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Working Futures 2012-2022

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Intelligence › Investment › Impact

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Working Futures 2012-2022

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Foreword

The UK Commission for Employment and Skills is a social partnership, led by Commissioners from large and small employers, trade unions and the voluntary sector. Our ambition is to transform the UK's approach to investing in the skills of its people as an intrinsic part of securing jobs and growth. Our strategic objectives are to:

- Maximise the impact of employment and skills policies and employer behaviour to support jobs and growth and secure an internationally competitive skills base;
- Work with businesses to develop the best market solutions which leverage greater investment in skills;
- Provide outstanding labour market intelligence which helps businesses and people make the best choices for them.

The third objective, relating to intelligence, reflects an increasing outward focus to the UK Commission's research activities, as it seeks to facilitate a better informed labour market, in which decisions about careers and skills are based on sound and accessible evidence. Relatedly, impartial research evidence is used to underpin compelling messages that promote a call to action to increase employers' investment in the skills of their people.

Intelligence is also integral to the two other strategic objectives. In seeking to lever greater investment in skills, the intelligence function serves to identify opportunities where our investments can bring the greatest leverage and economic return. The UK Commission's first strategic objective, to maximise the impact of policy and employer behaviour to achieve an internationally competitive skills base, is supported by the development of an evidence base on best practice: "what works?" in a policy context.

Our research programme provides a robust evidence base for our insights and actions, drawing on good practice and the most innovative thinking. The research programme is underpinned by a number of core principles including the importance of: ensuring 'relevance' to our most pressing strategic priorities; 'salience' and effectively translating and sharing the key insights we find; international benchmarking and drawing insights from good practice abroad; high quality analysis which is leading edge, robust and action orientated; being responsive to immediate needs as well as taking a longer term perspective. We also work closely with key partners to ensure a co-ordinated approach to research.

This current report presents the fifth 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 2022. This report makes an important contribution to our understanding of likely trends in the labour market in the medium to longer term, along with the report of our foresight study *The Future of Work: Jobs and Skills in 2030*. 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 forecasts 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.

But these outputs are only the beginning of the process and we are engaged in other mechanisms to share our findings, debate the issues they raise and extend their reach and impact.

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.

Lesley Giles

Deputy Director

UK Commission for Employment and Skills

Preface and Acknowledgements

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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 likely to be affected by even the very turbulent conditions experienced over the past 5 years. It presents a view of medium to longer term trends (5-10 years ahead), reflecting the likely path of recovery from recession and a gradual re-establishment of longer-term trends. These issues are elaborated in more detail in the main body of the report. 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. The opinions expressed in this report are those of the authors and do not necessarily reflect the views of the UK Commission.

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Glossary

BRICs - Brazil, Russia, India and China

CE – Cambridge Econometrics

IER – Institute for Employment Research, University of Warwick

LMI for All – UKCES project to make labour market information (LMI) data freely available for careers guidance and advice

MDM - CE's detailed multi-sectoral dynamic macroeconomic model (MDM-E3).

MDM C132F1A (revision 12015) - CE projections conducted in July 2013

MINT – Mexico, Indonesia, Nigeria and Turkey

MINTs – Mexico, Indonesia, Nigeria and Turkey

NQF - National Qualification Framework

QCF - Qualifications and Credit Framework

Replacement demand – job openings created by those leaving the labour force.

SIC – Standard Industry Classification

SOC– Standard Occupational Classification

Terminology for quarters, etc - 2012Q1 = first quarter of 2012, etc

Working Futures 2012-2022 - the latest in a long series of quantitative assessments of UK employment prospects over a ten year horizon.

Executive Summary

Working Futures

Working Futures 2012-2022 is the latest in a series of quantitative assessments of the employment prospects in the UK labour market over a ten 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.* 2014) 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 2012-2022 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:

- a slow but steady recovery from recession, with around 1.9 million additional jobs by 2022 compared with 2012;
- 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;
- some rebalancing of the economy is expected as a direct consequence of fiscal retrenchment, with a marked shift away from employment in public sector activities, and the share of public administration, health and education in total employment projected to decline from 26 to 25 per cent between 2012 and 2022;
- the manufacturing sector is projected to experience a further (albeit small) decline in its share of total employment, from 8 to 7 per cent of the total, despite a recovery in output levels, which enable it to maintain its share of total output (at around 10 per cent);
- the main source of recovery in employment levels is expected to continue to be focused in the service sector.

- Private services are the main engine of jobs growth, with employment in this part of the economy projected to rise by more than 1.5m (+8 per cent) between 2012 and 2022. Business and other services are the area where employment is expected to grow most rapidly, growing by more than 10 per cent, or 1 million jobs over the same period.

- 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.
    - Some 2 million additional jobs are projected for occupations such as managers, professionals and associate professional by 2022. Together these occupations are expected to increase their share of total employment from 42 per cent to 46 per cent over the decade.
    - Lower skilled jobs are also projected to remain a significant component of the labour market. The projections suggest an increase of more than 600,000 jobs in caring, personal and other service occupations (+23 per cent) and more modest increases in numbers of some jobs for elementary occupations over the decade (although overall this group see a slight decline of 67,000 jobs, -2 per cent). Most of this employment growth is focussed in service-based areas, especially related to health care.
- In contrast, for many blue collar jobs such as skilled and semi-skilled manual roles in skilled trade occupations and process, plant & machine operatives further job losses are expected, reflecting a combinations of structural change in terms of sectoral employment combined with technological and organisational changes within the sectors in which such jobs are concentrated. Around 500,000 such manual jobs are forecast to disappear over the decade to 2022, reducing their employment share from 17 per cent to 15 per cent.
- It is not just blue collar jobs that are under threat. The continuing impact of information and communications technology on the way office and related tasks are carried out means that many administrative, clerical and secretarial jobs are expected to disappear. In total, a loss of almost 500,000 jobs in these occupations between 2012 and 2022 is projected (around 13 per cent). Nevertheless, this area of employment will remain important, still accounting for around 3 million jobs in this occupational area in 2022. This amounts to about 10 per cent of total employment compared to 12 per cent in 2012.
- This highlights the importance of not just focusing on projected changes in employment levels. Even in areas where employment is expected to decline there will often be many new job openings and the need to recruit and train new entrants to replace those leaving the workforce for retirement or other reasons.

- Job openings created by those who leave the labour market (so called replacement demands) are projected to generate around 12 million job openings over the decade. This is much higher than the 1.8 million openings from the creation of new jobs. Replacement demands results in job openings in all industries and occupations, including those in which the net level of employment is expected to decline significantly. This has important implications for individuals who may be considering their future career and education and training options, since even those occupations where employment is projected to decline may still offer good career prospects.
- The other key measure of skills used in *Working Futures* is qualifications. The numbers of people holding formal qualifications who are economically active is projected to continue to rise. The supply of people holding higher level qualifications such as degrees is projected to grow steadily to 2022, despite the rising costs of attending university. The proportion of the labour force who are unqualified is expected to represent only a small minority by 2022.
- 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 suggests there will be an increase in qualification intensity within those occupations that have not previously employed higher level qualifications, since 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 is not necessarily indicative of excess supply of such qualifications. The nature of jobs may be changing to make higher qualifications more necessary.
- Turning to the geographical dimension of the results, the projection suggest that the southern part of England will continue to benefit more from the recovery than other parts of the country. Almost half of the growth in jobs in higher level occupations will occur in London, South East England and the East of England. The remainder of England, and the other nations of the UK are expected to see a recovery in employment levels, but they all fall further behind in relative terms over the coming decade.

1 Introduction and Background

- *Working Futures 2012-2022* is the 5th in 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 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 and Homenidou (2012)) 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 side?

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 Census of Population. 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 2013 (produced using MDM - CE's detailed multi-sectoral dynamic macroeconomic model (MDM-E3), MDM C132F1A (revision 12015), conducted in July 2013). 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.[19] 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 set out in detail in the main report.

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). 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.

[19] 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.

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.

Box 1.1: The rationale for *Working Futures* projections (continued)

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* 2012-2022 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 QCF 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). 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 and Homenidou, 2012) and is set out in detail in the accompanying *Technical Report*. (Wilson *et al.* (2014). 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. Innovations in *Working Futures 2012-2022* include the extension of the database to cover 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.

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 2012-2022, covering all the English regions and the devolved nations of the UK. The 75 industries are classified using the Standard Industrial Classification (SIC2007). 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 of Population) are used to develop historical measures of the occupational and qualification structure of employment within industries. A combination of econometric methods and judgement is then used to generate projections of these patterns forward to 2022. This is done using the Standard Occupational Classification (SOC2010).

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 National Qualifications Framework.

Full details of the approach are set out in the separate *Technical Report*. (Wilson *et al.* (2014)). A brief summary is provided in Annex A to the present report. This 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.[20] 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.

Annexes to the present report 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. They also cover the development of the 4-digit occupational results and a summary of 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.* (2014)) 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.

[20] Results have also been produced for the devolved nations and the regions of England that together make up the UK. These are presented in a separate Annex.

2 Macroeconomic and General Labour Market Context

Key messages

- The overall picture for the UK economy over the next decade is one of gradual upturn, but with no quick return to long term trends as observed following previous recessions.
- Overall, the number of jobs in the UK is projected to rise by around 1.9 million over the next decade.
- The macroeconomic environment, as always, remains subject to risks and uncertainties, but the forecast presented here provides a useful benchmark to assess ongoing trends at a more detailed level.

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 general prospects for the labour market are then summarised briefly in Section 2.4. The sensitivity of the results to key assumptions, and the macroeconomic uncertainties, are discussed in Section 2.5. Section 2.6 concludes with a comparison with other forecasts. Comparisons with the previous set of *Working Futures* results are presented in the separate Annexes.

2.2 Exogenous assumptions

The main exogenous variables in MDM-E3 are:

- world growth in GDP;
- world inflation (GDP deflators and prices of traded goods including oil);
- UK population and natural resources (including coal, oil and natural gas);
- current and capital spending of the UK government;
- UK tax rates and allowances;
- the sterling-dollar and other exchange rates;
- UK and US interest rates.

In many cases these assumptions are developed at a very detailed level, distinguishing different commodities and types of spending and many parts of the world. In combination, these assumptions drive the path of demand for the output of goods and services produced by the UK at a very disaggregated level.

The design of the model does not impose market-clearing in the labour market, rational or consistent expectations, or a policy reaction function in response to outcomes for target indicators. The model is therefore capable, in principle, of producing scenarios in which certain combinations of assumptions produce an unsustainable outcome (e.g. steadily increasing budget or trade deficits).

However, the case adopted as the basis for these baseline projections represents a sustainable and plausible outcome on the basis of the experience of the recent past and longer term trends.

It draws on the long-term forecasts prepared by CE as part of its regular commercial forecasting services. These projections have been presented to and discussed with subscribers to CE's forecasting services, who represent a broad range of private and public sector organisations.

2.3 Macroeconomic context

2.3.1 World Economy and Exchange Rates

World GDP growth slowed to an estimated 2½ per cent in 2012 as output in the EU contracted and growth in two of the main motors of the global economy, China and India, was much weaker than in any year during the previous decade. Recent trends in the economic performance of the UK's major trading partners have been positive but the outlook for the global economy remains fragile in the short-to-medium term.

Conditions in the eurozone improved after GDP returned to growth in 2013Q2 and 2013Q3 following six consecutive quarters of negative growth. Rises in consumption and investment were behind the improvement. Industrial production and construction growth remained positive throughout 2013, although retail trade was more volatile. Despite this improvement, unemployment in the eurozone did not fall back in 2013 and youth unemployment remains very high. Labour costs continued to rise over 2013 but at a slowing rate as consumer price inflation eased and labour productivity was largely flat. Eurozone GDP fell by around 1 per cent in 2013 as a whole. However, the pick-up in economic activity has fed into business and consumer confidence, which have risen steadily since 2013Q2, and this should prevent a fall of GDP overall in 2014. However, this relies in part on an expansion in world trade, while deleveraging in the public and private sector will continue to act as a drag.

After flagging a little in 2011, US GDP growth picked up in 2012 as the growth in investment spending strengthened and the contraction in government spending slowed sharply. Following relatively slow growth in 2013Q1, GDP picked up in 2013Q2 and 2013Q3. The pick-up was largely driven by investment, as well as positive contributions from household expenditure and net trade. However, the pace of growth was not as strong as that seen in 2012.

Depressed household demand and continued government measures to tackle high sovereign debt levels are expected to prevent a return in the near future to the rapid global growth seen before the start of the financial crisis. As a result world output growth is expected to remain static in 2013, at 2½ per cent, before picking up a little to 3 per cent in 2014.

In the medium term, global growth will accelerate slowly from this historically slow pace, with strong growth in China, India and the oil-producing countries making a greater contribution to the global economy. GDP growth in the EU will accelerate only very slowly, with the core EU economies expected to experience a further decline in 2014 before returning to modest growth subsequently. The high level of national debt in the US will prevent much acceleration in GDP growth and keep it at or below 2-2¼ per cent pa. Over the long term, world GDP growth is expected to accelerate to 4-4½ per cent pa, with emerging Asia, the newer EU Member States and the economies of some other developing countries leading the way.

Global inflation eased somewhat in 2012, as the effect of commodity price increases in 2011 fell out of the figures. Annual average inflation is estimated to have slowed further in 2013, to 3 per cent, with the steepest falls in the BRICs, as slower economic growth removes inflationary pressures. In the medium term, annual average inflation is expected to stay at around 3 per cent.

2.4 UK Domestic Spending and Inflation

In the UK, domestic demand has remained weak since the recession for several reasons, including falling real wages, rising unemployment and low consumer confidence stemming from weak employment prospects and uncertainty concerning the strength of any economic recovery.

Household spending grew modestly by 1¼ per cent in 2012 (see Table 2.1), driven largely by growth in the purchase of vehicles (14 per cent). While spending on non-durable goods fell in 2012, spending on durable goods (including purchase of vehicles) remained strong. Household spending grew at a similar rate in 2013. Consumers remain uncertain about the strength of the economic recovery, but there was a modest improvement in consumer confidence during 2013H2. The rise in real wages expected in 2014 should support positive but modest growth in household spending in the medium term.

Despite announcements of various public-sector cuts, government consumption saw moderate growth, of 2¼ per cent, in 2012 and it is estimated to have posted slow growth in 2013 as a whole. But public-sector cuts are scheduled to have a greater impact in the short-to-medium term. Government consumption is expected to fall each year over 2013-16 and not return to growth until 2017 when fiscal constraints are expected to be relaxed in the face of strong demand for public services.

Investment growth has generally been weak since the recession because business confidence has been hit by uncertainty about the weak domestic recovery and the continuing eurozone debt crisis. Firms have been more inclined to retain cash reserves and invest cautiously. Limited access to finance has also held back investment, particularly for SMEs. Investment growth slowed in 2013 as falls in government investment largely counterbalanced the growth of investment in dwellings and business investment (where the sharpest increases are expected to be in Manufacturing, Information & communication and Transport & storage).

Until recently business confidence remained low, given the uncertainty surrounding the recoveries in the UK and global economies, but a gradual improvement in confidence is expected to contribute to stronger growth in investment in 2014 and the medium term. It is expected that this will be led by a marked rise in investment by the broad Financial & business services sector and support pick-ups in investment in machinery & equipment and buildings.

Meanwhile, CPI inflation has been above the Bank of England's 2 per cent target since December 2009 but has been fairly stable at around 2½ per cent since 2012Q2. It fell back to 2¼ per cent in October 2013 but is expected to pick up again in the short term as rises in energy costs in late 2013 feed into the annual comparison.

Although inflation remains just above the 2 per cent target and sterling has depreciated sharply, the strength of economic activity continues to dominate the outlook, especially in light of the strong performance of the UK economy in 2013Q2 and 2013Q3. The Monetary Policy Committee has declared its willingness to tolerate above-target inflation in the short-to-medium term with the new Governor of the Bank of England stating that interest rates are unlikely to rise until the rate of unemployment falls to 7 per cent or below. However, the MPC appears increasingly unlikely to tie itself to this one indicator as a measure of inflationary pressure.

Table 2.1: Macroeconomic Indicators for the UK

	Historical trends		Recent trends			Projections	
	2002-07	2007-12	2009-10	2010-11	2011-12	2012-17	2017-22
GDP at Market Prices (% pa)	3.1	-0.4	1.8	0.8	0.5	1.7	2.5
GVA at Basic Prices (% pa)	3.2	-0.4	1.8	1.0	0.4	1.5	2.3
excl. Extra-Regio (% pa)	3.5	-0.2	1.9	1.3	0.6	1.5	2.3
GVA per capita (% pa)	2.1	-0.5	2.4	1.0	-2.0	1.0	1.6
Manufacturing Output (% pa)	1.6	-1.6	3.8	2.0	-0.8	1.1	1.8
Household Expenditure (% pa)	2.7	-0.6	1.3	-0.9	1.3	1.8	2.3
Employment (jobs, millions)	31.8	32.1	31.3	31.3	32.1	32.8	33.9
Unemployment (claimants, millions)	0.9	1.6	1.5	1.5	1.6	1.4	1.3
CPI Inflation (% pa)	1.9	3.2	3.3	4.5	2.7	2.5	2.2
BP/GDP (%)	-2.3	-3.7	-2.5	-1.9	-3.7	-2.4	-2.1
PSNCR/GDP (%)	2.5	13.1	0.3	-2.3	13.1	10.5	11.7

Source: Cambridge Econometrics, MDM revision 12015.

Notes:

a) GDP = Gross Domestic Product

b) GVA = Gross Value Added

c) CPI = Consumer Price Index

d) The balance of payment (BP) and the public sector net cash requirements (PSNCR) are expressed as a percentage of GDP at current prices.

e) Employment, unemployment, CPI, BP/GDP and PSNCR/GDP refer to the last year of the period concerned.

f) Employment is total workplace employment (jobs) and includes HM Forces

2.5 Employment and Output

Following near zero growth in 2012, GDP began to pick up through 2013, helped by a robust outturn for household spending in 2013Q2, which was sustained in 2013H2 despite a poor trade performance and weak government spending.

With regard to the sectors, a recovery for wholesalers after a poor 2012 allowed the Distribution sector to drive GDP growth in 2013, supported by modest growth of Financial & business services.

Weak global demand for UK exports contributed to a fall in manufacturing output in 2013. Demand from non-EU countries, particularly for niche products, along with a steady improvement in domestic demand is expected to help the sector return to growth in 2014 but medium-term growth will remain modest.

Reduced government investment weighed down on construction output in 2013, but there was a marked pick up in private dwellings work in 2013H2, boosted by the government's Help to Buy scheme. Further pick-ups in buildings investment are expected to support stronger growth in construction in 2014 and the medium term.

Financial & business services enjoyed only modest output growth in 2013, limited partly by the introduction of new regulations. Output will begin to pick up in the medium term as global demand slowly recovers and firms begin to invest more. However, growth is expected to remain slow by historical standards.

Despite being held back by rises in business rates, the Distribution sector contributed much more to growth in 2013 as wholesalers recovered from a difficult 2012. However, output growth in the sector is expected to be moderate in the medium term.

Similarly, Transport & storage output bounced back in 2013, following a fall in 2012. Uncertainty around the global economy will keep trade and demand for freight services in check in 2014. This is likely to curb growth in the short term, but growth is expected to strengthen in the medium term as the improvements in the domestic and global economies lift demand for Transport services.

In the medium term, total output growth is expected to pick up but remain below trend as the contraction in Public administration weighs down on the economy. Output growth of 2-2½ per cent pa is forecast in the long term as business and consumer confidence gradually improve along with global demand. One reason for this forecast of rather modest growth is the tendency of household spending to grow only weakly.

Total employment in the UK increased by 2½ per cent in 2012, driven by strong growth in two sectors in particular: Accommodation & food services (8 per cent) and Financial & business services (5 per cent). The increase in Accommodation & food services was mainly driven by one-off events such as the Jubilee and the London Olympic and Paralympic Games and so employment declined in 2013 as conditions returned to normal, but modest growth is forecast in the medium term. The increase in Financial & business services employment was most likely due to the greater degree of stability in global markets during 2012. Within the eurozone, some stability was given by Mario Draghi's pledge in July 2012 to do 'whatever it takes' to save the euro. The forecast for 2013 and 2014 indicates continued employment growth in Financial & business services, albeit at a more moderate rate of between 1 per cent and 2 per cent.

An overall fall of ¼ per cent in employment in Public administration, education, health and social work in 2012 is unsurprising given the continued deficit reduction programme. A small increase in employment in 2013 provided some respite, but this is expected to be followed by further falls in the short and medium term as the deficit reduction programme deepens in a bid to make an additional £11.5bn in savings by 2016 (on top of the reduction in public spending that had already been announced).

The other sector that saw a large decline in employment in 2012 was Construction. The government has announced several initiatives designed to boost house building and infrastructure work. This appears to be bearing some fruit and so the construction industry is likely to see robust employment growth in the medium term, but skills shortages remain an issue.

Services sectors, such as Information & communications, are likely to see the strongest employment growth in the medium term. In contrast, Manufacturing and Agriculture are forecast to see further declines in employment, albeit only modest falls in Manufacturing.

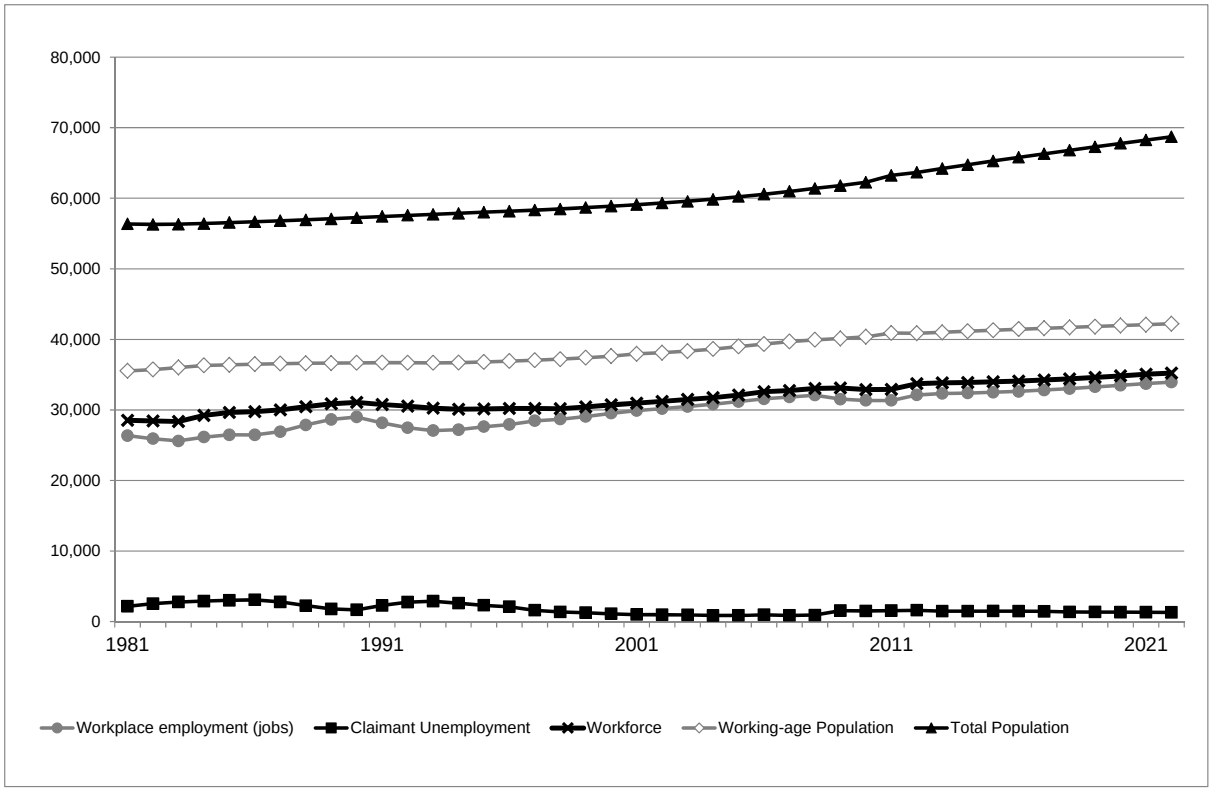
In the long term, Construction is expected to see the strongest rate of employment growth, particularly over 2017-22, and faster than the average for the whole economy. In view of the planned continuation of deficit reduction, employment in government services is forecast to grow only weakly, by about ¼ per cent pa over 2012-22. Continued declines are forecast for manufacturing, mining & quarrying and agriculture. Prospects by sector are discussed in more detail in Section 3 below.

