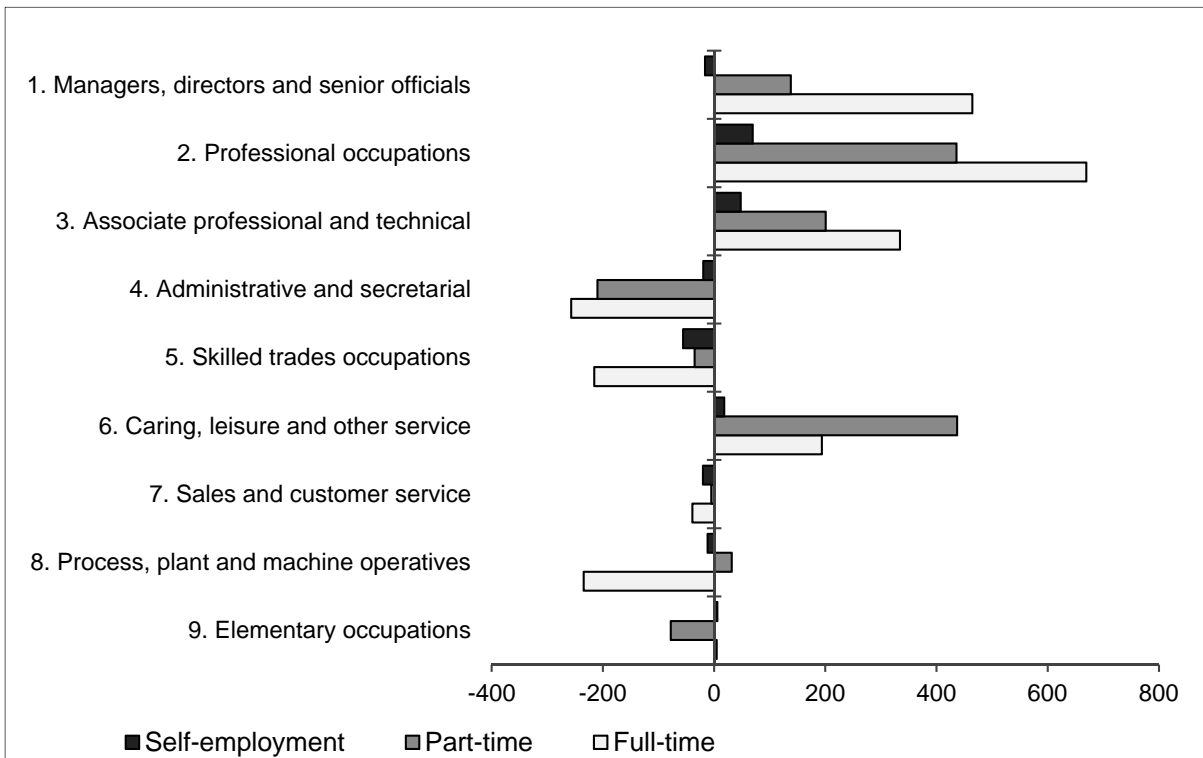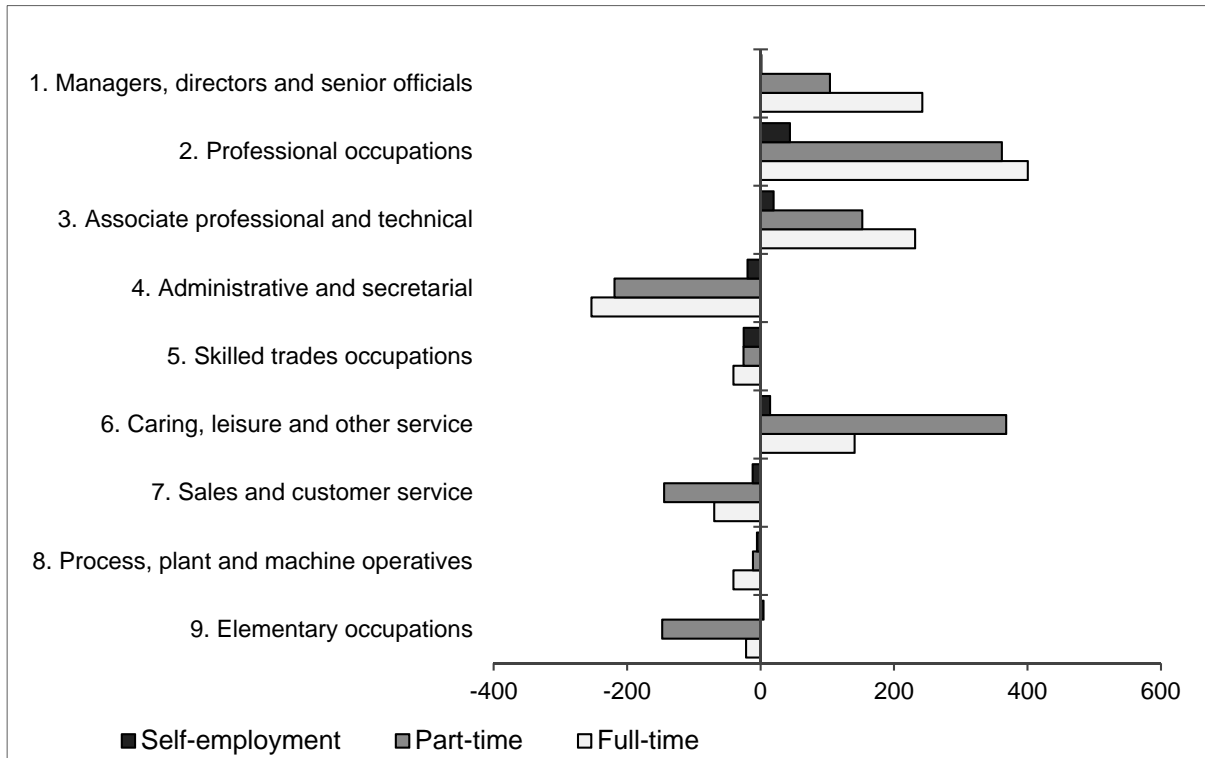

Source: IER estimates, MDM revision 12956.

Figure 4.7: Occupational change by status, females, UK 2014-2024 (000s)
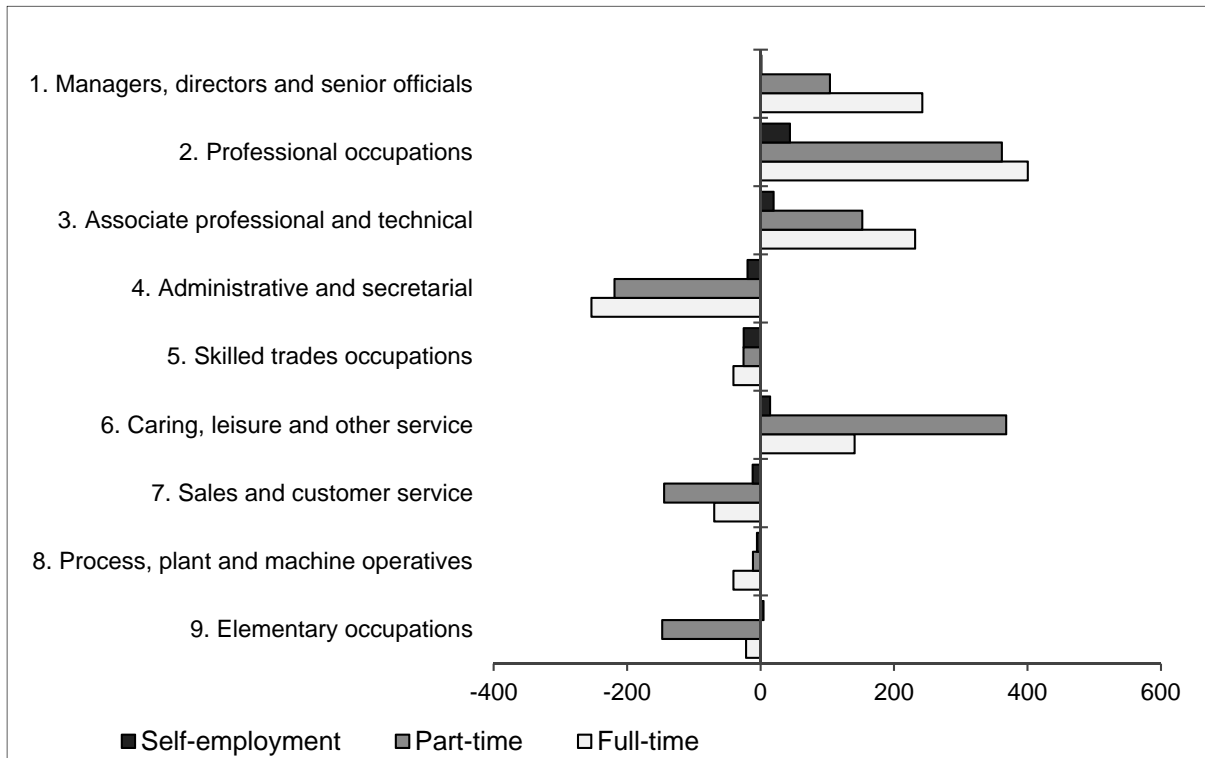
Source: IER estimates, MDM revision 12956.

Table 4.4: Changing composition of employment by occupation, UK 1994-2024

Employment Levels (000s)	1994	2004	2014	2019	2024	2014 - 2024 Net Change	Replacement Demands	Total Requirement
Managers, directors and senior officials	2,049	2,684	3,304	3,612	3,802	499	1,389	1,888
Professional occupations	3,996	5,247	6,596	7,115	7,471	875	2,631	3,506
Associate professional and technical	3,205	3,995	4,638	4,964	5,176	538	1,723	2,262
Administrative and secretarial	4,016	3,926	3,565	3,315	3,176	-389	1,504	1,114
Skilled trades occupations	3,913	3,805	3,611	3,576	3,514	-98	1,300	1,202
Caring, leisure and other service	1,711	2,443	3,134	3,359	3,543	409	1,387	1,796
Sales and customer service	2,172	2,489	2,600	2,605	2,603	3	947	950
Process, plant and machine operatives	2,395	2,204	2,067	1,991	1,936	-131	776	644
Elementary occupations	3,475	3,803	3,652	3,722	3,771	119	1,454	1,574
Total	26,931	30,596	33,167	34,259	34,992	1,825	13,110	14,936
Percentage Shares	1994	2004	2014	2019	2024	2014 – 2024 Percentage Changes		
Managers, directors and senior officials	8	9	10	11	11	15.1	42.0	57.1
Professional occupations	15	17	20	21	21	13.3	39.9	53.2
Associate professional and technical	12	13	14	14	15	11.6	37.2	48.8
Administrative and secretarial	15	13	11	10	9	-10.9	42.2	31.3
Skilled trades occupations	15	12	11	10	10	-2.7	36.0	33.3
Caring, leisure and other service	6	8	9	10	10	13.1	44.2	57.3
Sales and customer service	8	8	8	8	7	0.1	36.4	36.5
Process, plant and machine operatives	9	7	6	6	6	-6.3	37.5	31.2
Elementary occupations	13	12	11	11	11	3.3	39.8	43.1
Total	**100**	**100**	**100**	**100**	**100**	5.5	39.5	45.0

Source: IER estimates, MDM revision 12956.

4.3   Occupational trends by gender /status

Gender

There are some significant differences in occupational employment prospects for males and females as shown in Figures 4.4 - 4.7. Despite policies to reduce employment discrimination by gender, occupational employment structure remains strongly segregated, with many occupations much more strongly represented by one gender or the other.

The largest employment increases for men are projected in managerial and professional occupations, (237,000 and 298,000 extra jobs between 2014 and 2024 respectively). There is also some growth projected for associate professional, caring / leisure, sales and some elementary occupations. The main job losses projected for men are amongst skilled trades and process, plant & machine operatives.

For women the occupations providing the largest number of new jobs are also concentrated in the first three occupational categories, plus caring, leisure and other service occupations. Women are expected to bear the brunt of the significant job losses projected for administrative & secretarial occupations (because they account for a disproportionate share of employment in these areas).

Employment Status

Expected patterns by employment status (full-time and part-time employees or self-employment) are summarised in Figures 4.5 - 4.7.[19] There are significant differences in the pattern of change for different occupational and status categories. These reflect structural differences in terms of the demands from different sectors (changes in overall employment levels) and different trends in the patterns of gender and employment status mix within sectors. Because males and females are concentrated disproportionately in different jobs (both occupations and sectors) they are affected differently by the changing fortunes of different parts of the economy. For example, males in full time and self- employed jobs are most affected by the changing prospects in the construction sector. Prospects for females, in part-time jobs are very sensitive to trends in clerical employment (where employment is declining) and caring jobs (where employment is rising).

