Working Futures 2004-2014
Qualifications Report

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QUALIFICATIONS REPORT

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SUMMARY

This report is part of the **Working Futures 2004-14** series. It presents an analysis of historical changes and likely future developments in the demand for and supply of qualifications, focusing on the period from 2004 to 2014. The analysis builds upon the main *Working Futures* results, teasing out the implications for the kinds of formal qualifications that people are likely to need in the future.

Observed patterns of employment by qualification are the consequence of both supply and demand influences. There has been a sharp rise in the supply of people holding formal qualifications, in part at least in response to government policies to increase participation in higher education. There is evidence that demand has also increased, with many jobs requiring more formal higher level qualifications than used to be the case, while the returns to obtaining such qualifications have remained high.

An eclectic approach to analysis, modelling and forecasting has been adopted, which uses a variety of different data sources. The key data source (apart from the main *Working Futures* database) is the Labour Force Survey. The focus is on numbers of people. Qualifications are defined by reference to 6 levels of the *National Qualifications Framework*.

The analysis begins with a brief overview of historical trends. A series of models are then deployed to analyse and then forecast the numbers of people holding formal qualifications. The prime focus is at national (UK), but this is extended to cover all the constituent countries and regions of the UK and a detailed analysis by sector.

It is emphasised that the future cannot be predicted with precision or certainty. This is especially true of the qualifications dimension, for which data are less robust than for many other aspects of employment. The results presented here represent a benchmark for debate and reflection. They are not intended to be prescriptive. Users are advised to regard them as indicative rather than precise indications of both changing historical patterns and future changes.

Despite these caveats it is possible to provide a number of robust findings from this analysis at an aggregate level:
- The overall qualification profile will improve significantly over the next decade. The proportion and numbers of people qualified at higher levels will rise substantially. In contrast, the proportion and number of those in the workforce with qualifications at or below NQF level 1 will fall.
- These changes reflect changing patterns of requirements in most jobs although the balance between demand and supply is hard to predict.
- There has been a marked slowdown in the rate of improvement in qualifications acquisition over the period 1999 to 2004.
- However, based on a longer historical period (1994-2004) the projections assume that this slowdown is reversed.
- There are some significant differences in qualification profiles across both sectors and spatial areas, primarily driven by differences in employment

patterns by occupation (and 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 NQF levels 4 and 5 and reductions at levels 0 and 1.
- The highest qualified (NQF4+) are least likely to experience unemployment but will find it less easy to secure and retain employment in 2014 than 2004.
- The share of unemployment represented by those without qualifications has fallen from nearly 30% in 1994 to 20% in 2004.

INTRODUCTION

1.1 Introduction and Background

This document is one of five volumes that present **Working Futures 2004-14**. The latter is the second in a series of detailed projections of employment.[1] The present volume focuses on the demand for and supply of qualifications. The projections cover the period from 2004 to 2014.

It was commissioned by the Sector Skills Development Agency (SSDA) to provide a sound statistical foundation for the deliberations of a number of its key partners across the skills arena about the future demand for skills. These partners include the Sector Skills Councils (SSCs), the Learning and Skills Council (LSC) and its local arms (the Local Learning and Skills Councils (LLSCs)), the Department for Education and Skills (DfES), the Treasury, Regional Development Agencies (RDAs), as well as other partners such as the Scottish Executive, the Welsh Assembly and the Department for Employment and Lifelong Learning in Northern Ireland.

The projections are based on the use of the Cambridge Econometrics (CE) multi-sectoral, regional macroeconomic model (RMDM), which provides the general economic scenario, together with various models developed by the Warwick Institute for Employment Research (IER) for producing employment projections by occupation and qualification. Further information about these models is given in separate *Technical Reports*.[2] The present analysis builds upon the main *Working Futures* results in order to tease out the implications for the kinds of formal qualifications that people are likely to need in the economy of the future. It also draws on earlier projections of qualifications (Wilson, 2001 and 2002).

1.2 General Approach

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. The focus is on numbers employed. The key source of information on qualification patterns that is used 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. The analysis therefore focuses on different aspects in turn (occupation, spatial area, sector, etc), rather than all of them simultaneously.

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[1] *Working Futures* provides the most comprehensive picture available for the UK about future patterns of demand for skills, including both occupations and qualifications. The *National Report* (Wilson *et al.* (2006)) provides an overview and summary for the UK. It also presents detailed results for the 27 broad SSDA Sector Matrix Industries (SMIs). Analyses for each of the areas covered by the 9 English Regional Development Agencies and the other constituent countries within the UK are presented in a separate *Spatial Report* (Green, *et al.* (2006)). This is complemented by a separate *Sectoral Report*. This presents results customised more closely to the newly formed SSCs (Dickerson *et al.* (2006). Finally, a detailed account of sources and methods is provided in the *Technical Report* (Wilson *et al.* (2006b).

[2] Wilson *et al.* (2006b) and Wilson and Bosworth (2006).

Qualifications are defined by reference to the *National Qualifications Framework*. This is the framework into which all QCA-accredited qualifications fit. The framework has six levels and three categories for types of qualification. The three categories of qualifications are general, vocationally-related and occupational. The different levels are:

- NFQ 0 (Entry and none);
- NFQ 1 (Foundation);
- NFQ 2 (Intermediate);
- NFQ 3 (Advanced);
- NFQ 4 (Degree level or equivalent);
- NFQ 5 (Postgraduate level).

Levels 4 and 5 relate to higher level qualifications (e.g. degrees and other higher level awards at Levels 4 and 5). Entry Level is defined as being pre-Level 1 and is aimed at those learners who are not yet able to attain a Level 1 qualification. These include academic as well as vocational qualifications. For brevity the five levels are referred to as NQF 1-5. In addition a 6th category for those with no formal qualifications is defined, NQF 0. For most purposes, the focus is upon the highest qualification held.

A variety of different definition of employment and related indicators are used (see Box 1.1). The starting point for the analysis is the total numbers of people in the population of working age in possession of different qualifications (residence basis, heads). Not all these people are economically active. Of these, at any point in time, some are unemployed. Subtracting these away from the economically active gives a measure of the number of employed residents (heads). Finally of those who are employed some have more than one job. Moreover they may be employed in a workplace in a geographical area different from where they are resident. This requires the use of an alternative measure; workplace jobs. It is this measure that is the focus of the main *Working Futures* model.

For each gender/NQF category, there are two accounting identities linking the various elements:

- Employment (residence/heads) plus (ILO) unemployment) = total number economically active
- Economic activity rate = total number economically active/ total number

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

Box 1.1: 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 2004-2014* 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).

1.3   Models and Modules

The general approach to developing the projections involves a number of inter-related models and modules, which together cover various aspects of the supply of and demand for formal qualifications, at national and more detailed spatial levels. 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 Annex A. These problems are addressed in a variety of ways, depending upon the availability of data and the prime objectives of each particular element.

A **National level stock-flow/cohort model,** is used to produce projections of the total number of people qualified at broad NQF level, as well as the numbers of those economically active. 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 (or multi-logit) model.** These results are presented in Chapter 4.   More detailed results by occupation, sector and region are then presented in subsequent chapters. These are based on extrapolating patterns of qualification by occupation for those employed within these various categories. These more detailed results are constrained to provide a picture consistent with the overall stock-flow model results.[4]The estimates of employment by NQF level are then constrained using RAS iterative methods to:[5]

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

This provides some consistency across the full set of *Working Futures* projections. However, for reasons already specified, without developing a complete database across all the various dimensions (gender, status, sector, geographical area), complete consistency cannot be guaranteed.

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.

This chapter also provides a brief overview of the main methods and assumptions

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[4] Without developing a comprehensive employment database, adding qualifications to all the other dimensions in the *Working Futures* database (gender, status, sector, 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 produce such a database. In many cases no data are available.   In even more cases the data that are available are based on insufficiently large sample numbers to produce robust estimates. The results presented here present, as far as is possible, a consistent picture across all the main dimensions. They should be regarded as indicative.
[5] RAS is a iterative procedure which is used to generate a data array constrained to match certain row and column targets.

used. More complete details of data sources and methods are given in Annexes A and B.

1.4   Structure of this Report

Chapter 2 presents a brief overview of key historical trends. Chapter 3 presents the headline results for the whole of the UK, covering both supply and demand aspects. This includes projections of the total number of people by qualification at national (UK) level, together with corresponding estimates of the economically active labour force and total employment.

The analysis is extended in Chapter 4 to cover all the constituent countries and English regions of the UK using the spatial qualifications model. As with Chapter 3, this covers both supply and demand aspects. Chapter 5 moves on to consider patterns of qualification by occupation, concentrating on employment. This is followed in Chapter 6 by an overview of the prospects in individual sectors, again focusing upon employment. This detailed analysis is based on the 25 Sector Matrix Industry groupings used for national reporting.[7] Chapter 7 provides the main conclusions. Annex A provides further details on the more detailed results from the stock-flow model and the sensitivity of the results to a range of alternative assumptions.

A separate *Qualifications Technical Report*[8] accompanies this report giving further details of the data sources and methods used in the production of the projections and of the issues surrounding these.

1.5   General Caveats

Different users have different requirements for information of this kind, ranging from very basic information about typical qualification patterns in different jobs to more sophisticated information about unfolding patterns of both stocks and flows. In combination, the results presented here provide *benchmark projections* of qualifications at a sectoral, country and regional level. In addition, procedures have been developed which enable even more detailed local and sectoral level results to be produced. The analysis covers the influence of both supply and demand factors, using all the available information on both stocks and flows through the system.

It is important to emphasise that the future cannot be predicted with precision or certainty. Individuals and organisations all make plans for the future (even if it is simply that the future will be little different from the present and recent past). In doing so they adopt (implicitly at least) assumptions about what it might be like. The question,

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[7] The SSDA and its partners have identified 27 sectors at national level referred to as the Sector Matrix Industries. Some of these are too small to enable a robust analysis. Mining & quarrying and Utilities have been combined as have Wood & paper and Printing & publishing.

[8] Wilson and Bosworth (2006)

therefore, is not whether projections and forecasts need to be undertaken but rather how this should be done. The rationale behind *Working Futures* is that a comprehensive, systematic, consistent and transparent set of projections provides useful information for all the actors in the labour market.

It is also important to emphasise that the views presented here are not the only possible future. They represent a benchmark for debate and reflection. The detailed projections here present a carefully considered view of what the future might look like, if past patterns of behaviour and performance are continued. They are not intended to be prescriptive.

Using LFS and Census information it is possible to develop a robust analysis at an aggregate level. It is also possible to develop headline figures across various key dimensions such as gender, occupation, sector and spatial area. However, limited sample sizes mean that there are many gaps in the available data. The procedures developed here enable a set of results to be developed covering all the main dimensions of interest. However, there are inevitably discrepancies and inconsistencies if detailed comparisons are made. Users should treat all results as indicative rather than precise indications of historical patterns and future changes.

2.   RECENT TRENDS

There have been some remarkable changes in participation in education and training, in recent years. These have been reflected in the changing qualifications held by the population. The present study has undertaken a detailed examination of the shifts in highest level qualifications held over the period 1993 to 2004. This analysis is then used as the basis for then making projections forward to 2014.

Information from the LFS can be used to see how qualification profiles have been changing over time for both males and females. Figure 2.1 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) and those in employment (Figure 2.2).

There are some important 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. The main focus here is on totals for both genders and across all ages.

The patterns of employment by qualification observed are the result of a combination of both supply and demand factors. Separating them is not straightforward. Recent trends have seen a sharp rise in the formal qualifications held by those in employment. Some have argued that supply has outpaced demand and that this simply reflects increased numbers qualified rather than real requirements (Brown and Hasketh, 2004). However, there is some evidence that this reflects real **demand** changes, with many jobs requiring more formal higher level qualifications than used to be the case (Purcell *et al.* 2005). There are also indications that the returns to obtaining such qualifications have remained high (for a review see Wilson *et al.* (2005)).

On the other hand it is clear that there have been major changes on the **supply** side, in part at least in response to government policies to increase participation in higher education. The latter has resulted in a big increase in the numbers emerging on to the labour market with formal qualifications. The proportion of young people with formal qualifications is much higher than for older people. There is therefore a strong **cohort** effect. This has been reinforced to some extent by increasing qualification rates for older people as well (an "**upskilling**" effect).

The numbers in the total population holding different levels of formal qualifications can be regarded primarily as a supply indicator (although in practice it will reflect both demand and supply influences). The key drivers in recent years have been demographic changes, combined with increases in educational participation. The results of these two factors have seen large increases in both numbers and shares of the population qualified at higher levels (NQF 4 or 5) and reductions in the numbers and shares qualified to NQF level 1 or below. Over the period 1994-2004 the number and proportions qualified to level 2 in the population have fallen slightly

while those qualified to NQF level 3 have increased. Similar patterns can be observed for those in employment (Figure 2.1) and, (as shown in Figure 2.2), for those in the labour force.

Qualifications patterns vary considerably across occupations as Figure 2.3 illustrates. Higher level occupations, such as professionals and associate professions, (and to a lesser extent managers), tend to be much better qualified than less skilled occupations. Shifts in occupational structure in favour of the former have been a key factor in increasing the numbers of graduates in employment, as discussed in greater detail in Chapter 5. Qualification profiles have changed in almost all occupations in favour of higher level qualifications (NQF4+) and with sharp reductions for the less well qualified (NQF1 and below).

Qualifications profiles also vary very significantly across sectors (see Figure 2.4). 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 NQF 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.

There are also variations across spatial areas, although these are less marked (see Figure 2.5). London (and to lesser extent Scotland) stands out, employing the largest proportion of those qualified at NQF 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 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.