2.6 General labour market prospects

2.6.1 Population and the Labour Force

Over the period 2002-12, the UK total resident population increased by 4.4 million (7.3 per cent) to 63.7 million (see Figure 2.1). Most of this increase came in the 2007-12 period. This was reflected in a 9.3 per cent increase (2002-12) in the size of the labour force, which rose by 2.7m to 31.8 million by 2012.

Figure 2.1: Population, Unemployment and Labour Force Trends, 1981-2022 (000s)



Source: Cambridge Econometrics, MDM revision 12015

Table 2.2: Population and Labour Force in the UK

						percentage change over period			
	2002	**2007**	**2012**	**2017**	**2022**	**2002-2007**	**2007-2012**	**2012-2017**	**2017-2022**
Male									
Population	28,952	29,868	31,304	32,713	33,984	3.2	4.8	4.5	3.9
Population 16+	22,917	23,924	25,169	26,229	27,149	4.4	5.2	4.2	3.5
Labour Force	15,734	16,654	17,155	17,744	18,284	5.8	3.0	3.4	3.0
Activity Rate	69	70	68	68	67	1.4	-2.1	-0.7	-0.5
ILO Unemployment	901	905	1,428	1,586	1,652	0.5	57.8	11.1	4.1
Employment (headcount)	14,834	15,749	15,726	16,158	16,632	6.2	-0.1	2.7	2.9
Labour Market Residual (2)	1,137	1,141	1,282	1,150	1,150	0.0	0.0	0.0	0.0
Jobs = headcount + residual	15,970	16,890	17,008	17,308	17,782	5.8	0.7	1.8	2.7
Female									
Population	30,368	31,121	32,374	33,593	34,736	2.5	4.0	3.8	3.4
Population 16+	24,613	25,451	26,525	27,405	28,208	3.4	4.2	3.3	2.9
Labour Force	13,308	14,059	14,636	15,372	15,753	5.6	4.1	5.0	2.5
Activity Rate	54	55	55	56	56	2.2	-0.1	1.6	-0.4
ILO Unemployment	615	685	1,068	1,346	1,106	11.4	55.8	26.1	-17.8
Employment (headcount)	12,693	13,374	13,568	14,026	14,647	5.4	1.5	3.4	4.4
Labour Market Residual (2)	1,520	1,561	1,535	1,454	1,504	0.0	0.0	0.0	0.0
Jobs = headcount + residual	14,213	14,935	15,104	15,480	16,151	5.1	1.1	2.5	4.3
Total									
Population	59,320	60,988	63,678	66,306	68,721	2.8	4.4	4.1	3.6
Population 16+	47,530	49,376	51,694	53,634	55,358	3.9	4.7	3.8	3.2
Labour Force	29,042	30,713	31,790	33,116	34,036	5.8	3.5	4.2	2.8
Activity Rate	61	62	62	62	61	1.8	-1.1	0.4	-0.4
ILO Unemployment	1,516	1,590	2,496	2,933	2,758	4.9	56.9	17.5	-6.0
Employment (headcount)	27,527	29,123	29,294	30,184	31,279	5.8	0.6	3.0	3.6
Labour Market Residual (2)	2,656	2,702	2,818	2,605	2,655	0.0	0.0	0.0	0.0
Jobs = headcount + residual	30,183	31,825	32,112	32,788	33,933	5.4	0.9	2.1	3.5

Source: CE/IER estimates; CE projections MDM C132F1A (revision 12015)

Notes:

(1) 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.

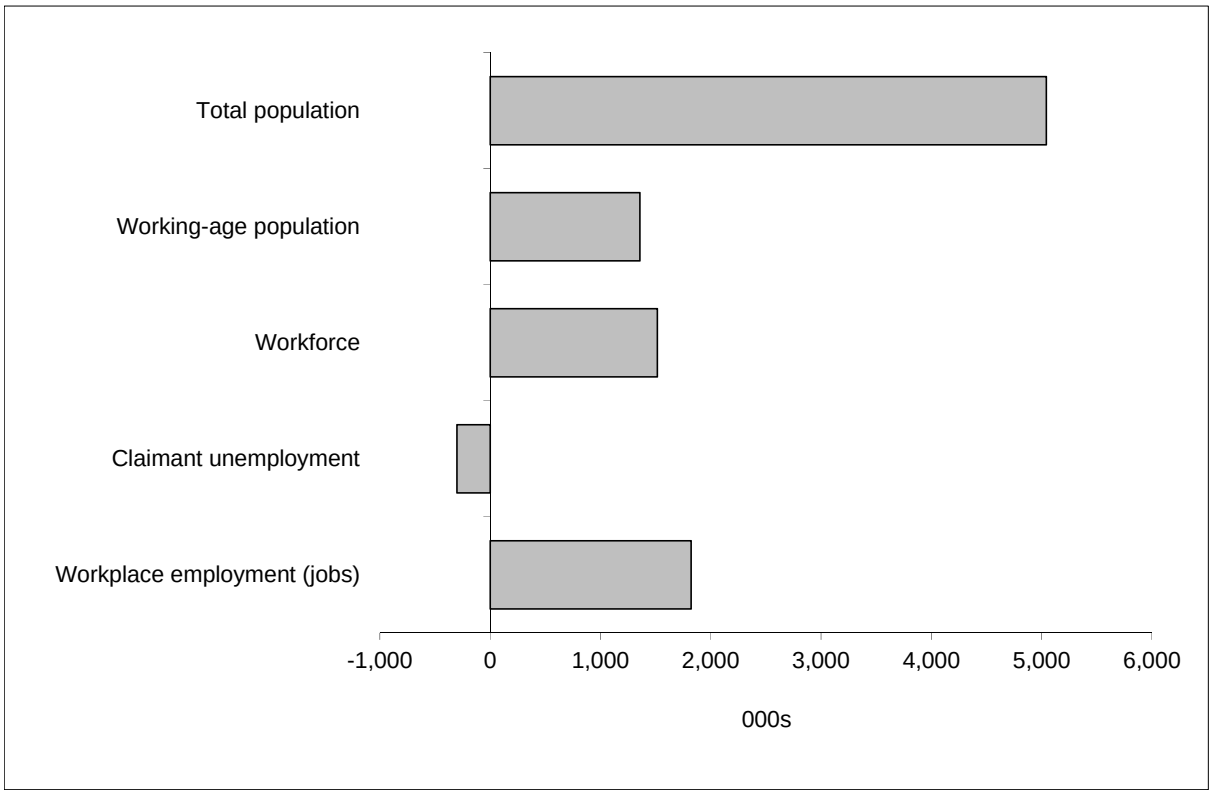
(2) Labour Market Residual is the difference of employment (number of jobs) and head count employment

The demographic assumptions embodied in the forecast incorporate the estimates of the mid-year UK population to 2011, together with the interim 2011-based population projections for England which were published in September 2012 and the 2010-based UK population projections which were published in October 2011. Over 2012-22, the UK population is expected to grow by 0.8 per cent per annum and so experience a slightly larger increase (7.8 per cent) compared to 2002-12. However, the population aged over 16 will grow at a slower rate over 2012-22 than over 2002-12 (see Table 2.2). As a result, the working age population is expected to increase by around 1.4 million (3.3 per cent) over 2012-22 (see Figure 2.2).

The number of children in the population declined in the early part of the 2002-12 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 12.0 million in 2012. By 2022 the number of children is projected to be 11½ per cent (around 1.4 million) higher than the 2012 level.

Overall, labour market participation, or activity rates, over the decade to 2012 increased slightly, but this was the result of a rising activity rate for women (by around 1 percentage point) and a falling activity rate for men (by 0.5 percentage points). However, by 2012 the activity rate of women was still about 13 percentage points lower than the activity rate for men.

Figure 2.2: Changes in Key Labour Market Indicators for the UK, 2012-2022 (000s)



Source: Cambridge Econometrics, MDM revision 12015

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 force and, over the period 2012-22, the gradually increasing pension age for women from 59 to 64. Overall participation rates are expected to increase slightly over 2012-17 but then see little change, such that the rate in 2022 will be about the same as in 2012.

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 still rising. This trend is projected to continue out to 2017; thereafter the female participation rate is forecast to remain about the same to 2022.

Labour market participation rates for younger people have fallen steadily in recent years as educational participation beyond the age of compulsory schooling has risen. However, participation rates of younger people are expected to stabilise in the coming years; the expansion of higher education is expected to be curbed by higher tuition fees (which apply to most parts of the UK) and uncertainties over future demand for graduate employment.

Activity rates for older workers (age 60-64), especially males, had fallen during the early-2000s as people chose to take rising real incomes in the form of earlier retirement. However, since the recession, these participation rates stopped falling, and along with those for the over 65s, participation rates are projected to rise due to concerns about the sustainability of pensions and planned rises in the State Pension age (see Box 2.1).

2.7 Employment

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

- numbers of jobs;
- numbers of people in employment (heads);
- by area of workplace; and
- by area of residence.

In most of *Working Futures 2012-2022*, 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.

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 2012-2022* 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: employed residents plus ILO unemployment.

Box 2.1 *(continued)*: Definitions of Employment and Related Labour Market Indicators

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.

2.7.1 Employment by Gender and Status

In 2012, employment (workplace jobs) in the UK increased by 2½ per cent. The steepest growth was in self-employment, especially among females (see Figures 2.3 & 2.4). Female self-employment increased by 7¾ per cent in 2012 and male self-employment rose by 6 per cent. There was also a substantial growth of just over 3½ per cent in male part-time employment, whereas female part-time employment grew modestly, by 1 per cent. However, female full-time employment rose by 2¾ per cent in 2012 compared with 1½ per cent growth in male full-time employment.

The result is that around 59 per cent (18.9 million) of all jobs in the UK in 2012 were full-time, while around 28 per cent (9.1 million) were part-time. The remaining 13 per cent (4.2 million) were self-employed (see Table 2.3).

Table 2.3: Employment Status, 2012-2022

Level				**000's**
2012				
Employment by Gender	Full-time	Part-time	Self-employed	Total
Male	11,755	2,412	2,842	17,008
Female	7,121	6,639	1,344	15,104
Total	18,876	9,050	4,186	32,112
2017				
Employment by Gender	Full-time	Part-time	Self-employed	Total
Male	11,853	2,625	2,831	17,308
Female	7,353	6,779	1,348	15,480
Total	19,206	9,404	4,179	32,788
2022				
Employment by Gender	Full-time	Part-time	Self-employed	Total
Male	12,054	2,890	2,839	17,782
Female	7,710	7,076	1,365	16,151
Total	19,765	9,965	4,204	33,933

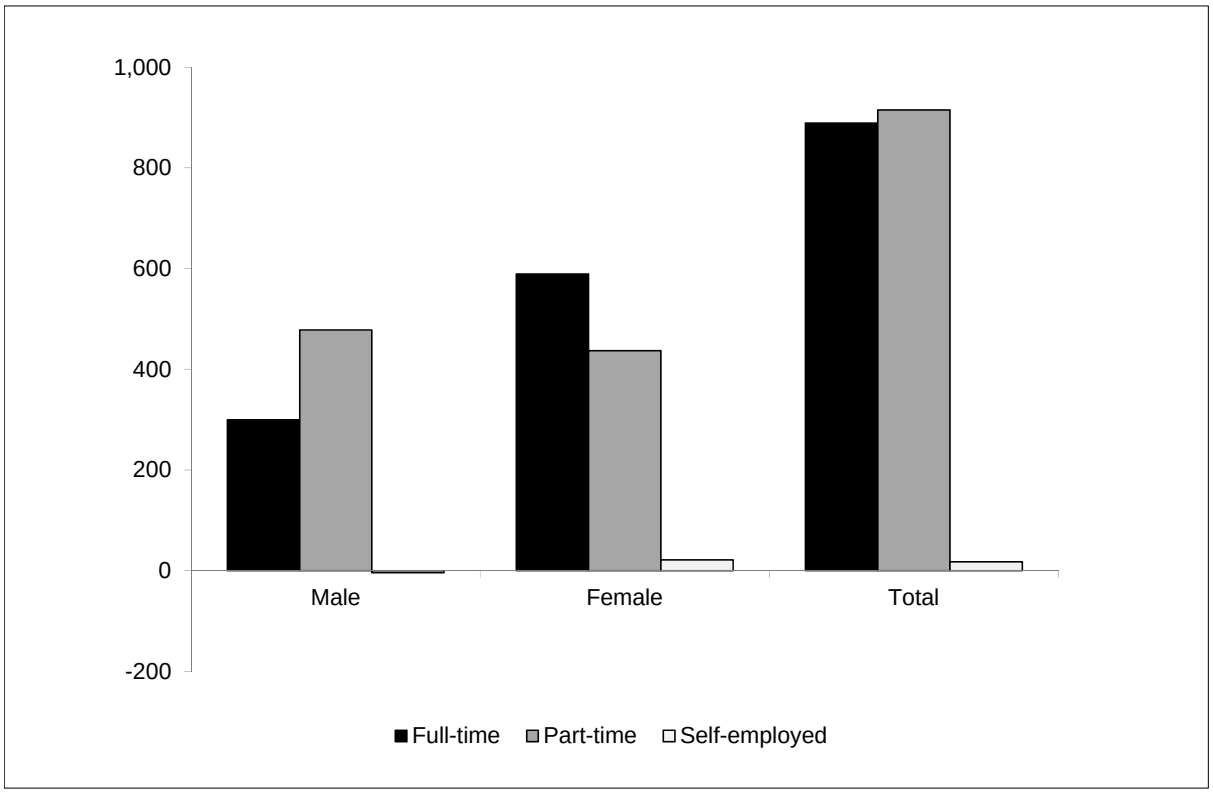
% of total				**%**
2012				
Employment by Gender	Full-time	Part-time	Self-employed	Total
Male	37	8	9	53
Female	22	21	4	47
Total	59	28	13	100
2017				
Employment by Gender	Full-time	Part-time	Self-employed	Total
Male	36	8	9	53
Female	22	21	4	47
Total	59	29	13	100
2022				
Employment by Gender	Full-time	Part-time	Self-employed	Total
Male	36	9	8	52
Female	23	21	4	48
Total	58	29	12	100

Change				**000's**
2012-2017				
Employment by Gender	Full-time	Part-time	Self-employed	Total
Male	98	213	-12	300
Female	232	141	4	376
Total	330	354	-8	676
2017-2022				
Employment by Gender	Full-time	Part-time	Self-employed	Total
Male	202	265	8	474
Female	357	296	17	671
Total	559	561	25	1,145
2012-2022				
Employment by Gender	Full-time	Part-time	Self-employed	Total
Male	300	478	-4	774
Female	589	437	21	1,048
Total	889	915	18	1,821

Source: Cambridge Econometrics, MDM revision 12015

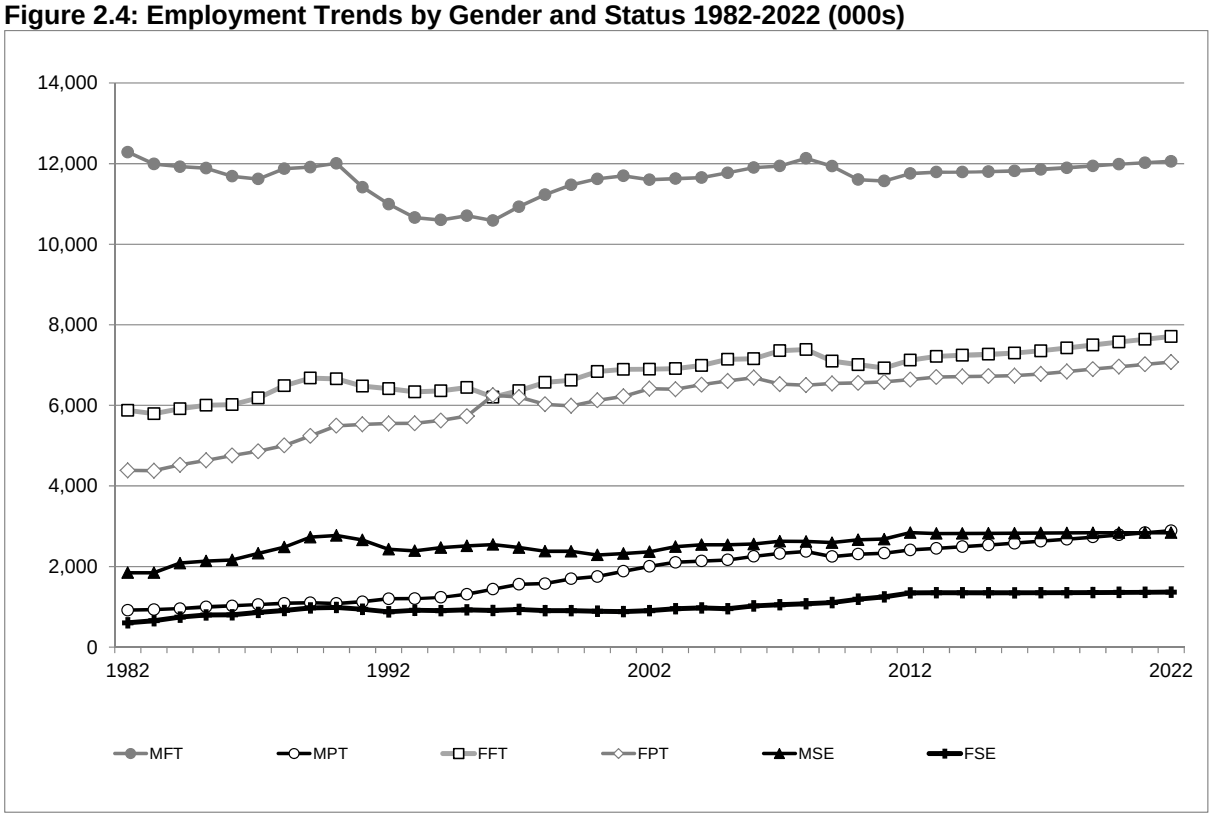
Numbers may appear not to sum due to rounding.

Figure 2.3: Changes in Employment by Status, UK, 2012-2022 (000s)



Source: Cambridge Econometrics, MDM revision 12015

Figure 2.4: Employment Trends by Gender and Status 1982-2022 (000s)



Source: Cambridge Econometrics, MDM revision 12015

Among men, full-time employee (jobs) was the dominant status, accounting for around 69 per cent (11.8 million) of all jobs held by men. Around 2.4 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 2012, while around 44 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. If this is what is happening, it may explain why productivity is not growing as fast as many economists would expect post-recession. It may also be symptomatic of a weak economy.

At ¾ per cent in the year to June 2013, employment growth is estimated to have been weaker than it was in 2012. In 2013 the overall growth in part-time jobs is estimated to have been stronger than the growth in full-time jobs and self-employment: male and female part-time employment grew by 1½ per cent and 1 per cent respectively in 2013. Contrary to recent years, overall self-employment is estimated to have fallen, albeit by only ¼ per cent.

At just ¼ per cent, employment growth in 2014 is forecast to be weaker than in 2013, as the government's deficit reduction measures continue to impact on employment, particularly in public administration. The greatest *increase* is again expected to be in part-time employment, driven by an increase in male part-time employment of 1¾ per cent. Female part-time employment is expected to see little growth. Growth in male and female full-time employment is expected to be modest, and, continuing the trend of the previous year, self-employment is expected to fall slightly.

Over 2012-22 female full-time employment is projected to continue growing at a faster pace (¾ per cent per annum) than male full-time employment (¼ per cent per annum).

2.7.2 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 1.6m in February 2012 to 1.31m in October 2013. 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 signal that the labour market is improving. Interestingly, the percentage decrease in those claiming JSA between May and June 2013 was the same in the 18-24 and the 25-49 age groups. For both age groups, the number of people claiming JSA fell by 1.6 per cent, adding further to the evidence that the short-term prospects for young people had improved.

The Labour Force Survey (LFS) paints a similar picture of gradual improvement in the UK labour market in 2012 and 2013. The LFS measure of unemployment, which is consistent with the International Labour Organisation's definition (ILO), fell during 2012 and 2013. Although the unemployment rate remains high compared to pre-recession levels of around 5 per cent, at around 7½ per cent, it is still favourable compared to the European Union as a whole. Unemployment there has been moving in the opposite direction to the UK and stood at 11 per cent between July and September 2013.

The LFS reveals the shift in employment from the public to the private sector. Between 2012Q3 and 2013Q3, the number employed in the public sector fell by 104,000 while the number employed in the private sector increased by 380,000. 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 rise from 2.5 million in 2012 to 2.9 million in 2017, as the expansion of the labour force outpaces growth of employment, before falling back to 2.75 million in 2022. Over 2012-17, robust population growth and rising participation of females will drive substantial expansion of the labour force. Consequently, and even though employment of females is forecast to grow faster than that of males, there will be a larger rise in unemployment over 2012-17 for females than for males. During 2017-22, the growth of female employment is forecast to accelerate, 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 as male unemployment continues rising, albeit at a slower pace than over 2012-17.

2.8 Macroeconomic uncertainties

There are a number of risks and uncertainties surrounding the macroeconomic forecast presented in this section, and these are discussed below.

2.8.1 The strength of the eurozone recovery

The eurozone remains a risk, with anaemic growth expected to continue in the short-to-medium term. Any recovery is likely to be vulnerable to shocks especially with low confidence and the constraints of deficit reduction measures. This means that there is likely to be weak demand from the eurozone for UK exports, and sterling is also expected to appreciate a little against the euro in 2014.

In addition, in the US uncertainty remains over negotiations over the federal budget. These uncertainties over global growth have potential impacts not only on demand for UK exports, but also on global financial markets and UK access to credit.

2.8.2 Long-term unemployment in the UK

The number of people in long-term unemployment has fallen slowly each month between March and September 2013. However, levels still remain high and there are risks to the workforce and productivity if this is maintained.

2.8.3 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.[21] 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.

2.8.4 UK asset prices

House price inflation started to pick up early in 2013 to reach record levels by September. While a pick-up in activity in the housing market could help boost GDP growth, there is also a potential risk that this could lead to a house price bubble, especially as price rises have been concentrated in London and the South East. Prices are expected to rise further as the Government's Help to Buy scheme increases demand.

In addition, in the final months of 2013 global stock markets reached new highs, and prompted some concerns over asset price inflation.

2.8.5 The strength of the recovery of UK business investment

The baseline forecast assumes that improved business confidence will support a gradual pick-up of business investment. However, a much sharper recovery of investment in the near term could be prompted if the recent improvements in business confidence are consolidated; much investment has been previously delayed and many large non-financial corporations have the finances to invest.

2.8.6 Referenda on political union

The forecast assumes that the UK will continue to include Scotland and that the UK will remain a member of the EU. Both of these assumptions would need to be reassessed if the planned referenda result in the country following a different path.

[21] 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.