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[19] These categories are defined as in the LFS (self- reporting). Part-time working is defined as those typically working fewer than 30 hours per week.

Amongst some occupations such as managers, directors & senior officials (SOC major group 1), and associate professionals (SOC 3), the main jobs growth is for full-time workers. Amongst professional occupations (SOC 2) a substantial increase in part-time working is also projected. Smaller increases are expected for part-time workers for the other two categories. Much smaller increases are associate professionals only. The faster growth amongst professionals for part-time working is probably related to the rising concentration of women in this occupational group and a preference for more flexible working patterns.

Amongst administrative & secretarial occupations (SOC 4) there are sharp declines expected, primarily focused on females, both full and part-time. Some significant job losses are also expected for female part-time sales occupations (SOC 7) although for males some growth is expected. As men increasingly take up jobs in this kind of occupation they may be forced to take on part-time roles. On the other hand social trends towards a more even balance in childcare and related responsibilities may be encouraging more men to take on such jobs.

For caring, leisure & other service occupations (SOC 6) the main growth is for part-time jobs, especially for women.

For skilled trades occupations, and for process, plant & machine operatives, the job losses are concentrated amongst full-time jobs, especially for men.

Self-employment numbers are not expected to change dramatically, but again, these patterns vary significantly within different sectors, with business and other services expected to account for a high proportion of growth.

The patterns by gender are generally similar for most of the status categories, but the occupational segregation of females and males into certain jobs results in some notable differences. For example, a much sharper growth in employment is expected for women than for men in caring, leisure & other service occupations, while men get the lion's share of full-time jobs in the managers, directors & senior officials category. Part time working is expected to increase amongst men in many occupations (most notably sales roles) but the biggest increase in male employment is for full-time workers in SOCs 1-3. The largest job losses for men are in SOCs 5 and 8. It is also notable that growth is expected for some male jobs in elementary occupations (mainly part-time), while for females there is modest growth (but for only full time jobs). This probably reflects the different nature of the elementary jobs taken by men and women.

4.4   Replacement demands

Measuring Replacement Demands

The projections summarised in Tables 4.1 – 4.3 and Figure 4.1 focus on the total numbers of people who are expected to be employed in particular occupations in the future. Such estimates provide a useful indication of areas of change, highlighting the likely 'gainers' and 'losers'. However, this may give a misleading impression of job opportunities and related training requirements. Even those occupations where employment is projected to decline may still offer good career prospects, with a significant number of job openings. This is because, as long as significant numbers are employed in such jobs, employers will need to replace those workers who leave due to retirement, career moves, mortality or other reasons.

Substantial changes in employment structure leading to job losses in a number of occupations are expected over the next decade. Nevertheless, there will be a need to recruit and train new entrants into these types of jobs to replace those retiring from the workforce or leaving for other reasons. Where employment is already projected to rise, such replacement demand elements will serve to reinforce this trend and lead to even greater requirements.

At any particular time, these outflows will include people leaving the employed work force to start a family, etc., as well as those permanently retiring because of old age. Over the longer term some of the former may return to the workforce, offsetting the other outflows (although in the very long-run everyone departs from the labour force). Together these outflows are referred to as "replacement demand".

The net change in employment levels is typically referred to as "expansion demand", although in many cases this may be negative. A better term might be structural demand. The sum of expansion or structural demand and replacement demand is referred to as the net requirement. Further details of definitions and methods used to calculate the replacement demands and total requirements are given in Box 4.2.

Replacement demand can easily outweigh any negative changes resulting from any projected employment decline. At a macro level replacement demands typically represent around 2-4 per cent per annum of the employed workforce. These rates can vary significantly at a more micro level, where (for example) a workforce with many people approaching statutory retirement age will usually imply much higher replacement needs than a younger one (all else being equal).[20]

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[20] For example an occupational category such as managers or a particular sector such as some parts of manufacturing where much of the workforce has been in post for many years.

Estimates of Replacement Demands

Table 4.4 provides a summary for the 9 major occupational groups. Further detail on the 25 occupational sub-major groups is presented in Table 4.5 and Figure 4.8.

The net requirement for workers is positive in all occupational groups. Replacement demand is substantial and easily outweighs any negative structural (expansion) demand (see Table 4.4). The rates of replacement needs vary from 25-55% over the 10 year period for the 2 digit categories (see Table 4.5). Over the decade as a whole, there is projected to be a net requirement of almost 15 million new job openings. Replacement demand accounts for 13.1 million of these. Retirements from the workforce because of old age are the principal component of the latter. For all occupations together, replacement demand over the period 2014-2024 is around seven times larger than expansion demand.

In many occupations the "expansion" or structural demand is negative (corresponding to declining employment levels). These include: administrative & secretarial occupations; skilled trades; sales & customer service occupations; and process, plant & machine operatives. In all these cases, the negative structural demand (the projected employment decline) is expected to be offset by positive replacement demand (mainly related to retirements from the workforce). Expansion demand is positive in all the other broad occupational groups. In such cases, expected retirements and other replacement demand elements will add to positive expansion demand to create even higher net requirements for new entrants. Similar patterns can be observed at the more detailed 2-digit level (see Table 4.5 and Figure 4.8). The estimates of replacement needs are based on quite limited information, using data from the Labour Force Survey (see Box 4.2 for details). They should be regarded as indicative rather than precise. Nevertheless, they provide a broad indication of the scale of such demands, compared to the structural changes projected.

In principle, considerable variations in these patterns might be expected by sector and region, as well as by gender and status, reflecting in particular the different age structures of the different groups. In practice, the information available from the LFS does not make it easy to develop such customised estimates of age structures and flow rates.

The fundamental message is that actors in the labour market need to focus not just on the projected changes in occupational employment levels but on replacement needs. As individuals retire from the workforce or leave jobs for other reasons, important education and training needs arise. Even in occupations where employment is forecast to decline, such needs must be met in order to support existing operations. This also means that there may be good job opportunities for new entrants in many such areas, even where overall employment levels may be falling.

Box 4.2: Replacements demands: definitions and methods

The projections described in this chapter define the so called "expansion" or structural demand arising from growth (or decline) in occupational employment levels. This is the net change in employment between two points in time. This is only part of the demand that needs to be met if employers are to maintain their operations. In order to do this they also need to replace those members of their staff who leave.

In principle, four components of replacement demands for occupations can be separately identified:

> • losses due to retirement from the workforce, which require positive replacement. These may be retirements for old age or more temporary withdrawals from the labour force for reasons such as family formation, etc., (the latter may be partly offset by flows back in to the labour force);

> • losses due to mortality;

> • net occupational mobility, which, when outward, positively adds to replacement demand; if inward, it reduces such replacement demand;

> • net geographical mobility, which, when outward, adds to replacement demand.

Total replacement demand is defined as the sum of these four elements. Some of these are net flows. In some instances it may be appropriate to consider just gross outflows. The estimates here use net flows.

When total replacement demand as defined here is added to expansion demand, an estimate of expected net requirements for each occupation is obtained. This measure provides an indication of the number of newly qualified entrants likely to be required in each occupational group over a period of time.

The data used to estimate both the age structure of the workforce and the various flows are based upon very limited information, mostly taken from the Labour Force Survey (LFS). The replacement demand estimates should, therefore, be regarded as indicative rather than precise.

Data on net migration by occupation are not readily available, so this is set equal to zero by assumption in all the tables. Net occupational mobility measures based on turnover of those who change occupations within a 12-month period are available from the LFS. These exclude those who remain in the same occupation. They also exclude those who may change jobs more than once in a 12-month period. They are therefore a lower bound estimate of total turnover. These have been used in previous estimates of replacement demands (for example, see those in Wilson, 2001b). However, it has proved impossible to develop a consistent set of such estimates for all the detailed specific sectors and geographical areas in the *Working Futures* database using data from the LFS. This is due to the latter's limited sample size. The estimates shown here and in the more detailed tables are therefore based just on estimated losses from retirements and mortality.

The methods for preparing estimates of replacement demands will be described in more detail in the separate ***Technical Report*** (Wilson *et al.* 2014).

4.5   More detailed occupational projections (SOC sub-major groups)

Table 4.5 and Figure 4.9 present a more detailed analysis for the 25 sub-major occupation groups (the 2 digit level of SOC2010).

Managers, directors & senior officials: The *corporate managers* category has been a significant source of employment growth for many years. Despite attempts to tighten up the definition of managers with the introduction of the new SOC2010 system for classifying jobs this remains the case in the revised historical data. This pattern of growth is also expected to continue over the coming decade. The other category within this group is *other managers & proprietors.* This includes the owners and managers of many small businesses, especially in the service sector. This category has also experienced steady growth in the past decade. This is expected to continue over the coming decade, partly linked to the rebalancing of the economy towards the private sector. The growth is moderated by the restructuring of the distribution and retailing sector, including the shift towards the use of the internet, which is causing the closure of many small businesses.[21]

Professional occupations: All the sub-major groups included in this major group experienced employment growth between 2004 and 2014. This is projected to continue. The highest rate of growth for 2014-2024 is projected for Health professionals as the health sector begins to recover from slowdown caused by deficit reduction constraints. Science, research, engineering and technology professionals and Business, media and public service professionals are also expected to see significant growth. All these professional groups are projected to increase their share of overall employment.

Associate professional & technical occupations: Substantial employment growth has been experienced for a number of these sub-major groups. Employment has grown most rapidly over the previous decade for associate professionals engaged in the culture, media and sports occupations and for health and social care associate professionals. The latter was affected by cuts in public spending, but this is not expected to slow down the longer term trend. This group is projected to experience one of the most rapid increase of all sub-major groups between 2014 and 2024. Business and public service associate professionals are also projected to see substantial growth in job numbers. Within this broad occupational category growth was slowest over the past decade for science, engineering & technology associate professionals and was actually negative for protective service occupations, which saw a net

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[21] For a recent review of the impact of the internet in retail businesses see the report form the Centre for Retail Research (http://www.retailresearch.org/retail2018.php)

decline over the decade as a whole. These patterns are projected to continue over the decade from 2014-2024.

Administrative & secretarial occupations: The latest data suggests a continuation of the decline in employment for this group as a whole as ICT displaces many such jobs, especially amongst the secretarial and related occupations. Such job losses are projected to continue over the coming decade, if anything even more concentrated on the latter group, which includes secretaries, typists and word processing operators, who are especially vulnerable to being displaced by advances in computer technology.

Skilled trades occupations: The recession has accelerated the already significant loss of jobs in many skilled trades occupations. Job losses in manufacturing and, post 2008 in construction, have impacted negatively on skilled metal & electrical trades, textile, printing & other skilled trades and construction & building trades. Construction trades are expected to recover over the coming decade, but this is not sufficient to prevent an overall decline for skilled trades. Over the next decade jobs in construction & building trades are expected to grow more quickly than the average for the economy as a whole. For textiles, printing and other skilled trades the decline is expected to continue but at a slower pace. Indeed the results of the projections at the more detail 4-digit level suggest that there are some occupations within this group (such as chefs) that have brighter employment prospects.

Caring, leisure & other service occupations: Historical employment growth in these categories is expected to continue over the coming decade. Caring personal service occupations were the most rapidly growing occupational sub-major group between 2004 and 2014. They slip into third place in terms of rate of growth over the period 2014-2024 (behind customer service occupations and corporate managers and directors). However, in absolute terms they remain the most significant areas of job growth, with an increase of over 400 thousand jobs. A key driver here is the rising demand for services for an ageing population. The majority of these jobs are expected to be taken by women. In contrast, the rate of growth in leisure, travel and related personal service jobs is expected to be negligible.

Sales & customer service occupations: This group is dominated numerically by occupations such as sales assistants and check-out operators in retail outlets who fall into the Sales Occupations sub-major group. Females account for the greater part of employment in this occupational sub group, with many working part-time. This category has seen job losses in recent years as the retail and distribution sector restructures itself. Increasing concentration of businesses, competition from the Internet and technological developments such as automated checkout are expected to reduce the need for more traditional sales occupations

meaning that this pattern is expected to continue. In contrast, the demand for customer service (more specialist sales and customer care) occupations represent a much smaller but rapidly growing category, which is expected to continue to increase in importance over the coming decade. These jobs are probably less vulnerable to the effects of technological change.

Process, plant & machine operatives: This group includes a variety of occupations, some operating fixed plant in factories (part of the manufacturing sector) while others drive mobile plant as well as passenger and goods vehicles (mostly in the distribution and transport sectors). Employment declined quite rapidly for the former category (process, plant & machine operators) over the last decade, linked to the loss of jobs in manufacturing. However, there were modest job gains for the transport & mobile machine drivers category. Over the coming decade, further substantial job losses are expected amongst process, plant & machine operators, whilst there is expected to be a very modest increase in the numbers of jobs for the transport & mobile machine drivers category.