Figure 2.1: Changing Patterns of Qualification of those in Employment
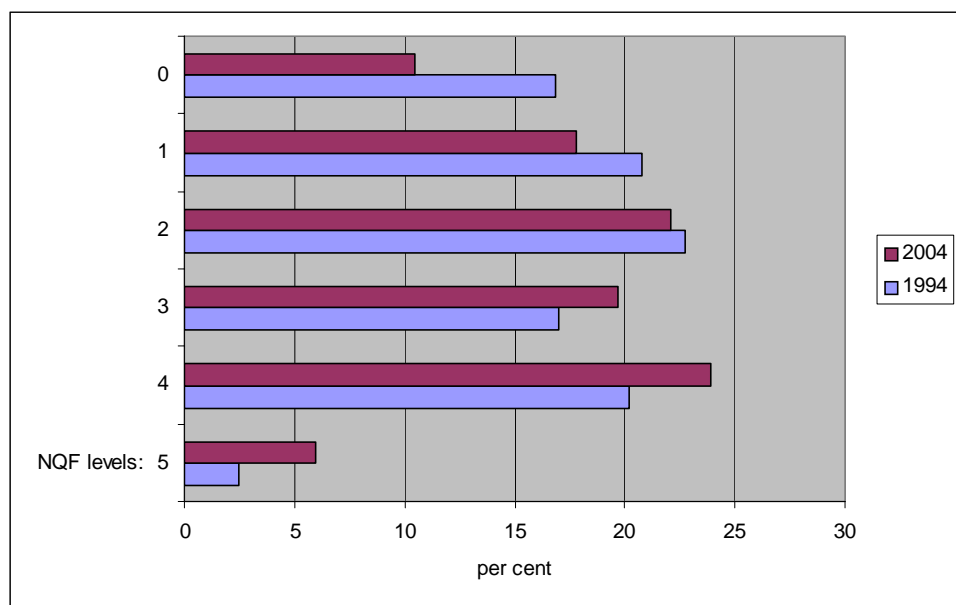
Source: IER estimates based on LFS data, constrained to match *Working Futures* estimates.
Notes: The estimates shown are based on LFS shares applied to *Working Futures* data on employment levels (jobs).

Figure 2.2: Changing patterns of Qualification within the Labour Force
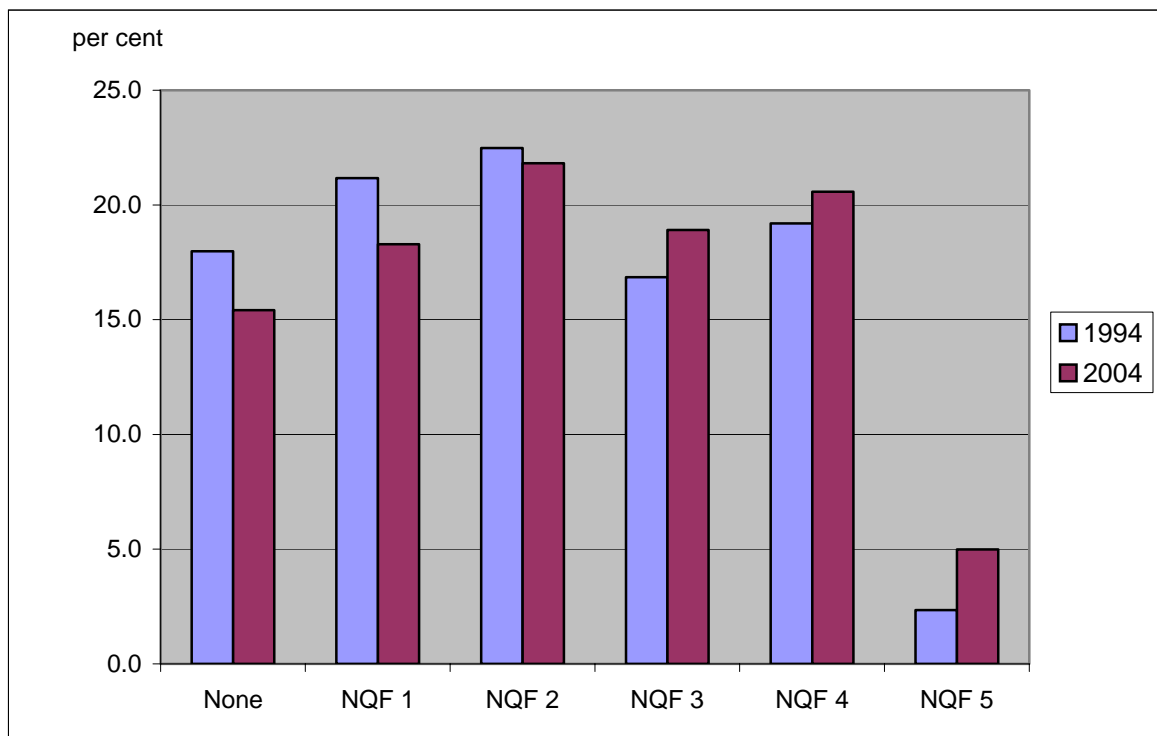
Source: IER estimates based on LFS data, constrained to match *Working Futures* estimates.

Figure 2.3: Qualification Patterns by Occupation
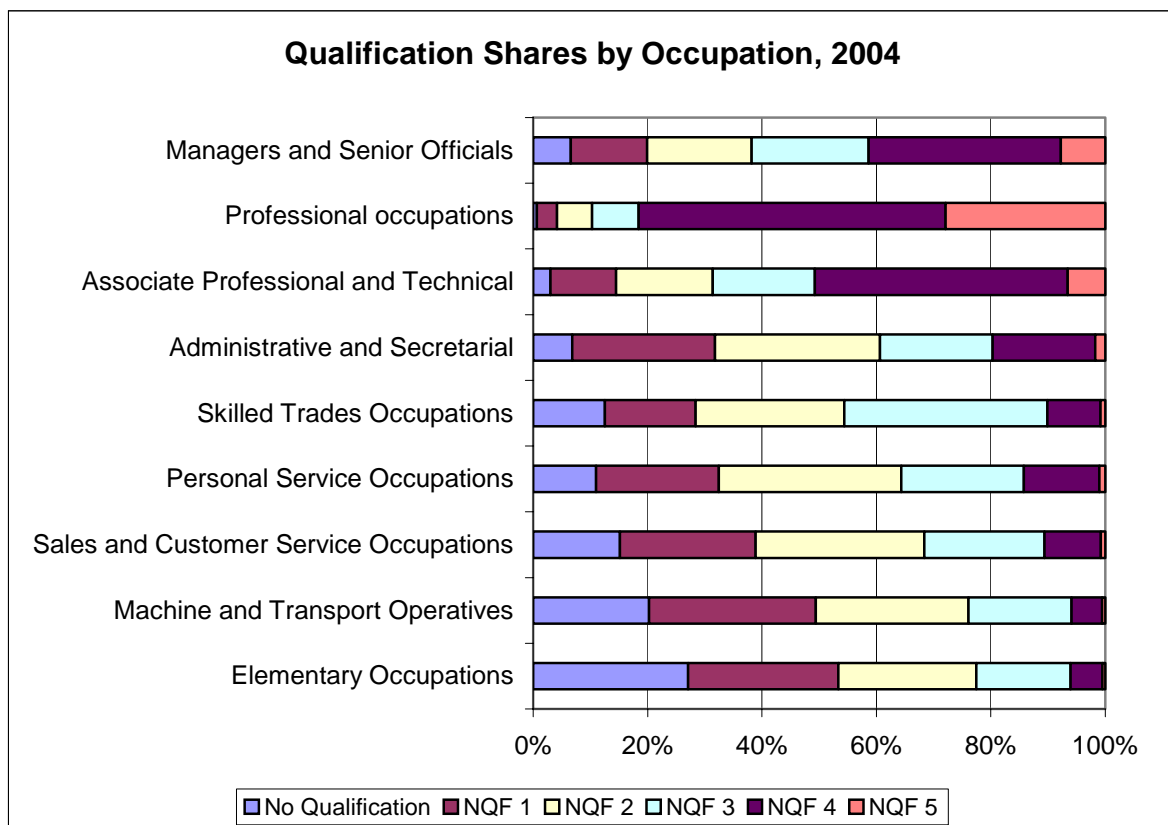
Source: IER estimates based on LFS data, constrained to match *Working Futures* estimates.

Figure 2.4: Qualification Patterns by Sector
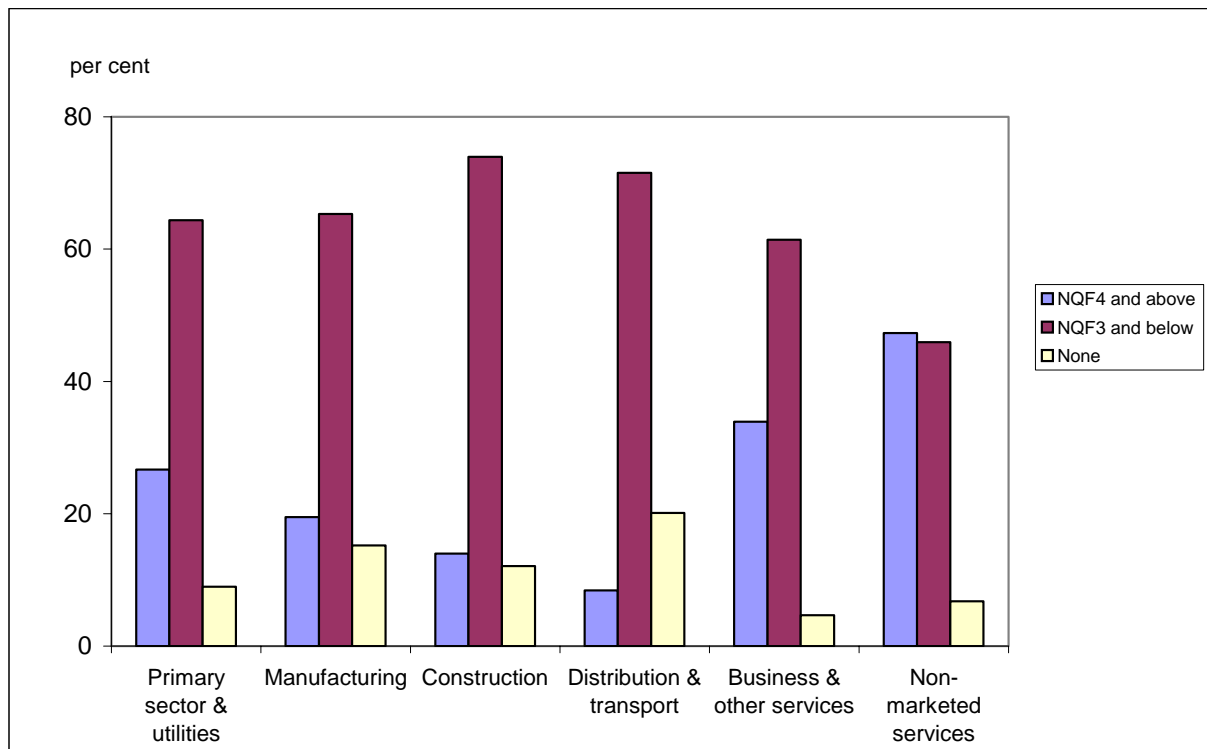
Source: IER estimates based on LFS data, constrained to match *Working Futures* estimates.

Figure 2.5: Spatial Patterns
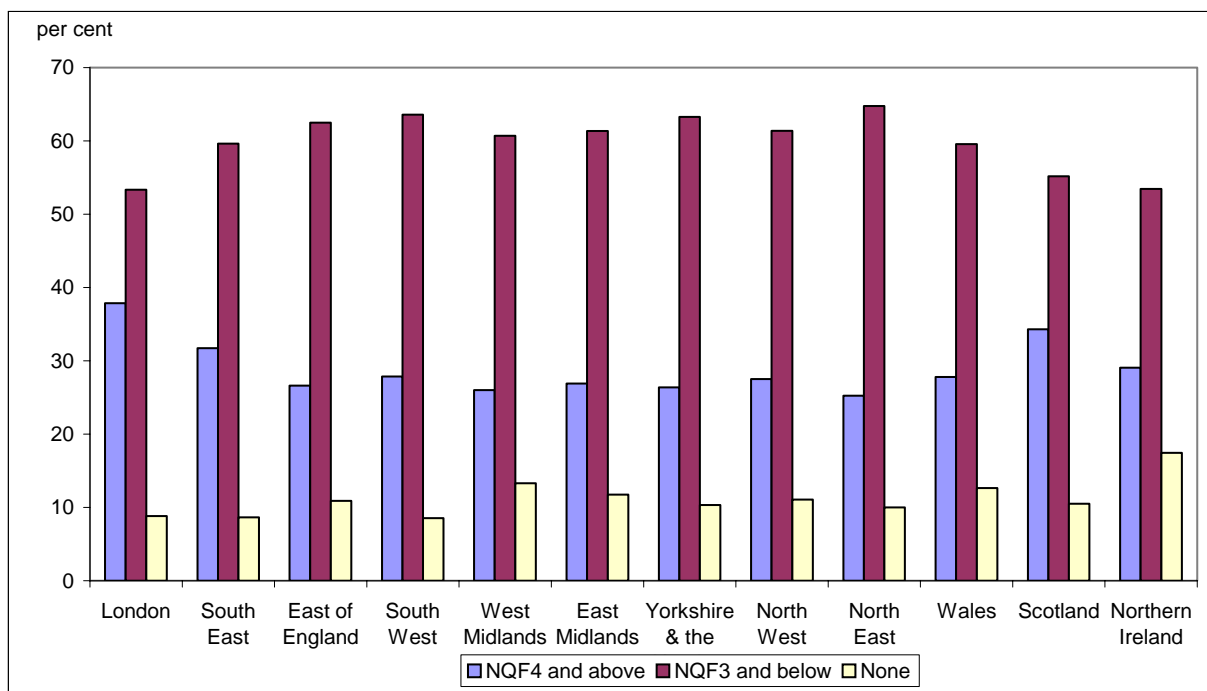
Source: IER estimates based on LFS data, constrained to match *Working Futures* estimates.

3. FUTURE NUMBERS BY QUALIFICATION

3.1 Benchmark Projections

Tables 3.1-3.5 summarise the results from the stock-flow model and show the progression to estimated patterns of employment by qualification within occupations in particular sectors and regions in the main *Working Futures* database.