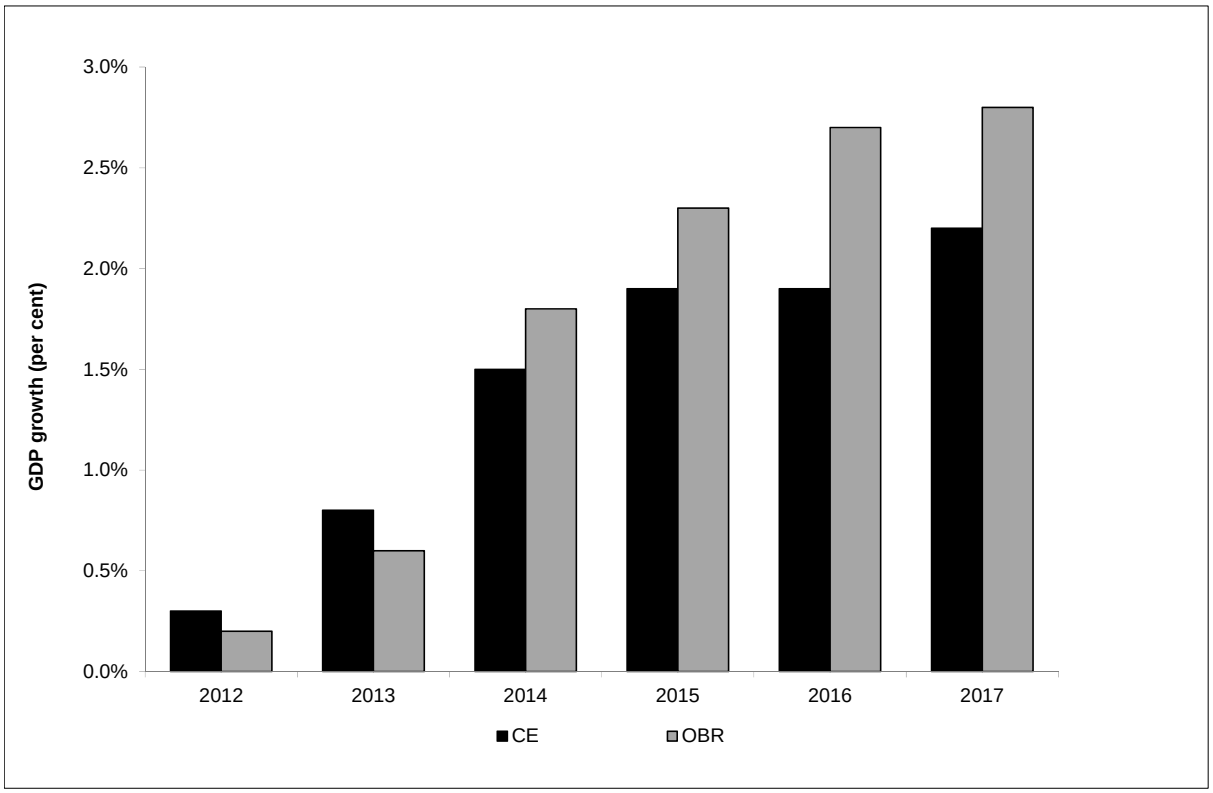
2.9 Comparison of forecasts

The *Working Futures* projections are underpinned by the Cambridge Econometrics (CE) baseline forecast that was finalised in July 2013. Few long-term forecasts are publicly available against which comparisons can be made, but Figure 2.5 compares CE's medium-term GDP forecast with that of the Office for Budget Responsibility (OBR, published in March 2013[22]).

The CE forecast is less optimistic than that of OBR. As described above, CE forecasts that GDP growth will remain subdued, reaching no more than 2 per cent pa in the years to 2016. In contrast, OBR forecasts a more rapid return to growth, with GDP growth expected to exceed 2½ per cent pa in 2016 and 2017. The OBR forecast is underpinned by a stronger recovery of business and private dwellings investment. OBR assumes that credit conditions will begin to normalise and real wages and productivity will start to recover, supporting stronger growth of household expenditure than CE forecasts in 2016 and 2017. In addition, OBR is a little more upbeat than CE about the UK trade performance; over 2013-17 OBR forecasts that net trade will make a small positive contribution to GDP growth (+0.1pp pa) whereas CE expects it to make zero contribution. Consequently, OBR forecasts slightly faster growth of (headcount) employment, 0.6 per cent pa over 2013-17, compared to 0.4 per cent pa forecast by CE, and that ILO unemployment will fall to just less than 7 per cent by 2017, whereas CE expects it will exceed 8 per cent.

[22] The latest OBR report was published 6 December 2013.

Figure 2.5: Comparison of CE and OBR GDP forecasts



Source: Cambridge Econometrics MDM-E3 revision 12015 July 2013, Office for Budget Responsibility Economic and Fiscal Outlook March 2013.

More recent data show that since mid-2013 the pace of UK growth has accelerated, and survey results show that business and consumer confidence has improved. This momentum is likely to spill over into the coming months, and GDP growth in 2013 and 2014 looks likely to be a little faster than in CE's baseline forecast for *Working Futures*. However, the outlook for global growth appears to be deteriorating, with political discord in the US and ongoing uncertainty regarding Eurozone sovereign debt; and if the UK government sticks to its plans, domestic growth will be held back by the planned cuts in spending. GDP growth is expected to pick up in the next few years in the *Working Futures* baseline, but is forecast to remain below pre-recession long-term rates for several years yet.

3 Sectoral Output and Employment Prospects

Key messages

- General growth prospects for 2012 to 2022 are somewhat more positive than historic performance in the decade to 2012, although the rate of recovery is forecast to be modest relative to the pre-recession picture.
- Total GVA growth is forecast to be affected by below trend growth in business & other services.
- Trade, accommodation and transport output is also forecast to recover modestly while the manufacturing sector is expected to experience an improved rate of growth compared with the previous decade, but with deceleration in the long term under pressure from global competition in domestic and overseas markets.
- Employment in public services is expected to recover slowly in the long term with the relaxation of deficit reduction measures after 2016.
- Employment in private services is forecast to increase by over 1.5 million jobs over 2012-22.

3.1 General prospects

Output

This section focuses on six broad sectors with Table 3.1 and Figure 3.1 showing their long-term aggregate output projections. The top two panels of Table 3.1 show how the structure of the economy has changed over the past two decades and what is implied from the forecast. The bottom two panels show historical and expected patterns of growth; the third panel presents annual growth rates, while the last panel shows the total percentage change over the period covered. Figure 3.1 presents the annual rates of growth over the three decades graphically.

Table 3.1: Output by Broad Sector, 2012-2022

	1992	2002	2012	2017	2022
GVA levels (£2009m)					
Primary sector & utilities	70,113	93,084	65,278	64,012	63,732
Manufacturing	131,214	138,954	138,945	146,584	160,194
Construction	74,890	91,934	87,931	95,848	107,727
Trade, accomm. & transport	165,846	227,316	240,599	259,276	281,198
Business & other services	205,950	335,375	452,935	509,526	585,714
Public admin, health, education	187,126	218,858	262,005	263,291	295,698
Total	817,663	1,136,520	1,305,252	1,404,076	1,571,651

GVA Share (%)	**1992**	**2002**	**2012**	**2017**	**2022**
Primary sector & utilities	8.6	8.2	5.0	4.6	4.1
Manufacturing	16.0	12.2	10.6	10.4	10.2
Construction	9.2	8.1	6.7	6.8	6.9
Trade, accomm. & transport	20.3	20.0	18.4	18.5	17.9
Business & other services	25.2	29.5	34.7	36.3	37.3
Public admin, health, education	22.9	19.3	20.1	18.8	18.8
Total	100	100	100	100	100

GVA Growth (% pa)	**1992-2002**	**2002-2012**	**2012-2017**	**2017-2022**	**2012-2022**
Primary sector & utilities	2.9	-3.5	-0.4	-0.1	-0.2
Manufacturing	0.6	0.0	1.1	1.8	1.4
Construction	2.1	-0.4	1.7	2.4	2.1
Trade, accomm. & transport	3.2	0.6	1.5	1.6	1.6
Business & other services	5.0	3.1	2.4	2.8	2.6
Public admin, health, education	1.6	1.8	0.1	2.3	1.2
Total	3.3	1.4	1.5	2.3	1.9

GVA Growth (%)	**1992-2002**	**2002-2012**	**2012-2017**	**2017-2022**	**2012-2022**
Primary sector & utilities	32.8	-29.9	-1.9	-0.4	-2.4
Manufacturing	5.9	0.0	5.5	9.3	15.3
Construction	22.8	-4.4	9.0	12.4	22.5
Trade, accomm. & transport	37.1	5.8	7.8	8.5	16.9
Business & other services	62.8	35.1	12.5	15.0	29.3
Public admin, health, education	17.0	19.7	0.5	12.3	12.9
Total	39.0	14.8	7.6	11.9	20.4

Source: Cambridge Econometrics, MDM revision 12015

Notes:

a. The six broad sectors are defined in Annex A and in the separate Technical Report.

b. Total output of the six broad sectors differs from total GVA; the latter includes ownership of dwellings.

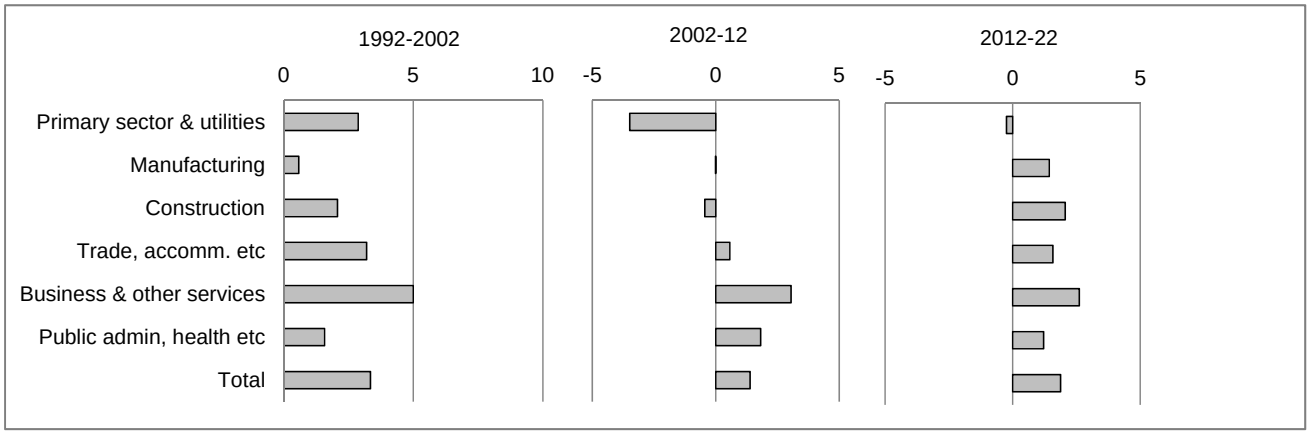
GDP growth is forecast to pick-up in 2014 following modest growth in 2013. This will be supported by a pick-up in investment and further modest growth in household consumption. However, falling government consumption is expected to constrain overall growth in the short term. Growth will be led by Business & other services and supported by a gradually recovering Construction sector. Government deficit reduction measures are expected to lead to a fall in output in Public Administration, health and education in 2014.

In the medium term, GDP growth is forecast to remain modest. Weak output performance in Public administration, health and education will constrain overall growth until at least 2017 when deficit reduction measures are then expected to be relaxed. Business & other services will continue to lead growth in the medium term although growth in the sector will remain subdued compared to the historical trend. Global and domestic demand are expected to recover only gradually; hence, Manufacturing and Trade, accommodation & transport are forecast to record only modest growth in the medium term.

In the longer term (2017-22), UK output is forecast to grow by around 2.3 per cent per annum. This will be driven by a recovery in Business & other services and Construction. There will also be support from Public administration, health and education which should begin to grow again when cuts in spending on public services come to an end. All sectors aside from Primary sector & utilities will pass pre-recession levels of output before 2022.

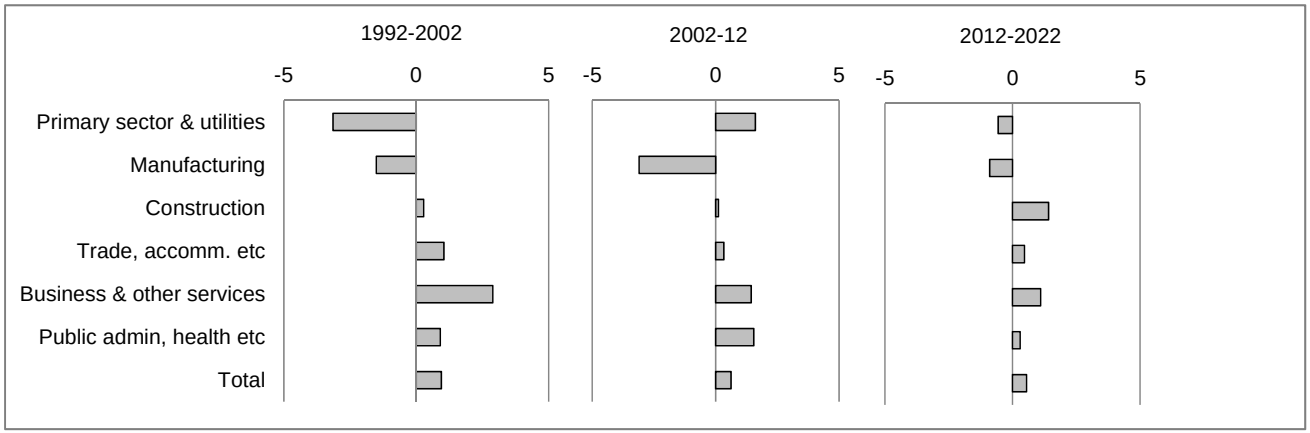
Looking at the changing structure of the economy, only Primary sectors & utilities is expected to see a noticeable fall in its share of total output (principally because UK extraction of oil & gas is projected to decline) while the shares of most other broad sectors will remain largely unchanged. Manufacturing is not expected to increase its share of the economy because of relatively poor trade performance in the face of increasing pressure from international manufacturing competitors. However, the contribution of manufacturing output is not expected to shrink as fast as in recent decades; manufacturing is forecast to contribute only a slightly smaller proportion of UK output in 2022 compared to 2012.

Figure 3.1: Output growth by Broad Sector, 1990-2020 (per cent per annum)



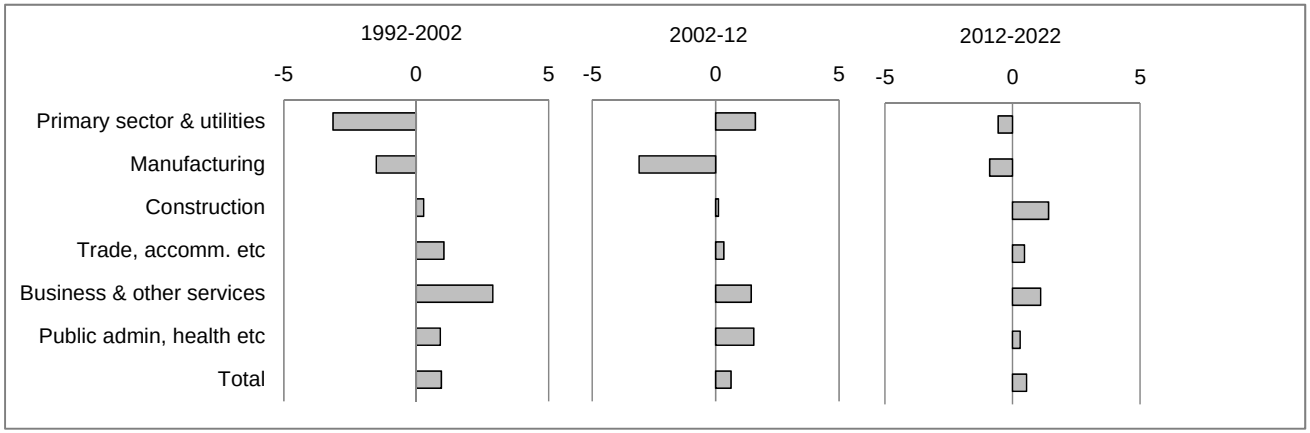
Source: Cambridge Econometrics, MDM revision 12015.

Figure 3.2: Employment growth by Broad Sector, (per cent p.a.)



Source: Cambridge Econometrics, MDM revision 12015.

Figure 3.3: Employment growth by Broad Sector, (000s)



Source: Cambridge Econometrics, MDM revision 12015.

Employment

The forecast for employment across the six broad sectors is summarised in Table 3.2 and Figures 3.2 and 3.3. The top two panels of Table 3.2 summarise the structure of the economy in terms of employment, while the bottom two panels summarise historical and forecast employment growth. Figure 3.2 presents annual rates of growth over the last two decades and the forecast period, while Figure 3.3 presents absolute changes in job levels.

With government deficit reduction measures expected to persist until 2016, public-sector job cuts are expected in the short-to-medium term. The forecast suggests that the private sector, particularly trade, accommodation & transport and business & other services, will create enough jobs such that total employment achieves modest growth of just under ½ per cent per annum over the 2012-17 period.

UK employment is forecast to grow by an average of 0.7 per cent per annum over 2017-22. Employment in Primary sector & utilities is forecast to stagnate while Manufacturing experiences a decline. However, employment in all other sectors is forecast to grow over the period.

Employment in the Manufacturing sector has been declining since the turn of the century across most sub-sectors. This is as the UK has struggled to keep up with its international competitors with only niche manufacturing sub-sectors growing in the UK. Manufacturing employment is expected to fall further as automation in the sector gradually increases. In comparison with 2012, employment in the sector is forecast to have fallen by over 200,000 jobs by 2022 (a fall of just under one per cent pa over 2012-22). Manufacturing is expected to account for around one percentage point less of total employment by 2022.

Construction employment is forecast to grow faster compared to any other broad sector over 2017-22. Following a boost to the sector from the housing market in the short-to-medium term, construction employment will receive a further boost in the long term from a revival in government demand and a number of planned major infrastructure projects. However, the rate of growth will still remain slower than pre-recession growth during the mid-2000s.

Modest growth is forecast for employment in the Trade, accommodation & transport sector as a slow recovery in consumer confidence and incomes holds the sector back. Even so, the sector is relatively large and is forecast to generate around 414,000 jobs over 2012-22 and to continue to account for more than one quarter of total UK employment.

Business & other services employment is forecast to grow by an average of just over 1 per cent per annum over 2012-22. Most of this will occur in the first half of the decade as UK investment is expected to pick up from 2014. Modest growth will then be maintained through to 2022, resulting in a net increase of more than 1,100 jobs over 2012-22.

In the longer term, employment in Public administration, health and education is forecast to grow in line with the total economy over 2017-22 as the easing of deficit reduction measures allows creation of public-sector jobs. This means that employment will be around 250,000 jobs higher in 2022 compared to 2012. However, the proportion of UK employment accounted for by Public administration, health and education is forecast to shrink a little by 2022.

Table 3.2: Employment by Broad Sector, 2012-2022

	1992	2002	2012	2017	2022
Employment levels (000s)					
Primary sector & utilities	960	698	819	769	773
Manufacturing	4,221	3,627	2,646	2,542	2,417
Construction	1,932	1,986	2,010	2,151	2,312
Trade, accommodation, transport	7,468	8,289	8,572	8,651	8,986
Business & other services	6,300	8,376	9,665	10,327	10,788
Public admin, health and education	6,581	7,207	8,401	8,350	8,657
Total	27,461	30,183	32,112	32,788	33,933

Employment share (per cent of total)	1992	2002	2012	2017	2022
Primary sector & utilities	3.5	2.3	2.5	2.3	2.3
Manufacturing	15.4	12.0	8.2	7.8	7.1
Construction	7.0	6.6	6.3	6.6	6.8
Trade, accommodation, transport	27.2	27.5	26.7	26.4	26.5
Business & other services	22.9	27.8	30.1	31.5	31.8
Public admin, health and education	24.0	23.9	26.2	25.5	25.5
Total	100.0	100.0	100.0	100.0	100.0

Employment growth (% pa)	1992-2000	2002-2012	2012-2017	2017-2022	2012-2022
Primary sector & utilities	-3.1	1.6	-1.2	0.1	-0.6
Manufacturing	-1.5	-3.1	-0.8	-1.0	-0.9
Construction	0.3	0.1	1.4	1.5	1.4
Trade, accommodation, transport	1.0	0.3	0.2	0.8	0.5
Business & other services	2.9	1.4	1.3	0.9	1.1
Public admin, health and education	0.9	1.5	-0.1	0.7	0.3
Total	0.9	0.6	0.4	0.7	0.6

Employment change (000s)	1992-02	2002-12	2012-17	2017-22	2012-22
Primary sector & utilities	-263	121	-50	4	-45
Manufacturing	-594	-981	-104	-124	-228
Construction	55	24	141	161	302
Trade, accommodation, transport	821	284	79	336	414
Business & other services	2,076	1,289	662	461	1,123
Public admin, health and education	627	1,194	-52	307	255
Total	2,722	1,929	676	1,145	1,821

Source: Cambridge Econometrics, MDM revision 12015

Notes:

a. *The six broad sectors are defined in the Technical Report.*

b. *Total employment and employment in non-market services includes H. M. Forces.*

c. *b. Numbers may appear not to sum due to rounding.*

3.2 Prospects by broad sector

3.2.1 Primary Sector & Utilities

Output

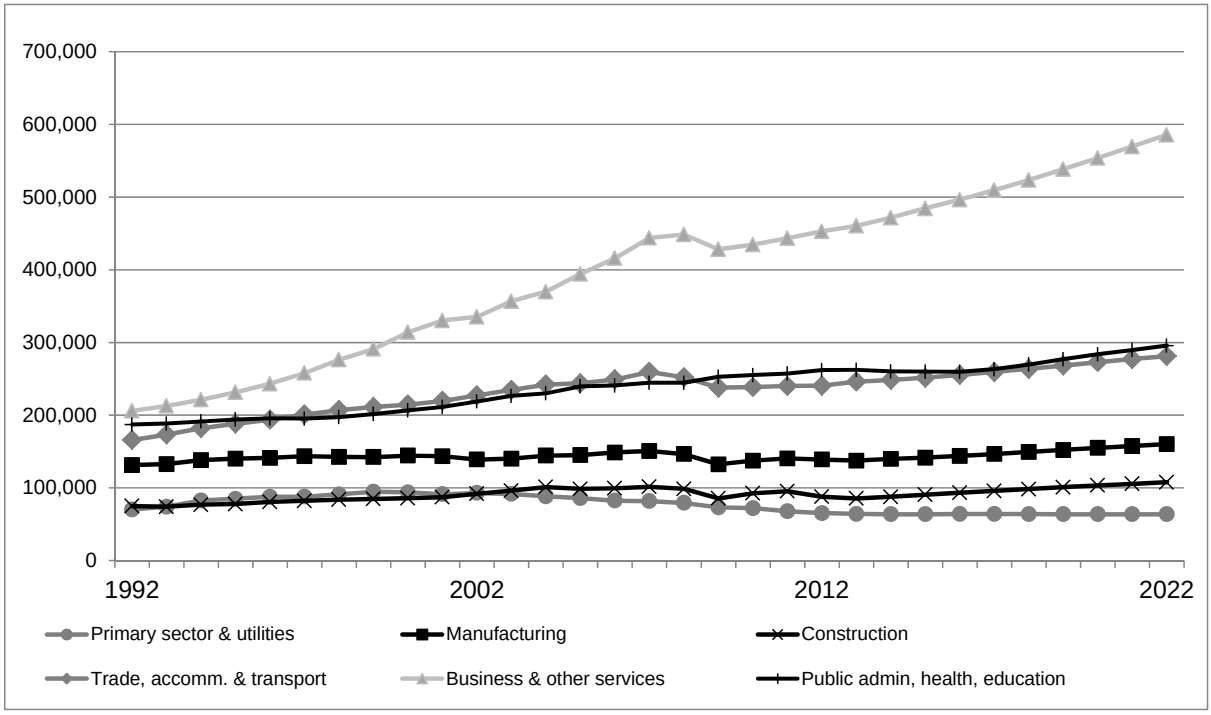
The Primary sector & utilities sector consists of three distinctly different types of industry: agriculture, mining & quarrying and utilities services. The sector accounted for 5 per cent of total GVA in 2012. Total output in the Primary sector & utilities declined at an average of 3.5 per cent per annum between 2002 and 2012. This was driven by steep falls in output for the agriculture and extraction sub-sectors. Output in the broad sector is forecast to decline by 2.4 per cent between 2012 and 2022 reflecting a deceleration in the rate of decline over 2012-17 followed by a further deceleration over 2017-22. Modest growth is forecast for agriculture and utilities but the broad sector will be held down by a continued steep decline in mining & quarrying output because extraction of oil & gas is projected to decline.

The impact of the recession on the agriculture sub-sector was intensified by cost pressures, particularly from fuel and animal feed. Output initially fell by 6.3 per cent in 2009 and it has continued to fall in each year since as cost pressures have persisted (exacerbated by poor crop yields in the US in 2012). However, an expected easing of commodity prices will decrease cost pressures on the agriculture sector which will contribute to weak output growth in the medium term.

Agriculture is expected to maintain modest growth over 2017-22. In the long run a gradual rise in global demand for food (supported by rising population and incomes) will support growth in the UK agriculture sector.

Output in mining & quarrying continued to fall sharply in 2012 and further falls are expected in 2013 and 2014. The declining viability of coal seams and of the UK Continental Shelf (UKCS) places a physical constraint on the long-term growth of the coal and oil & gas industries. As it becomes more difficult (and expensive) to extract more fuel, the output of these sectors will continue to decline.