Elementary occupations: The final occupational group contains elementary occupations which are not classifiable elsewhere. These are jobs that require little or no prior training. Employment levels across this group of occupations have been in long-term trend decline for many years, but there are some offsetting trends. The service sector, in particular, has generated a number of extra jobs in this area. The growth of employment in call centres, and fast food outlets, etc, has helped to offset the long term trend decline in employment for elementary occupations in other areas (although some of these jobs may fall within the more skilled customer service occupations category). Overall, small increases in job numbers are expected, but especially in the service category (SOC 9.2).

Table 4.5: Expansion and replacement demand by occupation, UK 2014-2024

(Results in 000s)	Base employment level 2014	Expansion demand	% of base	Replacement demands (retirements & mortality)	% of base	Net requirement (excluding occupational mobility)	% of base
11 Corporate managers and directors	2,194	381	17.4	841	38.3	1,222	55.7
12 Other managers and proprietors	1,110	118	10.6	548	49.4	666	60.0
21 Science, research, engineering and technology prof	1,712	218	12.7	529	30.9	747	43.6
22 Health professionals	1,435	207	14.5	588	40.9	795	55.4
23 Teaching and educational professionals	1,686	171	10.1	750	44.5	920	54.6
24 Business, media and public service professionals	1,763	279	15.8	764	43.4	1,043	59.2
31 Science, engineering and technology associate prof	575	30	5.3	176	30.6	206	35.9
32 Health and social care associate professionals	489	77	15.7	191	39.1	267	54.8
33 Protective service occupations	376	-13	-3.4	92	24.4	79	21.0
34 Culture, media and sports occupations	738	95	12.9	318	43.1	413	56.0
35 Business and public service associate professionals	2,459	349	14.2	947	38.5	1,295	52.7
41 Administrative occupations	2,762	-113	-4.1	1,156	41.8	1,042	37.7
42 Secretarial and related occupations	804	-276	-34.4	348	43.3	72	9.0
51 Skilled agricultural and related trades	419	13	3.2	236	56.4	249	59.6
52 Skilled metal, electrical and electronic trades	1,258	-119	-9.5	374	29.8	255	20.3
53 Skilled construction and building trades	1,176	76	6.5	399	34.0	476	40.5
54 Textiles, printing and other skilled trades	760	-68	-8.9	290	38.2	222	29.2
61 Caring personal service occupations	2,464	394	16.0	1,080	43.8	1,473	59.8
62 Leisure, travel and related personal service occupations	670	15	2.3	307	45.8	322	48.1
71 Sales occupations	2,014	-101	-5.0	740	36.8	639	31.7
72 Customer service occupations	586	104	17.8	206	35.2	310	53.0
81 Process, plant and machine operatives	904	-154	-17.1	266	29.5	112	12.4
82 Transport and mobile machine drivers and operatives	1,163	23	2.0	509	43.8	532	45.8
91 Elementary trades and related occupations	584	6	0.9	200	34.3	206	35.2
92 Elementary administration and service occupations	3,068	114	3.7	1,254	40.9	1,368	44.6
All Occupations	33,167	1,825	5.5	13,110	39.5	14,936	45.0

Source: IER estimates, MDM revision 12956. Notes: a) Numbers may not sum due to rounding. b) Occupational and Geographical mobility are assumed to be zero in these estimates.

Figure 4.8: Net requirements by SOC2010 sub-major group, UK 2014-2024 (000's)
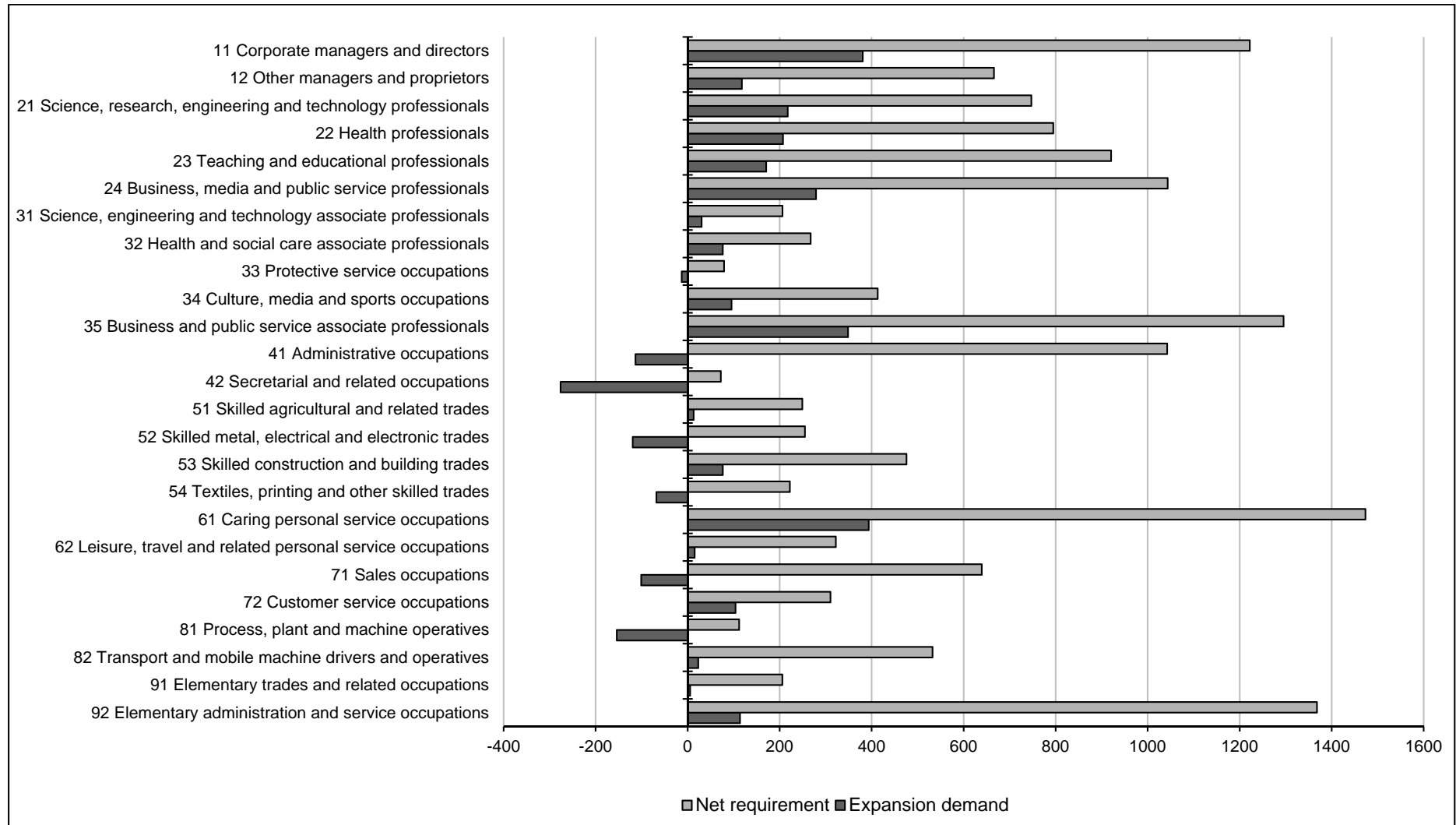
4.6　Components of occupational change

Box 4.3: Shift-share analysis of occupational change

The *scale effect* measures the impact of the overall expansion (or decline) of employment levels in the economy, assuming this applies strictly proportionally to all industries, and occupations.

The *industrial mix effect* measures the impact of the changing patterns of final demands on the industrial structure of employment, whilst holding constant the occupational composition within the industries. It is measured as the difference between the growth or decline in employment in the sector concerned and the scale effect.

The *occupational effect* measures the impact of organisational and technological changes on the occupational structure of employment within the industries. This is computed as the difference between the total change and the sum of the scale and industry effects.

The shift-share analysis is carried out at a detailed industry level, for the 25 SOC sub-major occupational groups, for males and females separately. The industry and occupational effects, by definition sum to zero when added up across all occupations.

The results depend upon the level of aggregation of both industry and occupation categories used. In Tables 4.6 and 4.7 the results of the shift-share analysis for the historical period 2004-2014 and for the projection period 2014-2024 are based on the 2 digit level of SOC and the 22 industry categories. These tables show the projected net employment changes across each of the 25 sub-major occupations in terms of both absolute levels and percentages. These net changes are decomposed into the 3 component effects.

Note that in the accompanying *Working Futures* workbooks the shift-share analysis and results will vary depending on the level of sectoral aggregation used in each workbook.

The occupational projections and observed historical change can be analysed using shift-share techniques. This provides a description of how the changes can be broken down into three main components: a scale effect, an industrial mix effect and an occupational effect, (see Box 4.3 for details). The effects rarely all point in the same direction. The scale effect is uniformly positive over both the historical period 2004-2014 and for the projected period 2014-2024. The scale effect reflects the overall employment increases projected across all categories. Over the decade 2004-2014, employment rose to 2008 before falling back and then recovering. The scale effect measures the overall change over the whole period. The other two effects both exhibit differing signs across the various occupational groups, in each case summing across all occupations to zero.

The dominant explanation of change for most occupations for the period 2004-2014 was attributable to occupational effects, the impact of changing industrial employment structure is significant but is general modest in comparison (see Table 4.6). The scale effect over the decade 2004-2014 as a whole was also important, despite the impact of the recession following 2008. All else being equal, the scale effect resulted in an increase of just over 8 per cent in each occupational employment level over that decade.

In many occupations the occupational effect was of a much greater significance, resulting in both large positive and negative changes. For many white-collar, (non-manual) occupations it was a positive influence, although notably not for administrative and clerical and secretarial occupations. For the latter the continuing impact of information and communications technology (ICT) has led to significant job losses as previously labour intensive but repetitive work in this area has increasingly been automated. Negative occupational effects were also observed for many blue-collar, (manual) workers as ICT and other technological developments have resulted in machines taking over much work previously done by craftsmen and machine operatives.

Over the period 2004-2014 the industry mix effect was really important for a small number of occupations. Some of these are where these effects are negative (for those occupations linked to the fortunes of declining sectors such as manufacturing). In other cases they are positive, linked most closely to growing parts of the service sector, most notably health and social care.

For the forecast period 2014-2024 the scale and occupational effects are again dominant (see Table 4.7). The scale effect results in an increase of around 5½ per cent in employment levels for each occupation over the 2014-2024 period (all else being equal). Although there are not quite such extreme values as in 2004-2014, the overall changes in magnitude for the occupational effect in the projection period are generally much more significant than industrial effects.

In absolute terms, the industry mix effects are insignificant except in a small number of occupations, such as teaching professionals (where it is negative) and elementary occupations (where it is positive). The former is linked to the declining share of public sector expenditure on education over the coming decade. The latter is rooted in the growth of employment opportunities in some parts of the service sector for jobs requiring little training but which are hard to automate.

The occupational effect is very strongly positive for most professional and associate professional groups and especially in the case of the caring personal service occupations. In the period 2004-2014 there was a strong industry effect for this last occupational group as the scale of social care activities grew. In the forecast this is less of a driver as constraints on public expenditure have reduced this growth.

Occupational effects impose a strong negative impact for some other occupations, including: administrative occupations, secretarial & related occupations, skilled metal & electrical trades, textile, printing and other skilled trades, sales occupations and process, plant & machine operatives. In all of these sub-major groups, significant changes in organisation and technology within the employing industries are expected to have a marked negative impact on employment levels.

The nature of the industry effects are generally consistent with the results for the previous decade, with the exception of occupations dependent on the public sector where they have switched from being positive to negative. Industry effects are generally much less significant than observed in previous decades, when the decline of employment in the primary and manufacturing industries and the shift to services was much more pronounced.

The key drivers of occupational employment change over the decade 2014-2024 are therefore expected to be more closely related to changing ways of working within industries and the way in which technological change, especially IT, impacts on the need for different skills. This is in contrast to earlier decades when it has been the changing sectoral structure of employment that was the prime driver.

For the moment, more skilled non-manual occupations are less vulnerable to the effects of automation, but with the increasing sophistication of the development of expert systems even these types of jobs seem likely to become increasingly vulnerable to automation beyond 2024.