Table 3.1 presents the headline results from the stock-flow model. This shows the total numbers of people in the population of working age in possession of different qualifications (residence basis, heads). It covers all individuals, both economically active and inactive. These results are based on taking the existing stock of people by age and gender and then adding in the new inflows (as people acquire qualifications) and deducting outflows.

There is clear evidence of significant increases in the numbers of people acquiring higher level qualifications. In the benchmark projections, it is assumed that rates of acquisition of qualifications will continue at the same rate as that observed over the whole of the decade 1994-2004. In practice rates of acquisition have slowed in the second half of the decade and the rates of improvement may not be so rapid as shown here. The sensitivity of the results to this and other assumptions is considered in the Annex (A6)

Table 3.2 shows the number of people who are economically active. This is also on a residence/heads basis. It is also derived from the stock-flow model and focuses on results for the whole of the UK, for those of working age. Annex A.4 provides a breakdown by gender of the economically active population.

In order to draw out the implications for total employment it is necessary to take a view about unemployment by level of qualification. Based on LFS data there is a clear monotonic relationship between unemployment rates and qualifications held, with rates falling the better qualified people are. Between 1994 and 2004, the overall rate of unemployment (ILO basis) fell sharply from just under 10 to below 5 per cent. Most groups benefited from this, but the better qualified generally benefited the most. This was despite the large increase in their share of total employment. As Table 3.3 shows, the shares of total unemployment amongst the various NQF categories changed in a rather different fashion. The unqualified category accounted for almost 30 per cent of total unemployment in 1994. By 2004 its share of the much smaller total had fallen to just over 20 per cent. This reflected the rapidly declining share of this group in the workforce as a whole.

By contrast, the shares of both the workforce and unemployment for better qualified categories (all those qualified at NQF level 2 or above) rose, with the largest increases (in proportionate terms) being for the best qualified. Those qualified at NQF level 5 accounted for just 1 per cent of total unemployment in 1994. By 2004, despite the big shifts in favour of the latter in terms of total employment these patterns had only changed marginally. Those qualified at NQF level 5 still only accounted for 3 per cent of total unemployment (an ILO rate of about 2½ per cent,

compared to around 5½ per cent in 1994) while the unqualified accounted for 20 per cent of the total (an ILO rate of 10 per cent, down from almost 18 per cent in 1994).

In the main *Working Futures* scenario unemployment as a whole is projected to rise very slightly and the various gender/NQF categories are assumed to be similarly affected by this. The results in terms of their shares of total unemployment and overall unemployment levels are summarised in Tables 3.3 and 3.4 respectively. Unemployment rates are assumed to rise slightly for graduates but they increase most significantly for the unqualified category, a group that will increasingly represent a core of disaffected and disabled people, unwilling or unable to take part in the formal economy.

In practice, the rising supply of better qualified workers may result in a more extreme change in the patterns of unemployment observed. An alternative scenario might be one in which the continued rise in the proportion of the workforce that are better qualified will result in a larger increase in the share of such groups in total unemployment. However, as noted in the Annex this is likely to affect the overall patterns of change in employment patterns only marginally.

Table 3.5 presents estimates of employment (residence/heads basis) implied by these unemployment assumptions for 2014. These patterns (shares by NQF level) are then applied to the *Working Futures* estimates employment on a workplace/jobs basis to get the final set of results presented in Table 3.6. These figures are then used as the benchmark to which all the other employment figures in this report are constrained. In particular the projections of changing qualification profiles within occupations, in aggregate, and separately by sector and by region, are all constrained to match these overall totals.

Table 3.1: Total numbers by qualification (working age population)

Total population of working age (000s)

Supply	1994	2004	Projected 2014
NQF level			
5	694	1,849	3,240
4	5,951	7,617	9,892
3	5,731	7,001	9,077
2	7,714	8,076	7,856
1	7,315	6,768	5,860
0	7,850	5,710	2,025
All quals.	35,255	37,021	37,950

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

Table 3.2: Economically active population by qualification (working age only)

Economically active (000s)

NQF level	2004	2014
5	1,654	2,773
4	6,659	8,493
3	5,573	7,195
2	6,276	6,072
1	5,148	4,284
0	3,119	889
All quals.	28,429	29,706

Source: IER estimates based on LFS data, constrained to match *Working Futures* estimates.
Note: Working age only. The totals for all ages in 2004 and 2014 are 29,450 and 30,897 respectively.

Table 3.3: Shares of total unemployment by qualification

Unemployment shares (%)

	1994	2004	2014
NQF level			
5	1.3	3.0	6.1
4	9.6	13.8	16.3
3	15.6	17.3	19.1
2	19.9	21.6	23.9
1	24.7	24.1	24.7
0	28.8	20.3	9.8
All quals.	100.0	100.0	100.0

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

Table 3.4: Implied unemployment levels

Implied Unemployment (000s)

NQF level	1994	2004	2014
5	35	37	100
4	246	176	263
3	401	232	319
2	514	292	409
1	637	334	430
0	743	288	174
Total	2,576	1,359	1,695

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

Table 3.5: Employment (residence/heads)

Employment (heads) (000s)

NQF level	1994	2004	2014
5	610	1,616	2,671
4	5,035	6,478	8,222
3	4,238	5,340	6,873
2	5,671	5,983	5,665
1	5,189	4,817	3,860
0	4,204	2,836	720
Total	24,945	27,071	28,011

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

Table 3.6: Employment (workplace/jobs)

Workplace employment jobs (000s)

NQF level	1994	2004	2014
5	655	1,795	2,992
4	5,404	7,197	9,207
3	4,549	5,936	7,700
2	6,087	6,652	6,353
1	5,569	5,359	4,335
0	4,512	3,159	812
Total	26,775	30,099	31,399

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

4. QUALIFICATION PATTERNS WITHIN COUNTRIES AND REGIONS OF THE UK

4.1 Introduction: Qualification Projections for the Population and Labour Force

This chapter summarises the results produced for each constituent country and English Region within the UK consistent with main *Working Futures* results. Details of how these estimates were produced can be found in Annex A, which summarises the approach used to develop projections of qualifications for the total population, the economically active workforce and those in employment.

The model focuses upon the probability of people acquiring different levels of qualification. By applying the predicted probabilities to projections of the overall numbers of people by spatial area, gender and age, projections of the numbers and proportions with different qualification levels are derived. To ensure consistency, these have been constrained to match the overall UK figures described in Chapter 3.

This analysis focuses upon **stocks** rather than **flows**. At a spatial level migration and commuting flows can result in significant changes to the patterns, depending on whether the emphasis is on **residence** or **workplace**. The results presented here effectively assume fixed patterns of net migration and net commuting between the spatial areas. Tables 4.1 and 4.2 focus on the total population of working age. Tables 4.3 and 4.4 move on to consider those who are economically active.

There are significant differences in the patterns across the different spatial areas. London and Scotland, in particular, stands out as having a higher proportion of those qualified at higher level, but the differences are not huge.

Patterns of change over time are very similar across all areas. All show continued rapid growth of numbers and proportions qualified at higher levels and reductions for the numbers and proportions qualified at level 1 or below.

Table 4.1: Projections of Qualifications by Region and Country Total Population of Working Age

Cross-regional comparison of qualification structure (000s & % shares)

		None	NQF1	NQF2	NQF3	NQF4	NQF5	total
UK	2004	5,710	6,768	8,076	7,001	7,617	1,849	37,021
	2014	2,025	5,860	7,856	9,077	9,892	3,240	37,950
% shares	2004	15.4	18.3	21.8	18.9	20.6	5.0	100.0
	2014	5.3	15.4	20.7	23.9	26.1	8.5	100.0
London	2004	739	921	988	765	1,156	377	4,945
	2014	312	867	979	960	1,579	573	5,270
% shares	2004	14.9	18.6	20.0	15.5	23.4	7.6	100.0
	2014	5.9	16.5	18.6	18.2	30.0	10.9	100.0
South East	2004	553	922	1,096	983	1,142	295	4,990
	2014	160	775	1,014	1,216	1,442	514	5,122
% shares	2004	11.1	18.5	22.0	19.7	22.9	5.9	100.0
	2014	3.1	15.1	19.8	23.7	28.1	10.0	100.0
East of England	2004	454	681	787	617	658	154	3,351
	2014	159	583	769	830	831	264	3,436
% shares	2004	13.6	20.3	23.5	18.4	19.6	4.6	100.0
	2014	4.6	17.0	22.4	24.1	24.2	7.7	100.0
South West	2004	334	599	692	628	618	147	3,018
	2014	86	503	624	840	863	267	3,184
% shares	2004	11.1	19.8	22.9	20.8	20.5	4.9	100.0
	2014	2.7	15.8	19.6	26.4	27.1	8.4	100.0
West Midlands	2004	600	622	702	603	601	128	3,256
	2014	193	536	766	843	759	237	3,336
% shares	2004	18.4	19.1	21.6	18.5	18.5	3.9	100.0
	2014	5.8	16.1	23.0	25.3	22.8	7.1	100.0
East Midlands	2004	434	506	553	527	505	110	2,636
	2014	149	496	545	726	618	169	2,703
% shares	2004	16.5	19.2	21.0	20.0	19.2	4.2	100.0
	2014	5.5	18.3	20.2	26.9	22.9	6.2	100.0
Yorkshire & the Humber	2004	475	622	693	604	560	134	3,088
	2014	178	521	677	850	705	239	3,170
% shares	2004	15.4	20.1	22.4	19.6	18.1	4.3	100.0
	2014	5.6	16.4	21.4	26.8	22.2	7.5	100.0
North West	2004	727	711	943	822	816	159	4,179
	2014	243	588	915	1,134	1,000	322	4,201
% shares	2004	17.4	17.0	22.6	19.7	19.5	3.8	100.0
	2014	5.8	14.0	21.8	27.0	23.8	7.7	100.0
North East	2004	281	313	360	290	259	60	1,563
	2014	100	247	373	381	328	113	1,542
% shares	2004	18.0	20.1	23.0	18.6	16.5	3.8	100.0
	2014	6.5	16.0	24.2	24.7	21.3	7.3	100.0
England	2004	4,597	5,897	6,814	5,840	6,316	1,565	31,028
	2014	1,580	5,115	6,663	7,782	8,125	2,698	31,963
% shares	2004	14.8	19.0	22.0	18.8	20.4	5.0	100.0
	2014	4.9	16.0	20.8	24.3	25.4	8.4	100.0
Wales	2004	332	288	412	336	331	85	1,783
	2014	124	246	396	422	419	201	1,808
% shares	2004	18.6	16.1	23.1	18.9	18.5	4.8	100.0
	2014	6.8	13.6	21.9	23.4	23.2	11.1	100.0
Scotland	2004	512	461	611	644	785	149	3,162
	2014	204	381	539	644	1,086	263	3,115
% shares	2004	16.2	14.6	19.3	20.4	24.8	4.7	100.0
	2014	6.5	12.2	17.3	20.7	34.8	8.4	100.0
Northern Ireland	2004	270	122	239	181	185	50	1,047
	2014	117	118	259	229	263	78	1,064
% shares	2004	25.7	11.7	22.8	17.3	17.7	4.8	100.0
	2014	11.0	11.1	24.3	21.5	24.7	7.3	100.0

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

Table 4.2: Projections of Qualifications Shares within Regions and Countries

Shares of UK qualification numbers

		None	NQF1	NQF2	NQF3	NQF4	NQF5	total
UK	2004	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	2014	100.0	100.0	100.0	100.0	100.0	100.0	100.0
London	2004	12.9	13.6	12.2	10.9	15.2	20.4	13.4
	2014	15.4	14.8	12.5	10.6	16.0	17.7	13.9
South East	2004	9.7	13.6	13.6	14.0	15.0	16.0	13.5
	2014	7.9	13.2	12.9	13.4	14.6	15.9	13.5
East of England	2004	8.0	10.1	9.7	8.8	8.6	8.3	9.1
	2014	7.8	10.0	9.8	9.1	8.4	8.2	9.1
South West	2004	5.9	8.8	8.6	9.0	8.1	7.9	8.2
	2014	4.3	8.6	7.9	9.3	8.7	8.2	8.4
West Midlands	2004	10.5	9.2	8.7	8.6	7.9	6.9	8.8
	2014	9.6	9.1	9.8	9.3	7.7	7.3	8.8
East Midlands	2004	7.6	7.5	6.8	7.5	6.6	6.0	7.1
	2014	7.4	8.5	6.9	8.0	6.3	5.2	7.1
Yorkshire & the Humber	2004	8.3	9.2	8.6	8.6	7.4	7.2	8.3
	2014	8.8	8.9	8.6	9.4	7.1	7.4	8.4
North West	2004	12.7	10.5	11.7	11.7	10.7	8.6	11.3
	2014	12.0	10.0	11.6	12.5	10.1	9.9	11.1
North East	2004	4.9	4.6	4.5	4.1	3.4	3.2	4.2
	2014	5.0	4.2	4.7	4.2	3.3	3.5	4.1
England	2004	80.5	87.1	84.4	83.4	82.9	84.6	83.8
	2014	78.0	87.3	84.8	85.7	82.1	83.3	84.2
Wales	2004	5.8	4.3	5.1	4.8	4.3	4.6	4.8
	2014	6.1	4.2	5.0	4.7	4.2	6.2	4.8
Scotland	2004	9.0	6.8	7.6	9.2	10.3	8.1	8.5
	2014	10.1	6.5	6.9	7.1	11.0	8.1	8.2
Northern Ireland	2004	4.7	1.8	3.0	2.6	2.4	2.7	2.8
	2014	5.8	2.0	3.3	2.5	2.7	2.4	2.8

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

Table 4.3: Projections of Qualifications by Region and Country Economically Active Population

Cross-regional comparison of qualification structure (000s & % shares)