Figure 3.4: Output by Broad Sector (£m)



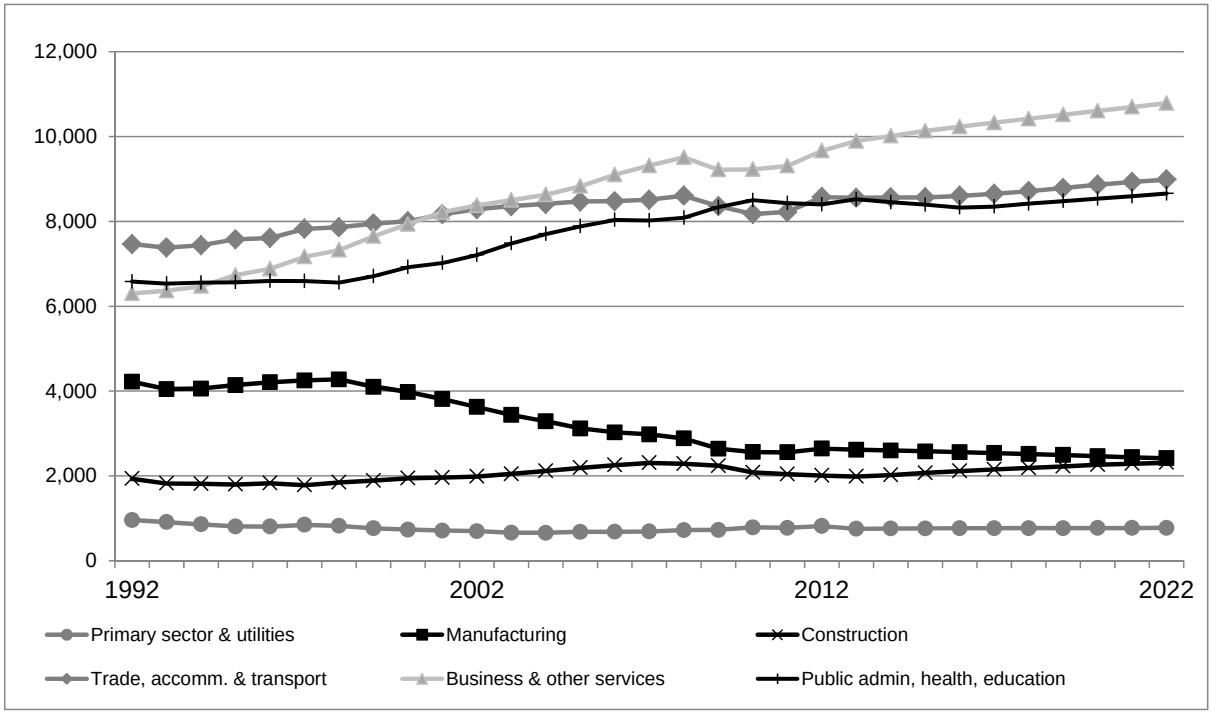
Source: Cambridge Econometrics, MDM revision 12015

Economic factors that will influence the future output of these sectors include adequate economic demand and, because these two extraction industries produce commodities, global prices. From a demand point of view, environmental legislation and energy policies will continue to grow in importance.

Any modest growth in coal demand in the short-to-medium term will be driven by modest growth in industrial demand for electricity as the economy slowly recovers from recession.

In the long term, coal production is projected to decline a little less than oil and gas production, at around 3 per cent per annum, since although it struggles for competitiveness, it will not be as hampered by declining reserves. Demand for coal is forecast to decline in the long term partly due to the Climate Change Agreements, resulting in energy savings and energy efficiency in the energy-intensive sectors. The investments required to continue using coal in line with government policies are expected to dampen demand from the electricity generation sector post-2020.

Figure 3.5: Employment Profiles by Broad Sector (000s)



Source: Cambridge Econometrics, MDM revision 12015

UK oil and gas production peaked in 1999 and 2000 respectively, and since then has been in long-term decline due to falling UK reserves. Output fell sharply following the recession as demand weakened (imports fell by even more than domestic supply), but partly also due to the fall in oil and gas prices. A mild rebound in demand in 2009 was not sustained in the following three years as demand began to fall again, largely driven by a fall in demand from households. Supply of oil and gas is expected to continue falling from 2013 onwards although the rate of decline in the short term may be curbed slightly by a legacy of investment that took place before the recession and by tax allowances to encourage investment in smaller fields.

The industry's prospects are constrained by the limited remaining UKCS reserves. There is no prospect of the industry returning to growth in the short or long term, and the major UK oil and gas firms are looking abroad for growth opportunities. UK demand already far outstrips domestic supply, with the gap being filled by growing imports. Production is expected to decline at a slightly slower pace in the long term on the assumption that there is sufficient investment to allow profitable production of oil remaining on the UKCS. This is particularly important given that pressure from high oil prices is expected to be sustained.

In the utilities sector, output is forecast to grow modestly in 2014-15 following robust growth in 2013 driven by the electricity & gas sector. The growth in electricity & gas is expected to be driven by a rise in domestic supply stemming from the extended cold period in 2013H1. Output of the water & sewerage industry stagnated over 2012-13.

Household expenditure on electricity is forecast to fall in 2013 as consumers remain constrained by tight budgets and look to improve their energy efficiency. Further falls are forecast in the short-to-medium term although the decline should be curbed by expected growth in real incomes in 2014-15. The demand for water is forecast to fall slightly in 2013, driven by reduced industrial demand. Demand is then forecast to grow modestly for both consumers and industry in 2014-15.

In the long term, utilities output is forecast to grow modestly. Water demand is expected to grow at a stable rate, despite projected improvements in resource efficiency, and electricity output is forecast to grow modestly alongside household electricity expenditure. This is because the number of appliances in the home and the use of consumer electronics are both expected to gradually increase over time

Employment

Employment in Primary sector & utilities saw strong growth in 2012 driven by pick-up in agriculture and mining & quarrying. However, broad sector growth was curbed by falling utilities employment. The growth in the broad sector is in contrast to the fall in output in 2012.

Primary sector & utilities employment is forecast to record a steep fall in 2013. Following this, weak growth in the short-to-medium term is expected. The 2013 decline will be driven by a large fall in agriculture employment as weak global growth leads to a decline in industrial demand for agricultural products.

Cost pressures are likely to persist in the agriculture sector. The sector will remain vulnerable to food and fuel price shocks alongside pressure from supermarkets. These pressures alongside CAP reforms will drive the need for productivity improvements in the sector, perhaps with increased use of more automated farming techniques. This is forecast to result in falling agriculture employment as output steadily grows.

Employment in mining & quarrying will fall in the long term as the output in the sector deteriorates under the pressure of dwindling domestic reserves and the high cost of extracting these reserves compared to importing. Utilities employment will grow steadily in the long term as demand grows modestly, although employment growth will be curbed by efforts to improve efficiency in the sector.

3.3 Manufacturing

Output

Manufacturing accounted for 10.6 per cent of UK GVA in 2012. The share of UK GVA has been in long-term decline as competition from overseas manufacturers, and output in UK services, have both grown. Manufacturing output fell in 2012 and is expected to record a further fall in 2013. Output is forecast to grow in 2014 as business investment starts to pick up and global demand for UK exports, particularly niche manufactured goods, begins to slowly rise.

Manufacturing output was falling or flat through much of 2011 and 2012, after recovery in 2010. However, manufacturing activity and confidence among manufacturers have both been rising since the early months of 2013. The CBI Quarterly Industrial Trends Survey for 2013Q3 shows the largest positive balance (+24 per cent) for increased optimism about the general business situation since April 2010 (when the balance was also +24 per cent) and the largest positive balance for an increase in total orders (+6 per cent) since April 2012 (+8 per cent). The increase in orders is due far more to domestic orders. The Markit-CIPS Purchasing Managers' Index for manufacturing rose above 50 in April 2013, rose to a peak of 57.1 in August (the highest figure since early 2011) and fell back only slightly in September-October.

However, the picture for manufacturing exports is mixed. A low positive balance for export orders was reported in the CBI survey. However, ONS data suggest that total UK exports increased by 3½ per cent between the first and second quarters of 2013 following a decline in 2013Q1. UK goods exports are now split almost evenly between the EU and the rest of the world. Companies responding to the PMI's October survey reported a strong pick-up in orders from mainland Europe, Asia, the US, Ireland, the Middle East and Russia. This is as sterling has depreciated throughout much of 2013. However, global demand still remains fragile with any recovery likely to be only gradual. In spite of strengthening position in latter half of year export demand, domestic demand and business investment are all expected to record modest falls overall in 2013, and this drives the forecast of a 1 per cent fall in manufacturing output in 2013.

The transport equipment sub-sector has consistently outperformed the broad manufacturing sector since the recession. This is expected to continue in 2013 with 4.4 per cent output growth but the rate of growth is then forecast to decelerate in 2014-15. The domestic market for cars has remained resilient in the face of tough economic conditions but the SMMT predicts that growth of domestic car sales in 2014 and 2015 will slow to around 1 per cent pa. The industry sells 80 per cent of its production abroad. The slow pace of the global recovery is expected to restrain export demand of transport equipment to modest growth in the short-to-medium term. The UK industry is well placed to increase exports of luxury vehicles with strong demand from Asia and Latin America and companies have investments planned for the short-to-medium term in their UK plants. Cuts in defence spending have restrained the shipbuilding industry and caused some engineers to move from military to civil aerospace. Margins in civil aerospace are narrow but prospects for specialists look good in the short-to-medium term assuming that demand from Boeing and Airbus holds out.

Output for food, drink & tobacco is forecast to record a slight fall in 2013 followed by a return to growth in 2014-15. The strongest performer in the sector is whisky, thanks to strong export demand from Asia and the US. A gradual rise in the demand for food is also expected to support modest growth in the sector in the short-to-medium term.

Output for machinery is expected to fall steeply in 2013 as a rise in imports causes a fall in domestic production of UK machinery. However, the sector is expected to resume growth in the short-to-medium term, as global demand for specialist engineering products increases. Prospects should improve across the board during the second half of this decade as global growth begins to pick up more strongly. Specialists supplying equipment for defence and healthcare face weaker demand as government budgets are cut. Manufacturers of mining equipment face weak export demand in the short term from China. However, UK makers of precision instruments for industrial applications and makers of detection and security equipment are recognised as leaders in global markets and have the advantage that the needs of their clients are relatively unaffected by recessionary pressures. The rest of the machinery sector will continue to face stiff competition from exports in the short-to-medium term.

The pharmaceuticals industry is forecast to record a fall in output in 2013 as it has since the recession. However, modest growth over 2014-15 is then expected as prospects in the short-to-medium term pick up. This depends heavily on the discoveries arising from restructured R&D activities and companies' success in winning approval for new, potentially block-buster, drugs.

Manufacturing output growth is expected to pick up only modestly in the medium term. An expected appreciation in the value of sterling will dampen export growth and domestic demand for consumer durables will be restrained by weak growth in consumer confidence and incomes. Growth will be supported by acceleration in growth in the manufacture of electronics and electronic products, particularly electronic components. Manufacture of motor vehicles and food & beverages are also forecast to grow robustly in the medium term. However, most other sectors are forecast to record either falling output or only modest growth.

Over 2017-22, manufacturing output growth is forecast to continue at a slightly slower pace (1.8 per cent per annum) than whole economy growth. This is as household spending on durables gradually accelerates in line with a gradual economic recovery. However, exports and investment in the sector are expected to decelerate in the long term.

Employment

Employment in Manufacturing has broadly been in decline since 1999. The recession then led to an 8.3 per cent fall in jobs in 2009. Manufacturing employment did achieve growth in 2012 as it lagged a robust performance in 2011 output compared to the whole economy. However, employment is forecast to decline modestly in the short-to-medium term as manufacturers look to improve their productivity in a climate of weak demand and increasing competition from international producers. Productivity is expected to gradually rise in each year between 2013 and 2022.

The decline in employment is expected to accelerate slightly in the long term as increased automation in the sector drives down the demand for workers. This is highlighted by sectors such as electronics and food & beverages. Manufacturers of these products are likely to lead output growth but they are both forecast to see employment stagnate or fall slightly in the long term. Employment in Manufacturing is forecast to fall by an average of 1 per cent per annum over 2012-22. This suggests a reduction of 230,000 jobs over the period.

3.4 Construction

Output

Construction output fell sharply in 2012 as public-sector demand weakened and projects building up to the London Games came to a close. Construction output is expected to fall by 2.7 per cent in 2013, as the industry continues to face declining demand from both the public and private sector. Construction output in 2013Q1 fell by 2.5 per cent, while new orders declined by 7 per cent quarter-on-quarter; the result of a large fall in infrastructure orders (a 55 per cent drop quarter-on-quarter). However, there are growing signs of a recovery in the short-to-medium term; in 2013Q2 there was strong growth of output in public housing and private housing, which outweighed the continuing decline in output of infrastructure. This pick-up in activity in the housing market is expected to drive construction output growth of 2.1 per cent in 2014 and 3 per cent in 2015.

As a result of homebuyers' access to finance improving, in the short run demand for housing is likely to rise. As producer confidence begins to grow, modest growth in construction output is expected in 2014, the first increase in 3 years. However, house prices are expected to rise as the supply of houses continues to grow more slowly than the demand for housing.

In the long run, growth will depend on the recovery of lending to the private sector and the end to cuts in public investment spending. Several major infrastructure projects (which include the construction of the high speed rail network HS2) are likely to contribute to output growth. Recovery of construction sector output to its pre-recession levels is not likely to happen before 2017. Output is forecast to grow by an average of 2.4 per cent per annum over 2017-22.

Employment

The construction industry is an important employer in the UK. Before the recession approximately 2.3 million people were employed directly in construction, over 7 per cent of total employment. Following the recession construction employment fell sharply by 7 per cent. Employment in the construction industry has continued to decline in the last two years, albeit at lower rates (by 2 per cent in 2011 and 1.5 per cent in 2012).

Following trend, employment in the Construction sector is forecast to fall by 1.2 per cent in 2013. However, employment is expected to pick up in 2014 as house builders react to increasing demand from the private sector. A slight pick-up is forecast for employment in the medium term and long-term employment is expected to grow modestly by an average of 1.5 per cent per annum over 2017-22.

3.5 Trade, Accommodation & Transport

Output

The broad Trade, accommodation & transport sector accounted for almost one fifth of the UK total GVA (in 2012). Sector output fell sharply by 5.7 per cent in 2009 as the recession took its toll. The sector returned to growth in 2010 but output growth remained modest over 2010-12. The fastest growth in this broad sector, in both the short-to-medium term and the long term, is expected to be seen in air transport services, resuming the rapid growth seen before the recession. Postal & courier services is also expected to see fairly rapid output growth over the same period as growth in the economy as a whole picks up. However, the bulk of the sector is accounted for by wholesale & retail trade and these areas are expected to grow only modestly in the short-to-medium term.

Output across wholesale, retail & hospitality grew by 1.3 per cent in 2013Q3 quarter-on-quarter following similar growth in the previous two quarters. Retail was the main contributor to growth as retail sales grew robustly by 2.4 per cent in 2013Q3. Sector output in 2013Q3 was 3.8 per cent higher than the same period during 2012, which is noteworthy as the London Games took place in 2012Q3. This highlights the modest yet robust growth of the broad sector. This was supported by a pick-up in the GfK consumer confidence index through 2013Q3. However, confidence stalled in October and household finances deteriorated under pressure from weak wage growth and rising utility prices. This is expected to hold back the sector in the short-to-medium term; hence the forecast pick-up to 2.2 per cent growth across wholesale, retail & hospitality in 2013 will not be sustained in 2014-15. Further modest growth in the medium term, as household confidence and expenditure pick up once again, will yield average output growth of 1.9 per cent per annum over 2012-17.

Output of wholesalers fell in 2012, but a recovery is forecast for 2013 as food wholesalers experience a modest rise in demand (particularly given the cost savings they can offer to grocery retailers engaged in intense price competition) and builders' merchants receive a boost from increasing activity in the housing market. The motor vehicle retail sector has performed strongly through 2012-13 although a deceleration in the number of new car registrations is expected to hold back the sector in 2014-15. Retail output is expected to grow modestly in the short-to-medium term as consumer confidence recovers slowly and real wages are not expected to grow until 2014-15. Discounters and premium retailers are expected to lead growth in the grocery retail sector while convenience stores and online services rise in popularity. The hospitality sector suffered from oversupply in 2013 following the 2012 London Games. This is expected to result in a fall in output for the sector. However, a return to growth in 2014 and a gentle acceleration in the medium term is forecast as tourism and investment in the sector bounce back somewhat.

There was an overall increase of transport & storage output through the first three quarters of 2013, as the industry recovered from a fall in 2012. This sector is highly dependent on activity in the wider economy, both of individuals and firms. In 2012, the broader economy grew weakly and freight services struggled with falling demand and over-capacity. This led to the fall in broad sector output in 2012. In the short-to-medium term the rail and air industries are expected to face capacity constraints as demand for passenger services is picking up.

Land transport output was hit hard by the recession as it drove down demand from commuters, which accounts for a large proportion of sector output. However, full-time employment and the demand for air travel (which drives demand for coaches) have grown in 2013. This supported an increase in demand for land transport; hence, output growth of 3.4 per cent is forecast for 2013. Short term prospects for land transport demand were also boosted by a government price cap on increases in regulated rail fares. Some increase in capacity is expected in 2014 but it is unlikely to keep up with demand. Output in this sector is forecast to grow modestly in the short-to-medium term. Rail companies and the Department for Transport are proposing a larger increase in capacity to come into effect in 2019.

Demand for air travel has recently grown modestly after falling during the recession. Air passenger numbers have grown through 2013 and airports are struggling to cope with the rise in demand. This has prompted several airports and airlines to invest further in expanding capacity to cope with the rise in demand. For example, London City airport has announced a £200m expansion project to double its passengers to six million over the next decade. However, the benefits of these plans will not be felt in the short term; hence, growth in output of 2.4 per cent is forecast in 2013 with similar growth in 2014. Growth is forecast to then accelerate to 3.8 per cent in 2015 as UK GDP grows modestly and some investments in capacity begin to yield benefits.

Elsewhere in the transport & storage sector, the postal & courier services industry is forecast for a mixed period of transition following the privatisation of Royal Mail in 2013. Output is forecast to grow strongly for 2013 but then stagnate in 2014. The sector should then resume growth in 2015 and achieve robust growth in the long term. Water transport output is more reliant on freight than passenger services. Weak business confidence and weak export growth resulted in falling output in 2012, with a modest fall forecast for 2013. However, growth is expected to resume in 2014 as investment and business confidence gradually pick up.

In the long term, output across trade, accommodation & transport is forecast to grow modestly and below trend. This is as confidence, incomes and UK GDP are expected to all grow relatively slowly. Output is forecast to grow by an average of 1.6 per cent per annum over 2017-22 and the broad sector is expected to account for a slightly smaller share of total output by 2022.

Employment

The Trade, accommodation & transport sector accounted for over 25 per cent of UK jobs 2012. Strong employment growth of over 4 per cent in 2012 was driven by temporary positions associated with the London Games. This is why employment growth is forecast to have fallen slightly in 2013. However, full-time employment has been growing through 2013, suggesting that employment growth could be sustainable. Weak growth of 0.1 per cent is projected in 2014, with similar growth to follow in the medium term.

Productivity is forecast to grow modestly for most sub-sectors within trade, accommodation & transport. The only sub-sector expected to see a fall is warehousing as employment grows slightly faster than output. Air transport will experience the fastest growth in productivity with 8.1 per cent growth forecast for 2013 and 3.1 per cent growth forecast for 2014. There is pressure in the air transport sector to improve efficiency and sustainability particularly with cost pressures squeezing budgets of the airlines and their customers. This pressure will drive productivity growth in the short-to-medium term.

Employment is expected to stagnate for the retail trade sector in 2014-15. There is little scope to generate more jobs in the sector given the expected slow recovery in demand and the number of high street administrations through 2012-13. There is some scope for employment to fall given the popularity of online stores and self-service but this is expected to have little impact. Productivity is expected to grow modestly in the short-to-medium term as output grows slowly.

Employment is forecast to grow modestly in the medium term for transport & storage as the ability to expand capacity only slowly limits the number of jobs created. Technological progress could influence the number of jobs created, for example, by accelerating the amount of capacity expansion. However, if technology reduces the need for face-to-face business meetings it could also reduce demand from business travellers. Weak employment growth is also forecast across wholesale, retail & hospitality in the medium term. Wholesalers will see the strongest growth in this group as a pick-up in consumer and industrial demand drives the sector to create more jobs. Food and beverage services are also expected to see robust growth in employment, particularly chain brands that have fared better than independents post-recession and are opening further outlets.

Employment is forecast to grow modestly in the long term for the broad sector. Over 2017-22, employment is expected to grow by an average of 0.8 per cent per annum. The proportion of UK employment accounted for by this sector will see little change to 2022. Weak productivity growth across the sub-sectors is forecast in the long term.

3.6 Business & Other Services

Output

Business & other services (comprising a wide range of services including media, IT, finance and insurance, real estate, professional services [such as accounting, architecture and advertising], support services [such as rental, leasing or security], and leisure services) is the largest of the broad six sectors, accounting for more than one third of total UK GVA. Over the last two decades the sector has been leading UK growth. During the recession it was the second best performing sector (in terms of output growth) with the best performing sector being Public administration, health and education. Output in business & other services fell by 4.6 per cent in 2009, compared with falls of 9.7 per cent and 13.3 per cent in manufacturing and construction respectively. Business & other services achieved relatively weak output growth of 1.5 per cent in 2010, but began to record stronger growth in 2011 and 2012. It is worth noting that the business & other services sector covers a large breadth of smaller sectors, all of which have weathered the recession differently.

The performance of the financial sector is strongly linked to the economy as a whole. The banking industry is going to extraordinary measures to shore up balance sheets in order to comply with the incoming Basel III regime, and this is by no means complete. Net lending to business continues to contract, with SMEs particularly affected, but consumer lending is improving, with government schemes such as Help to Buy providing extra support to mortgage demand. Turnover for insurance companies is expected to exceed pre-crisis levels by 2015, helped by higher housing market turnover, enrolment in pension schemes and an ageing population. Overall, however, the financial sector is expected to record modest growth of about 2 per cent in 2013 and a return to pre-recession rates of growth is not likely to occur until after 2015.

A key driver of the business & other services sector's recovery has been the information & communications sector, which has been a strong performer in recent years and recovered quickly after the economic crisis in 2008. A fall in output of 1.7 per cent in 2009 was followed by growth of 8.6 per cent in 2010. Investment growth, both publicly and privately funded, has remained strong in the sector. For example, the government has continued to invest in Tech City, the new hub of tech start-ups in London. This sort of investment is important for the long-term health of the sector. Output of information & communications is expected to grow more rapidly than the whole economy, with growth rates of around 2 per cent over 2013-2015.

In the short term, telecommunications companies are likely to benefit greatly from the rollout of 4G and the consequent higher demand. Internet usage and mobile broadband usage (currently 64 per cent of people use mobile broadband) will continue to rise throughout the UK; and this should result in higher levels of GVA in the sector. A wider accessibility of high-speed broadband may also provide a boost to the whole economy by raising productivity.

Computer services are expected to drive growth in the next few years. Output growth of 1.7 per cent is forecast for 2013 for the industry. Technological improvements will continue to support output growth.

The publishing industry has been faced with increasing competition in 2012 and 2013, from online and digital markets. Output fell by 0.3 per cent in 2011 and 1.5 per cent in 2012, but is expected to bounce back slightly to grow by 0.3 per cent in 2013.

The government's Help to Buy scheme, although perhaps impacting mainly on prices in the short term, should encourage developers to build more houses, and output of real estate is forecast to grow strongly (5½-6 percent per annum) in 2014 and beyond.

As a result of increasing demand in the business & other services sector, sector output is forecast to increase by 1.7 per cent and 2.4 per cent in 2013 and 2014 respectively, following similar growth rates in the previous two years. Little or no acceleration is expected in the medium term for sector output growth as business confidence is expected to recover only gradually. In the long term growth in output is expected to average 2.8 per cent per annum over 2017-22 as global and domestic demand accelerate modestly.