Figure 4.9: Detailed changes by SOC2010 sub-major group, UK 2014-2024 (000's)
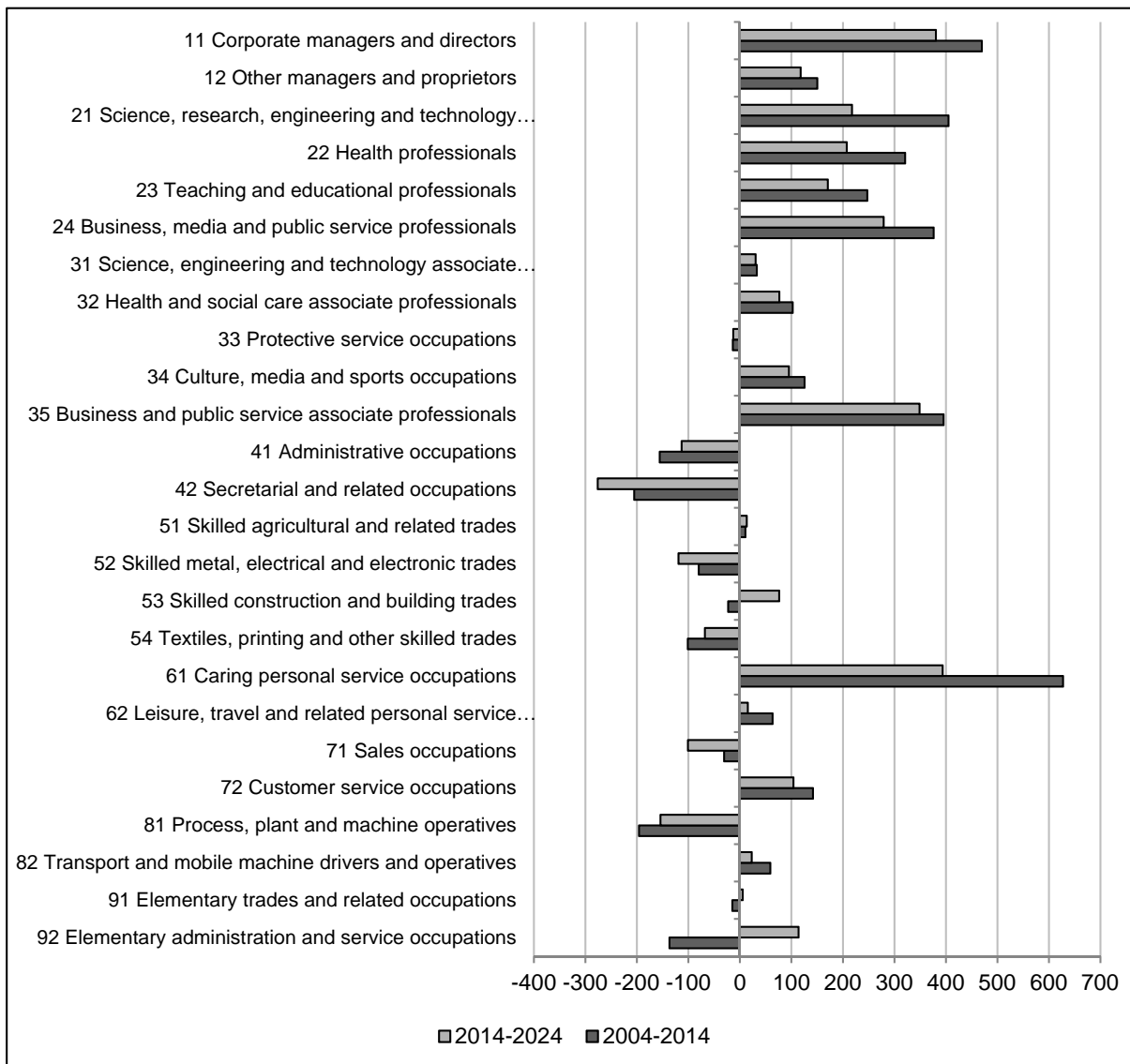
Source: IER estimates, MDM revision 12956.

Table 4.6: Total occupational employment, UK 2004-2014

SOC2010 Sub-Major Groups	Base year 000s	2004% share	Target year 000s	2014% share	Change 000s	2004-2014%	Scale effect 000s	%	Occupation effect 000s	%	Industry mix effect 000s	%
11 Corporate managers & directors	1,724	5.6	2,194	6.6	470	27.2	145	8.4	378	21.9	-54	-3.1
12 Other managers & proprietors	960	3.1	1,110	3.3	150	15.7	81	8.4	46	4.8	24	2.5
21 Science, research, engineering & technology pro	1,307	4.3	1,712	5.2	405	31.0	110	8.4	300	22.9	-4	-0.3
22 Health professionals	1,114	3.6	1,435	4.3	321	28.8	94	8.4	116	10.4	111	10.0
23 Teaching & educational professionals	1,439	4.7	1,686	5.1	247	17.2	121	8.4	33	2.3	93	6.5
24 Business, media & public service professionals	1,387	4.5	1,763	5.3	376	27.1	117	8.4	137	9.9	123	8.9
31 Science, engineering & technology associate pro	543	1.8	575	1.7	33	6.0	46	8.4	-5	-1.0	-8	-1.4
32 Health & social care associate professionals	386	1.3	489	1.5	103	26.6	32	8.4	30	7.8	40	10.4
33 Protective service occupations	390	1.3	376	1.1	-14	-3.5	33	8.4	0	0.1	-47	-12.0
34 Culture, media & sports occupations	613	2.0	738	2.2	125	20.5	52	8.4	46	7.5	28	4.6
35 Business & public service associate profes	2,064	6.7	2,459	7.4	395	19.2	173	8.4	221	10.7	1	0.1
41 Administrative occupations	2,917	9.5	2,762	8.3	-156	-5.3	245	8.4	-369	-12.7	-32	-1.1
42 Secretarial & related occupations	1,009	3.3	804	2.4	-205	-20.4	85	8.4	-371	-36.7	80	8.0
51 Skilled agricultural & related trades	408	1.3	419	1.3	11	2.6	34	8.4	-53	-13.0	29	7.2
52 Skilled metal, electrical & electronic trades	1,338	4.4	1,258	3.8	-80	-6.0	112	8.4	-27	-2.0	-165	-12.4
53 Skilled construction & building trades	1,199	3.9	1,176	3.5	-23	-1.9	101	8.4	-29	-2.4	-94	-7.9
54 Textiles, printing & other skilled trades	861	2.8	760	2.3	-101	-11.8	72	8.4	-134	-15.5	-40	-4.6
61 Caring personal service occupations	1,836	6.0	2,464	7.4	628	34.2	154	8.4	268	14.6	205	11.2
62 Leisure, travel & related personal service occup	607	2.0	670	2.0	63	10.5	51	8.4	10	1.7	2	0.4
71 Sales occupations	2,044	6.7	2,014	6.1	-31	-1.5	172	8.4	-49	-2.4	-154	-7.5
72 Customer service occupations	444	1.5	586	1.8	142	31.9	37	8.4	115	25.8	-10	-2.3
81 Process, plant & machine operatives	1,100	3.6	904	2.7	-196	-17.8	92	8.4	-113	-10.3	-175	-15.9
82 Transport & mobile machine drivers & operatives	1,104	3.6	1,163	3.5	59	5.4	93	8.4	-14	-1.3	-19	-1.8
91 Elementary trades & related occupations	599	2.0	584	1.8	-15	-2.4	50	8.4	-32	-5.4	-33	-5.5
92 Elementary administration & service occupations	3,204	10.5	3,068	9.2	-137	-4.3	269	8.4	-503	-15.7	97	3.0
All occupations	30,596	100.0	33,167	100.0	2,571	8.4						

Source: IER estimates, MDM revision 12956.

Table 4.7: Total occupational employment, UK 2014-2024

SOC2010 Sub-Major Groups	Base year 000s	2014 % share	Target year 000s	2024 % share	Change 000s	2014-2024%	Scale effect 000s	%	Occupation effect 000s	%	Industry mix effect 000s	%
11 Corporate managers & directors	2,194	6.6	2,574	7.4	381	17.4	121	5.5	252	11.5	8	0.4
12 Other managers & proprietors	1,110	3.3	1,228	3.5	118	10.6	61	5.5	34	3.1	23	2.1
21 Science, research, engineering & technology pro	1,712	5.2	1,930	5.5	218	12.7	94	5.5	98	5.7	26	1.5
22 Health professionals	1,435	4.3	1,642	4.7	207	14.5	79	5.5	144	10.1	-16	-1.1
23 Teaching & educational professionals	1,686	5.1	1,857	5.3	171	10.1	93	5.5	153	9.1	-75	-4.5
24 Business, media & public service professionals	1,763	5.3	2,042	5.8	279	15.8	97	5.5	144	8.2	38	2.2
31 Science, engineering & technology associate pro	575	1.7	606	1.7	30	5.3	32	5.5	-5	-0.8	4	0.6
32 Health & social care associate professionals	489	1.5	565	1.6	77	15.7	27	5.5	56	11.4	-6	-1.2
33 Protective service occupations	376	1.1	363	1.0	-13	-3.4	21	5.5	-25	-6.6	-9	-2.3
34 Culture, media & sports occupations	738	2.2	834	2.4	95	12.9	41	5.5	46	6.2	9	1.2
35 Business & public service associate professionals	2,459	7.4	2,808	8.0	349	14.2	135	5.5	203	8.2	11	0.4
41 Administrative occupations	2,762	8.3	2,648	7.6	-113	-4.1	152	5.5	-265	-9.6	-1	0.0
42 Secretarial & related occupations	804	2.4	528	1.5	-276	-34.4	44	5.5	-329	-40.9	8	1.0
51 Skilled agricultural & related trades	419	1.3	432	1.2	13	3.2	23	5.5	58	13.7	-67	-16.1
52 Skilled metal, electrical & electronic trades	1,258	3.8	1,138	3.3	-119	-9.5	69	5.5	-162	-12.8	-27	-2.1
53 Skilled construction & building trades	1,176	3.5	1,252	3.6	76	6.5	65	5.5	-48	-4.1	60	5.1
54 Textiles, printing & other skilled trades	760	2.3	692	2.0	-68	-8.9	42	5.5	-127	-16.7	17	2.3
61 Caring personal service occupations	2,464	7.4	2,858	8.2	394	16.0	136	5.5	308	12.5	-50	-2.0
62 Leisure, travel & related personal service occs	670	2.0	685	2.0	15	2.3	37	5.5	-20	-3.0	-2	-0.2
71 Sales occupations	2,014	6.1	1,913	5.5	-101	-5.0	111	5.5	-241	-12.0	29	1.4
72 Customer service occupations	586	1.8	690	2.0	104	17.8	32	5.5	64	10.9	8	1.4
81 Process, plant & machine operatives	904	2.7	750	2.1	-154	-17.1	50	5.5	-160	-17.7	-44	-4.9
82 Transport & mobile machine drivers & operatives	1,163	3.5	1,186	3.4	23	2.0	64	5.5	-9	-0.8	-32	-2.7
91 Elementary trades & related occupations	584	1.8	590	1.7	6	0.9	32	5.5	-9	-1.5	-18	-3.1
92 Elementary administration & service occs	3,068	9.2	3,182	9.1	114	3.7	169	5.5	-160	-5.2	105	3.4
All occupations	33,167	100.0	34,992	100.0	1,825	5.5						

Source: IER estimates, MDM revision 12956.

4.7 Detailed occupational changes within industries

Occupational employment structure varies considerably across industries, as does how it is expected to change over time. Figure 4.10 presents an overview of both history (employment levels in 2014) and projections (expected changes 2014 to 2024), focusing on the 22 *Working Futures* industries and 25 2 digit SOC2010 sub-major groups (see previous table for key to occupational categories).

Those industries and occupations expected to grow or decline most rapidly are highlighted by shading of the row and column headers. Dark shading indicates that Electricity and gas and Information Technology are projected to grow by 15 per cent or more between 2014 and 2024.

The first of these industries does not employ large numbers of people. This is indicated by the lack of shading of any of the cells in that row. Within the body of the figure, cells which include 100,000 or more people employed are lightly shaded. These will be areas where there are significant replacement demands.

Similarly the following occupational categories are projected to grow rapidly, by 15 per cent or more over the decade:

- 11 Corporate managers and directors

- 24 Business, media and public service professionals

- 32 Health and social care associate professionals

- 61 Caring personal service occupations

- 72 Customer service occupations

In contrast, those industries and occupations that are expected to decline by 15 per cent or more are indicated by patterned shading of row and column headers. These comprise the Agriculture and Engineering sectors, and the following occupations:

- 42 Secretarial and related occupations

- 54 Textiles, printing and other skilled trades

- 81 Process, plant and machine operatives

The cells with the most rapid changes (+ or – 20 per cent or more), are indicated by a + or – symbol. Where such symbols occur in a shaded cell, the changes are most significant in terms of numbers involved.