		None	NQF1	NQF2	NQF3	NQF4	NQF5	total
UK	2004	3,119	5,148	6,276	5,573	6,659	1,654	28,429
	2014	889	4,284	6,072	7,195	8,493	2,773	29,706
% shares	2004	11.0	18.1	22.1	19.6	23.4	5.8	100.0
	2014	3.0	14.4	20.4	24.2	28.6	9.3	100.0
London	2004	337	653	695	563	991	327	3,566
	2014	102	594	651	717	1,310	485	3,859
% shares	2004	9.4	18.3	19.5	15.8	27.8	9.2	100.0
	2014	2.6	15.4	16.9	18.6	33.9	12.6	100.0
South East	2004	361	732	886	792	1,011	266	4,049
	2014	96	592	843	969	1,283	449	4,232
% shares	2004	8.9	18.1	21.9	19.6	25.0	6.6	100.0
	2014	2.3	14.0	19.9	22.9	30.3	10.6	100.0
East of England	2004	298	547	638	516	581	138	2,718
	2014	90	463	643	693	735	231	2,855
% shares	2004	11.0	20.1	23.5	19.0	21.4	5.1	100.0
	2014	3.1	16.2	22.5	24.3	25.7	8.1	100.0
South West	2004	213	472	551	510	540	134	2,420
	2014	48	394	526	678	727	248	2,621
% shares	2004	8.8	19.5	22.8	21.1	22.3	5.5	100.0
	2014	1.8	15.0	20.1	25.9	27.7	9.5	100.0
West Midlands	2004	340	469	549	492	520	114	2,484
	2014	85	397	590	672	637	185	2,567
% shares	2004	13.7	18.9	22.1	19.8	20.9	4.6	100.0
	2014	3.3	15.4	23.0	26.2	24.8	7.2	100.0
East Midlands	2004	251	387	441	425	445	100	2,048
	2014	69	367	426	607	545	139	2,153
% shares	2004	12.2	18.9	21.5	20.7	21.7	4.9	100.0
	2014	3.2	17.0	19.8	28.2	25.3	6.4	100.0
Yorkshire & the Humber	2004	254	470	543	477	493	120	2,357
	2014	77	371	530	670	619	217	2,484
% shares	2004	10.8	19.9	23.1	20.2	20.9	5.1	100.0
	2014	3.1	14.9	21.3	27.0	24.9	8.7	100.0
North West	2004	363	538	729	656	712	143	3,141
	2014	103	426	694	896	829	279	3,227
% shares	2004	11.6	17.1	23.2	20.9	22.7	4.5	100.0
	2014	3.2	13.2	21.5	27.8	25.7	8.7	100.0
North East	2004	118	222	271	226	222	52	1,110
	2014	32	170	281	288	282	81	1,133
% shares	2004	10.6	20.0	24.4	20.3	20.0	4.7	100.0
	2014	2.8	15.0	24.8	25.4	24.9	7.1	100.0
England	2004	2,536	4,492	5,303	4,657	5,516	1,391	23,894
	2014	703	3,774	5,183	6,191	6,967	2,314	25,130
% shares	2004	10.6	18.8	22.2	19.5	23.1	5.8	100.0
	2014	2.8	15.0	20.6	24.6	27.7	9.2	100.0
Wales	2004	174	212	313	266	286	79	1,329
	2014	50	167	296	323	347	178	1,360
% shares	2004	13.1	15.9	23.5	20.0	21.5	6.0	100.0
	2014	3.7	12.3	21.8	23.8	25.5	13.1	100.0
Scotland	2004	273	358	488	514	692	137	2,461
	2014	88	273	423	507	947	212	2,450
% shares	2004	11.1	14.5	19.8	20.9	28.1	5.6	100.0
	2014	3.6	11.1	17.3	20.7	38.7	8.6	100.0
Northern Ireland	2004	136	86	173	137	166	47	745
	2014	48	71	170	174	232	70	765
% shares	2004	18.3	11.6	23.2	18.4	22.3	6.3	100.0
	2014	6.3	9.2	22.2	22.8	30.4	9.1	100.0

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

Table 4.4: Projections of Qualifications Shares within Regions and Countries

Shares of UK qualification numbers

		None	NQF1	NQF2	NQF3	NQF4	NQF5	total
UK	2004	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	2014	100.0	100.0	100.0	100.0	100.0	100.0	100.0
London	2004	10.8	12.7	11.1	10.1	14.9	19.8	12.5
	2014	11.5	13.9	10.7	10.0	15.4	17.5	13.0
South East	2004	11.6	14.2	14.1	14.2	15.2	16.1	14.2
	2014	10.8	13.8	13.9	13.5	15.1	16.2	14.2
East of England	2004	9.6	10.6	10.2	9.3	8.7	8.4	9.6
	2014	10.1	10.8	10.6	9.6	8.7	8.3	9.6
South West	2004	6.8	9.2	8.8	9.1	8.1	8.1	8.5
	2014	5.4	9.2	8.7	9.4	8.6	8.9	8.8
West Midlands	2004	10.9	9.1	8.7	8.8	7.8	6.9	8.7
	2014	9.6	9.3	9.7	9.3	7.5	6.7	8.6
East Midlands	2004	8.0	7.5	7.0	7.6	6.7	6.0	7.2
	2014	7.8	8.6	7.0	8.4	6.4	5.0	7.2
Yorkshire & the Humber	2004	8.1	9.1	8.7	8.6	7.4	7.2	8.3
	2014	8.7	8.7	8.7	9.3	7.3	7.8	8.4
North West	2004	11.6	10.5	11.6	11.8	10.7	8.6	11.0
	2014	11.5	9.9	11.4	12.5	9.8	10.1	10.9
North East	2004	3.8	4.3	4.3	4.1	3.3	3.1	3.9
	2014	3.6	4.0	4.6	4.0	3.3	2.9	3.8
England	2004	81.3	87.3	84.5	83.6	82.8	84.1	84.0
	2014	79.1	88.1	85.4	86.0	82.0	83.4	84.6
Wales	2004	5.6	4.1	5.0	4.8	4.3	4.8	4.7
	2014	5.6	3.9	4.9	4.5	4.1	6.4	4.6
Scotland	2004	8.7	7.0	7.8	9.2	10.4	8.3	8.7
	2014	9.9	6.4	7.0	7.0	11.2	7.6	8.2
Northern Ireland	2004	4.4	1.7	2.8	2.5	2.5	2.8	2.6
	2014	5.4	1.6	2.8	2.4	2.7	2.5	2.6

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

4.2 Employment (workplace/jobs)

The basic sources and methods used to produce the detailed spatial results for employment (workplace jobs) are similar to those already described for the population of working age and the labour force.

LFS data are used to analyse the changing patterns of qualification profiles for each occupation within the relevant country or English region, separately by gender. Where no robust data are available the nearest equivalent is substituted.

These patterns are extrapolated forward and applied to the detailed occupational employment projections from *Working Futures.* The resulting numbers are then constrained to match the estimates as described above from the spatial qualification model for each country and region. It is these results which then provide the benchmark projections for the main *Working Futures* results.

Tables 4.5 and 4.6 summarise the results for workplace/jobs, comparing all the constituent countries and English regions within the UK.

Table 4.5: Projections of Qualifications by Region and Country Employment (Workplace Jobs)

Cross-regional comparison of qualification structure (000s & % shares)

		None	NQF1	NQF2	NQF3	NQF4	NQF5	total
UK	2004	3,159	5,359	6,652	5,936	7,197	1,795	30,099
	2014	812	4,335	6,353	7,700	9,207	2,992	31,399
% shares	2004	10.5	17.8	22.1	19.7	23.9	6.0	100.0
	2014	2.6	13.8	20.2	24.5	29.3	9.5	100.0
London	2004	396	806	873	718	1,281	421	4,496
	2014	112	712	801	906	1,652	602	4,785
% shares	2004	8.8	17.9	19.4	16.0	28.5	9.4	100.0
	2014	2.3	14.9	16.7	18.9	34.5	12.6	100.0
South East	2004	365	754	931	835	1,063	278	4,227
	2014	90	610	894	1,048	1,382	491	4,514
% shares	2004	8.6	17.8	22.0	19.8	25.1	6.6	100.0
	2014	2.0	13.5	19.8	23.2	30.6	10.9	100.0
East of England	2004	299	546	647	527	592	140	2,751
	2014	80	450	648	710	756	240	2,885
% shares	2004	10.9	19.8	23.5	19.1	21.5	5.1	100.0
	2014	2.8	15.6	22.5	24.6	26.2	8.3	100.0
South West	2004	218	496	585	537	569	140	2,545
	2014	42	384	533	691	744	251	2,646
% shares	2004	8.6	19.5	23.0	21.1	22.4	5.5	100.0
	2014	1.6	14.5	20.1	26.1	28.1	9.5	100.0
West Midlands	2004	346	480	577	521	554	121	2,599
	2014	78	394	618	717	685	197	2,689
% shares	2004	13.3	18.5	22.2	20.0	21.3	4.7	100.0
	2014	2.9	14.7	23.0	26.7	25.5	7.3	100.0
East Midlands	2004	236	372	433	424	442	97	2,004
	2014	56	332	402	593	536	137	2,056
% shares	2004	11.8	18.6	21.6	21.2	22.1	4.8	100.0
	2014	2.7	16.2	19.6	28.8	26.1	6.7	100.0
Yorkshire & the Humber	2004	253	479	568	500	520	125	2,444
	2014	67	364	537	698	653	221	2,540
% shares	2004	10.3	19.6	23.2	20.4	21.3	5.1	100.0
	2014	2.6	14.3	21.1	27.5	25.7	8.7	100.0
North West	2004	372	566	782	714	772	152	3,358
	2014	96	438	738	981	906	300	3,459
% shares	2004	11.1	16.8	23.3	21.2	23.0	4.5	100.0
	2014	2.8	12.7	21.3	28.4	26.2	8.7	100.0
North East	2004	109	213	269	225	225	51	1,093
	2014	26	158	276	298	282	80	1,120
% shares	2004	10.0	19.5	24.6	20.6	20.6	4.7	100.0
	2014	2.3	14.1	24.7	26.6	25.2	7.1	100.0
England	2004	2,595	4,712	5,666	5,000	6,018	1,526	25,517
	2014	648	3,842	5,448	6,642	7,596	2,518	26,694
% shares	2004	10.2	18.5	22.2	19.6	23.6	6.0	100.0
	2014	2.4	14.4	20.4	24.9	28.5	9.4	100.0
Wales	2004	161	197	302	258	277	76	1,271
	2014	41	153	285	322	342	175	1,318
% shares	2004	12.7	15.5	23.7	20.3	21.8	6.0	100.0
	2014	3.1	11.6	21.7	24.4	25.9	13.3	100.0
Scotland	2004	265	361	499	531	723	143	2,522
	2014	78	270	438	545	1,017	225	2,572
% shares	2004	10.5	14.3	19.8	21.1	28.7	5.7	100.0
	2014	3.0	10.5	17.0	21.2	39.5	8.7	100.0
Northern Ireland	2004	138	89	185	148	179	50	789
	2014	46	70	182	191	253	74	816
% shares	2004	17.5	11.3	23.4	18.7	22.7	6.3	100.0
	2014	5.6	8.6	22.3	23.4	31.0	9.1	100.0

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

Table 4.6: Projections of Qualifications Shares within Regions and Countries

Shares of UK qualification numbers

		None	NQF1	NQF2	NQF3	NQF4	NQF5	total
UK	2004	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	2014	100.0	100.0	100.0	100.0	100.0	100.0	100.0
London	2004	12.5	15.0	13.1	12.1	17.8	23.5	14.9
	2014	13.8	16.4	12.6	11.8	17.9	20.1	15.2
South East	2004	11.6	14.1	14.0	14.1	14.8	15.5	14.0
	2014	11.1	14.1	14.1	13.6	15.0	16.4	14.4
East of England	2004	9.5	10.2	9.7	8.9	8.2	7.8	9.1
	2014	9.9	10.4	10.2	9.2	8.2	8.0	9.2
South West	2004	6.9	9.2	8.8	9.0	7.9	7.8	8.5
	2014	5.2	8.9	8.4	9.0	8.1	8.4	8.4
West Midlands	2004	11.0	9.0	8.7	8.8	7.7	6.7	8.6
	2014	9.7	9.1	9.7	9.3	7.4	6.6	8.6
East Midlands	2004	7.5	6.9	6.5	7.1	6.1	5.4	6.7
	2014	6.8	7.7	6.3	7.7	5.8	4.6	6.5
Yorkshire & the Humber	2004	8.0	8.9	8.5	8.4	7.2	7.0	8.1
	2014	8.2	8.4	8.4	9.1	7.1	7.4	8.1
North West	2004	11.8	10.6	11.8	12.0	10.7	8.5	11.2
	2014	11.8	10.1	11.6	12.7	9.8	10.0	11.0
North East	2004	3.5	4.0	4.0	3.8	3.1	2.8	3.6
	2014	3.2	3.6	4.3	3.9	3.1	2.7	3.6
England	2004	82.2	87.9	85.2	84.2	83.6	85.0	84.8
	2014	79.8	88.6	85.8	86.3	82.5	84.2	85.0
Wales	2004	5.1	3.7	4.5	4.3	3.8	4.3	4.2
	2014	5.0	3.5	4.5	4.2	3.7	5.8	4.2
Scotland	2004	8.4	6.7	7.5	8.9	10.0	7.9	8.4
	2014	9.6	6.2	6.9	7.1	11.0	7.5	8.2
Northern Ireland	2004	4.4	1.7	2.8	2.5	2.5	2.8	2.6
	2014	5.6	1.6	2.9	2.5	2.7	2.5	2.6

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

4.3 Benchmark Employment Projections by Country and English Region

Table 4.7 provides an overview of the qualification patterns in terms of **workplace jobs** within each of the countries and regions distinguished. The first sub-table shows corresponding results for the UK. These match the workplace jobs discussed in Chapter 3. The first section of each sub-table focuses upon numbers employed and the second section presents percentage shares and changes. As well as employment levels, the results also include replacement needs in the final column where these are added in to the projected change in levels (so called expansion demands).[10]

The results are then repeated for each of the countries and regions in turn, beginning with the English regions. The results provide important insights into how both the structure of employment varies across the different spatial areas and how these patterns are expected to change over the next decade.