Employment

In terms of employment the Business & other services sector accounts for just over 30 per cent of total UK jobs. However, this is lower than the share of the sector in terms of output, indicating the high productivity performance of the sector.

Employment in business & other services fell by 3.0 per cent in 2009, following the recession. However, weak employment growth rates of 0.1 per cent and 0.9 per cent were recorded in 2010 and 2011 respectively. Driven by rising demand in 2012, business & other services recorded employment growth of 3.8 per cent. Employment is expected to grow again in 2013, albeit at a more modest rate of 2.4 per cent.

Employment in the financial sector bounced back in 2012 growing by 6.2 per cent, following no growth in 2011 and weak growth in 2010. A much more modest growth of 1.2 per cent is expected in 2013, with similar growth rates in the medium-to-long term.

In information & communications, employment suffered more than output after 2008, falling in each year of the period 2008-10. However, growth of nearly 6 per cent returned in each year in 2011 and 2012, with similar levels of growth expected in 2013. However, technological improvements are likely to restrict employment growth by reducing the need for personnel. Employment in the publishing industry, in particular, is likely to be adversely affected by technological improvements, as it faces increasing competition from online and digital markets. Increased competition is expected to result in a fall in employment of around 9.7 per cent in 2013, as companies attempt to cut costs and shift to digital services in order to remain competitive.

Newspapers may also face more costs, both in time and money, through the new press regulator. Smaller newspapers may find it hard to carry the costs and the time required to deal with complaints. These pressures may result in some closures and potentially job losses.

In the long term, employment in business & other services is expected to increase by around 1 per cent per annum, notably slower than output. This indicates that productivity levels in the broad sector are likely to improve. However, employment growth in the sector is still expected easily to outstrip that of the total economy over 2012-22.

3.7 Public administration, health and education

Output

This sector comprises the activity of public administration, education, health, residential care and social work, sectors which are driven principally by government demand but which in some cases (e.g. education and health) also include some market-based provision of these services. Output of Public administration, health and education is difficult to measure because by definition there is no final market for its services from which to calculate the value of its output. In the past, output was measured by equating it to the inputs used to produce it. However, this assumed that value added was zero, and meant that the measured output could only ever grow at the same rate as inputs. Productivity growth would therefore always be zero. Much (at least 60 per cent) of government output is now measured using alternative, output measures, with the rest estimated by equating output to inputs.[23]

The prospects for Public administration, health and education continue to reflect government budget reductions, although some progress has been reported on dealing with deficits. For instance, the National Audit Office reports that thus far local authorities have achieved efficiency savings to meet about half of the planned expenditure reduction for the period 2011-15, although there is survey evidence to suggest that reduced service levels have also contributed to reducing expenditure. In 2012-13 there was a relatively wide variance in budget reductions implemented at local authorities, ranging from 1.1 per cent at the lower end to the largest reduction of 8.8 per cent. Furthermore, the pressures on local authorities to meet increased demand for high-cost services such as adult social care and child services suggest that greater difficulties lie ahead in achieving further reductions.

[23] See Pont, M, 'Improvements to the measurement of government output in the National Accounts', in Economic & Labour Market Review, Vol2, No2, February 2008, ONS.

For example, across the UK as a whole, the public service suffering the steepest reduction (36 per cent) has been planning and development, whereas adult social care has seen its expenditure reduced by only 6 per cent. Monitor, the health regulator, reports that the health service is improving its performance in reducing gross deficits with a fall from 19 to 16 in the number of trusts in gross deficit yielding an aggregate surplus of £540m for the year ended March 2013. Most of this saving was probably due to capital budgeted for but unspent, expenditure being 33 per cent below budget in 2013 similar to 2012 when capital expenditure was 30 per cent below budget. On the other hand, cost-saving measures were 14.8 per cent below target for the year ended March 2013, largely because of the demands of acute services. Furthermore, the aggregate surplus of £540m obscures a deterioration in the trusts in deficit. The 16 trusts in gross deficit have increased the total gross deficit from £105m in 2012 to £143m in 2013 with most of the deficit in 2013 due to the five poorest performers.

Issues regarding the adequacy, transparency and assumptions underpinning budgeting at the Ministry of Defence (MoD) have been highlighted by the public accounts committee (PAC). The PAC cites a lack of evidence to demonstrate realistic quantitative budget plans and assumptions. In particular, the PAC highlights that the projected increase in the share of equipment expenditure from 38 per cent of the budget in 2012 to 45 per cent in 2022 is based on an optimistic assumption of an annual 1 per cent real increase in funding from the Treasury over the period. Furthermore, the likelihood of achieving planned reductions in non-equipment expenditure is low, given the failure to deliver projects within the specified timescales, particularly relating to IT. In addition, a £4.8bn contingency provision (3 per cent of the budget) risks being inadequate to meet cost growth whereas £8bn designated as unallocated expenditure may be needed to meet costs rather than purchasing new equipment. Further concerns were highlighted about the costs of recovering equipment from Afghanistan.

Meanwhile, in education, student numbers applying to universities are showing some growth following earlier declines after increased tuition fees (in most parts of the UK) and stricter immigration controls. In contrast, student numbers in higher education outside of university continue to fall steeply. UCAS, the higher education application service, reports that the number of students applying to enter university in 2013 at the June deadline has risen by 3.1 per cent. But this must be seen in the context of a 7.7 per cent decline in 2012 when the higher fees were introduced. The contrast between a rise in university applications and a decline in applications to the non-university sector is also seen in the May 2013 Migrations Statistics Quarterly Report published by the ONS: the report found a fall of 10 per cent in student visa applications, made up of a 5 per cent increase in the university sector in the year to March 2013 (compared to a fall of 3 per cent in the year to March 2012), and continuing steep declines of 46 per cent in both tertiary and further education and 7 per cent in other colleges.

The government has maintained its policy of ring-fencing education (schools) and health budgets from large expenditure reductions. These cuts imply substantial changes in the composition of the government budget. The Institute for Fiscal Studies (IFS) suggests that, as a result of current government policy, health and pensions in particular will make up 36 per cent of the budget in 2017-18 compared to 32 per cent in 2003-04. This marks a striking shift in the focus of government spending over a short period of time from other services to the provision of health and pensions.

One of the consequences of ring-fencing schools and health budgets is a very large reduction in expenditure on Public administration and defence (PAD). However, some defence spending might be reclassified as peacekeeping and conflict prevention and thus be brought under the international development budget, which the government aims to raise to 0.7 per cent of GDP. However, there may be legal constraints on such a reclassification. There are also concerns about the effectiveness of increased expenditure on international development. One of the largest components of the future defence budget, the Trident nuclear deterrent, is not likely to be cut after 2015, but there is some scope for savings. The UK currently spends 2.6 per cent of GDP on Defence but this will fall to 2.2 per cent after withdrawal from Afghanistan. However, pressure from the US not to fall below the NATO agreed 2 per cent expenditure level leaves the government in a difficult position, if it is to balance budgetary targets and NATO commitments.

Commitments to reduce spending in the short term will lead to falls in output, mainly affecting in services outside of health, notably PAD. Output is expected to fall by 0.8% in 2014 followed by similar falls in 2015-16 for Public administration, health and education, primarily driven by falling output in defence while output in health is expected to increase. Education output is also expected to see some decline from 2013 to 2016, as non-school budget cuts affect some parts of the sector..

In the longer term, the need for reducing expenditure in Public administration, health and education will decrease as economic growth returns. Output is therefore forecast to recover in the long term; over the period 2017-2022, an average growth rate of about 2.3 per cent per annum in output is expected. Health and social work output will increase relative to other government services driven by demographic changes and rising incomes, while supply will be boosted by technological advances.

Employment

As government services continue to face a reduction in expenditure under current policy commitments, a decline in employment averaging about 0.1 per cent per annum is expected over 2012-17, as large declines in PAD employment are counteracted by a small increase in health employment.

Public administration, health and education employment is projected to continue falling between 2013 and 2016 as further public-sector cuts are implemented. Job creation in the private sector is forecast to be sufficient to offset these job losses in the public sector. As economic activity begins to recover in the medium term, employment for Public administration, health and education is expected to gradually recover, although at a slower rate than output, as productivity grows. In the long term, employment in public administration and defence is expected to continue declining. However, overall employment in the sector is expected to increase by an average of 0.7 per cent pa over 2017-22, driven by modest growth in education and health & social work.

4 Changing Occupational Structure and Replacement Demands

Key Messages

- The occupational structure of employment is continuing to change in favour of white collar and more skilled occupations, although there will still be a large number of job opportunities for less skilled workers.
- Changes in occupational employment structure are largely driven by longer term trends, including those related to sectoral employment patterns and technological and organisational trends that influence the patterns of demand within sectors.
- Following the fallout from the global financial crisis of 2008 and the subsequent worldwide recession the longer term trends have begun to reassert themselves. The impact of the recession on occupational employment structure (shares of the total) and trends (as opposed to the impact on employment levels) is minor.
- The results suggest significant employment growth for managers, most professional occupations and many associate professional and technical roles.
- The other occupational group that is projected to see significant employment growth is caring, leisure and other service occupations.
- The main areas expected to experience job losses include: administrative & secretarial occupations; skilled trade occupations; and process, plant & machine operatives.
- Some elementary occupations are projected to experience job growth reflecting the continued trend towards polarisation of job opportunities, with employment increase in some less skilled occupations where tasks are not so easily subject to automation.
- There are considerable variations in the general patterns of occupational employment by gender and status, reflecting existing patterns of 'gender segregation'.
- Job openings 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.
- New detailed results for 369 4 digit unit group occupations are presented in for the first time (in Annex D).

4.1 Introduction and general approach

Skills in *Working Futures* are measured in two ways - Occupation and Qualification.[24] 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. Information on historical employment patterns is available from sources such as the Labour Force Survey and the Census of Population. 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.[25] 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).[26] More detailed projections down to the 4 digit level have also been developed. These are presented in Annex D. All the results reflect the latest information available from the Labour Force Survey. Some limited comparisons have also been made with the emerging results from the 2011 Census of Population (although insufficient detail has been released so far to permit greater use of the Census data).

Projections of occupational employment looking forward to 2022 are presented, covering all industry sectors.[27] The main focus here is on results at a UK level, but projections have also been developed for the four constituent countries of the UK and the nine English regions.

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.

[24] 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.
[25] These are described in more detail in Annex A. This requires an extensive reclassification of historical data. This is summarised in the Annex and described in more detail in the accompanying *Technical Report* (Wilson *et al.,* 2014).
[26] Full detail of these classifications is provided in Annex A.
[27] 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 2012 and 2022.
- 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.

A separate Annex (D) presents a summary of the implications for occupational employment change at the most detailed 4 digit occupational level.

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. Those sectors that benefit from such changes will see employment grow. Conversely those that fail to keep pace 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.

Box 4.1 (continued): Drivers of Occupational Change

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 2022. 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) on changing occupational 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 also based on information from Censuses of Population, notably for 1991-2001. Data are now beginning to emerge from the 2011 Census. However this information has not been published in sufficient detail to be incorporated into the current set of results. The initial results suggest that some reassessment of the situation may be required. There appear to be some significant differences between the Census and the current Labour Force Survey estimates (and hence the *Working Futures* estimates). However, the reasons for these differences remain unclear at present so the current set of results relies on the published LFS data. Annex C discusses this in detail.

The recent historical trends already reflect two distinctive factors when comparing the current results with those published in earlier *Working Futures* reports.[10] 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 global financial crisis and subsequent recession.

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

- managers, where the definition of managerial roles has been tightened up;[11]
- nurses, who have been moved from one occupational category to another in reflection of the changing nature of the work involved (nurses being increasingly regarded as professional rather than associate professionals reflected by the move towards an all-graduate occupation).

[10] 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.

[11] 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 recession has impacted on some sectors much more than others and 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) but subsequently there has been a recovery in some parts of the economy, especially the private as opposed to public sector. Despite this, the broad underlying trends in occupational employment shares have continued more or less unabated, (see Figure 4.3, which focuses on shares on total employment, and which barely shows a blip as a result of the recession). As Figure 4.3 shows, for most occupations the trend over the period 2008-2012 is indiscernible from that prior to the crisis in 2008.

The key features have been:

- rising employment levels and shares for higher level, white-collar groups such as:
    - managers, directors & senior officials;
    - professionals; and
    - 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 a slight decline in employment is now expected compared to the slight increase projected in *Working Futures 2010-2020*.

The latest LFS data confirms these patterns. The Census of Population reveals a somewhat different pattern (as detailed in Annex C) but until the reasons for this have been established the *Working Futures* results will continue to rely on the published LFS information.

Projections to 2022

Table 4.1 and Figures 4.1 and 4.2 present employment projections for the 9 major occupations for the period from 2012-2022 based on the current LFS data with no adjustment made to try to match the Census.

These are compared with developments over the previous decade. If anything, the pace of change in occupational structure to 2022 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). However, the general trends in favour of more highly skilled occupations, some growth in less skilled employment in areas that are currently difficult to automate and a reduction in traditional clerical and skilled and semi-skilled manual jobs remain (see Figure 4.2).

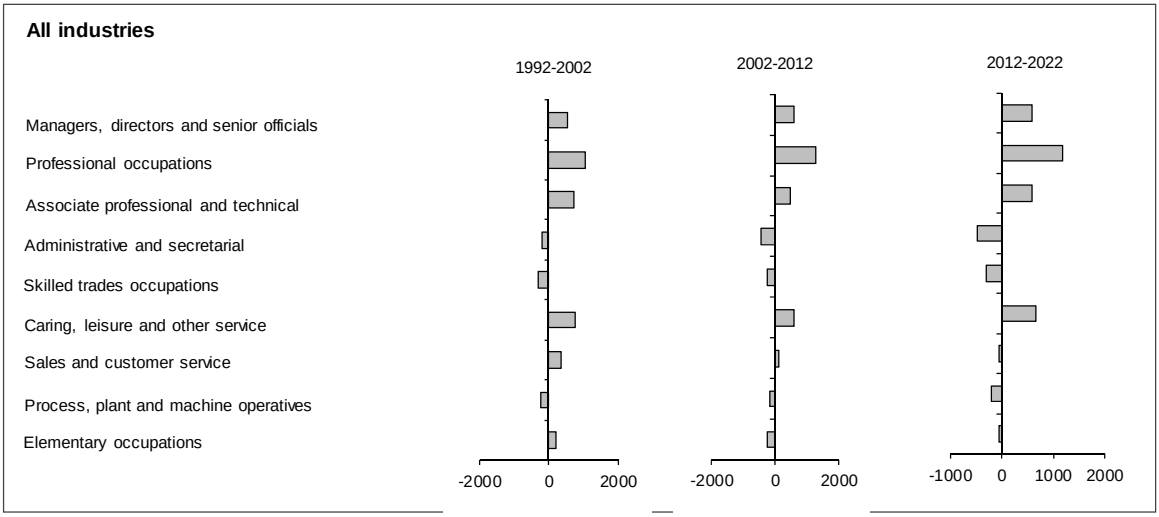
- **Managers, Professional,** and **Associate professional & technical occupations** are all expected to show significant increases in employment to 2022.
- **Caring, leisure & other service occupations**, and some parts of the **Sales & customer service occupation** group and **Elementary occupations** are projected to experience some positive employment prospects[12]. 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 by machines.
- Modest job losses are now 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, this category will still employ well over 3 million people in 2022.

[12] In the case of Elementary occupations there is projected to be a recovery in employment in the second half of the period following a decline between 2012-2017.

- **Skilled trades occupations**, **Process, plant & machine operatives**, and parts of the **Elementary occupations** group are expected to experience further job losses 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.
- As noted above some modest growth in the latter half of the period 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. This part of the polarisation of the demand for skills, has been 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 4.9 below illustrates how patterns of change vary by detailed 2-digit level occupations across industries.

Tables 4.1 - 4.3 present the details of change, including how they vary by gender. Figures 4.3 - 4.6 also illustrate this, as well as differences by employment status.

Figure 4.1: Changes in Occupational Employment Structure (000s), 1992-2022



Source: IER estimates, MDM revision 12015.

Table 4.1: Occupational Categories, SOC2010 – Major Groups

All Industry Sectors Employment Levels (000s)	1992	2002	2012	2017	2022
1. Managers, directors and senior officials	2,179	2,710	3,303	3,571	3,889
2. Professional occupations	3,958	4,997	6,270	6,917	7,444
3. Associate professional and technical	2,981	3,704	4,182	4,452	4,764
4. Administrative and secretarial	4,419	4,208	3,756	3,490	3,270
5. Skilled trades occupations	4,065	3,747	3,522	3,327	3,216
6. Caring, leisure and other service	1,534	2,271	2,859	3,189	3,508
7. Sales and customer service	2,222	2,579	2,698	2,622	2,633
8. Process, plant and machine operatives	2,406	2,167	1,989	1,859	1,775
9. Elementary occupations	3,393	3,586	3,348	3,202	3,280
Total	27,157	29,969	31,926	32,630	33,781

Percentage Shares	1992	2002	2012	2017	2022
1. Managers, directors and senior officials	8.0	9.0	10.3	10.9	11.5
2. Professional occupations	14.6	16.7	19.6	21.2	22.0
3. Associate professional and technical	11.0	12.4	13.1	13.6	14.1
4. Administrative and secretarial	16.3	14.0	11.8	10.7	9.7
5. Skilled trades occupations	15.0	12.5	11.0	10.2	9.5
6. Caring, leisure and other service	5.7	7.6	9.0	9.8	10.4
7. Sales and customer service	8.2	8.6	8.4	8.0	7.8
8. Process, plant and machine operatives	8.9	7.2	6.2	5.7	5.3
9. Elementary occupations	12.5	12.0	10.5	9.8	9.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Net Changes	1992-2002	2002-2012	2012-2017	2017-2022	2012-2022
1. Managers, directors and senior officials	531	593	268	318	586
2. Professional occupations	1,038	1,273	647	528	1,175
3. Associate professional and technical	723	478	271	312	583
4. Administrative and secretarial	-210	-453	-265	-221	-486
5. Skilled trades occupations	-319	-224	-195	-111	-306
6. Caring, leisure and other service	737	587	330	319	649
7. Sales and customer service	358	118	-76	12	-64
8. Process, plant and machine operatives	-239	-178	-130	-84	-214
9. Elementary occupations	193	-238	-145	78	-67
Total	2,812	1,957	704	1,151	1,855

Source: IER estimates, MDM revision 12015.

Table 4.2: Females. Occupational Categories, SOC2010 – Major Groups

All Industry Sectors **Employment Levels (000s)**	**1992**	**2002**	**2012**	**2017**	**2022**
1. Managers, directors and senior officials	551	802	1,136	1,297	1,484
2. Professional occupations	1,766	2,330	3,072	3,485	3,878
3. Associate professional and technical	973	1,431	1,761	1,946	2,164
4. Administrative and secretarial	3,651	3,398	2,970	2,710	2,479
5. Skilled trades occupations	650	507	470	410	379
6. Caring, leisure and other service	1,262	1,852	2,329	2,593	2,853
7. Sales and customer service	1,578	1,791	1,752	1,603	1,526
8. Process, plant and machine operatives	511	337	211	181	154
9. Elementary occupations	1,874	1,748	1,384	1,241	1,219
Total	12,817	14,195	15,086	15,465	16,135

Percentage Shares	**1992**	**2002**	**2012**	**2017**	**2022**
1. Managers, directors and senior officials	4.3	5.6	7.5	8.4	9.2
2. Professional occupations	13.8	16.4	20.4	22.5	24.0
3. Associate professional and technical	7.6	10.1	11.7	12.6	13.4
4. Administrative and secretarial	28.5	23.9	19.7	17.5	15.4
5. Skilled trades occupations	5.1	3.6	3.1	2.6	2.3
6. Caring, leisure and other service	9.8	13.0	15.4	16.8	17.7
7. Sales and customer service	12.3	12.6	11.6	10.4	9.5
8. Process, plant and machine operatives	4.0	2.4	1.4	1.2	1.0
9. Elementary occupations	14.6	12.3	9.2	8.0	7.6
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: IER estimates, MDM revision 12015.

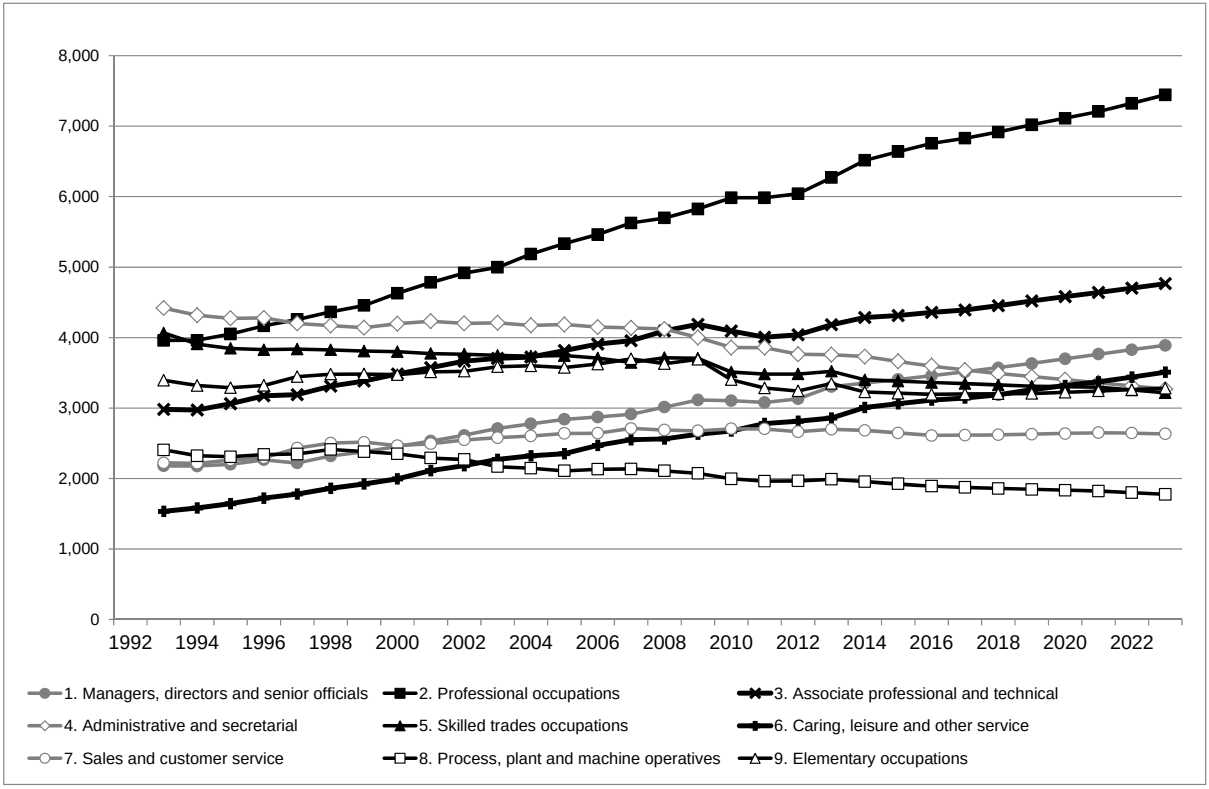
Table 4.3: Males, Occupational Categories, SOC2010 – Major Groups

All Industry Sectors **Employment Levels (000s)**					
	1992	**2002**	**2012**	**2017**	**2022**
1. Managers, directors and senior officials	1,627	1,908	2,167	2,274	2,406
2. Professional occupations	2,192	2,666	3,197	3,431	3,566
3. Associate professional and technical	2,008	2,274	2,421	2,507	2,600
4. Administrative and secretarial	767	811	785	780	791
5. Skilled trades occupations	3,416	3,240	3,052	2,918	2,838
6. Caring, leisure and other service	272	419	529	595	655
7. Sales and customer service	644	788	946	1,019	1,108
8. Process, plant and machine operatives	1,895	1,829	1,778	1,678	1,621
9. Elementary occupations	1,519	1,838	1,964	1,962	2,061
Total	14,340	15,774	16,840	17,164	17,646

Percentage Shares					
	1992	**2002**	**2012**	**2017**	**2022**
1. Managers, directors and senior officials	11.3	12.1	12.9	13.3	13.6
2. Professional occupations	15.3	16.9	19.0	20.0	20.2
3. Associate professional and technical	14.0	14.4	14.4	14.6	14.7
4. Administrative and secretarial	5.4	5.1	4.7	4.5	4.5
5. Skilled trades occupations	23.8	20.5	18.1	17.0	16.1
6. Caring, leisure and other service	1.9	2.7	3.1	3.5	3.7
7. Sales and customer service	4.5	5.0	5.6	5.9	6.3
8. Process, plant and machine operatives	13.2	11.6	10.6	9.8	9.2
9. Elementary occupations	10.6	11.7	11.7	11.4	11.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

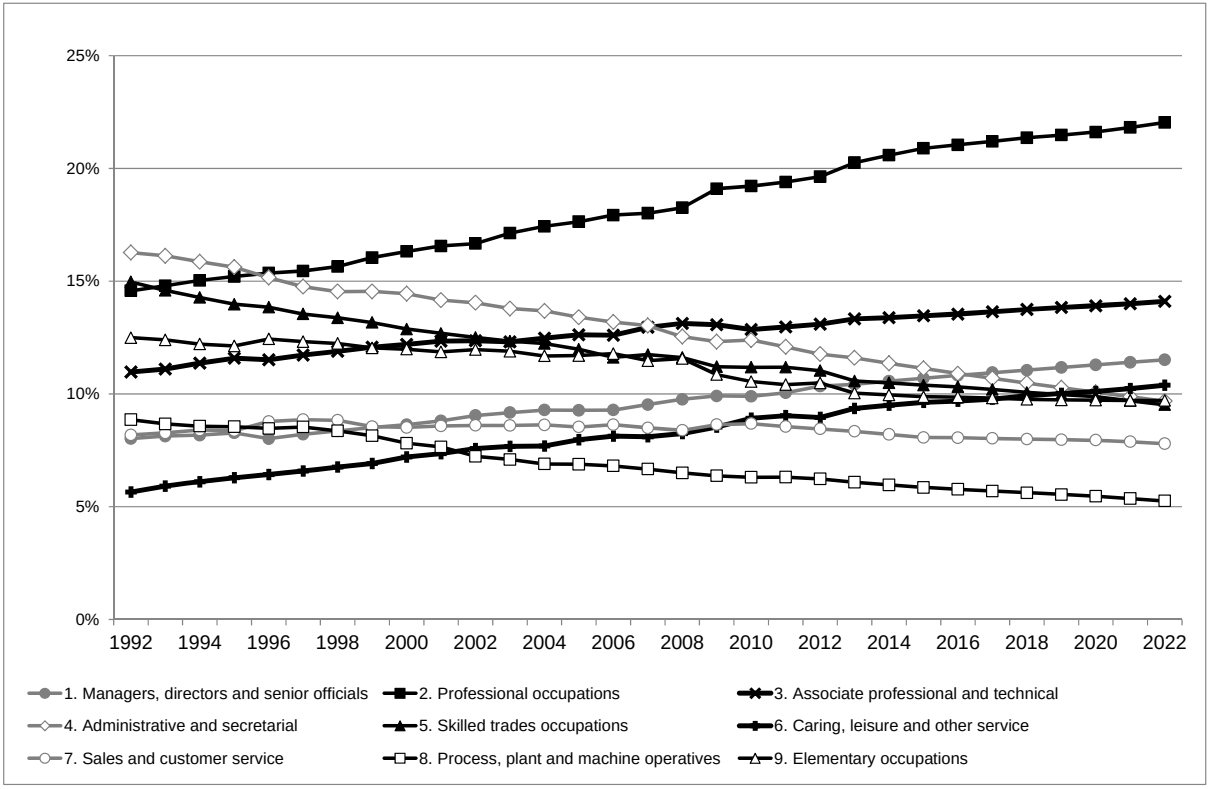
Source: IER estimates, MDM revision 12015.