Figure 4.10: Occupational change by 22 industries, UK 2014-2024

Sub-Major Groups

	11	12	21	22	23	24	31	32	33	34	35	41	42	51	52	53	54	61	62	71	72	81	82	91	92
Agriculture		-			-			-				-	-		-	-	-		-	-		-	-	-	-
Mining and quarrying				+	+			+					-	+				+					+	+	
Food drink and tobacco				+	+			+						+		-	+								
Engineering			-		-			-				-	-	+	-	-	-		-			-		-	-
Rest of manufacturing				+				+					-	+				+				-			
Electricity and gas	+	+	+	+	+	+	+	+			+			+				+		+					
Water and sewerage				+				+	+	+			-	+				+							
Construction	+	+	+	+	+	+	+	+	+	+	+		-	+				+	+			+		+	
Wholesale and retail trade	+			+		+		+		+	+		-	+				+				+			
Transport and storage				+									-	+				+							
Accommodation and food	+		+	+	+	+		+		+	+	+		+				+	+			+		+	+
Media													-	+	-				-			-			
Information technology	+			+	+	+		+		+	+		-	+				+				+		+	
Finance and insurance													-	+			-	+							
Real estate								+					-	+				+							
Professional services	+			+		+		+			+		-	+				+						+	
Support services	+			+	+			+					-	+				+			+				
Public admin. and defence													-	+				+							
Education												-	-		-	-	-		-						-
Health and social work												-	-		-		-		-			-			-
Arts and entertainment	+			+	+			+					-	+				+							
Other services				+	+			+					-	+				+				-			

level of employment in 2012 and/or 2022 is 100000 or greater.

+ growth in employment between 2012 and 2022 is forecast to be 20% or greater.

- growth in employment between 2012 and 2022 is forecast to be -20% or less.

growth in employment in the sector or the occupation between 2012 and 2022 is forecast to be 15% or greater.

growth in employment in the sector or the occupation between 2012 and 2022 is forecast to be -15% or less.

United Kingdom

Source: IER estimates, MDM revision 12956.

5   Implications for Qualifications

Key messages

- The holding of formal qualifications is a key way in which skills are defined and measured in *Working Futures*.

- Skill supply, as measured by the number of people categorised by the highest formal qualification they hold, is rising rapidly as more young people in particular stay in education longer and acquire more higher level qualifications.

- The proportion of the labour force who are unqualified is expected to represent only a small minority by 2024.

- The demand for skills, as measured by the numbers employed in higher level occupations, and the numbers employed holding higher level qualifications, is also projected to rise.

- The average level of qualifications held is rising in all occupations.

- How much this is due to increases in demand as opposed to the supply side changes remains a point of contention, but there is some evidence of rising demand as well as supply.

5.1   Introduction and general approach

Formal qualifications held by individuals provide an alternative measure of skill to their occupation. Qualifications are awarded to accredit learning and skills acquired during education and training. In some respects, qualifications are better at measuring the supply of skills (numbers of people holding certain credentials) than the demand for skills. It is not so easy to measure the demand for qualifications by employers as there is typically a broad range of qualifications held by the workforce in any particular job.

Better qualified people have a higher probability of obtaining and retaining a job than someone less well qualified. They are also more likely to be active in the labour market than less qualified people, except when they are young and still acquiring qualifications.

Demand is proxied in the present results by those in employment, although it is recognised that observed employment levels are the consequence of both demand and supply influences. The strong trends towards many more people being better qualified in recent years has seen the shares of those in employment holding higher level qualifications rise steadily while the share of those with no or few formal qualifications has fallen sharply.

Qualifications are defined here with reference to the Regulated Qualifications Framework (RQF). This framework defines formal qualifications by their level (i.e. level of difficulty) and size (how much time the average learner would take to complete the qualification). Level is the main dimension of interest in the present context. Box 5.1 sets out the broad features. The framework has 8 main levels plus no formal qualifications. These are condensed into 6 for the main analysis as shown at the foot of the box. Further details are given in Bosworth (2013a, b and c), as well as Bosworth and Leach (2015).

In this section a distinction is made between employed residents, technically referred to as "heads", and employment in the workplace "jobs". The prime focus is on numbers employed and the highest qualification held. A variety of different definitions of employment and related indicators are used in *Working Futures* (see Box 5.2). The starting point for the analysis of the supply of and demand for qualifications is the total number of people age 16+ in possession of different qualifications (residence basis, heads). Not everyone is economically active, and of those that are economically active some are unemployed. Subtracting the latter from the total number economically active gives a measure of the number of employed residents (heads). A further complication is that some people have more than one job. Moreover they may be employed in a workplace in a geographical area different from where they are resident. The latter is recognised in the use of an alternative measure of employment - workplace jobs - which is the main indicator used in Chapters 2-4.

Box 5.1: Levels within Regulated Qualifications Framework (RQF)

Level	RQF Qualifications examples	NQF Qualifications examples	Framework for Higher Education examples
Entry	• Entry Level VQs: • Entry Level Awards, Certificates and Diplomas • Foundation Learning Tier pathways • Functional Skills at Entry level	• Entry Level Certificates • Skills for Life at Entry level	
1	• Level 1 VQs: • BTEC Awards, Certificates and Diplomas at level 1 • Functional Skills level 1 • OCR Nationals • Foundation Learning Tier pathways	• GCSEs graded D-G • NVQs at level 1 • Key Skills level 1 • Skills for Life • Foundation Diploma	
2	• Level 2 VQs: • BTEC Awards, Certificates and Diplomas at level 2 • Functional Skills level 2	• GCSEs graded A*-C • NVQs at level 2 • Level 2 VQs • Key Skills level 2 • Skills for Life • Higher Diploma	
3	• Level 3 VQs: • BTEC Awards, Certificates and Diplomas at level 3 • BTEC Nationals • OCR Nationals	• AS/A levels • Advanced Extension Awards • International Baccalaureate • Key Skills level 3 • NVQs at level 3 • Cambridge International Awards • Advanced and Progression Diploma	
4	• Level 4 VQs: • BTEC Professional Diplomas, Certificates and Awards	• NVQs at level 4 • Key Skills level 4 • Certificates of Higher Education	• Certificates of Higher Education
5	• Original NQF Level 4* • Level 5 VQs: • HNCs and HNDs • BTEC Professional Diplomas, Certificates and Awards	• Higher National Diplomas • Other Higher Diplomas • NVQs at level 4	• Diplomas of Higher Education and Further Education, Foundation Degrees and Higher National Diplomas
6	• Level 6 VQs: • BTEC Advanced Professional Diplomas, Certificates and Awards	• National Diploma in Professional Production Skills • NVQs at level 4*	• Bachelor Degrees, Graduate Certificates and Diplomas
7	• Original NQF Level 5* • Level 7 VQs: • Advanced Professional Awards, Certificates and Diplomas	• Postgraduate Certificates and Diplomas • BTEC Advanced Professional Awards, Certificates and Diplomas • Fellowships and Fellowship Diplomas • Diploma in Translation • NVQs at level 5*	• Masters Degrees, Postgraduate Certificates and Diplomas
8	• Level 8 VQs: • Award, Certificate and Diploma in Strategic Direction	• NVQs at level 5	• Doctorates

For each gender/RQF category, there are two accounting identities linking the following indicators:

- Total number economically active = Employment (residence/heads) plus (ILO) unemployment

- Economic activity rate = Total number economically active / Total number in the population

The database used for the supply model (LFS/GAD) focuses on resident employment (heads). The main *Working Futures* (WF) database (ABI/BRES /ONS) focuses on workplace employment (jobs).

Modelling the demand for and supply of Qualifications

A ***National level model*** developed and refined by Bosworth (2013a, b and c), is used to produce projections of the total number of people qualified at broad RQF level, as well as the numbers of those economically active. This deals with the supply side. By making assumptions about unemployment patterns by qualification this is then translated into implications for employment. These results have been extended to cover the individual countries and English regions within the UK using a ***spatial qualification model.***[22]

The supply side results are compared with a demand side by analysing trends in employment patterns within occupations. Detailed patterns by occupation, cross classified by sector and region are considered. The projections are based on extrapolating patterns of qualification intensities by occupation for those employed within these various categories.

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[22] The general approach adopted in analysing and modelling this aspect of the labour market is eclectic, involving a range of different data sets and models. Together the various inter-related models and modules cover various aspects of the supply of and demand for formal qualifications, at national and more detailed spatial levels. It builds upon earlier work, including the time series model developed in Bosworth, D.L. and G. Kik (2009). Adding in a qualifications dimension to the analysis of employment trends raises a number of technical and conceptual issues (which are discussed in more detail in separate technical reports (e.g: Bosworth and Wilson, 2011). These problems are addressed in a variety of ways, depending upon the availability of data and the prime objectives of each particular element.

The occupational employment structure of each industry, and how this is changing over time, is one of the key drivers for the numbers of formally qualified people employed. The key source of information on qualification patterns is the Labour Force Survey (LFS), although various other data are also exploited. The LFS, while large, does not provide a sufficiently large sample to enable the full *Working Futures* database to be expanded to cover the qualification dimension using the original data. A full database has been created by assuming common patterns apply at more detailed levels and using RAS techniques to fill the gaps.[23]

These more detailed results are then constrained to provide a picture consistent with the overall supply results from the national model.[24] The estimates of employment by RQF level are constrained using RAS[25] iterative methods to:

- reconcile the aggregate sum of qualification requirements by qualification level with the numbers available as indicated by the national model and related analysis of economic activity rates; and
- reconcile the separate industry or regional totals with the UK totals.

This provides consistency across the full set of *Working Futures* projections. The results from the spatial analysis are used to produce the initial estimates of qualification shares at individual country and English regional level. These are then constrained to match the overall UK totals using a RAS process. These values are then used as control totals to constrain a detailed analysis of changing qualification patterns within occupations. The same qualification patterns for resident (heads) are assumed to apply to the workplace jobs employment estimates.

More complete details of data sources and methods are given in the separate *Technical Report*.[26]

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[23] RAS is an iterative technique used to fill gaps in a two dimensional data array given row and column totals. It is extended here to cover multidimensional arrays.

[24] When adding qualifications to all the other dimensions in the *Working Futures* database (gender, status, sector, occupation spatial area), it is impossible to ensure complete consistency across all dimensions. The data available from the LFS, which form the basis for most of the qualification estimates, are inadequate to fully populate such a database. In many cases no data are available. In even more cases the data that are available are based on insufficiently large sample numbers to produce robust estimates. The results presented here present, as far as is possible, a consistent picture across all the main dimensions. They should be regarded as indicative.

[25] RAS is an iterative procedure which is used to generate a data array constrained to match certain row and column targets.

[26] See Wilson *et al.* (2015); for further details also see Bosworth and Wilson (2011).

Section 5.2 presents a brief overview of key historical and projected trends in the supply of people by highest qualification held. Section 5.3 presents the corresponding picture for the demand side (as measured by employment); Section 5.4 makes a comparison between the two; Section 5.5 concludes.

Box 5.2: Definitions of employment and related labour market indicators

There are various ways of looking at employment. For example, a distinction can be made between the number of people in employment (head count) and the number of jobs. These two concepts represent different things, as one person may hold more than one job. In addition, a further distinction can be made between area of residence and area of workplace.

Similarly there are various different definitions of unemployment, the labour force, workforce and population. In *Working Futures 2014-2024* the following definitions are used:

Residence basis: measured at place of residence, as in the Labour Force Survey (LFS).

Workplace basis: measured at place of work, as in the Annual Business Inquiry (ABI).

Workplace employment (number of jobs): these are typically estimated using surveys of employers, such as the ABI, focusing upon the numbers of jobs in their establishments. In this report references to employment relate to the number of jobs unless otherwise stated.

Employed residents (head count): the number of people in employment. These estimates are based primarily on data collected in household surveys, e.g. the LFS. People are classified according to their main job. Some have more than *one* job.

ILO unemployment: covers people who are out of work, want a job, have actively sought work in the previous four weeks and are available to start work within the next fortnight (or out of work and have accepted a job that they are waiting to start in the next fortnight).

Claimant Unemployed: measures people claiming Job Seeker's Allowance benefits.

Workforce: the total number of workforce jobs is obtained by summing workplace employment (employee jobs and self-employment jobs), HM Forces, government-supported trainees and claimant unemployment.

Labour Force: employed residents plus ILO unemployment.

Labour market participation or Economic activity rate: the number of people who are in employment or (ILO) unemployed as a percentage of the total population aged 16 and over.

Labour Market Accounts Residual: workplace employment minus Residence employment. The main cause of the residual at national level is "double jobbing". At a more disaggregated spatial level, net commuting across geographical boundaries is also very significant. The difference will also reflect data errors and other minor differences in data collection methods in the various sources.

Total Population: the total number of people resident in an area (residence basis).

Population 16+: the total number of people aged 16 and above (residence basis).

Working-age population: the total number of people aged 16-65 (males) or 16-60 (females), (residence basis).