Patterns of employment by qualification vary considerably across the different parts of the UK. This is primarily driven by differences in their industrial and occupational employment structures. The employed workforce in London stands out as being rather better qualified at NQF levels 4 and 5 than all other parts of the country. Scotland is also above average in this respect. London also has one of the lowest proportion with no formal qualifications. As noted above, the results presented here are based on the assumption that qualification patterns are similar for those resident and those working in a geographical area. For most parts of the country the difference between the two is probably not very significant but this may be a more significant issue for London and its immediate neighbours. This is a topic for further research.

These patterns have been changing rapidly and are projected to continue to do so over the next decade. Without exception the countries and regions of the UK are expected to see rising shares of employment for those qualified at NQF levels 4 and 5 and declines for those with no, or low (NQF level 1), qualifications. The position for those qualified at NQF levels 2 and 3 is less clear, not least because the focus here is on **highest qualification held**. Although increasing numbers and proportions of people are acquiring formal qualifications at NQF levels 2 and 3, many go on to obtain even higher qualifications. The net effect is that the number of people holding level 2 and 3 qualifications as their highest qualifcation can fall.

The replacement demand and total requirement estimates are based on the module and data used for the main *Working Futures* results*.* The LFS data, upon which the occupation specific qualification profiles for each industry or spatial area are based, can be inadequate in certain respects. In particular, the sample sizes were not large enough to provide customised data for every occupation. When the qualification by occupation profiles used to generate the numbers contains a zero entry for a particular occupation, this is replaced by the nearest equivalent (e.g. the all industry or all region equivalent).

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[10] Expansion demands is somewhat of a misnomer since these can sometimes be negative when overall employment levels are falling.

Table 4.7: Projections of Workplace Employment (Jobs) and Replacement Demands by Country and Region

Implications for Qualifications					UK
	Base year level 2004	**Change 2004 - 2014**	**Projected level 2014**	**Replacement demand 2004 - 2014**	**000s**
NQF category					**Total requirement 2004 - 2014**
NQF 5	1,795	1,197	2,992	650	1,847
NQF 4	7,197	2,010	9,207	2,605	4,615
NQF 3	5,936	1,764	7,700	2,149	3,912
NQF 2	6,652	-299	6,353	2,408	2,109
NQF 1	5,359	-1,024	4,335	1,940	916
NQF 0	3,159	-2,347	812	1,143	-1,204
total	30,099	1,300	31,399	10,894	12,194
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	6.0	66.7	9.5	6.0	102.9
NQF 4	23.9	27.9	29.3	23.9	64.1
NQF 3	19.7	29.7	24.5	19.7	65.9
NQF 2	22.1	-4.5	20.2	22.1	31.7
NQF 1	17.8	-19.1	13.8	17.8	17.1
NQF 0	10.5	-74.3	2.6	10.5	-38.1
total	100.0	4.3	100.0	100.0	40.5

Implications for Qualifications					London
	Base year level 2004	**Change 2004 - 2014**	**Projected level 2014**	**Replacement demand 2004 - 2014**	**000s**
NQF category					**Total requirement 2004 - 2014**
NQF 5	421	181	602	152	333
NQF 4	1,281	371	1,652	464	834
NQF 3	718	188	906	260	448
NQF 2	873	-73	801	316	244
NQF 1	806	-94	712	292	198
NQF 0	396	-284	112	143	-141
total	4,496	289	4,785	1,627	1,916
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	9.4	42.9	12.6	9.4	79.1
NQF 4	28.5	28.9	34.5	28.5	65.1
NQF 3	16.0	26.2	18.9	16.0	62.4
NQF 2	19.4	-8.3	16.7	19.4	27.9
NQF 1	17.9	-11.7	14.9	17.9	24.5
NQF 0	8.8	-71.7	2.3	8.8	-35.5
total	100.0	6.4	100.0	100.0	42.6

Implications for Qualifications   **South East**

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	278	212	491	101	313
NQF 4	1,063	320	1,382	385	704
NQF 3	835	213	1,048	302	515
NQF 2	931	-37	894	337	300
NQF 1	754	-145	610	273	128
NQF 0	365	-276	90	132	-143
total	4,227	287	4,514	1,530	1,817
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	6.6	76.2	10.9	6.6	112.4
NQF 4	25.1	30.1	30.6	25.1	66.3
NQF 3	19.8	25.5	23.2	19.8	61.7
NQF 2	22.0	-4.0	19.8	22.0	32.2
NQF 1	17.8	-19.2	13.5	17.8	17.0
NQF 0	8.6	-75.4	2.0	8.6	-39.2
total	100.0	6.8	100.0	100.0	43.0

Implications for Qualifications   **East of England**

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	140	100	240	51	151
NQF 4	592	164	756	214	378
NQF 3	527	184	710	191	374
NQF 2	647	1	648	234	235
NQF 1	546	-95	450	198	102
NQF 0	299	-219	80	108	-111
total	2,751	134	2,885	996	1,130
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	5.1	71.4	8.3	5.1	107.6
NQF 4	21.5	27.6	26.2	21.5	63.8
NQF 3	19.1	34.9	24.6	19.1	71.1
NQF 2	23.5	0.2	22.5	23.5	36.4
NQF 1	19.8	-17.5	15.6	19.8	18.7
NQF 0	10.9	-73.2	2.8	10.9	-37.0
total	100.0	4.9	100.0	100.0	41.1

Implications for Qualifications

South West

000s

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	Total requirement 2004 - 2014
NQF 5	140	111	251	51	162
NQF 4	569	175	744	206	381
NQF 3	537	154	691	194	348
NQF 2	585	-52	533	212	160
NQF 1	496	-111	384	179	68
NQF 0	218	-175	42	79	-97
total	2,545	101	2,646	921	1,022
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	5.5	79.4	9.5	5.5	115.6
NQF 4	22.4	30.8	28.1	22.4	67.0
NQF 3	21.1	28.6	26.1	21.1	64.8
NQF 2	23.0	-8.9	20.1	23.0	27.3
NQF 1	19.5	-22.5	14.5	19.5	13.7
NQF 0	8.6	-80.5	1.6	8.6	-44.3
total	100.0	4.0	100.0	100.0	40.2

Implications for Qualifications

West Midlands

000s

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	Total requirement 2004 - 2014
NQF 5	121	75	197	44	119
NQF 4	554	130	685	201	331
NQF 3	521	196	717	188	385
NQF 2	577	41	618	209	250
NQF 1	480	-85	394	174	88
NQF 0	346	-268	78	125	-143
total	2,599	90	2,689	941	1,031
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	4.7	62.3	7.3	4.7	98.5
NQF 4	21.3	23.5	25.5	21.3	59.7
NQF 3	20.0	37.6	26.7	20.0	73.8
NQF 2	22.2	7.1	23.0	22.2	43.3
NQF 1	18.5	-17.8	14.7	18.5	18.4
NQF 0	13.3	-77.3	2.9	13.3	-41.2
total	100.0	3.5	100.0	100.0	39.7

Implications for Qualifications   **East Midlands**

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	97	40	137	35	75
NQF 4	442	94	536	160	254
NQF 3	424	169	593	153	322
NQF 2	433	-31	402	157	126
NQF 1	372	-40	332	135	95
NQF 0	236	-180	56	85	-95
total	2,004	52	2,056	725	777
	% share	% change	% share	% share	% of base year level
NQF 5	4.8	40.9	6.7	4.8	77.1
NQF 4	22.1	21.2	26.1	22.1	57.4
NQF 3	21.2	39.9	28.8	21.2	76.1
NQF 2	21.6	-7.1	19.6	21.6	29.1
NQF 1	18.6	-10.8	16.2	18.6	25.4
NQF 0	11.8	-76.4	2.7	11.8	-40.2
total	100.0	2.6	100.0	100.0	38.8

Implications for Qualifications   **Yorkshire and Humberside**

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	125	96	221	45	141
NQF 4	520	133	653	188	321
NQF 3	500	199	698	181	380
NQF 2	568	-31	537	206	174
NQF 1	479	-115	364	173	59
NQF 0	253	-186	67	91	-94
total	2,444	96	2,540	885	981
	% share	% change	% share	% share	% of base year level
NQF 5	5.1	77.1	8.7	5.1	113.3
NQF 4	21.3	25.6	25.7	21.3	61.7
NQF 3	20.4	39.8	27.5	20.4	76.0
NQF 2	23.2	-5.5	21.1	23.2	30.7
NQF 1	19.6	-24.0	14.3	19.6	12.2
NQF 0	10.3	-73.5	2.6	10.3	-37.3
total	100.0	3.9	100.0	100.0	40.1

Implications for Qualifications — North West

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	152	148	300	55	203
NQF 4	772	134	906	279	413
NQF 3	714	267	981	258	526
NQF 2	782	-45	738	283	239
NQF 1	566	-128	438	205	77
NQF 0	372	-276	96	135	-141
total	3,358	101	3,459	1,215	1,316
	% share	% change	% share	% share	% of base year level
NQF 5	4.5	97.2	8.7	4.5	133.4
NQF 4	23.0	17.3	26.2	23.0	53.5
NQF 3	21.2	37.5	28.4	21.2	73.7
NQF 2	23.3	-5.7	21.3	23.3	30.5
NQF 1	16.8	-22.6	12.7	16.8	13.6
NQF 0	11.1	-74.2	2.8	11.1	-38.0
total	100.0	3.0	100.0	100.0	39.2

Implications for Qualifications — North East

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	51	29	80	19	47
NQF 4	225	58	282	81	139
NQF 3	225	72	298	81	154
NQF 2	269	7	276	98	104
NQF 1	213	-56	158	77	21
NQF 0	109	-83	26	40	-43
total	1,093	27	1,120	396	422
	% share	% change	% share	% share	% of base year level
NQF 5	4.7	56.2	7.1	4.7	92.4
NQF 4	20.6	25.6	25.2	20.6	61.8
NQF 3	20.6	32.2	26.6	20.6	68.4
NQF 2	24.6	2.6	24.7	24.6	38.8
NQF 1	19.5	-26.2	14.1	19.5	10.0
NQF 0	10.0	-76.0	2.3	10.0	-39.8
total	100.0	2.5	100.0	100.0	38.6

Implications for Qualifications — England

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	1,526	992	2,518	552	1,545
NQF 4	6,018	1,577	7,596	2,178	3,756
NQF 3	5,000	1,642	6,642	1,810	3,452
NQF 2	5,666	-218	5,448	2,051	1,832
NQF 1	4,712	-869	3,842	1,705	836
NQF 0	2,595	-1,948	648	939	-1,008
total	25,517	1,176	26,694	9,236	10,412
	% share	% change	% share	% share	% of base year level
NQF 5	6.0	65.0	9.4	6.0	101.2
NQF 4	23.6	26.2	28.5	23.6	62.4
NQF 3	19.6	32.8	24.9	19.6	69.0
NQF 2	22.2	-3.9	20.4	22.2	32.3
NQF 1	18.5	-18.5	14.4	18.5	17.7
NQF 0	10.2	-75.0	2.4	10.2	-38.8
total	100.0	4.6	100.0	100.0	40.8

Implications for Qualifications — Wales

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	76	98	175	28	126
NQF 4	277	65	342	100	165
NQF 3	258	64	322	93	157
NQF 2	302	-16	285	109	93
NQF 1	197	-44	153	71	27
NQF 0	161	-120	41	58	-62
total	1,271	47	1,318	460	507
	% share	% change	% share	% share	% of base year level
NQF 5	6.0	128.7	13.3	6.0	164.9
NQF 4	21.8	23.5	25.9	21.8	59.7
NQF 3	20.3	24.8	24.4	20.3	61.0
NQF 2	23.7	-5.4	21.7	23.7	30.8
NQF 1	15.5	-22.5	11.6	15.5	13.7
NQF 0	12.7	-74.7	3.1	12.7	-38.5
total	100.0	3.7	100.0	100.0	39.9

Implications for Qualifications   **Scotland**

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	143	82	225	52	134
NQF 4	723	294	1,017	262	555
NQF 3	531	14	545	192	206
NQF 2	499	-62	438	181	119
NQF 1	361	-91	270	131	39
NQF 0	265	-187	78	96	-91
total	2,522	50	2,572	913	962
	% share	% change	% share	% share	% of base year level
NQF 5	5.7	57.4	8.7	5.7	93.6
NQF 4	28.7	40.6	39.5	28.7	76.8
NQF 3	21.1	2.7	21.2	21.1	38.9
NQF 2	19.8	-12.3	17.0	19.8	23.9
NQF 1	14.3	-25.3	10.5	14.3	10.9
NQF 0	10.5	-70.6	3.0	10.5	-34.4
total	100.0	2.0	100.0	100.0	38.2

Implications for Qualifications   **Northern Ireland**

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	50	24	74	18	42
NQF 4	179	74	253	65	139
NQF 3	148	44	191	53	97
NQF 2	185	-3	182	67	64
NQF 1	89	-19	70	32	13
NQF 0	138	-92	46	50	-42
total	789	28	816	286	313
	% share	% change	% share	% share	% of base year level
NQF 5	6.3	48.4	9.1	6.3	84.6
NQF 4	22.7	41.2	31.0	22.7	77.3
NQF 3	18.7	29.7	23.4	18.7	65.9
NQF 2	23.4	-1.6	22.3	23.4	34.6
NQF 1	11.3	-21.5	8.6	11.3	14.7
NQF 0	17.5	-66.9	5.6	17.5	-30.7
total	100.0	3.5	100.0	100.0	39.7

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

5. CHANGING PATTERNS WITHIN OCCUPATIONS

5.1 Occupational Trends

Qualification profiles vary enormously across different occupations. Changing patterns of occupational employment are therefore an important driver of changing qualification requirements by employers. The main *Working Futures* results focus upon the changing patterns by SOC 2000 major and sub major groups. For convenience tables summarizing these results are presented here as Tables 5.1 and 5.2 respectively. These illustrate the shifting patterns of employment (workplace jobs) in favour of occupations such as managers, professional and associate professionals who tend to be better qualified.