Figure 4.2: Occupational Trends (000s), 1992-2022



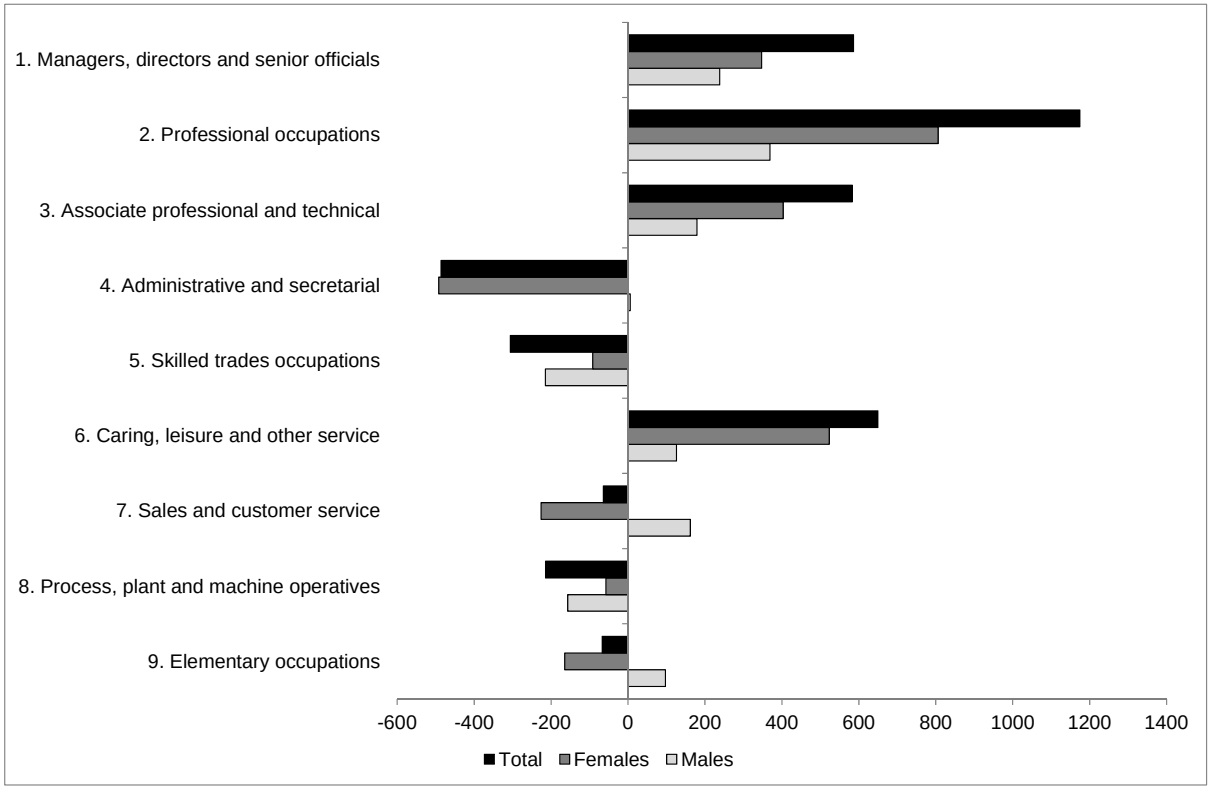
Source: IER estimates, MDM revision 12015.

Figure 4.3: Occupational Trends (% shares) 1992-2022



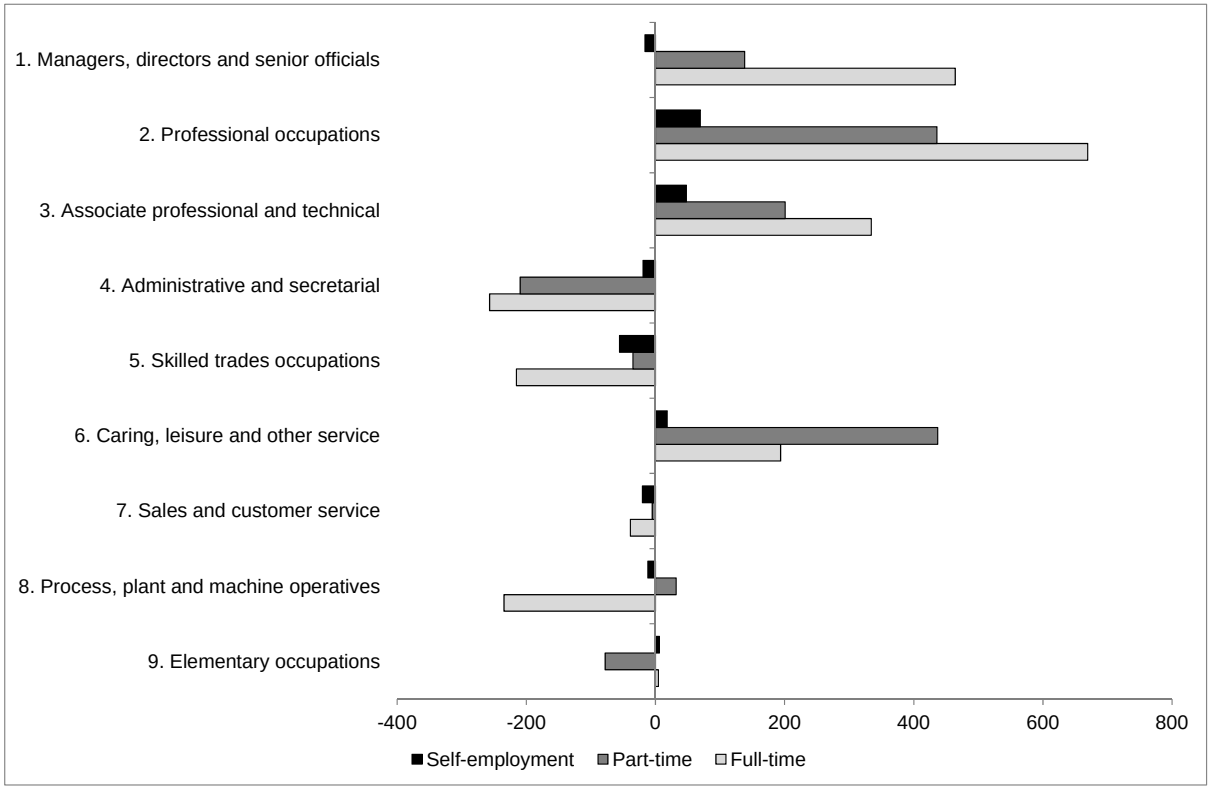
Source: IER estimates, MDM revision 12015.

Figure 4.4: Occupational Change by Gender, 2012-2022, Total Employment (000s)



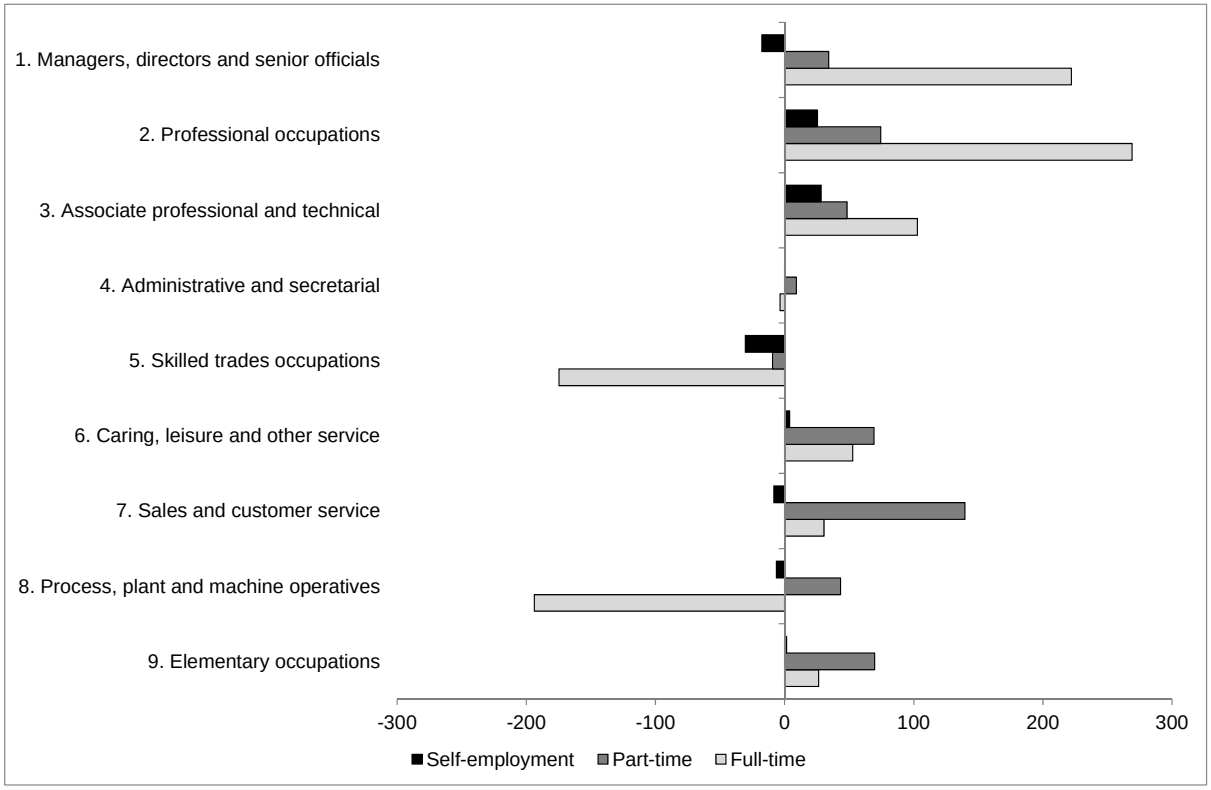
Source: IER estimates, MDM revision 12015.

Figure 4.5: Occupational Change by Status, 2012-2022, Total Employment (000s)



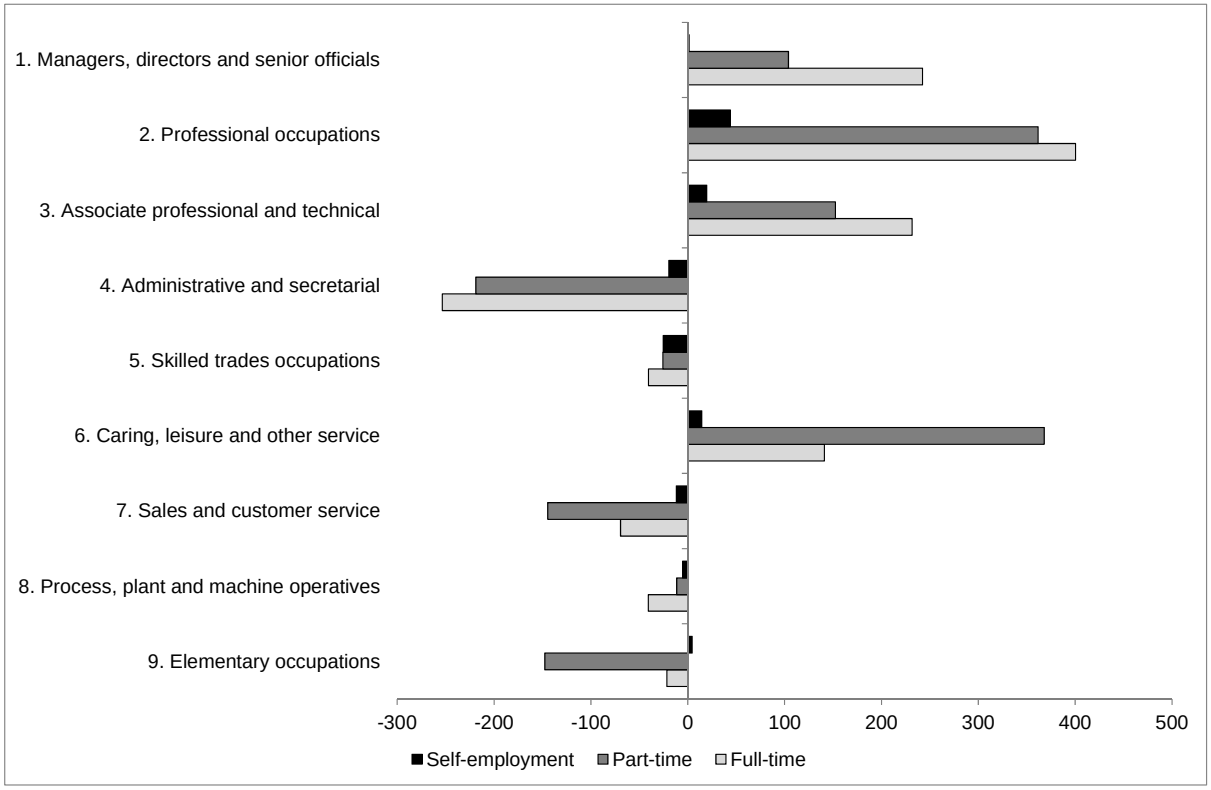
Source: IER estimates, MDM revision 12015.

Figure 4.6a: Occupational Change by Status, Males, 2012-2022 (000s)



Source: IER estimates, MDM revision 12015.

Figure 4.6b: Occupational Change by Status, Females, 2012-2022 (000s)



Source: IER estimates, MDM revision 12015.

Table 4.4: Changing Composition of Employment by Occupation, 1992-2022

SOC2010 Major Groups, United Kingdom	Total					2012 - 2022 Net		
Employment Levels (000s)	**1992**	**2002**	**2012**	**2017**	**2022**	**Change**	**Replacement Demands**	**Total Requirement**
1. Managers, directors and senior officials	2,179	2,710	3,303	3,571	3,889	586	1,378	1,964
2. Professional occupations	3,958	4,997	6,270	6,917	7,444	1,175	2,536	3,711
3. Associate professional and technical	2,981	3,704	4,182	4,452	4,764	583	1,541	2,124
4. Administrative and secretarial	4,419	4,208	3,756	3,490	3,270	-486	1,607	1,121
5. Skilled trades occupations	4,065	3,747	3,522	3,327	3,216	-306	1,195	889
6. Caring, leisure and other service	1,534	2,271	2,859	3,189	3,508	649	1,324	1,973
7. Sales and customer service	2,222	2,579	2,698	2,622	2,633	-64	953	889
8. Process, plant and machine operatives	2,406	2,167	1,989	1,859	1,775	-214	730	515
9. Elementary occupations	3,393	3,586	3,348	3,202	3,280	-67	1,237	1,169
Total	27,157	29,969	31,926	32,630	33,781	1,855	12,501	14,356
Percentage Shares	**1992**	**2002**	**2012**	**2017**	**2022**	**Percentage Changes**		
1. Managers, directors and senior officials	8	9	10	11	12	17.7	41.7	59.4
2. Professional occupations	15	17	20	21	22	18.7	40.5	59.2
3. Associate professional and technical	11	12	13	14	14	13.9	36.9	50.8
4. Administrative and secretarial	16	14	12	11	10	-12.9	42.8	29.8
5. Skilled trades occupations	15	13	11	10	10	-8.7	33.9	25.2
6. Caring, leisure and other service	6	8	9	10	10	22.7	46.3	69.0
7. Sales and customer service	8	9	8	8	8	-2.4	35.3	33.0
8. Process, plant and machine operatives	9	7	6	6	5	-10.8	36.7	25.9
9. Elementary occupations	12	12	10	10	10	-2.0	36.9	34.9
Total	**100**	**100**	**100**	**100**	**100**	5.8	39.2	45.0

Source: IER estimates, MDM revision 12015.

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 - 4.6. Despite policies to reduce discrimination by gender, occupational 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, (240,000 and 370,000 extra jobs between 2012 and 2022 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.

Employment Status

Expected patterns by employment status (full-time and part-time employees or self-employment) are summarised in Figures 4.4 - 4.6. There are significant differences in the pattern of change for different occupational and status categories. These reflect structural differences in terms of the demands for different sectors and different trends in the patterns of gender and employment status mix within sectors.

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 and, other than managers, for self-employment. The faster growth amongst professionals may be 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.

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. More detailed results by region are presented in Section 6.

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, but the opposite is expected for females).

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.

At any particular time this 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'. This component of labour demand is usually much more significant than any change arising from net jobs growth. Replacement demand can also easily outweigh any negative changes resulting from any projected employment decline. At a macro level replacement demands typically represent around 2-4 % 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 equal).

Traditionally the net change in employment is referred to as “expansion demand” although where employment is declining this can 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.

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 28-51% over the 10 year period. Over the decade as a whole, there is projected to be a net requirement of almost 14½ million new job openings. Replacement demand accounts for 12½ 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 2012-2022 is around seven times larger than expansion demand.

In many occupations the "expansion" or structural demand is negative (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 (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).

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.

The estimates of replacement needs presented here 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. Nevertheless, an attempt has been made to indicate the potential variation in such flows across these various dimensions. These are considered in even more detail in the next sections.

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

Methodology & Caveats

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 are described in more detail in the separate ***Technical Report*** (Wilson *et al.* (2014).There is a brief summary of this in Annex A of the present document.

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

More detailed analysis by 2- digit occupational categories

Table 4.5 and Figure 4.7 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.[13]

Professional occupations: All the sub-major groups included in this major group experienced employment growth between 2002 and 2012. This is projected to continue. The highest rate of growth for 2012-2022 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.

[13] 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)

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 especially 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 now projected to experience the most rapid increase of all sub-major groups between 2012 and 2022. Growth was slowest over the past decade for science, engineering & technology associate professionals and for protective service occupations, both of which saw a net decline over the decade as a whole. The latter are expected to see some further job losses but things are expected to pick up for science, engineering & technology associate professionals as the economy recovers.

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 reverse the overall decline for skilled trades. For textiles, printing and other skilled trades the pace of decline accelerates. Over the next decade jobs in construction & building trades are expected to grow more quickly than the average for the economy as a whole.

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 2002 and 2012. Although they slip into second place in terms of rate of growth over the period 2012-2022, in absolute terms they remain in top place, with an increase of over half a million 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. The rate of growth in leisure, travel and related personal service jobs is expected to be more modest.

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, customer service occupations represent a much smaller but rapidly growing category. The demand for more specialist sales and customer care occupations is expected to continue over the coming decade.

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 and 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 little change in the numbers of jobs for the transport & mobile machine drivers category is expected.

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 signs of this changing. The service sector, in particular, is beginning to generate a number of extra jobs in this area. The development of some new opportunities in call centres, fast food outlets, etc, may help to reverse the long term trend decline in employment for such jobs, although some of these may fall within the more skilled customer service occupations category. Overall, small job losses are expected.

Table 4.5: Expansion and Replacement Demand by Occupation, 2012-2022

UK, All industries (Results in 000s)	Base employment level 2012	Expansion demand	% of base	Replacement demands (retirements & mortality)	% of base	Net requirement (excluding occupational mobility)	% of base
11 Corporate managers and directors	2,189	493	22.5	844	38.5	1,337	61.1
12 Other managers and proprietors	1,115	93	8.3	534	47.9	627	56.2
21 Science, research, eng. and technology professionals	1,731	354	20.4	559	32.3	913	52.7
22 Health professionals	1,330	332	25.0	572	43.0	905	68.0
23 Teaching and educational professionals	1,507	152	10.1	666	44.2	818	54.2
24 Business, media and public service professionals	1,701	337	19.8	739	43.4	1,076	63.3
31 Science, eng. and technology associate professionals	532	47	8.9	167	31.4	215	40.3
32 Health and social care associate professionals	334	102	30.7	138	41.5	241	72.1
33 Protective service occupations	450	-39	-8.7	112	24.8	72	16.1
34 Culture, media and sports occupations	610	88	14.5	259	42.5	347	56.9
35 Business and public service associate professionals	2,255	384	17.0	865	38.3	1,249	55.4
41 Administrative occupations	2,811	-159	-5.7	1,176	41.8	1,017	36.2
42 Secretarial and related occupations	945	-327	-34.6	431	45.6	104	11.0
51 Skilled agricultural and related trades	403	-41	-10.2	205	50.7	164	40.6
52 Skilled metal, electrical and electronic trades	1,340	-103	-7.7	419	31.3	316	23.6
53 Skilled construction and building trades	1,116	73	6.6	374	33.5	447	40.1
54 Textiles, printing and other skilled trades	663	-236	-35.5	198	29.8	-38	-5.7
61 Caring personal service occupations	2,212	594	26.9	1,015	45.9	1,609	72.7
62 Leisure, travel and related personal service occupations	647	55	8.5	310	47.9	364	56.3
71 Sales occupations	2,032	-202	-10.0	718	35.3	516	25.4
72 Customer service occupations	666	138	20.8	235	35.3	373	56.1
81 Process, plant and machine operatives	810	-211	-26.1	226	27.9	14	1.8
82 Transport and mobile machine drivers and operatives	1,179	-3	-0.2	504	42.7	501	42.5
91 Elementary trades and related occupations	577	-23	-4.0	194	33.7	171	29.7
92 Elementary administration and service occupations	2,771	-44	-1.6	1,043	37.6	998	36.0
All Occupations	31,926	1,855	5.8	12,501	39.2	14,356	45.0

Source: IER estimates, MDM revision 12015.