5.2   Supply trends

The *numbers* of people obtaining formal qualifications, especially at the highest level, have risen steadily over the past half century. The *share* of people in the population of working age and the economically active labour force who possess formal qualifications has risen commensurately. The numbers and the shares of those with no or low qualifications have shrunk. Information from the Labour Force Survey (LFS) can be used to see how qualification profiles have been changing over time. Figure 5.1 shows estimates of the proportions of those in the economically active workforce holding different levels of qualification (by highest qualification held).

Very similar trends can be observed for the total population (active and inactive), for those in employment (Figure 5.2) and for both males and females.

There are of course significant differences in the levels and trends by age. In particular younger people tend to be much more likely to possess or acquire qualifications than older people. However, the main focus here is on totals for both genders and across all ages. Both Table 5.1 and 5.2 present data on a residence/heads basis, and focus on results for the whole of the UK, for those aged 16+.

Figure 5.1: Changing patterns of qualification within the UK labour force (UK 16+, % of total)
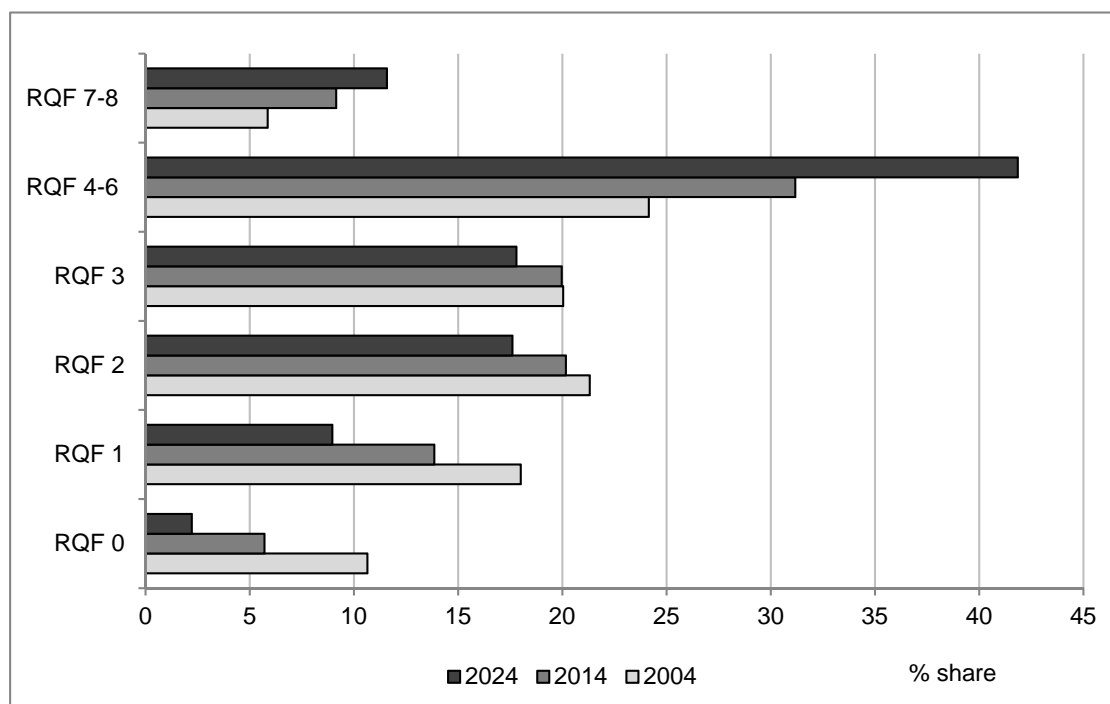
Source: IER estimates based on LFS data, constrained to match Working Futures estimates.

Figure 5.2: Changing qualification pattern of UK employment (workplace / jobs, % of total)
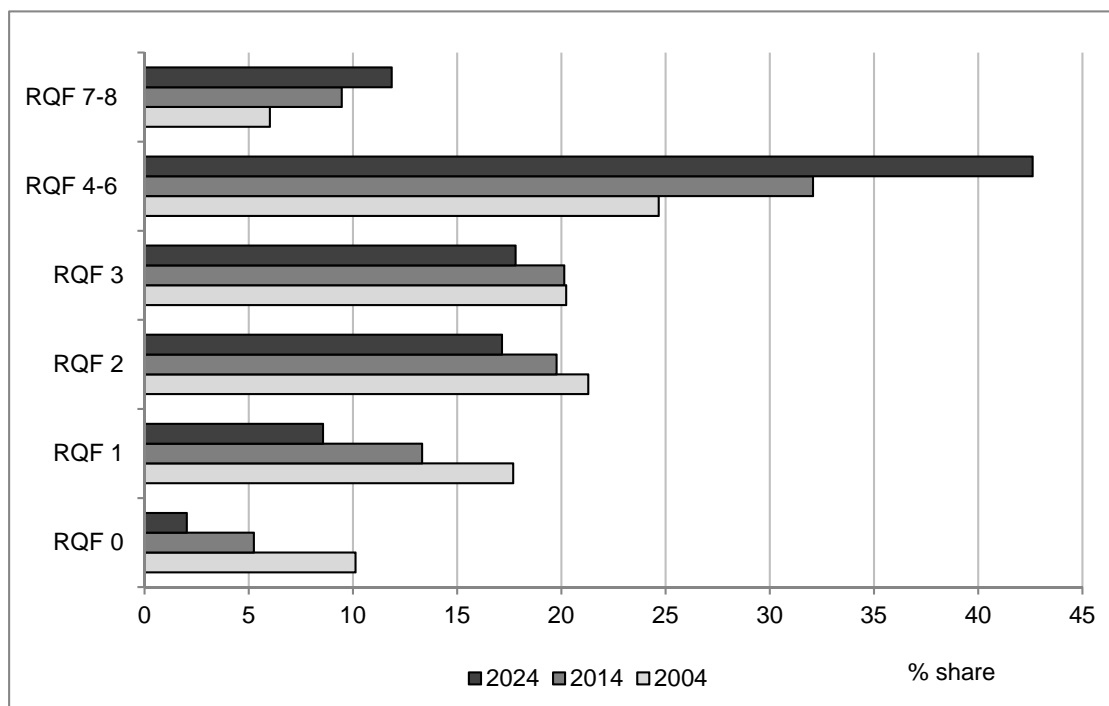
Source: IER estimates based on LFS data, constrained to match Working Futures estimates.
Note: The estimates shown are based on LFS shares applied to Working Futures data on employment levels (jobs)

Table 5.1 presents the estimated numbers in the total population aged 16+ holding different levels of formal qualifications, including projections based on the national time series model described in Bosworth (2013,a, b and c).

Table 5.2 presents corresponding information for the economically active labour force. The shares in each qualification category have been applied to the population or labour force numbers from the MDM estimates and projections as described in Chapter 2 to obtain a consistent picture of the supply of skills.

Together with the numbers economically active, the population numbers represent a measure of supply by qualification level. Of course, in practice, they reflect both demand and supply influences. The key drivers of supply in recent years have been demographic change (the changing structure of the population by age and gender), combined with increases in educational participation (the latter encouraged by government policy to boost skill levels, including raising the minimum age that people are expected to remain in education and training).

Table 5.1: Total numbers by qualification (total UK population 16+, 000s)

RQF level	2004	2014	2024
RQF 0	10,291	4,974	2,273
RQF 1	8,252	7,707	5,712
RQF 2	9,317	10,777	10,727
RQF 3	8,598	10,236	9,896
RQF 4, 5 & 6	9,537	14,593	21,313
RQF 7 & 8	2,258	4,155	5,834
Total	48,253	52,442	55,755

Source: IER estimates based on LFS data, constrained to match Working Futures estimates.

Table 5.2: Economically active UK population by qualification level (16+, 000s)

RQF level	2004	2014	2024
RQF 0	3,166	1,852	758
RQF 1	5,356	4,498	3,068
RQF 2	6,339	6,551	6,026
RQF 3	5,962	6,484	6,092
RQF 4, 5 & 6	7,184	10,125	14,327
RQF 7 & 8	1,743	2,970	3,965
Total	29,751	32,481	34,236

Source: IER estimates based on LFS data, constrained to match Working Futures estimates.

Table 5.3: Unemployed by qualification level (UK 16+, 000s)

RQF level	2004	2014	2024
RQF 0	300	256	98
RQF 1	345	443	283
RQF 2	309	531	446
RQF 3	231	352	300
RQF 4, 5 & 6	194	359	463
RQF 7 & 8	40	89	108
Total	1,419	2,030	1,698

Source: IER estimates based on LFS data, constrained to match Working Futures estimates.

In the past decade there have been very large increases in both numbers and shares of the population and the economically active labour force qualified at higher levels (RQF 4+), and reductions in the numbers and shares qualified to RQF level 1 or below. Over the last decade the number and proportions qualified to RQF levels 2 and 3 have risen slightly. These patterns represent a continuation of previous longer term trends.

This has resulted in a large increase in the numbers emerging on to the labour market with formal qualifications at higher levels. The proportion of young people with formal qualifications is much higher than for older people.

Some feared that the recession, as well as the increasing direct costs[27] associated with participation in higher levels of education, would impact negatively on decisions of many young people to invest in higher and further education, (although others have

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[27] It should be noted that different tuition fee systems for higher education apply across the UK nations.

argued that the poor state of the labour market would encourage young people to stay on in higher and further education).

In order to draw out the implications for projected total employment, assumptions are made about the distribution of unemployment by level of qualification. All else equal the better qualified tend to have lower unemployment rates but their shares of total unemployment have been rising as their share of the labour force increases. All groups saw unemployment rates rise as the recession struck but then fell as the labour market improved. The hierarchy of unemployment rates has been maintained and this is assumed to continue as shown in Tables 5.3 – 5.5 which illustrate the implications in terms of levels, rates and shares of total unemployment respectively. Unemployment rates remain persistently high for a core of people, unwilling or unable to acquire formal qualifications.

Table 5.4: UK Unemployment rates by qualification level (%)

RQF level	2004	2014	2024
RQF 0	9.5	13.8	12.9
RQF 1	6.4	9.8	9.2
RQF 2	4.9	8.1	7.4
RQF 3	3.9	5.4	4.9
RQF 4, 5 & 6	2.7	3.5	3.2
RQF 7 & 8	2.3	3.0	2.7
Total	4.8	6.2	5.0

Source: IER estimates based on LFS data, constrained to match Working Futures estimates.

Table 5.5: Share of total UK unemployment by qualification level (16+, 000s)

RQF level	2004	2014	2024
RQF 0	21.1	12.6	5.8
RQF 1	24.3	21.8	16.7
RQF 2	21.8	26.2	26.3
RQF 3	16.3	17.3	17.7
RQF 4, 5 & 6	13.7	17.7	27.3
RQF 7 & 8	2.8	4.4	6.3
Total	100.0	100.0	100.0

Source: IER estimates based on LFS data, constrained to match Working Futures estimates.

Table 5.6 presents estimates of employment (also on a residence/heads basis) implied by these unemployment assumptions for 2024. They show the implied pattern of supply "in employment". This reflects the growing shares of better qualified people compared with the less well qualified in total unemployment, but a continuing lower unemployment rate for the better qualified.

Finally Table 5.7 translates this to a workplace/jobs basis. This is based on assuming that the patterns (shares of employment by RQF level) on the residence/heads basis can be applied to the workplace/jobs estimates which are used elsewhere in the

report.[28] These estimates are then used to constrain all the other employment figures. In particular the projections of changing qualification profiles within occupations, in aggregate, and separately by sector and by region, are all constrained to match these overall totals.

Table 5.6: UK Employment by qualification level (residence / heads, 16+, 000s)

RQF level	2004	2014	2024
RQF 0	2,867	1,596	660
RQF 1	5,011	4,055	2,785
RQF 2	6,030	6,020	5,580
RQF 3	5,731	6,133	5,793
RQF 4, 5 & 6	6,990	9,766	13,864
RQF 7 & 8	1,704	2,881	3,857
Total	28,332	30,451	32,538

Source: IER estimates based on LFS data, constrained to match Working Futures estimates.

Table 5.7: UK Employment by qualification level (workplace / jobs, 000s)

RQF level	2004	2014	2024
RQF 0	3,119	1,745	712
RQF 1	5,463	4,435	3,004
RQF 2	6,563	6,589	6,026
RQF 3	6,207	6,707	6,258
RQF 4, 5 & 6	7,610	10,698	14,975
RQF 7 & 8	1,852	3,156	4,166
Total	30,814	33,331	35,141

Source: IER estimates based on LFS data, constrained to match Working Futures estimates.
Notes: Includes HM Forces. Tables in Annex E exclude HM Forces.

5.3   Demand for formal qualifications

The numbers in employment by level of qualification can be regarded as an indicator of demand. Strictly speaking employment levels are the result of a combination of both supply and demand factors; employment would only represent demand if there were excess supply. Separating demand and supply influences is not straightforward. Recent trends have seen a sharp rise in the formal qualifications held by those in employment. However it is clear from the earlier discussion that, in part at least, this simply reflects the large increases on the supply side.