5.2 Projections of Qualifications for all Occupations
The overall change in qualification requirements, when summed over all occupations is summarised in Table 5.3. These figures are benchmark projections consistent with the main *Working Futures* projections and the qualification results described above.

Table 5.1 Occupational Categories SOC 2000 – Major Groups

United Kingdom: All Industry Sectors

Employment Levels (000s)

	1984	1994	2004	2009	2014
1. Managers and senior officials	3,102	3,636	4,607	4,905	5,226
2. Professional occupations	2,163	2,670	3,535	3,867	4,222
3. Associate professional and technical occupations	2,592	3,219	4,300	4,523	4,765
4. Administrative, clerical and secretarial occupations	3,837	3,952	3,788	3,620	3,450
5. Skilled trades occupations	4,210	3,640	3,437	3,359	3,287
6. Personal service occupations	1,056	1,512	2,245	2,457	2,683
7. Sales and customer service occupations	1,564	1,870	2,411	2,589	2,778
8. Transport and machine operatives	3,020	2,595	2,372	2,313	2,256
9. Elementary occupations	4,133	3,681	3,403	3,072	2,733
Total	**25,676**	**26,775**	**30,099**	**30,705**	**31,399**

Percentage Shares

	1984	1994	2004	2009	2014
1. Managers and senior officials	12.1	13.6	15.3	16.0	16.6
2. Professional occupations	8.4	10.0	11.7	12.6	13.4
3. Associate professional and technical occupations	10.1	12.0	14.3	14.7	15.2
4. Administrative, clerical and secretarial occupations	14.9	14.8	12.6	11.8	11.0
5. Skilled trades occupations	16.4	13.6	11.4	10.9	10.5
6. Personal service occupations	4.1	5.6	7.5	8.0	8.5
7. Sales and customer service occupations	6.1	7.0	8.0	8.4	8.8
8. Transport and machine operatives	11.8	9.7	7.9	7.5	7.2
9. Elementary occupations	16.1	13.7	11.3	10.0	8.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Net Changes (000s)

	1984-1994	1994-2004	2004-2009	2009-2014	2004-2014
1. Managers and Senior Officials	534	971	298	322	619
2. Professional Occupations	507	864	332	355	687
3. Associate Professional and Technical Occupations	627	627	1,081	223	242
4. Administrative, Clerical and Secretarial Occupations	115	115	-164	-168	-170
5. Skilled Trades Occupations	-570	-202	-78	-73	-151
6. Personal Service Occupations	456	733	212	226	438
7. Sales and Customer Service Occupations	307	541	177	190	367
8. Machine and Transport Operatives	-425	-223	-60	-57	-116
9. Elementary Occupations	-451	-278	-331	-339	-671
Total	**1,099**	**3,324**	**605**	**695**	**1,300**

Source: *Working Futures 2004-2014* **National Report**, Wilson *et al.* (2006, Table 4.1), CE/IER estimates.

Table 5.2 Total Occupational Employment, 2004-14
United Kingdom: All Industry Sectors

SOC 2000 Sub Major Groups	2004		2014		Change and components of change, 2004-2014						
					Net change		Scale effect	Occupation effect		Industry mix effect	
	000s	%	000s	%	%	000s	000s	000s	%	000s	%
11 Corporate Managers	3500	11.6	4195	13.4	19.9	695	148	495	14.2	52	1.5
12 Managers & Proprietors	1107	3.7	1031	3.3	-6.9	-76	47	-159	-14.4	36	3.2
21 Science/Tech Professionals	964	3.2	1137	3.6	17.9	173	39	104	10.8	29	3
22 Health Professionals	285	0.9	365	1.2	28.5	81	12	48	16.8	21	7.4
23 Teaching/Research Prof.	1478	4.9	1796	5.7	21.5	318	66	230	15.6	22	1.5
24 Business/Public service Prof.	808	2.7	923	2.9	14.3	115	34	46	5.6	35	4.4
31 Science/Tech Associate Prof.	605	2	675	2.1	11.7	71	25	39	6.4	7	1.1
32 Health Associate Prof.	1081	3.6	1165	3.7	7.8	84	50	-9	-0.8	43	3.9
33 Protective Service	407	1.4	419	1.3	2.9	12	17	-10	-2.4	5	1.2
34 Culture/Media/Sport	653	2.2	808	2.6	23.7	155	28	98	15.1	28	4.3
35 Bus/Public Serv. Assoc Prof.	1554	5.2	1698	5.4	9.3	144	67	46	3	31	2
41 Administrative Occupations	2845	9.5	2740	8.7	-3.7	-105	129	-246	-8.6	13	0.4
42 Secretarial & Related	943	3.1	710	2.3	-24.8	-234	44	-315	-33.4	37	4
51 Skilled Agricultural Trades	370	1.2	427	1.4	15.4	57	15	74	19.9	-32	-8.5
52 Skilled Metal/Elect. Trades	1258	4.2	918	2.9	-27	-339	50	-313	-24.9	-76	-6
53 Skilled Construct. Trades	1171	3.9	1397	4.4	19.2	225	46	258	22	-79	-6.7
54 Other Skilled Trades	639	2.1	545	1.7	-14.7	-94	27	-118	-18.5	-3	-0.4
61 Caring Personal Service	1696	5.6	2095	6.7	23.6	400	79	287	16.9	33	2
62 Leisure/Oth Pers Service	550	1.8	588	1.9	6.9	38	25	-3	-0.5	16	2.9
71 Sales Occupations	1987	6.6	2220	7.1	11.7	232	90	135	6.8	8	0.4
72 Customer Service	424	1.4	559	1.8	31.8	135	19	110	25.9	6	1.4
81 Process, Plant & Mach Ops	1263	4.2	955	3	-24.4	-308	52	-256	-20.3	-104	-8.2
82 Transport Drivers and Ops	1109	3.7	1301	4.1	17.3	192	44	211	19	-63	-5.7
91 Elementary: Trades/Plant/Storage	1046	3.5	674	2.1	-35.6	-372	43	-337	-32.2	-78	-7.4
92 Elementary: Admin/Service	2357	7.8	2058	6.6	-12.7	-299	104	-415	-17.6	12	0.5
All occupations	30099		31399		4.3	1300	1300	0		0	

Source: *Working Futures 2004-2014* **National Report,** Wilson *et al.* (2006, Table 4.2)

Table 5.3: Summary of Implications of Occupational Change for Qualifications

	1994	2004	2014
Employment levels (000s)			
NQF levels: 5	655	1,795	2,992
4	5,404	7,197	9,207
3	4,549	5,936	7,700
2	6,087	6,652	6,353
1	5,569	5,359	4,335
0	4,512	3,159	812
total	26,775	30,099	31,399
Proportions of total employment (%)			
NQF levels: 5	2.4	6.0	9.5
4	20.2	23.9	29.3
3	17.0	19.7	24.5
2	22.7	22.1	20.2
1	20.8	17.8	13.8
0	16.9	10.5	2.6
total	100.0	100.0	100.0

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

5.3 Projections of Qualifications within SOC sub-major groups (2-digit level)

The analysis is conducted primarily at the level of 2-digit SOC categories. Using LFS data on qualification shares within occupations, linear extrapolations were made, The analysis was conducted first at an overall UK level (for males and females separately) and then independently for individual industries and for each country and region. The results for 2014 from this analysis were then separately constrained to match the results as set out in Chapters 3 and 4. The detailed occupational, sectoral and spatial results therefore conform to the overall implications for employment derived from the stock-flow model. Sectoral results are presented in the following chapter.

The results for the 25 SOC sub-major groups are summarised in Table 5.4. This shows the historical estimates for 2004 obtained by applying qualification shares taken from the LFS to the *Working Futures* estimates of employment (jobs). The figures shown here are the combined sum of males and females, although the initial estimates were made separately. The first 3 columns show the proportions within each occupation qualified to different levels (highest qualification held).

The corresponding estimates of numbers in employment are shown in the second part of the table (the right hand columns). The final column shows the employment numbers (jobs) constrained to match the overall qualification patterns that emerged from the stock-flow model. These results form the benchmark set of qualification projections and profiles used in *Working Futures 2004-2014*.

The results show a sharp increase in proportions and numbers qualified in most occupations, the main exceptions being where qualification proportions were already high (i.e. qualification shares were reaching a saturation point). The proportions and numbers qualified at NQF levels 4 and 5 are generally projected to rise, the exceptions being some occupations where the proportions qualified at level 4 were already high and an increasing proportion are now qualified to NQF level 5.

In almost all occupations there are projected reductions in the proportions qualified at NQF levels 1 or below. In most cases there are reductions for both those with NQF level 0 and NQF level 1, the main exceptions being the least skilled occupations (elementary occupations).

Table 5.4: Projections of Workplace Employment (Jobs) by Occupation

Occupation	Projected (%)				Projected (000s)		
	1994	2004	2014		1994	2004	2014
Corporate Managers							
NQF 5	3.7	8.5	12.7	NQF 5	95	298	534
4	30.5	36.0	45.3	4	783	1262	1904
3	19.0	19.5	20.6	3	488	684	867
2	21.5	18.0	13.0	2	552	632	546
1	16.1	13.0	8.0	1	412	454	335
0	9.2	4.9	0.3	0	236	173	12
total	100.0	100.0	100.0	total	2565	3503	4199
Managers & Proprietors							
NQF 5	1.8	3.2	4.8	NQF 5	19	36	49
4	17.9	22.6	32.0	4	190	250	329
3	18.3	21.6	27.6	3	194	239	284
2	23.2	21.0	18.1	2	246	233	186
1	20.2	18.0	13.8	1	214	199	142
0	18.7	13.5	3.8	0	199	150	39
total	100.0	100.0	100.0	total	1063	1107	1028
Science/Tech Professionals							
NQF 5	10.2	16.2	20.7	NQF 5	72	157	237
4	52.0	52.0	55.3	4	365	503	633
3	16.8	14.7	12.7	3	118	143	145
2	11.6	10.0	7.4	2	81	97	84
1	6.6	5.8	3.9	1	46	56	44
0	2.8	1.2	0.0	0	20	12	0
total	100.0	100.0	100.0	total	702	968	1144
Health Professionals							
NQF 5	25.0	36.2	44.8	NQF 5	52	103	165
4	64.9	54.1	46.8	4	134	154	172
3	1.8	2.2	2.7	3	4	6	10
2	3.5	3.0	2.2	2	7	8	8
1	4.1	4.2	3.4	1	9	12	13
0	0.7	0.3	0.0	0	2	1	0
total	100.0	100.0	100.0	total	207	285	368
Teaching/Research Prof.							
NQF 5	16.7	40.1	60.1	NQF 5	192	592	1080
4	72.2	52.3	35.9	4	831	773	645
3	3.0	2.7	2.5	3	35	40	45
2	4.0	2.4	0.8	2	46	36	15
1	3.3	2.0	0.6	1	38	30	11
0	0.8	0.4	0.0	0	9	6	1
total	100.0	100.0	100.0	total	1151	1478	1797

Occupation	Projected (%)				Projected (000s)		
	1994	2004	2014		1994	2004	2014
Business/Public service Prof.							
NQF 5	9.1	17.9	24.0	NQF 5	56	145	222
4	57.2	58.4	61.4	4	351	472	569
3	10.5	10.4	10.1	3	64	84	93
2	12.2	8.2	3.5	2	75	66	32
1	7.8	4.5	1.0	1	48	36	9
0	3.2	0.6	0.0	0	19	5	0
total	100.0	100.0	100.0	total	614	809	926
Science/Tech Associate Prof.							
NQF 5	3.4	5.4	7.0	NQF 5	16	33	48
4	37.7	39.2	43.3	4	178	237	295
3	22.3	24.6	27.2	3	105	149	185
2	18.2	17.2	14.1	2	86	104	96
1	11.6	11.1	8.3	1	55	67	57
0	6.8	2.5	0.0	0	32	15	0
total	100.0	100.0	100.0	total	472	606	681
Health Associate Prof.							
NQF 5	1.7	5.9	9.2	NQF 5	15	64	108
4	74.0	67.5	63.8	4	658	730	744
3	5.7	9.4	13.1	3	50	102	152
2	8.2	9.3	8.9	2	73	101	104
1	6.6	6.5	5.0	1	59	71	58
0	3.8	1.4	0.0	0	33	15	0
total	100.0	100.0	100.0	total	888	1082	1166
Protective Service Occs							
NQF 5	0.4	1.6	2.6	NQF 5	1	6	10
4	11.0	19.9	30.7	4	30	81	125
3	23.7	28.9	34.3	3	65	117	139
2	29.2	29.0	25.1	2	80	118	102
1	24.6	16.9	7.3	1	67	69	30
0	11.2	3.8	0.0	0	31	16	0
total	100.0	100.0	100.0	total	273	406	407
Culture/Media/Sport Occs							
NQF 5	5.5	8.7	11.2	NQF 5	22	57	90
4	39.1	47.7	60.1	4	154	312	486
3	17.7	15.9	14.3	3	70	104	115
2	19.3	14.7	8.7	2	76	96	70
1	12.3	9.5	5.3	1	48	62	43
0	6.0	3.5	0.4	0	24	23	4
total	100.0	100.0	100.0	total	394	654	808