Notes:

a) Numbers may not sum due to rounding.

b) Occupational and Geographical mobility are assumed to be zero in these estimates.

4.6 Components of occupational change

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 2002-2012 and for the projected period 2012-2022. The scale effect reflects the overall employment increases projected across all categories. Over the decade 2002-2012, 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, summing across all occupations to zero.

The dominant explanation of change for most occupations for the period 2002-2012 is attributable to occupational effects (see Table 4.6). The scale effect 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 6 per cent in each occupational employment level over the past decade.

In many cases 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 those categories 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 2002-2012 the industry mix effect was important for only a small number of occupations. The notable exceptions are often where these effects are negative (for those occupations linked to the fortunes of declining sectors such as manufacturing). However, they are positive for some other occupations linked most closely to growing parts of the service sector, most notably health and social care.

For the forecast period 2012-2022 the scale and occupational effects are again dominant (see Table 4.7). The scale effect results in an increase of just under 6 per cent in employment levels for each occupation over the 2012-2022 period (all else being equal). This is very similar to that observed over the previous decade.

Although there are not quite such extreme values as in 2002-2012 the overall changes in magnitude for the occupational effect in the projection period is slightly greater.

In absolute terms, the industry mix effects are much smaller in the projection period and are insignificant except in a small number of occupations, such as teaching professionals. The latter is linked to the declining share of public sector expenditure on education over the coming decade. 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.

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 a shift-share analysis for the historical period 2002-2012 and for the projection period 2012-2022 based on the 2 digit level of SOC and the 22 industry categories is presented. 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.

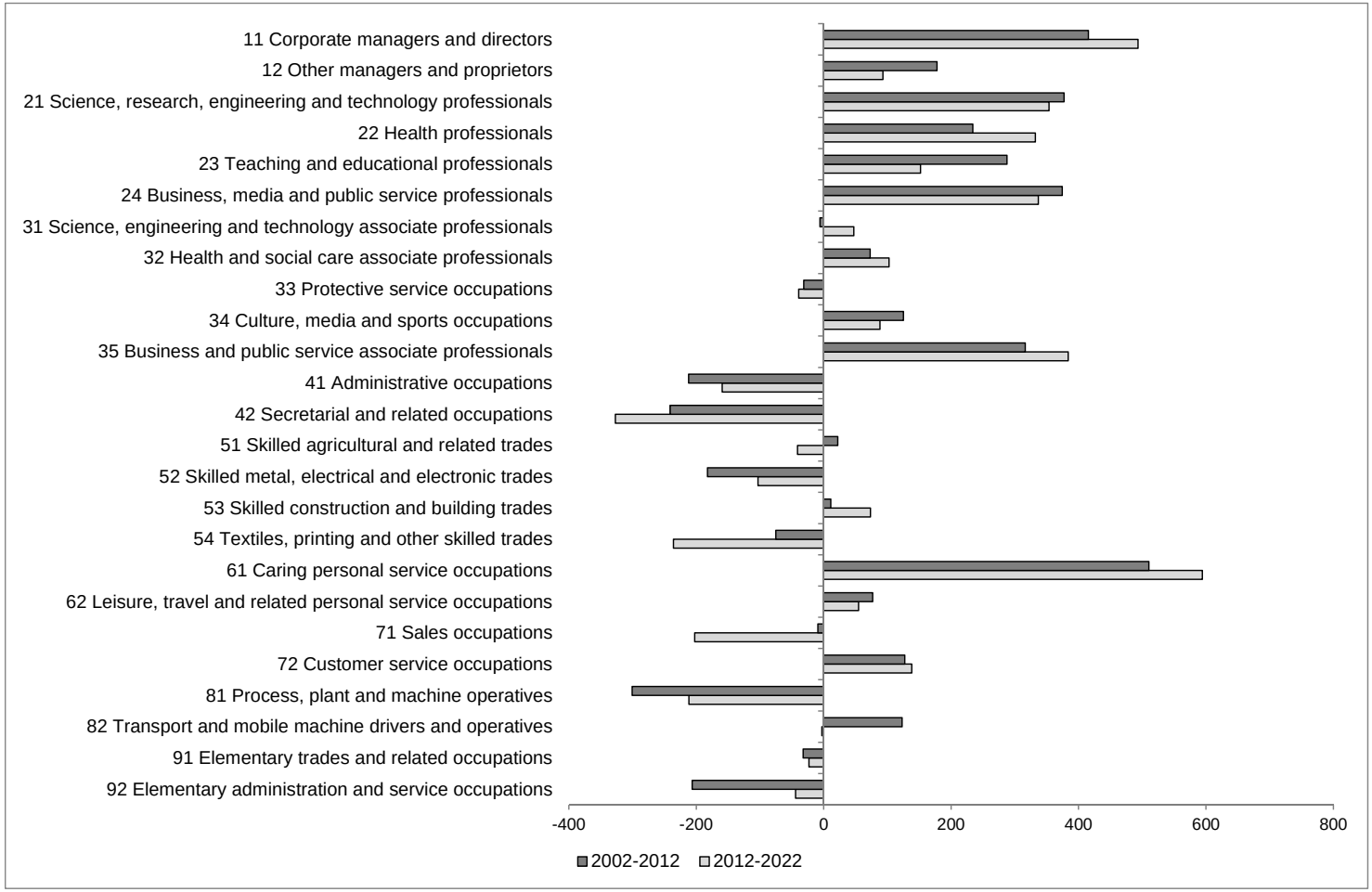
The industry mix effect is strongly significant for the projected period in only a few occupations such as Science, research, engineering and technology professionals. The occupational effect is very strongly positive for most professional and associate professional groups and especially in the case of the caring personal service occupations.[14] In contrast it imposes a strong negative impact for administrative occupations, secretarial & related occupations, skilled metal & electrical trades, textile, printing and other skilled trades, and process, sales occupations, plant & machine operatives and elementary occupations. 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 key drivers of occupational employment change over the decade 2012-2022 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 2022.

[14] In the period 2002-2012 there was a strong industry effect for this occupational groups 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.

Figure 4.7: Detailed changes by occupation (000s)



Source: IER estimates, MDM revision 12015.

Table 4.6: Total Occupational Employment, 2002-2012, UK: All Industry Sectors

SOC2010 Sub-Major Groups	Base year 2002		Target year 2012		Change 2002-2012		Components of change					
							Scale effect		Occupation effect		Industry mix effect	
	000s	% share	000s	% share	000s	%	000s	%	000s	%	000s	%
11 Corporate managers and directors	1,773	5.9	2,189	6.9	415	23.4	116	6.5	377	21.3	-77	-4.4
12 Other managers and proprietors	937	3.1	1,115	3.5	178	19.0	61	6.5	92	9.8	25	2.6
21 Science, research, engineering and technology professionals	1,354	4.5	1,731	5.4	377	27.8	88	6.5	313	23.1	-24	-1.8
22 Health professionals	1,096	3.7	1,330	4.2	234	21.4	72	6.5	24	2.2	138	12.6
23 Teaching and educational professionals	1,220	4.1	1,507	4.7	288	23.6	80	6.5	63	5.1	145	11.9
24 Business, media and public service professionals	1,326	4.4	1,701	5.3	374	28.2	87	6.5	194	14.6	94	7.1
31 Science, engineering and technology associate professionals	538	1.8	532	1.7	- 6	-1.1	35	6.5	-25	-4.6	-16	-3.0
32 Health and social care associate professionals	261	0.9	334	1.0	73	27.9	17	6.5	22	8.4	34	13.0
33 Protective service occupations	482	1.6	450	1.4	- 31	-6.5	31	6.5	-30	-6.3	-33	-6.8
34 Culture, media and sports occupations	485	1.6	610	1.9	125	25.9	32	6.5	85	17.5	9	1.8
35 Business and public service associate professionals	1,939	6.5	2,255	7.1	316	16.3	127	6.5	206	10.6	-16	-0.8
41 Administrative occupations	3,022	10.1	2,811	8.8	- 212	-7.0	197	6.5	-396	-13.1	-14	-0.4
42 Secretarial and related occupations	1,186	4.0	945	3.0	- 241	-20.3	77	6.5	-404	-34.1	86	7.3
51 Skilled agricultural and related trades	381	1.3	403	1.3	22	5.8	25	6.5	-12	-3.1	9	2.3
52 Skilled metal, electrical and electronic trades	1,523	5.1	1,340	4.2	- 182	-12.0	99	6.5	-73	-4.8	-209	-13.7
53 Skilled construction and building trades	1,104	3.7	1,116	3.5	11	1.0	72	6.5	11	1.0	-72	-6.5
54 Textiles, printing and other skilled trades	738	2.5	663	2.1	- 75	-10.2	48	6.5	-82	-11.1	-41	-5.6
61 Caring personal service occupations	1,701	5.7	2,212	6.9	511	30.0	111	6.5	159	9.4	240	14.1
62 Leisure, travel and related personal service occupations	570	1.9	647	2.0	77	13.5	37	6.5	28	4.9	11	2.0
71 Sales occupations	2,041	6.8	2,032	6.4	- 9	-0.4	133	6.5	-14	-0.7	-129	-6.3
72 Customer service occupations	539	1.8	666	2.1	127	23.6	35	6.5	108	20.0	-15	-2.8
81 Process, plant and machine operatives	1,111	3.7	810	2.5	- 301	-27.1	73	6.5	-155	-13.9	-219	-19.7
82 Transport and mobile machine drivers and operatives	1,056	3.5	1,179	3.7	123	11.7	69	6.5	66	6.3	-12	-1.1
91 Elementary trades and related occupations	609	2.0	577	1.8	- 32	-5.3	40	6.5	-29	-4.7	-43	-7.1
92 Elementary administration and service occupations	2,977	9.9	2,771	8.7	- 206	-6.9	194	6.5	-528	-17.7	127	4.3
All occupations	29,969	100.0	31,926	100.0	1,957	6.5						

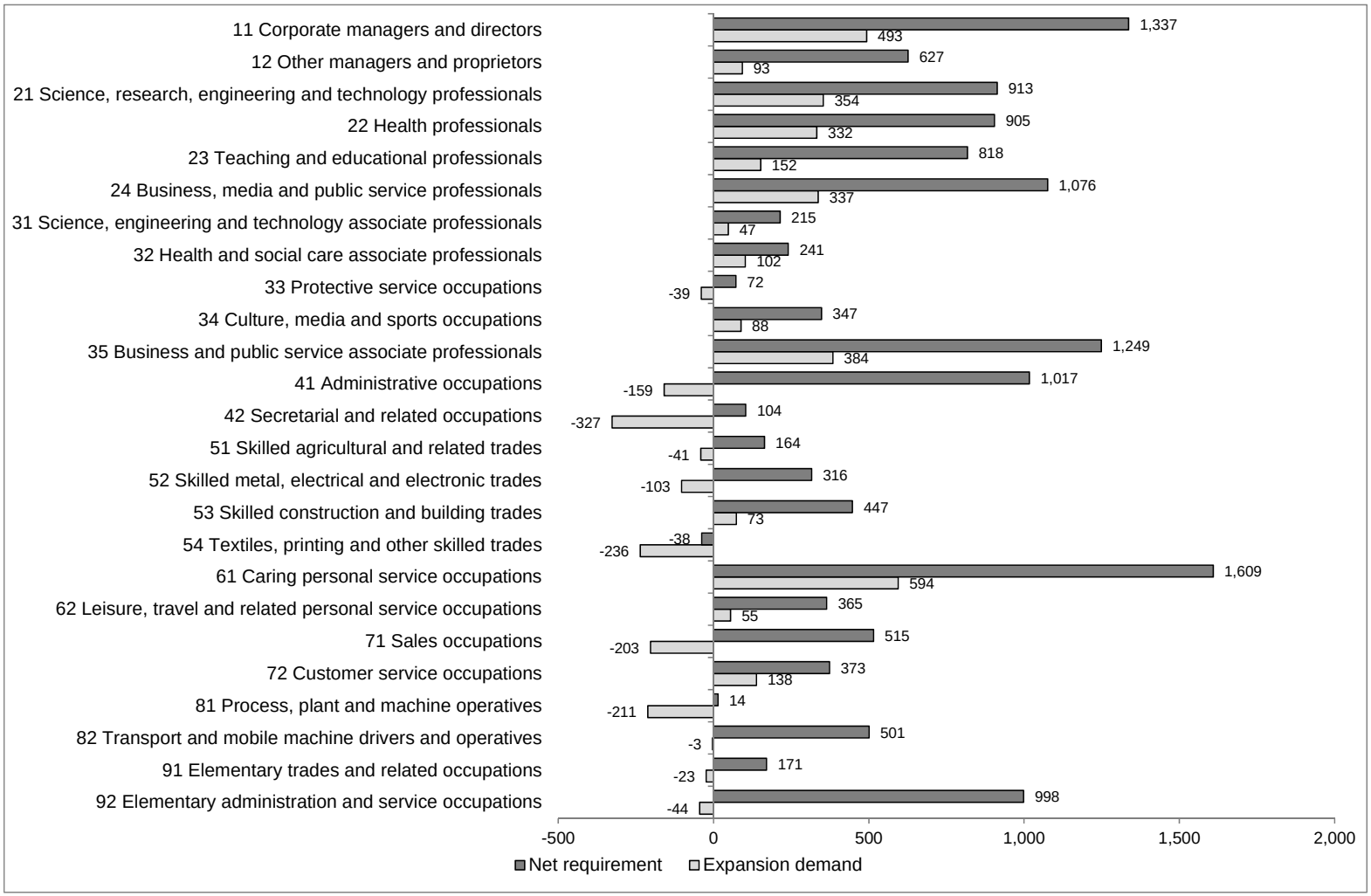
Source: IER estimates, MDM revision 12015., 22UK.xls, Shift-share.

Table 4.7: Total Occupational Employment, 2012-2022, UK: All Industry Sectors

SOC2010 Sub-Major Groups	Base year 000s	2012 % share	Target year 000s	2022 % share	Change 000s	2012-2022 %	Components of change: Scale effect 000s	Scale effect %	Occupation effect 000s	Occupation effect %	Industry mix effect 000s	Industry mix effect %
11 Corporate managers and directors	2189	6.9	2682	7.9	493	22.5	127	5.8	343	15.7	23	1.1
12 Other managers and proprietors	1115	3.5	1208	3.6	93	8.3	65	5.8	27	2.5	1	0.1
21 Science, research, engineering and technology professionals	1731	5.4	2085	6.2	354	20.4	101	5.8	187	10.8	66	3.8
22 Health professionals	1330	4.2	1662	4.9	332	25.0	77	5.8	213	16.0	42	3.2
23 Teaching and educational professionals	1507	4.7	1659	4.9	152	10.1	88	5.8	154	10.2	-90	-6.0
24 Business, media and public service professionals	1701	5.3	2038	6.0	337	19.8	99	5.8	193	11.4	45	2.7
31 Science, engineering and technology associate professionals	532	1.7	580	1.7	47	8.9	31	5.8	9	1.8	7	1.3
32 Health and social care associate professionals	334	1.0	436	1.3	102	30.7	19	5.8	73	21.8	10	3.0
33 Protective service occupations	450	1.4	411	1.2	-39	-8.7	26	5.8	-33	-7.4	-32	-7.1
34 Culture, media and sports occupations	610	1.9	699	2.1	88	14.5	35	5.8	52	8.5	1	0.1
35 Business and public service associate professionals	2255	7.1	2639	7.8	384	17.0	131	5.8	238	10.6	15	0.6
41 Administrative occupations	2811	8.8	2651	7.8	-159	-5.7	163	5.8	-316	-11.2	-7	-0.2
42 Secretarial and related occupations	945	3.0	618	1.8	-327	-34.6	55	5.8	-394	-41.7	12	1.3
51 Skilled agricultural and related trades	403	1.3	362	1.1	-41	-10.2	23	5.8	-10	-2.6	-54	-13.4
52 Skilled metal, electrical and electronic trades	1340	4.2	1237	3.7	-103	-7.7	78	5.8	-155	-11.5	-26	-2.0
53 Skilled construction and building trades	1116	3.5	1189	3.5	73	6.6	65	5.8	-51	-4.5	59	5.3
54 Textiles, printing and other skilled trades	663	2.1	428	1.3	-236	-35.5	39	5.8	-259	-39.0	-15	-2.3
61 Caring personal service occupations	2212	6.9	2806	8.3	594	26.9	129	5.8	438	19.8	28	1.3
62 Leisure, travel and related personal service occupations	647	2.0	702	2.1	55	8.5	38	5.8	11	1.8	6	0.9
71 Sales occupations	2032	6.4	1829	5.4	-202	-10.0	118	5.8	-297	-14.6	-23	-1.1
72 Customer service occupations	666	2.1	804	2.4	138	20.8	39	5.8	92	13.8	8	1.2
81 Process, plant and machine operatives	810	2.5	598	1.8	-211	-26.1	47	5.8	-211	-26.0	-48	-5.9
82 Transport and mobile machine drivers and operatives	1179	3.7	1176	3.5	-3	-0.2	69	5.8	-66	-5.6	-5	-0.4
91 Elementary trades and related occupations	577	1.8	554	1.6	-23	-4.0	34	5.8	-37	-6.5	-19	-3.4
92 Elementary administration and service occupations	2771	8.7	2727	8.1	-44	-1.6	161	5.8	-202	-7.3	-3	-0.1
All occupations	31926	100.0	33781	100.0	1855	5.8						

Source: IER estimates, MDM revision 12015., 22UK.xls, Shift-share.

Figure 4.8: Net Requirements by SOC2000 Sub-major Group, 2012-2022



Source: IER estimates, MDM revision 12015.

Notes: Figures for total requirements exclude replacement demands arising from occupational mobility.

4.7 Detailed occupational changes within industries

Occupational employment structure and how it is expected to change over time varies considerably across industries. Figure 4.9 presents an overview of both history (employment levels in 2012) and projections (expected changes 2012 to 2022), focussing on the 22 Working Futures industries and 25 2 digit SOC2010 sub-major groups.

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, Construction and Information Technology are projected to grow by 15 per cent or more between 2012 and 2022.

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
- 21 Science, research, engineering and technology professionals
- 22 Health professionals
- 24 Business, media and public service professionals
- 32 Health and social care associate professionals
- 35 Business and public service 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 sector 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 4.9: Occupational change 2012-2022, across the 22 Industries

	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.

Source: IER estimates, MDM revision 12015

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 2022.
- 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 National Qualification Framework (NQF) and the Qualifications and Credit Framework (QCF). The latter is the national credit transfer system for qualifications in England, Wales and Northern Ireland.[42] This framework defines formal qualifications by their level (i.e. level of difficulty) and credit value (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).

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.

For each gender/QCF 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

[42] QCF is the framework currently used for vocational qualifications. Scotland has its own qualification framework, the Scottish Credit and Qualifications Framework (SCQF), and its own system of levels. Correspondences between the levels used in QCF / NQF and the SCQF are mapped in *Qualifications can cross boundaries* (SCQF, 2011).

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 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 QCF 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 are then extended to cover the individual countries and English regions within the UK using a ***spatial qualification model.*** The country / regional results are presented in Section 6.[43]

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.

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.[44]

These more detailed results are then constrained to provide a picture consistent with the overall supply results from national model.[45] The estimates of employment by QCF level are constrained using RAS[46] iterative methods to:

[43] 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 a separate *Qualifications Technical Report* (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.

[44] 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.

[45] 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

- 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.

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.

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

Box 5.1: Levels within the Qualifications and Credit Framework (QCF)

Level	QCF 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

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*.[47]

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.

[47] Wilosn *et al*. (2014); for further details also see Bosworth and Wilson (2011).

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 2012-2022* 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 and the shares with no or low qualifications has shrunk. Information from the Labour Force Survey LFS, which recently celebrated its 40th birthday,[48] 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. The data reported relate to the 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 and gender. 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.

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).

[48] See: Wilson (2013), paper presented at an ONS event on 28th November to celebrate 40 years of the Labour Force Survey. (http://ukdataservice.ac.uk/media/351604/rwilson.pdf).). The programme for the event, can be viewed at: http://ukdataservice.ac.uk/ and http://www.ons.gov.uk/ons/.

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 (QCF 4+), and reductions in the numbers and shares qualified to QCF level 1 or below. Over the last decade the number and proportions qualified to QCF levels 2 and 3 have risen slightly. These patterns represent a continuation of previous longer term trends.

This has resulted in a big 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. Around 43% of those aged 25-34 are qualified at QCF level 4+ compared to 34% of those aged 60-64. There is therefore a strong cohort effect. The overall rise in qualifications has been reinforced to some extent by increasing qualification rates ("upskilling") for older people. The net result is that by 2022 around 48% of those aged 60-64 are expected to be qualified at QCF level 4+. This compares to 34% of the corresponding age group in 2012.

Some feared that the recession, as well as the increasing direct costs[49] 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 argued that the poor state of the labour market would encourage young people people to stay on in higher and further education). The latest evidence suggest that any slowdown in educational participation rates has been temporary. Record number of applicants were accepted into UK higher education in 2013 according to the December *UCAS 2013 End of* Cycle Report. This paints a picture of increased recruitment at the UK's universities and colleges, following a dip in 2012.

There is clear evidence of significant further increases in the numbers of people acquiring higher level qualifications in the most recent LFS data. In the benchmark projections from the national time series mode, it is assumed that rates of acquisition of qualifications will continue at the same rate as that observed over the past decade or so. 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+.

In order to draw out the implications for 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

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

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 5.6 presents estimates of employment (also on a residence/heads basis) implied by these unemployment assumptions for 2022. 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 QCF level) on the residence/heads basis can be applied to the workplace/jobs estimates which are used elsewhere in the report.[50] 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.

[50] 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.