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[28] Analysis of the LFS suggest that double jobbing qualification patterns are not the exactly the same for heads and jobs but the discrepancies would not make a huge difference here.

Figures 5.3 shows that qualification patterns vary considerably across occupations. Generally speaking, occupations such as professionals and associate professionals, (and to a lesser extent managers), tend to be much better qualified than less skilled occupations, but average qualification levels are rising for most occupations. How much the latter is due to increasing demand requirements as opposed to "qualifications inflation" (as supply has risen) remains a bone of contention.[29]

The shift in occupational structure in favour of the occupational major groups 1-3 (as discussed in Chapter 4) have been a key factor in increasing the numbers of graduates in employment. But qualification profiles (the shares of employment qualified at different levels) have changed in almost all occupations in favour of higher level qualifications (RQF4+). They also exhibit sharp reductions in the employment shares of those less well qualified (RQF1 and below).

Some occupations have much higher proportions of well qualified employees (RQF4+) than others. For many of these occupations these proportions are close to 100%, so the scope for further growth is limited to the overall growth in employment levels in the occupation concerned. For others, where the shares are well below 100%, the scope for increasing shares is greater. Some occupations have quite a high concentration of employees with no or low (RQF1) qualifications.

Qualifications profiles also vary significantly across sectors (see Figure 5.4). To a large extent this reflects their occupational structure. Sectors such as health, education and public administration employ large numbers of people in higher level occupations and, as a consequence, large numbers of people qualified at RQF level 4+. In contrast some other sectors, such as other parts of the service sector, employ large numbers in occupations which tend to be less well qualified.

Overall qualification patterns within sectors depend on the mix of occupations they employ. In most cases the patterns of change mirror those shown in the more aggregate picture cross all occupations and sectors.

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[29] See for example the debate between Brown and Hasketh (2004) and Purcell *et al.* (2005). Some recent results by Elias and Purcell, (2011) suggest that rates of return to investment in HE may still be rising for some but declining for those in the bottom decile.

Table 5.8: Changing qualification pattern of UK employment (workplace / jobs, % of total)

RQF level	2004	2014	2024
RQF 0	10.1	5.2	2.0
RQF 1	17.7	13.3	8.5
RQF 2	21.3	19.8	17.1
RQF 3	20.1	20.1	17.8
RQF 4, 5 & 6	24.7	32.1	42.6
RQF 7 & 8	6.0	9.5	11.9
Total	100.0	100.0	100.0

Source: IER estimates based on LFS data, constrained to match Working Futures estimates of workplace jobs.

Figure 5.3: Qualification pattern of UK employment by occupation, 2014 (workplace / jobs, % of total)
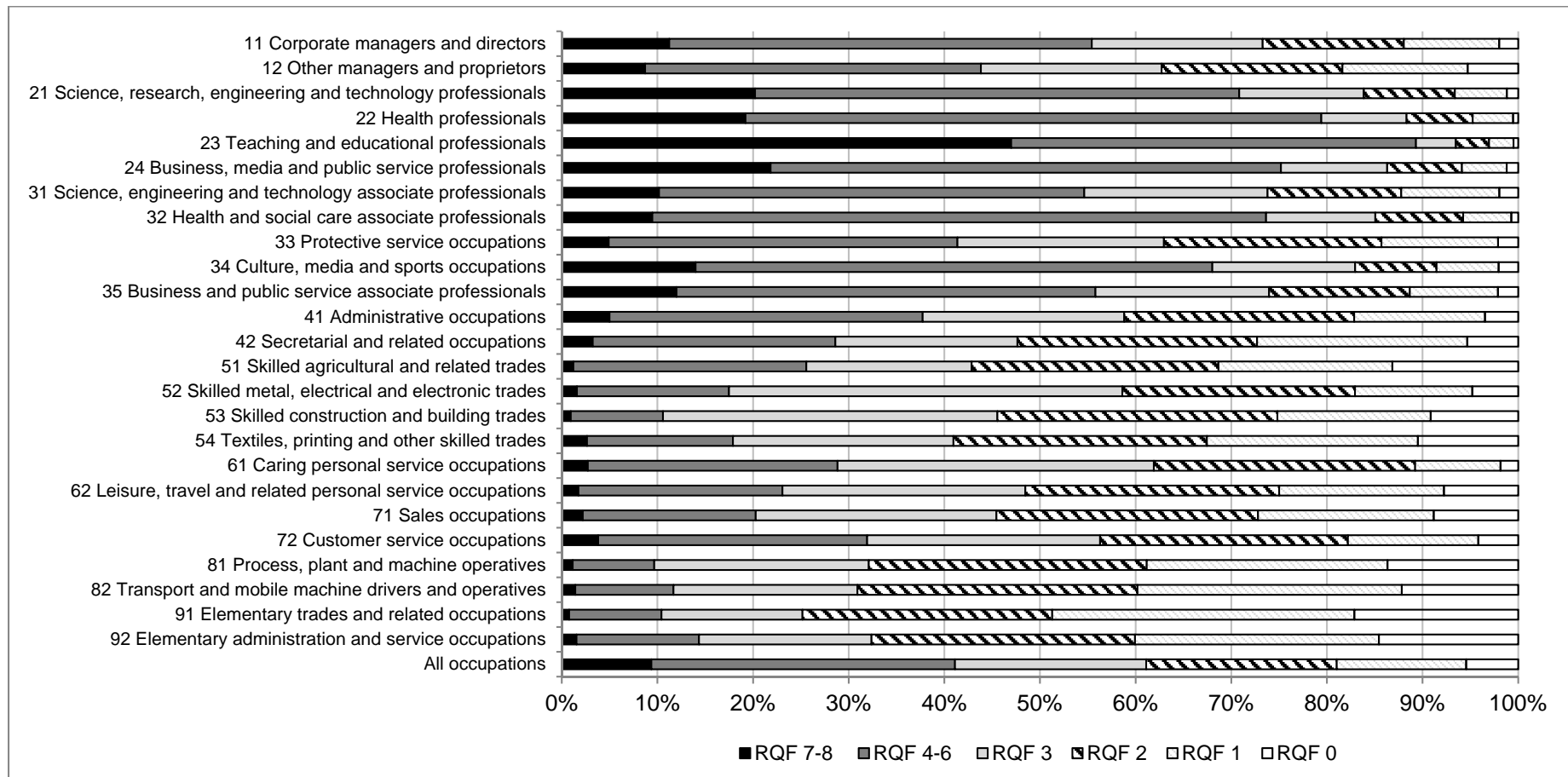
Source: IER estimates based on LFS data, constrained to match Working Futures estimates

Figure 5.4: Changing qualification pattern of UK employment by sector, 2014-2024 (workplace / jobs, % of total)
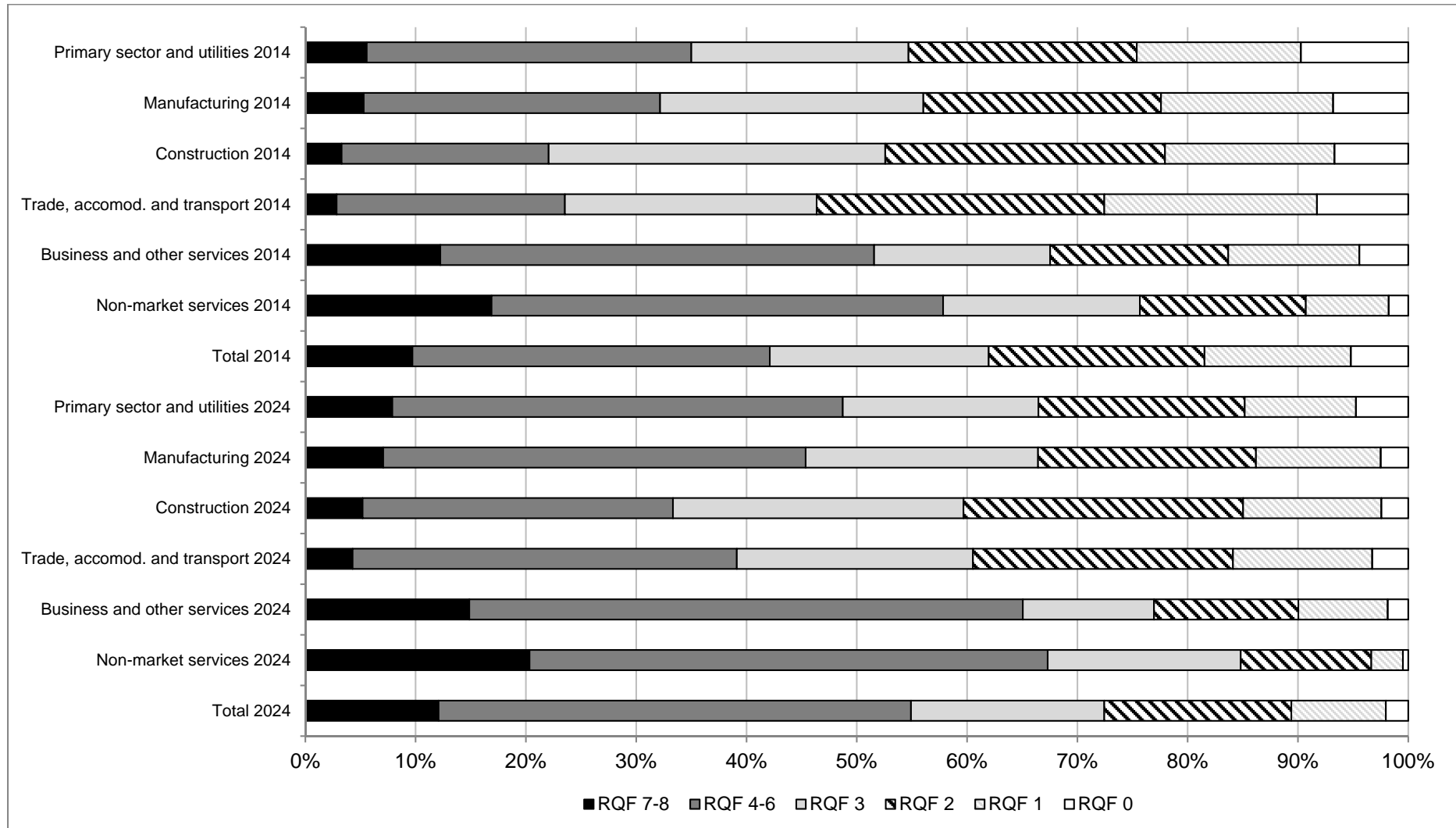
Source: IER estimates based on LFS data, constrained to match Working Futures estimates

5.4   Reconciliation, imbalances and mismatches

The projections of the supply of people by highest qualification held (population numbers and those economically active) and the projections of the patterns of employment by qualification level within industries and occupations are carried out independently. There is no guarantee these will match.

In order to ensure consistency, a reconciliation is imposed by making certain assumptions about unemployment rates by highest qualifications held, and then reallocating people to jobs until all those available are employed. This involves raising the qualifications intensity of all jobs if initial supply exceeds demand and reducing it if the converse is true. An iterative process is used to achieve this, maintaining the original patterns of employment by industry, occupation, gender status and region. The assumptions regarding unemployment are set out in Tables 5.3 –5.4 above.

Figure 5.5 illustrates the impact of this adjustment process for 2024. For each sub major occupational group, and for the total of all occupations, two bars are shown. The top bar shows the pattern of qualifications based on extrapolating past trends in historical patterns of employment. The second bar shows how this has to be altered to reflect the numbers projected to be available in the labour market (i.e. those economically active in employment).

For most occupations the qualification intensity (especially those holding qualifications at RQF 4+) has to be raised to bring demand into balance with supply. Those occupations in which the workforce is already highly qualified (such as professionals) have less room for further increases. Inevitably this rise in qualifications intensity has been happening more in those occupations that have not previously employed higher level qualifications, since this is where there is more scope for increase. This is not necessarily indicative of excess supply of such qualifications. The nature of jobs may be changing to make higher qualifications more necessary.[30]

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[30] Education and health professions are good examples of where the entry requirements have seen a steady rise as the technical demands of jobs for teachers and nurses have risen.