	Projected (%)					Projected (000s)		
Occupation	1994	2004	2014			1994	2004	2014
Bus/Public Serv. Assoc Prof.								
NQF 5	3.6	7.6	11.0	NQF	5	42	118	187
4	31.3	35.9	43.9		4	373	558	745
3	17.9	20.2	23.0		3	213	314	390
2	22.6	19.6	14.6		2	270	305	248
1	17.2	13.2	7.4		1	204	205	125
0	7.4	3.5	0.0		0	88	54	1
total	100.0	100.0	100.0		total	1192	1554	1697
Administrative Occupations								
NQF 5	0.9	2.0	3.1	NQF	5	25	56	85
4	13.8	18.7	27.3		4	379	534	753
3	15.2	20.2	27.3		3	420	575	753
2	30.1	27.7	23.8		2	829	790	657
1	27.8	24.4	17.8		1	766	694	490
0	12.2	7.0	0.8		0	335	199	22
total	100.0	100.0	100.0		total	2753	2849	2760
Secretarial & Related Occs								
NQF 5	0.4	1.0	1.8	NQF	5	5	10	12
4	12.3	14.9	21.3		4	148	141	150
3	12.0	16.6	24.1		3	144	156	170
2	32.3	29.5	26.3		2	388	277	185
1	34.1	30.1	23.3		1	410	283	164
0	8.9	7.9	3.2		0	107	74	22
total	100.0	100.0	100.0		total	1202	941	703
Skilled Agricultural Trades								
NQF 5	0.8	2.3	4.3	NQF	5	3	9	18
4	9.4	12.7	20.4		4	33	47	87
3	14.8	16.8	22.5		3	52	62	96
2	19.0	21.3	24.5		2	66	79	104
1	18.8	20.5	20.9		1	65	76	89
0	37.3	26.3	7.4		0	130	97	32
total	100.0	100.0	100.0		total	348	370	427
Skilled Metal/Elec Trades								
NQF 5	0.3	0.6	0.9	NQF	5	5	8	8
4	10.7	10.0	10.9		4	164	126	100
3	36.3	41.8	51.9		3	557	524	475
2	28.1	25.7	22.2		2	430	323	203
1	13.1	13.1	11.4		1	200	165	104
0	11.5	8.8	2.7		0	176	110	25
total	100.0	100.0	100.0		total	1532	1256	915

Occupation	Projected (%)				Projected (000s)		
	1994	2004	2014		1994	2004	2014
Skilled Construct. Trades							
NQF 5	0.1	0.4	0.8	NQF 5	2	5	11
4	4.0	3.8	4.5	4	41	44	62
3	35.9	37.8	45.7	3	370	441	637
2	28.5	27.2	25.8	2	294	318	360
1	12.6	16.9	19.1	1	130	197	266
0	19.0	13.9	4.1	0	196	162	57
total	100.0	100.0	100.0	total	1032	1167	1394
Other Skilled Trades							
NQF 5	0.2	0.8	1.6	NQF 5	1	5	9
4	5.7	8.6	14.1	4	41	55	77
3	21.1	24.2	31.5	3	154	155	172
2	24.8	27.6	30.2	2	182	176	165
1	22.6	21.7	18.7	1	165	139	102
0	25.6	17.1	4.0	0	187	109	22
total	100.0	100.0	100.0	total	731	640	546
Caring Personal Service Occs							
NQF 5	0.6	1.2	1.7	NQF 5	6	20	35
4	13.9	17.1	22.1	4	135	290	460
3	9.2	20.7	33.1	3	90	351	688
2	20.7	28.4	31.9	2	202	480	663
1	30.7	22.3	11.2	1	299	378	234
0	24.9	10.3	0.0	0	243	174	1
total	100.0	100.0	100.0	total	975	1694	2081
Leisure/Oth Pers Serv Occs							
NQF 5	0.3	0.5	0.8	NQF 5	2	3	5
4	7.4	10.7	16.2	4	40	59	95
3	22.1	29.0	39.1	3	118	160	230
2	28.2	29.3	28.7	2	150	161	168
1	20.7	18.7	14.3	1	111	103	84
0	21.3	11.7	0.9	0	114	64	5
total	100.0	100.0	100.0	total	534	550	587
Sales Occupations							
NQF 5	0.2	0.7	1.3	NQF 5	3	14	30
4	6.4	8.2	12.4	4	106	164	276
3	12.7	20.1	31.9	3	211	400	709
2	25.4	29.1	32.7	2	423	579	728
1	27.8	23.7	17.7	1	463	471	394
0	27.5	18.1	4.1	0	457	360	90
total	100.0	100.0	100.0	total	1663	1988	2227

Occupation	Projected (%)				1994	Projected (000s) 2004	2014
	1994	2004	2014		1994	2004	2014
Customer Service Occupations							
NQF 5	0.7	0.8	0.8	NQF 5	2	3	5
4	13.0	15.2	19.8	4	27	65	111
3	14.6	24.2	35.5	3	30	103	199
2	27.7	31.4	31.8	2	58	133	178
1	28.7	21.7	12.1	1	60	92	68
0	15.3	6.7	0.0	0	32	28	0
total	100.0	100.0	100.0	total	209	424	560
Process Plant & Mach Ops							
NQF 5	0.2	0.5	0.9	NQF 5	2	6	9
4	4.5	5.1	7.8	4	71	65	74
3	15.8	17.3	23.6	3	254	218	224
2	19.1	23.7	30.7	2	307	298	292
1	24.7	26.7	28.1	1	396	336	267
0	35.7	26.7	9.0	0	573	336	85
total	100.0	100.0	100.0	total	1603	1259	950
Transport Drivers and Ops							
NQF 5	0.2	0.5	0.8	NQF 5	2	5	11
4	3.4	4.2	6.8	4	34	47	88
3	16.7	17.3	22.7	3	166	192	295
2	26.2	26.0	28.2	2	261	289	367
1	34.9	33.7	32.3	1	346	374	419
0	18.6	18.2	9.1	0	185	202	119
total	100.0	100.0	100.0	total	993	1108	1299
Elementary: Trades/Plant/Stor							
NQF 5	0.2	0.2	0.3	NQF 5	2	2	2
4	3.7	3.5	4.9	4	49	37	33
3	14.8	14.7	19.2	3	195	154	129
2	19.5	23.0	30.1	2	256	241	203
1	26.9	29.7	33.3	1	354	311	225
0	34.9	28.9	12.2	0	458	302	82
total	100.0	100.0	100.0	total	1312	1047	675
Elementary: Admin/Service							
NQF 5	0.1	0.5	1.1	NQF 5	2	12	22
4	4.2	5.7	9.5	4	100	134	195
3	11.5	15.4	24.1	3	273	363	496
2	20.0	23.2	28.6	2	473	546	587
1	25.5	26.7	27.4	1	604	629	562
0	38.7	28.5	9.3	0	917	672	191
total	100.0	100.0	100.0	total	2368	2357	2053

Occupation	Projected (%)				Projected (000s)		
	1994	2004	2014		1994	2004	2014
All occupations							
NQF 5	2.4	5.9	9.5	NQF 5	644	1768	2992
4	20.2	23.7	29.3	4	5412	7138	9208
3	16.6	19.4	24.5	3	4439	5838	7700
2	22.1	21.6	20.2	2	5910	6487	6353
1	20.8	18.3	13.8	1	5569	5508	4335
0	17.9	11.2	2.6	0	4801	3360	812
total	100.0	100.0	100.0	total	26775	30099	31399

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

6. OVERVIEW BY SECTOR

6.1 Assumptions and Methods

The basic sources and methods used to produce the detailed Sectoral results are similar to those already described for occupations.   LFS data are used to analyse changing patterns of qualification profiles for each occupation within the industry, separately by gender. Where no robust data are available the nearest equivalent is substituted.

These patterns are extrapolated forward and applied to the detailed occupational employment projections from *Working Futures.*   The resulting numbers are then constrained to match the estimates set out in Chapters 3-5.

6.2 Benchmark Projections by Sector

Table 6.1 provides an overview of the qualification needs within each of the 25 Sector Matrix Industries used for reporting purposes.[11]   The first part of the table shows results for all industries and services. These correspond to those discussed in Chapter 3. The first part of the table focuses upon numbers employed the second part percentage shares and changes. As well as employment levels, the results also include replacement needs in the final column where these are added in to the projected change in levels (so called expansion demands)[12] to give total requirement.

The results are then repeated for each of the 25 industries in turn.   The results provide important insights into how both the structure of employment varies across the different industries and how these patterns are expected to change over the next decade.

Qualification at the highest level (NQF 4+) is relatively unimportant in many industries in 2004. These include Agriculture, etc, Transport & storage and Post & telecommunications, Metals & metal goods, Construction and a number of sectors involved in retailing, distribution and related services.   The proportion of the workforce in these sectors with qualifications at NQF levels 4 or 5 is typically 15 per cent or less.

In contrast, these proportions are much higher in sectors such as Professional services, Other business services, Computing & related services, Education and Health & social work. In all these sectors the proportion of the workforce employed holding NQF 4 or higher is typically around 40 per cent or more.

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[11] The SSDA and its partners have identified 27 sectors at national level referred to as the Sector Matrix Industries. Some of these are too small to enable a robust analysis. Mining & quarrying and Utilities have been combined as have Wood & paper and Printing & publishing.

[12] Expansion demands is somewhat of a misnomer since these can sometimes be negative when overall employment levels are falling.

At the other end of the spectrum, a number of sectors still have very high proportions of their workforce with no formal qualification. These include Agriculture, etc, Textiles & clothing (and some other parts of manufacturing), as well as many parts of the service sector.

These patterns have been changing rapidly and are projected to continue to do so over the next decade. Almost without exception industries are expected to see rising shares for those qualified at NQF levels 4 and 5 and declines for those with no, or low, qualifications. The position for those qualified at NQF levels 2 and 3 is less clear, not least because the focus here is on **highest qualification held**. Although increasing numbers and proportions of people are acquiring formal qualifications at NQF levels 2 and 3, many go on to obtain even higher qualifications. The net effect for the highest qualification held being levels 2, 3 (or in a few cases 4), can sometimes fall as a consequence.

The replacement demand and total requirement estimates are based on the module and data used for *Working Futures.* The LFS data upon which the occupation specific qualification profiles for each industry or spatial area are based, can be inadequate in certain respects. In particular, the sample sizes were not large enough to provide data for every occupation. When the qualification by occupation profiles used to generate the numbers contains a zero entry for a particular occupation, this is replaced by the nearest equivalent (e.g. the all industry or all region equivalent).

Table 6.1: Implications for Sector Matrix Industries, United Kingdom

United Kingdom: All industries

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	1,795	1,197	2,992	650	1,847
NQF 4	7,197	2,010	9,207	2,605	4,615
NQF 3	5,936	1,764	7,700	2,149	3,912
NQF 2	6,652	-299	6,353	2,408	2,109
NQF 1	5,359	-1,024	4,335	1,940	916
NQF 0	3,159	-2,347	812	1,143	-1,204
total	30,099	1,300	31,399	10,894	12,194
	% share	% change	% share	% share	% of base year level
NQF 5	6.0	66.7	9.5	6.0	102.9
NQF 4	23.9	27.9	29.3	23.9	64.1
NQF 3	19.7	29.7	24.5	19.7	65.9
NQF 2	22.1	-4.5	20.2	22.1	31.7
NQF 1	17.8	-19.1	13.8	17.8	17.1
NQF 0	10.5	-74.3	2.6	10.5	-38.1
total	100.0	4.3	100.0	100.0	40.5

United Kingdom: Agriculture etc

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	8	6	14	3	9
NQF 4	48	14	62	18	32
NQF 3	72	16	89	27	43
NQF 2	99	-3	96	37	34
NQF 1	92	-13	79	34	21
NQF 0	107	-84	23	39	-44
total	426	-64	362	158	94
	% share	% change	% share	% share	% of base year level
NQF 5	2.0	68.7	3.9	2.0	105.7
NQF 4	11.2	30.1	17.2	11.2	67.2
NQF 3	17.0	22.5	24.4	17.0	59.6
NQF 2	23.2	-3.0	26.5	23.2	34.1
NQF 1	21.6	-14.6	21.8	21.6	22.5
NQF 0	25.0	-78.8	6.2	25.0	-41.8
total	100.0	-15.0	100.0	100.0	22.1

United Kingdom: Mining, quarrying & utilities

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	9	0	9	3	3
NQF 4	49	-2	47	16	14
NQF 3	45	-5	40	15	10
NQF 2	40	-7	33	13	6
NQF 1	27	-7	20	9	2
NQF 0	13	-10	4	4	-6
total	183	-31	152	60	29
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	4.8	5.1	6.1	4.8	37.7
NQF 4	26.8	-5.1	30.6	26.8	27.5
NQF 3	24.4	-11.4	26.1	24.4	21.3
NQF 2	21.9	-18.2	21.6	21.9	14.4
NQF 1	14.7	-25.3	13.2	14.7	7.3
NQF 0	7.3	-73.8	2.3	7.3	-41.2
total	100.0	-17.0	100.0	100.0	15.6

United Kingdom: Food, drink & tobacco

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	9	6	16	3	10
NQF 4	68	28	96	24	52
NQF 3	89	13	102	31	43
NQF 2	102	-14	88	35	21
NQF 1	107	-19	89	37	18
NQF 0	81	-60	21	28	-32
total	458	-46	412	158	112
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	2.0	69.2	3.8	2.0	103.7
NQF 4	14.9	41.2	23.4	14.9	75.8
NQF 3	19.5	14.1	24.7	19.5	48.7
NQF 2	22.4	-13.6	21.5	22.4	21.0
NQF 1	23.5	-17.4	21.5	23.5	17.2
NQF 0	17.7	-74.7	5.0	17.7	-40.1
total	100.0	-10.0	100.0	100.0	24.6

United Kingdom: Textiles & clothing

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	2	1	3	1	1
NQF 4	22	1	24	8	9
NQF 3	29	-7	22	10	4
NQF 2	38	-16	22	14	-2
NQF 1	42	-13	29	15	2
NQF 0	49	-40	9	17	-22
total	183	-74	109	65	-9
	% share	% change	% share	% share	% of base year level
NQF 5	1.2	25.3	2.6	1.2	61.0
NQF 4	12.3	6.6	21.9	12.3	42.2
NQF 3	15.7	-22.7	20.4	15.7	13.0
NQF 2	21.0	-42.0	20.4	21.0	-6.3
NQF 1	23.0	-32.0	26.2	23.0	3.7
NQF 0	26.7	-81.2	8.4	26.7	-45.6
total	100.0	-40.4	100.0	100.0	-4.7