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

	2002	2012	2022
QCF level			
QCF 0	7,720	5,354	3,418
QCF 1	8,836	7,579	6,475
QCF 2	10,108	10,865	10,881
QCF 3	8,980	9,946	9,467
QCF 4, 5 & 6	9,657	13,923	18,504
QCF 7 & 8	2,230	4,024	6,612
Total	47,530	51,692	55,357

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

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

	2002	2012	2022
QCF level			
QCF 0	3,255	2,075	1,321
QCF 1	5,432	4,407	3,577
QCF 2	6,432	6,746	6,653
QCF 3	5,704	6,188	5,800
QCF 4, 5 & 6	6,555	9,416	12,309
QCF 7 & 8	1,564	2,851	4,630
Total	28,941	31,684	34,291

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

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

	2002	2012	2022
QCF level			
QCF 0	331	355	262
QCF 1	381	536	503
QCF 2	321	674	754
QCF 3	239	414	439
QCF 4, 5 & 6	196	412	607
QCF 7 & 8	47	105	194
Total	1,516	2,496	2,758

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

Table 5.4: Unemployment rates by qualification level (%)

	2002	2012	2022
QCF level			
QCF 0	10.2	17.1	19.8
QCF 1	7.0	12.2	14.1
QCF 2	5.0	10.0	11.3
QCF 3	4.2	6.7	7.6
QCF 4, 5 & 6	3.0	4.4	4.9
QCF 7 & 8	3.0	3.7	4.2
All levels	5.2	7.9	8.0

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

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

	2002	2012	2022
QCF level			
QCF 0	21.9	14.2	9.5
QCF 1	25.1	21.5	18.2
QCF 2	21.2	27.0	27.3
QCF 3	15.8	16.6	15.9
QCF 4, 5 & 6	13.0	16.5	22.0
QCF 7 & 8	3.1	4.2	7.0
Total	100.0	100.0	100.0

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

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

	2002	2012	2022
QCF level			
QCF 0	2,923	1,720	1,059
QCF 1	5,051	3,871	3,074
QCF 2	6,111	6,072	5,899
QCF 3	5,465	5,774	5,361
QCF 4, 5 & 6	6,358	9,004	11,702
QCF 7 & 8	1,517	2,746	4,437
Total	27,425	29,188	31,533

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

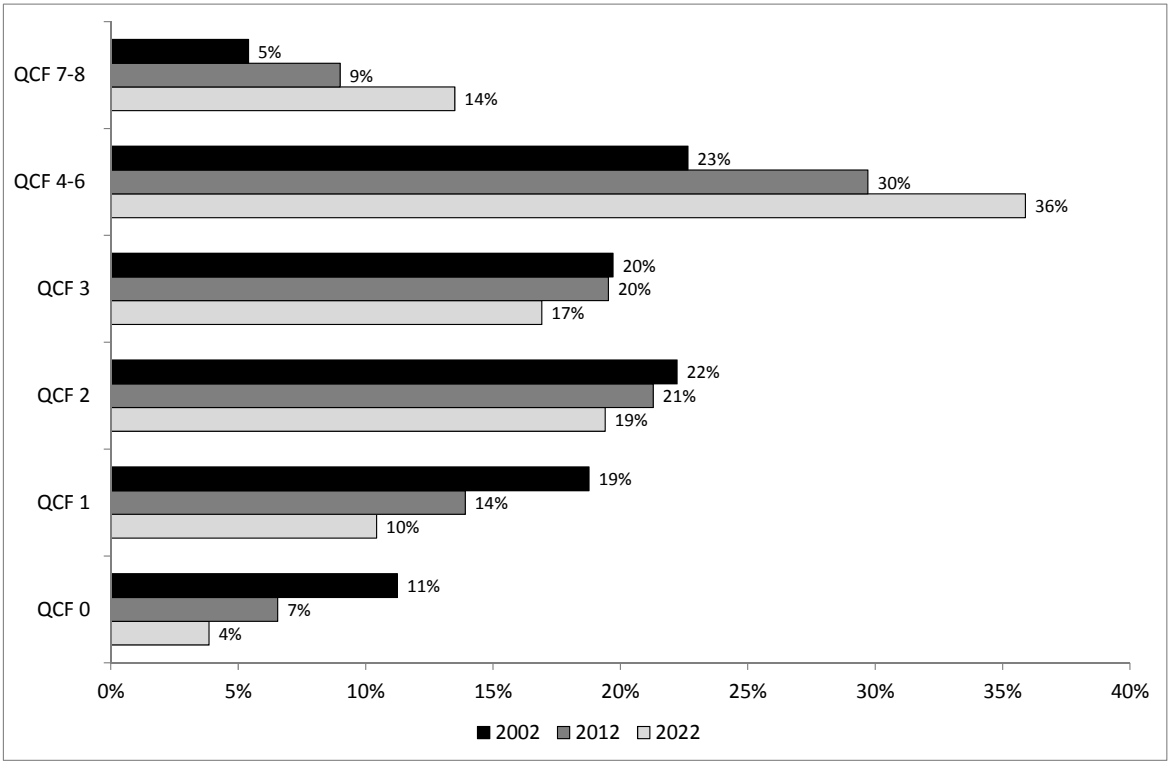
Table 5.7: Employment by qualification level (workplace / jobs, 000s)

	2002	2012	2022
QCF level			
QCF 0	3,220	1,890	1,134
QCF 1	5,569	4,256	3,285
QCF 2	6,731	6,681	6,346
QCF 3	5,993	6,348	5,772
QCF 4, 5 & 6	7,002	9,914	12,626
QCF 7 & 8	1,667	3,023	4,771
Total	30,183	32,112	33,933

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

Notes: Includes HM Forces. Tables in Annex E exclude HM Forces.

Figure 5.1: Changing patterns of qualification within the labour force (16+, % of total)



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

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.

Figures 5.3 and 5.4 show 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.[51]

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 (QCF4+). They also exhibit sharp reductions in the employment shares of those less well qualified (QCF1 and below).

Some occupations have much higher proportions of well qualified employees (QCF4+) 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 (QCF1) qualifications. In all cases these proportions are declining.

[51] 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.

Qualifications profiles also vary very 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 QCF level 4+. In contrast some other sectors, such as some 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.

There are also variations across spatial areas. Figure 5.5 provides an overview.[52] The differences are not as marked as for sectors. London (and to lesser extent Scotland and Wales) stands out, employing the largest proportion of those qualified at QCF level 4+. These differences reflect London's sectoral and occupational structure, with strong concentration of employment in education, public administration, banking and finance and head office functions. In the case of Scotland and Wales there are similar factors at work, as well as the fact that Scotland has a rather different education system to the remainder of the UK.

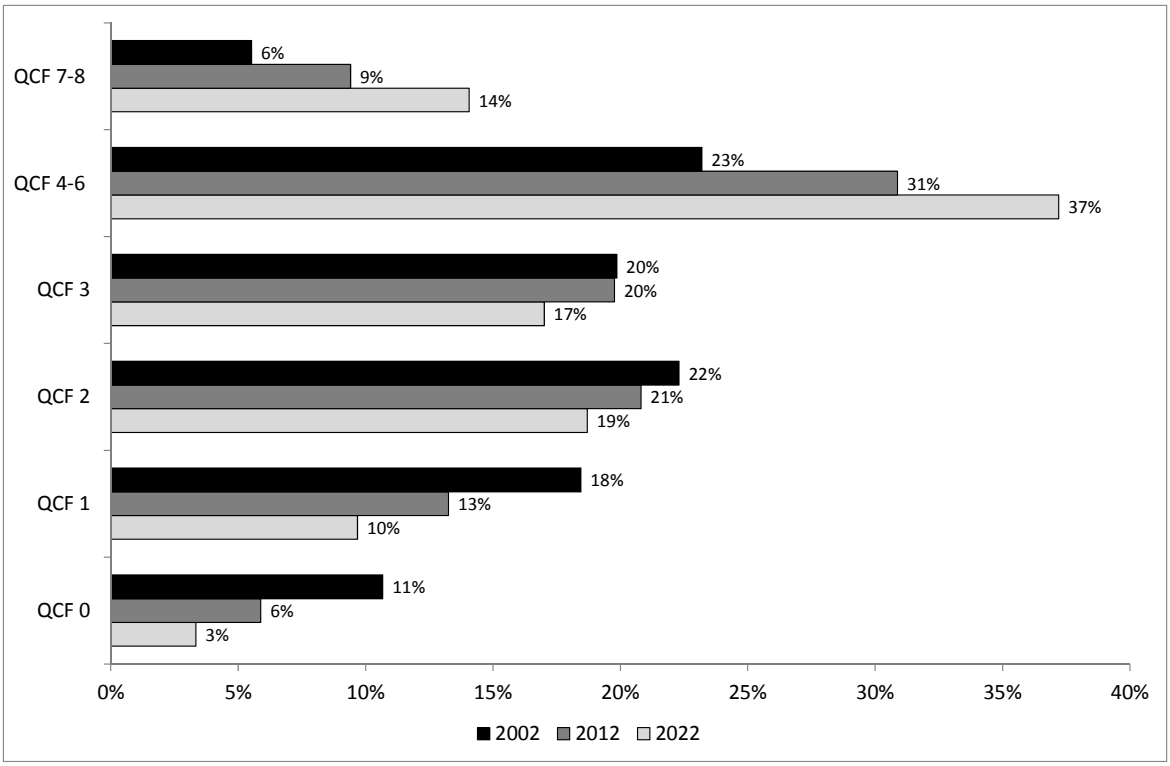
Table 5.8: Changing qualification pattern of employment (workplace / jobs, % of total)

	2002	2012	2022
QCF level			
QCF 0	10.7	5.9	3.3
QCF 1	18.5	13.3	9.7
QCF 2	22.3	20.8	18.7
QCF 3	19.9	19.8	17.0
QCF 4, 5 & 6	23.2	30.9	37.2
QCF 7 & 8	5.5	9.4	14.1
Total	100.0	100.0	100.0

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

[52] These matters are discussed in much more detail in the separate Spatial Annex E

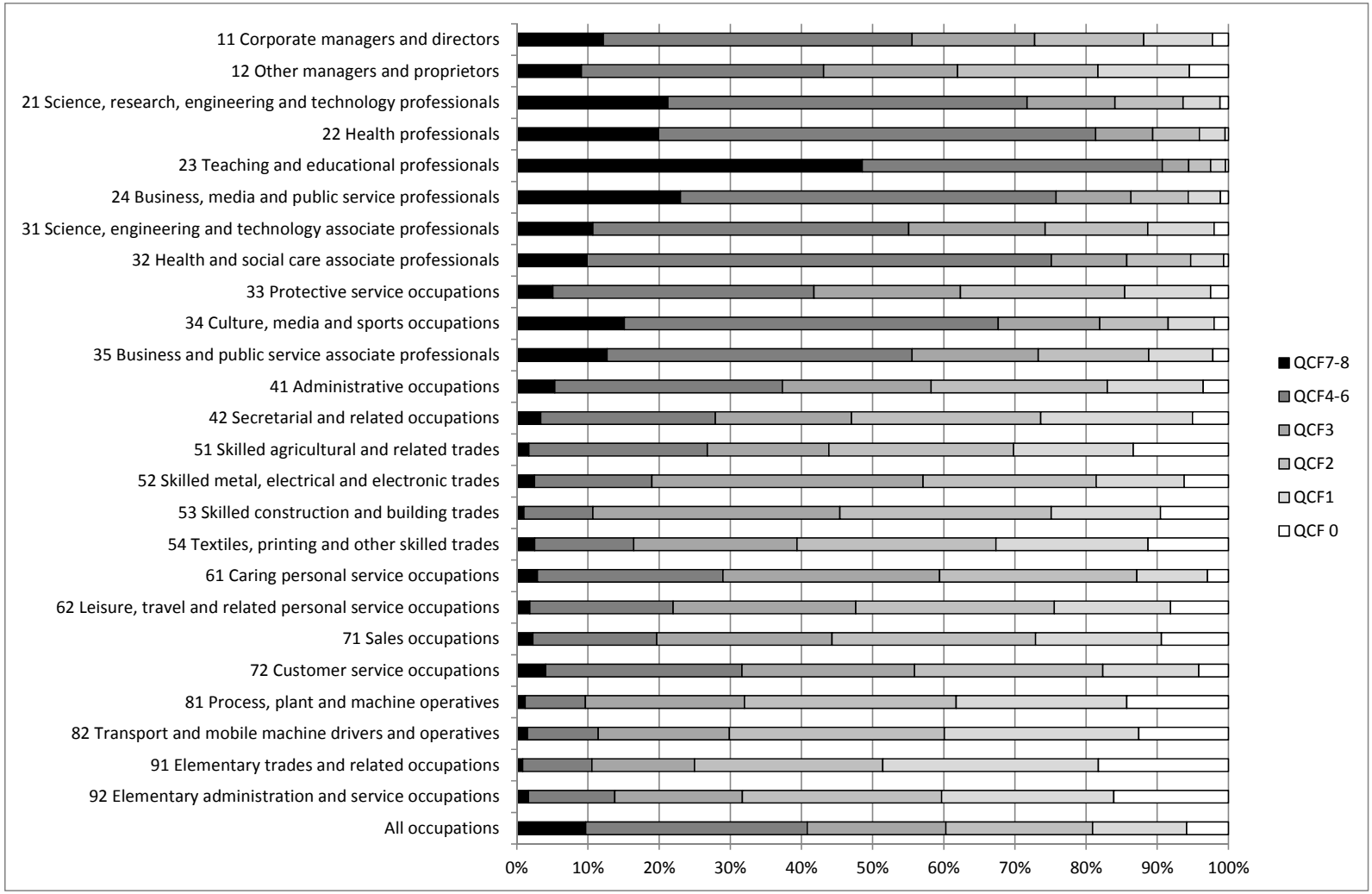
Figure 5.2: Changing qualification pattern of employment (workplace / jobs, % of total)



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

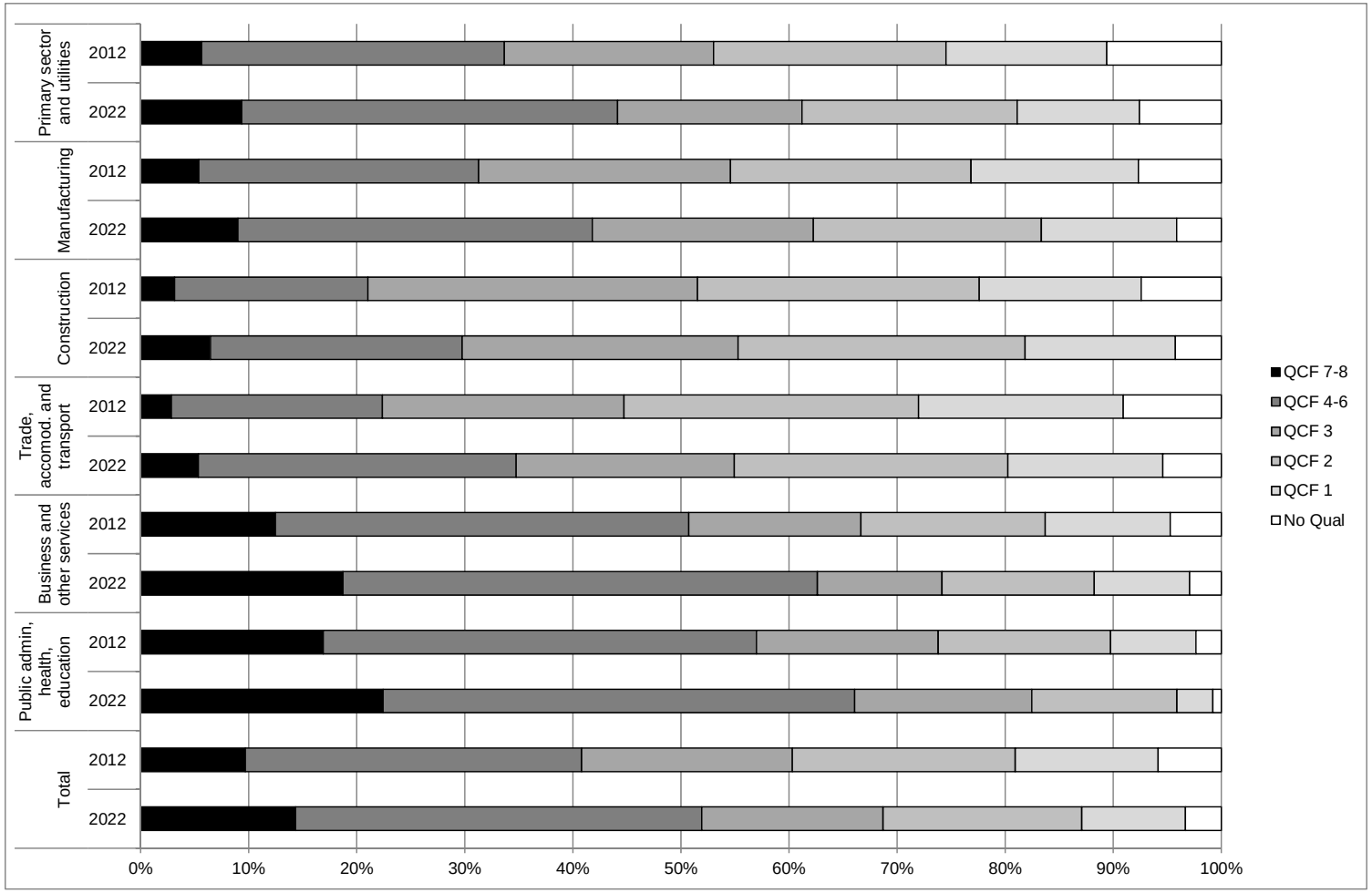
Note: The estimates shown are based on LFS shares applied to Working Futures data on employment levels (jobs)

Figure 5.3: Qualification pattern of employment by occupation, 2012 (workplace / jobs, % of total)



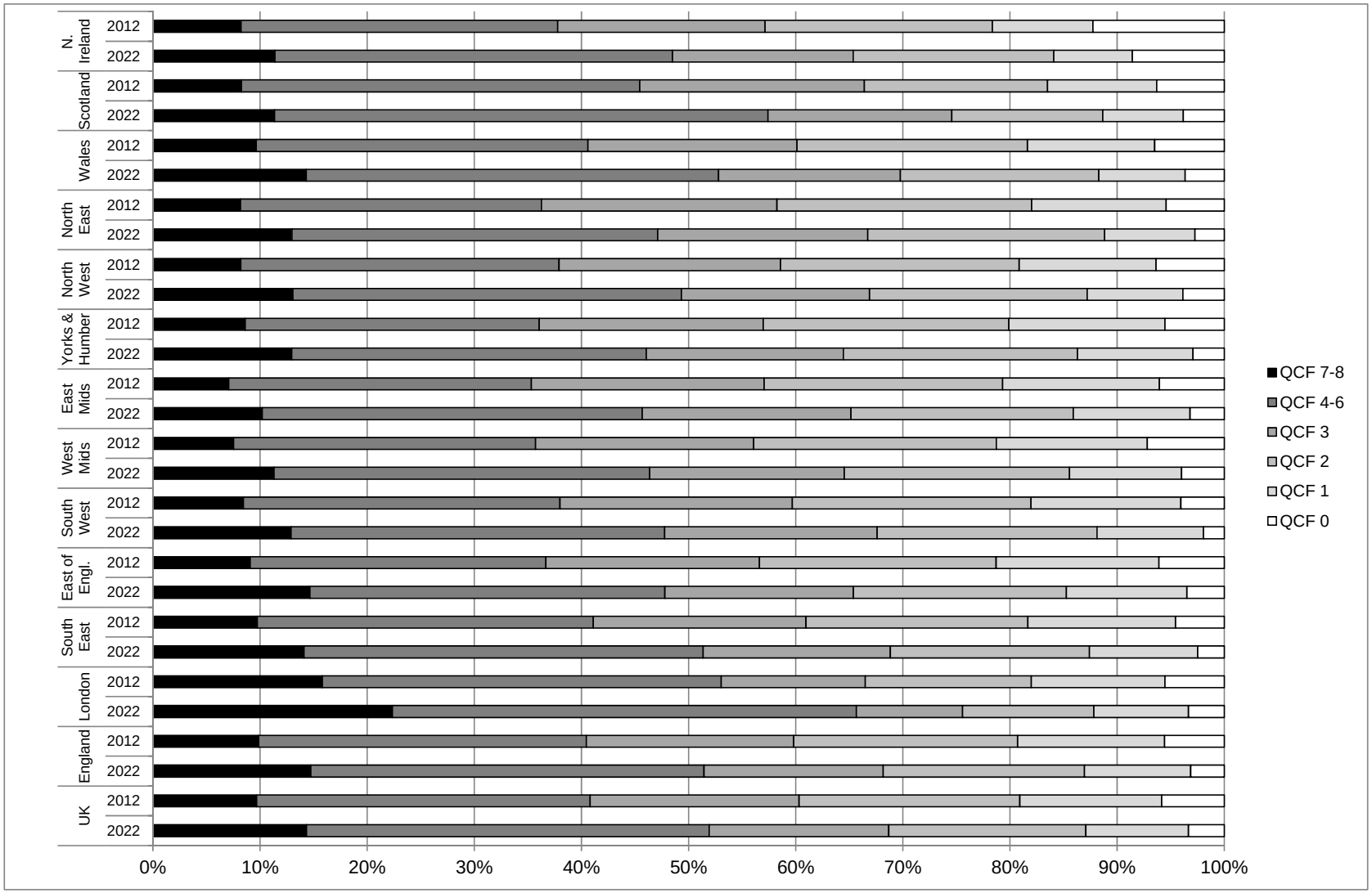
Source: IER estimates based on LFS data, constrained to match Working Futures estimates

Figure 5.4: Changing qualification pattern of employment by sector, 2012-2022 (workplace / jobs, % of total)



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

Figure 5.5: Spatial Variations in Employment Patterns by Qualification, 2012-2022



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.

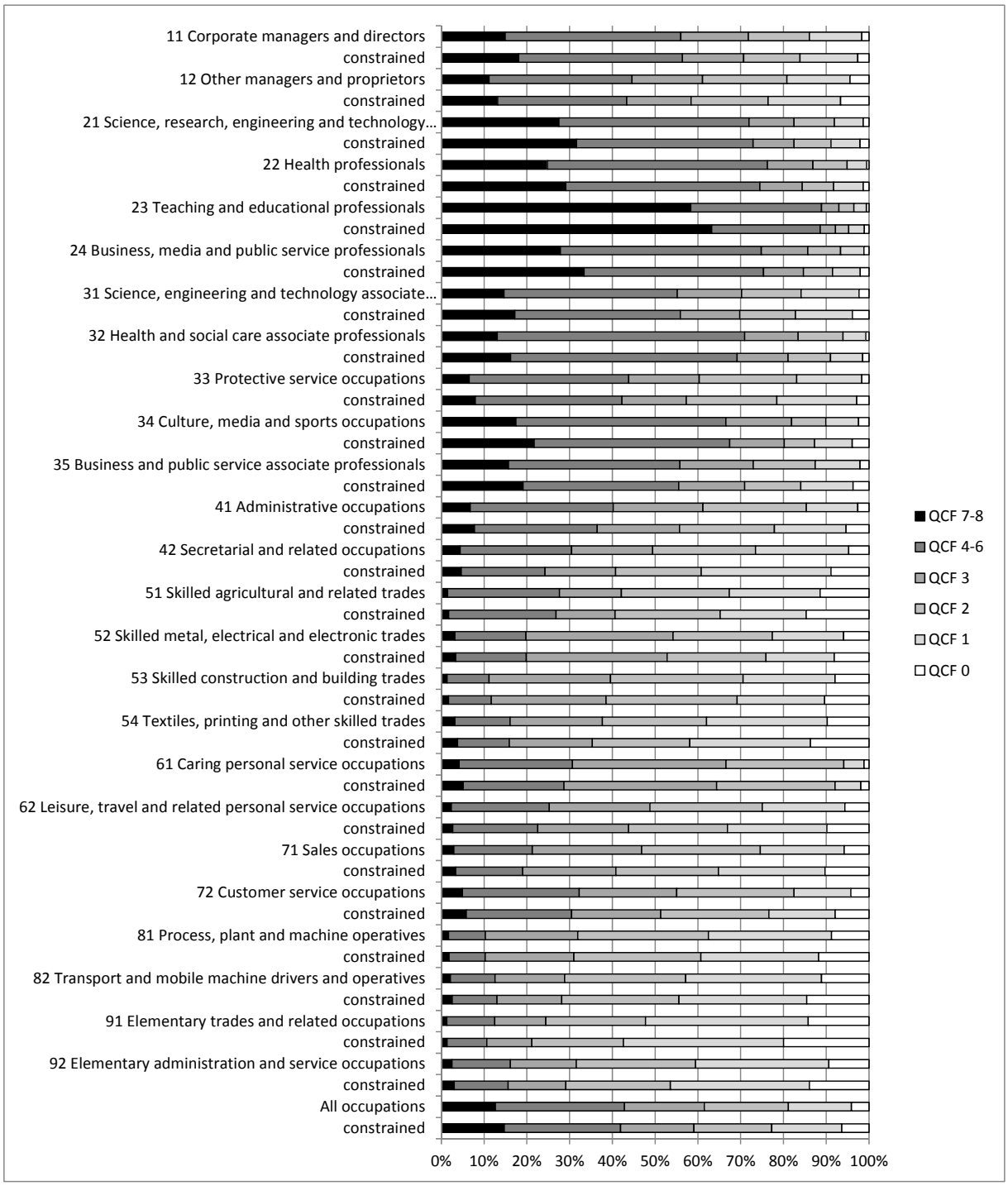
In order to ensure consistency, a reconciliation is imposed by making certain assumptions about unemployment rates by highest qualifications held, and then reallocating people to jobs until all those available are employed. This involves raising the qualifications intensity of all jobs if initial supply exceeds demand and conversely. 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 5.6 illustrates the impact of this adjustment process for 2022. 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 QCF 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.[27]

[27] 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 5.6: Reconciling demand and supply in 2020– increasing qualification intensity by occupation (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 (QCF4+) will rise substantially. In contrast, the proportion and number of those in the workforce with qualifications at QCF 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 QCF 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 and spatial areas. These differences are primarily driven by variations in their employment patterns by occupation (and also by sector in the case of spatial areas).

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

Bibliography

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

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

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

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

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

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

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

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

Wilson R.A. (ed.) (2001b). *Projections of Occupations and Qualifications, 2000/2001*. Department for Education and Employment/University of Warwick, Institute for Employment Research, Coventry.

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

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, pp561-609.

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

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

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

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

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

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

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