Figure 5.5: Reconciling demand and supply in 2024– increasing qualification intensity by occupation (UK workplace / jobs, % of total)
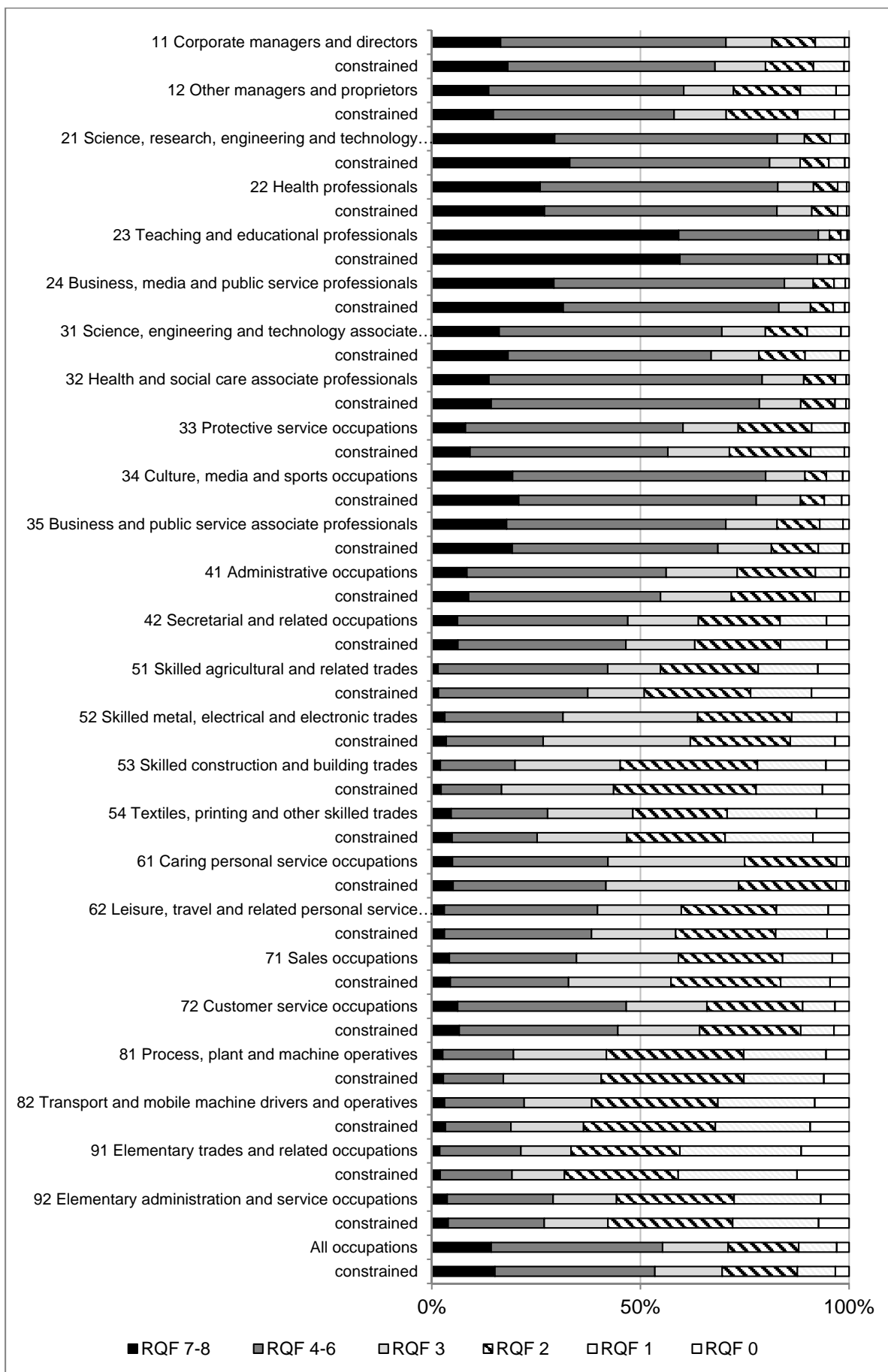
Source: IER estimates based on LFS data, constrained to match Working Futures estimates

5.5 Concluding remarks

The supply of skills is set to continue to grow as more people acquire higher level qualifications. The overall qualification profile of the workforce will improve significantly over the next decade. The proportion and numbers of people qualified at the highest levels (RQF4+) will rise substantially. In contrast, the proportion and number of those in the workforce with qualifications at RQF level 1 or below will fall.

Qualification levels amongst the employed workforce are also projected to rise significantly, in line with these trends. This reflects changing patterns of requirements in many jobs.

The relative significance of demand and supply influences is not easy to assess. The latest evidence suggests that rates of return to higher qualifications have shown some signs of decline, although they still indicate significant positive benefits from investing in courses of study at HE and FE levels.

Patterns of unemployment rates by RQF level are assumed to maintain the same hierarchy (i.e. the less well qualified are significantly more likely to be unemployed) although the better qualified will take an increasing share of total unemployment (commensurate with their increasing share of the labour force).

Qualification profiles vary significantly across both sectors. These differences are primarily driven by variations in their employment patterns by occupation.

Nearly all sectors are projected to see significant improvements in average qualification levels, with increased proportions and numbers employed at RQF level 4+ and reductions at RQF levels 0 and 1.

Bibliography

Airports Commission, (2015), *Airports Commission: Final Report*. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/440316/airports-commission-final-report.pdf

ARUP, (2013), *The Smart City Market: Opportunities for the UK*, Department for Business, Innovation and Skills: London.

Bosworth, D, (2013a), *The Changing Qualifications Mix of the UK to 2020, 2013*. Report produced on behalf of UK Commission for Employment and Skills: Wath on Dearne. Institute for Employment Research, University of Warwick: Coventry.

Bosworth, D, (2013b), *UK Qualifications Projections – Time Series Model: Technical Report, 2013*. Report for UK Commission for Employment and Skills: Wath on Dearne. Institute for Employment Research, University of Warwick: Coventry.

Bosworth, D, (2013c), *Regional Qualifications Projections – Apportionment Model: Technical Report, 2013, 2013*. Report for UK Commission for Employment and Skills: Wath on Dearne. Institute for Employment Research, University of Warwick: Coventry.

Bosworth, D. and Kik, G. (2010), "Immigrant Skills: what we know and what we don't know from the LFS". Working paper. http://www.derekbosworth.co.uk/

Bosworth, D. and Leach, A. (2015), *UK Skill Levels and International Competitiveness, 2014*. Report for UK Commission for Employment and Skills: Wath on Dearne. Institute for Employment Research, University of Warwick: Coventry.

Bosworth, D. L. and Wilson, R.A. (2011), *Working Futures* Qualifications *Technical Report*, UKCES: Wath on Dearne.

Briscoe, G. and Wilson, R. A. (2003), 'Modelling UK Occupational Employment'. *International Journal of Manpower.* 24, 5, 568-589.

British Tourist Authority, (2013), VisitBritain & VisitEngland Annual Report and Accounts. Office for Budget Responsibility, (July 2015), Economic and fiscal outlook.

Brown, P. and Hesketh, A. (2004), *The MisManagement of Talent: Employability and the Competition for Jobs in the Knowledge Economy*, Oxford: Oxford University Press.

Cambridge Econometrics, Institute for Employment Research, IFF Research, (2013), *Working for a green Britain and Northern Ireland 2013-23: employment in the UK wind and marine energy industries*, RenewablesUK: London.

Centre for Retail Research, (2015), Online Retailing: Britain, Europe, US and Canada 2015. http://www.retailresearch.org/onlineretailing.php

Crossrail Ltd., (2015), *Europe's largest construction project*, http://www.crossrail.co.uk/construction/, November 2015.

Department for Business Innovation & Skills, (2013a), *BIS Research Paper No.136, The Smart City Market: Opportunities for the UK*.

Department of Business, Innovation and Skills, (2013b), *UK construction: An economic analysis of the sector*, Department of Business, Innovation and Skills: London.

Department of Energy and Climate Change, (2012), *The government's long- term plans to deliver secure, low carbon and affordable electricity:* Department of Energy and Climate Change: London.

Department for Transport, (2013), *UK Aviation Forecasts*, Department for Transport: London.

Elias, P. and K. Purcell, (2011), *Higher education, intergenerational mobility and earnings: the case of the UK*. Institute for Employment Research, University of Warwick: Coventry.

European Commission, (2015), *Smart Cities*, http://ec.europa.eu/digital-agenda/en/smart-cities.

Financial Times, December 30, (2014), *Venture capital funding of London tech start-ups doubles*, http://www.ft.com/cms/s/0/0ff8687c-8f52-11e4-b080-00144feabdc0.html#axzz43kK84fHO

High Speed Two (HS2) Limited, (2015), *High Speed Two Information Paper, D6: HS2 Phase One Construction Timetable*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/437347/D6_-__HS2_phase_one_construction_timetable_v1.2.pdf

HM Government, (2013), *Construction 2025*, HM Government: London.

International Monetary Fund, (September, 2011), *World Economic Outlook, Slowing growth, rising risks*, https://www.imf.org/external/pubs/ft/weo/2011/02/pdf/text.pdf

Kriechel, B, Rašovec, T. and Wilson, R. (2016), *Skills Forecasts. Part B of the ETF, ILO and Cedefop Guide on Skills Foresights, Scenarios and Forecasts*. CEDEFOP/ETF/ILO: Turin.

Management Consultancies Association, (2015), *The definitive guide to UK Consulting Industry 2015: Summary Report*, Management Consultancies Association: London.

Office for Budget Responsibility, (July 2015), *Economic and fiscal outlook.*

Office for National Statistics, (2009), *Indexes to the UK Standard Industrial Classification of Economic Activities 2007*. ONS: Newport.

Office for National Statistics, (2010), *Standard Occupational Classification 2010*. ONS: Newport.

Office for National Statistics, (2015), *E-commerce in the UK and the European Union*, October, http://www.ons.gov.uk/ons/rel/rdit2/e-commerce-and-internet-use/eu-comparisons/sty-e-commerce-in-the-uk-and-the-european-union.html

Purcell, K. Elias, P. Davies, R. and Wilton, N. (2005), *The Class of '99*, Department for Education and Skills: DfES Nottingham.

Pont, M, (2008), 'Improvements to the measurement of government output in the National Accounts', *Economic & Labour Market Review*, Vol 2, No2, February 2008, ONS.

Powley, T, (2015), *London's £27bn Crossrail 2 plans advance*, Financial Times: 27 October 2015.

SCQF (Scottish Credit and Qualifications Framework Partnership) (2011), *Qualifications can cross boundaries: A rough guide to comparing qualifications in the UK and Ireland*. SCQF, Glasgow.

UCAS (2013), *2013 Application Cycle: End of Cycle Report*. UCAS Analysis and Research, UCAS, December http://www.ucas.com/system/files/UCAS%202013%20End%20of%20Cycle%20Report.pdf

UniversitiesUK (2014). *The Impact Of Universities On The Uk Economy*, http://www.universitiesuk.ac.uk/highereducation/Documents/2014/TheImpactOfUniversitiesOnTheUkEconomy.pdf

Wilson, R. A. May-Gillings, M. Pirie, J. and Beaven, R. (2016). *Working Futures 2014-2024: Technical report on sources and methods.* UK Commission for Employment and Skills: Wath on Dearne.

Wilson, R. A. Beaven, R. May-Gillings, M. Hay, G. and Stevens, J. (2014). *Working Futures 2012-2022: Technical Report.* UK Commission for Employment and Skills: Wath on Dearne.

Wilson, R. A. (2013), *40 years of using the LFS to assess and anticipate changing skill needs.* Paper presented at an ONS event on 28th November to celebrate 40 years of the Labour Force Survey. Institute for Employment Research, University of Warwick: Coventry.

Wilson, R. A. (2011). *Working Futures 2010-2020: Sectoral Report.* UK Commission for Employment and Skills: Wath on Dearne.

Wilson, R. A. and Homenidou, K. (2011), *Working Futures 2010-2020: Technical Report.* UK Commission for Employment and Skills: Wath on Dearne.

Wilson, R. A. and Homenidou, K. (2011), *Working Futures 2010-2020: Main Report.* UK Commission for Employment and Skills: Wath on Dearne.

Wilson, R. A. Woolard I. and Lee, D. (2004b). *Developing a National Skills Forecasting Tool for South Africa,* South African Department of Labour: Pretoria.

Wilson, R. A. Canny, A. and Homenidou, K. (2001*), Evaluation of UK Occupational Employment Projections: Final Report*, Working Paper 31, Institute for Employment Research, University of Warwick: Coventry.

Wilson, R. A. (2001a), *Forecasting Skill requirements at National and company Levels*, in P. Descy and M. Tessaring (eds.) (2001), *Training in Europe (2nd report on Vocational Training Research in Europe 2000: Background Report, Volume 2)* CEDEFOP Reference Series, Luxembourg, Office for Official Publications of the European Communities, pp. 561-609.

Wilson, R. A. (2001b), *Projections of Occupation and Qualifications.* Institute for Employment Research, University of Warwick: Coventry.

World Economic Forum, (2012), *The Future of Manufacturing – Opportunities to drive economic growth,* http://www3.weforum.org/docs/WEF_MOB_FutureManufacturing_Report_2012.pdf

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