United Kingdom: Wood, paper & publishing

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	16	12	28	5	17
NQF 4	106	40	145	36	76
NQF 3	142	14	156	49	62
NQF 2	145	-27	118	50	23
NQF 1	93	-28	65	32	4
NQF 0	64	-47	17	22	-25
total	566	-37	529	194	157
	% share	% change	% share	% share	% of base year level
NQF 5	2.8	73.9	5.3	2.8	108.1
NQF 4	18.6	37.5	27.4	18.6	71.8
NQF 3	25.1	9.6	29.4	25.1	43.8
NQF 2	25.6	-18.6	22.3	25.6	15.6
NQF 1	16.5	-30.1	12.3	16.5	4.1
NQF 0	11.3	-73.1	3.3	11.3	-38.9
total	100.0	-6.5	100.0	100.0	27.7

United Kingdom: Chemicals & non-metal minerals

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	29	10	39	10	20
NQF 4	120	24	144	41	65
NQF 3	113	-6	107	38	32
NQF 2	127	-18	109	43	25
NQF 1	132	-22	109	45	22
NQF 0	80	-61	19	27	-34
total	599	-73	527	204	131
	% share	% change	% share	% share	% of base year level
NQF 5	4.8	35.9	7.4	4.8	69.9
NQF 4	20.0	19.9	27.3	20.0	54.0
NQF 3	18.8	-5.4	20.3	18.8	28.7
NQF 2	21.2	-13.9	20.7	21.2	20.1
NQF 1	22.0	-17.0	20.7	22.0	17.0
NQF 0	13.3	-76.2	3.6	13.3	-42.2
total	100.0	-12.1	100.0	100.0	21.9

United Kingdom: Metal & metal goods

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	7	2	9	2	4
NQF 4	74	28	102	24	53
NQF 3	119	4	123	39	43
NQF 2	109	-17	92	36	19
NQF 1	94	-16	78	31	14
NQF 0	68	-54	14	22	-32
total	470	-52	418	154	102
	% share	% change	% share	% share	% of base year level
NQF 5	1.5	30.4	2.1	1.5	63.1
NQF 4	15.7	38.5	24.4	15.7	71.2
NQF 3	25.3	3.6	29.4	25.3	36.3
NQF 2	23.2	-15.2	22.1	23.2	17.5
NQF 1	20.0	-17.3	18.6	20.0	15.4
NQF 0	14.4	-79.8	3.3	14.4	-47.1
total	100.0	-11.1	100.0	100.0	21.6

United Kingdom: Engineering

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	30	12	43	10	23
NQF 4	145	8	152	48	56
NQF 3	144	-4	140	48	44
NQF 2	147	-11	135	49	38
NQF 1	126	-12	114	42	30
NQF 0	89	-57	32	30	-27
total	681	-64	617	227	162
	% share	% change	% share	% share	% of base year level
NQF 5	4.5	40.6	7.0	4.5	73.9
NQF 4	21.3	5.2	24.7	21.3	38.5
NQF 3	21.1	-2.7	22.7	21.1	30.7
NQF 2	21.6	-7.8	22.0	21.6	25.5
NQF 1	18.5	-9.8	18.5	18.5	23.5
NQF 0	13.0	-64.0	5.2	13.0	-30.7
total	100.0	-9.5	100.0	100.0	23.8

United Kingdom: Transport equipment

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	9	4	13	3	7
NQF 4	70	16	86	22	38
NQF 3	92	-5	86	29	24
NQF 2	84	-12	72	27	15
NQF 1	61	-13	48	20	6
NQF 0	45	-33	12	14	-19
total	362	-45	317	116	71
	% share	% change	% share	% share	% of base year level
NQF 5	2.6	38.8	4.1	2.6	70.9
NQF 4	19.3	22.7	27.1	19.3	54.8
NQF 3	25.4	-5.8	27.3	25.4	26.3
NQF 2	23.3	-14.7	22.7	23.3	17.4
NQF 1	17.0	-21.9	15.1	17.0	10.2
NQF 0	12.5	-74.0	3.7	12.5	-41.9
total	100.0	-12.4	100.0	100.0	19.6

United Kingdom: Manufacturing nes & recycling

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	3	2	5	1	3
NQF 4	22	8	30	8	15
NQF 3	57	24	82	20	44
NQF 2	55	5	61	19	24
NQF 1	54	-5	49	19	14
NQF 0	42	-27	15	14	-12
total	233	8	241	80	89
	% share	% change	% share	% share	% of base year level
NQF 5	1.1	85.8	2.0	1.1	120.2
NQF 4	9.4	34.9	12.3	9.4	69.4
NQF 3	24.6	42.4	33.9	24.6	76.9
NQF 2	23.7	9.9	25.1	23.7	44.4
NQF 1	23.2	-9.1	20.4	23.2	25.4
NQF 0	17.9	-64.1	6.2	17.9	-29.6
total	100.0	3.5	100.0	100.0	38.0

United Kingdom: Construction

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	26	17	43	8	25
NQF 4	267	68	334	85	153
NQF 3	657	86	743	210	296
NQF 2	529	-69	460	169	100
NQF 1	360	-4	356	115	111
NQF 0	252	-190	63	81	-109
total	2,090	-92	1,999	669	577
	% share	% change	% share	% share	% of base year level
NQF 5	1.2	67.0	2.1	1.2	99.0
NQF 4	12.8	25.4	16.7	12.8	57.4
NQF 3	31.4	13.1	37.2	31.4	45.1
NQF 2	25.3	-13.1	23.0	25.3	18.9
NQF 1	17.2	-1.0	17.8	17.2	31.0
NQF 0	12.1	-75.2	3.1	12.1	-43.2
total	100.0	-4.4	100.0	100.0	27.6

United Kingdom: Distribution relating to motors

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	5	7	12	2	9
NQF 4	52	25	77	17	42
NQF 3	183	45	227	60	104
NQF 2	164	9	173	54	62
NQF 1	127	-15	112	42	26
NQF 0	110	-71	38	36	-36
total	641	-2	639	209	207
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	0.8	133.0	1.9	0.8	165.7
NQF 4	8.2	46.7	12.0	8.2	79.4
NQF 3	28.5	24.4	35.6	28.5	57.0
NQF 2	25.6	5.3	27.0	25.6	37.9
NQF 1	19.9	-12.1	17.5	19.9	20.6
NQF 0	17.1	-65.2	6.0	17.1	-32.5
total	100.0	-0.3	100.0	100.0	32.3

United Kingdom: Wholesale distribution nes

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	35	28	63	12	40
NQF 4	177	93	269	60	152
NQF 3	253	89	342	85	175
NQF 2	312	21	333	105	127
NQF 1	306	-16	291	103	88
NQF 0	186	-127	59	63	-64
total	1,269	88	1,358	429	517
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	2.7	80.8	4.6	2.7	114.5
NQF 4	13.9	52.5	19.8	13.9	86.3
NQF 3	19.9	35.3	25.2	19.9	69.0
NQF 2	24.6	6.7	24.6	24.6	40.5
NQF 1	24.1	-5.1	21.4	24.1	28.7
NQF 0	14.7	-68.1	4.4	14.7	-34.3
total	100.0	7.0	100.0	100.0	40.7

United Kingdom: Retailing distribution nes

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	38	34	72	14	48
NQF 4	422	298	719	158	455
NQF 3	634	363	997	237	600
NQF 2	874	58	932	327	385
NQF 1	708	-132	576	265	133
NQF 0	468	-370	98	175	-195
total	3,145	250	3,395	1,176	1,426
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	1.2	88.5	2.1	1.2	125.9
NQF 4	13.4	70.5	21.2	13.4	107.9
NQF 3	20.2	57.3	29.4	20.2	94.7
NQF 2	27.8	6.6	27.5	27.8	44.0
NQF 1	22.5	-18.6	17.0	22.5	18.8
NQF 0	14.9	-79.1	2.9	14.9	-41.7
total	100.0	8.0	100.0	100.0	45.4

United Kingdom: Hotels and catering

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	45	39	84	17	56
NQF 4	278	166	444	107	273
NQF 3	456	198	655	176	374
NQF 2	513	16	528	197	213
NQF 1	392	-101	291	151	50
NQF 0	279	-207	72	107	-100
total	1,962	112	2,074	755	868
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	2.3	88.3	4.0	2.3	126.8
NQF 4	14.2	59.9	21.4	14.2	98.4
NQF 3	23.3	43.5	31.6	23.3	82.0
NQF 2	26.1	3.1	25.5	26.1	41.6
NQF 1	20.0	-25.7	14.0	20.0	12.8
NQF 0	14.2	-74.3	3.5	14.2	-35.8
total	100.0	5.7	100.0	100.0	44.2

United Kingdom: Transport and storage

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	25	26	50	8	34
NQF 4	179	115	294	61	176
NQF 3	285	56	341	97	153
NQF 2	340	-1	339	115	115
NQF 1	295	-52	242	100	48
NQF 0	163	-103	60	55	-47
total	1,286	41	1,327	437	478
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	1.9	104.1	3.8	1.9	138.1
NQF 4	13.9	64.2	22.2	13.9	98.2
NQF 3	22.2	19.5	25.7	22.2	53.5
NQF 2	26.4	-0.2	25.6	26.4	33.8
NQF 1	22.9	-17.8	18.2	22.9	16.2
NQF 0	12.7	-62.9	4.6	12.7	-28.9
total	100.0	3.2	100.0	100.0	37.1

United Kingdom: Post & telecommunications

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	13	8	21	4	12
NQF 4	78	32	109	26	58
NQF 3	112	25	137	38	63
NQF 2	158	14	172	53	68
NQF 1	112	-30	82	38	7
NQF 0	55	-41	14	18	-23
total	527	8	535	177	185
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	2.4	63.4	3.8	2.4	97.0
NQF 4	14.7	41.0	20.5	14.7	74.6
NQF 3	21.3	22.5	25.7	21.3	56.1
NQF 2	30.0	9.1	32.2	30.0	42.7
NQF 1	21.3	-27.1	15.2	21.3	6.4
NQF 0	10.3	-75.0	2.5	10.3	-41.4
total	100.0	1.5	100.0	100.0	35.1

United Kingdom: Banking & insurance

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	44	33	77	16	49
NQF 4	272	113	385	100	213
NQF 3	260	78	338	95	173
NQF 2	315	-91	224	115	24
NQF 1	214	-62	152	78	16
NQF 0	56	-39	17	20	-18
total	1,162	32	1,194	425	457
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	3.8	76.1	6.5	3.8	112.7
NQF 4	23.4	41.6	32.3	23.4	78.2
NQF 3	22.4	29.9	28.3	22.4	66.5
NQF 2	27.1	-29.0	18.8	27.1	7.6
NQF 1	18.5	-29.0	12.8	18.5	7.6
NQF 0	4.8	-69.8	1.4	4.8	-33.2
total	100.0	2.8	100.0	100.0	39.4

United Kingdom: Professional services

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	63	13	76	22	36
NQF 4	231	50	281	81	131
NQF 3	129	16	145	45	62
NQF 2	159	-15	144	56	41
NQF 1	136	-25	110	48	22
NQF 0	50	-39	11	18	-22
total	768	0	769	270	271
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	8.2	21.4	9.9	8.2	56.6
NQF 4	30.1	21.6	36.6	30.1	56.8
NQF 3	16.8	12.7	18.9	16.8	47.9
NQF 2	20.7	-9.2	18.8	20.7	26.0
NQF 1	17.7	-18.7	14.4	17.7	16.5
NQF 0	6.5	-78.6	1.4	6.5	-43.4
total	100.0	0.1	100.0	100.0	35.3

United Kingdom: Computing & related services

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	44	30	74	15	45
NQF 4	224	102	326	77	179
NQF 3	91	25	116	31	56
NQF 2	82	0	82	28	29
NQF 1	83	12	94	28	40
NQF 0	28	-9	19	10	1
total	550	161	711	190	351
	% share	% change	% share	% share	% of base year level
NQF 5	7.9	69.2	10.4	7.9	103.6
NQF 4	40.6	45.7	45.8	40.6	80.2
NQF 3	16.5	27.4	16.3	16.5	61.9
NQF 2	14.9	0.5	11.6	14.9	35.0
NQF 1	15.0	14.5	13.3	15.0	49.0
NQF 0	5.0	-30.7	2.7	5.0	3.8
total	100.0	29.3	100.0	100.0	63.8

United Kingdom: Other business services

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	233	154	387	83	237
NQF 4	1,153	384	1,537	410	794
NQF 3	579	233	811	206	438
NQF 2	690	64	754	245	309
NQF 1	573	-75	498	204	129
NQF 0	238	-173	66	85	-88
total	3,465	587	4,052	1,232	1,819
	% share	% change	% share	% share	% of base year level
NQF 5	6.7	66.3	9.5	6.7	101.8
NQF 4	33.3	33.3	37.9	33.3	68.9
NQF 3	16.7	40.2	20.0	16.7	75.7
NQF 2	19.9	9.3	18.6	19.9	44.8
NQF 1	16.5	-13.1	12.3	16.5	22.5
NQF 0	6.9	-72.5	1.6	6.9	-36.9
total	100.0	17.0	100.0	100.0	52.5

United Kingdom: Public admin and defence

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	106	61	167	37	98
NQF 4	428	117	545	151	268
NQF 3	325	40	365	114	154
NQF 2	337	-113	224	119	6
NQF 1	228	-70	158	80	11
NQF 0	111	-70	42	39	-31
total	1,535	-35	1,500	541	506
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	6.9	57.5	11.1	6.9	92.7
NQF 4	27.9	27.3	36.3	27.9	62.6
NQF 3	21.2	12.2	24.3	21.2	47.4
NQF 2	22.0	-33.5	14.9	22.0	1.7
NQF 1	14.8	-30.5	10.6	14.8	4.7
NQF 0	7.3	-62.6	2.8	7.3	-27.4
total	100.0	-2.3	100.0	100.0	32.9

United Kingdom: Education

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	619	432	1,051	255	686
NQF 4	974	-133	841	400	267
NQF 3	258	72	330	106	178
NQF 2	254	-67	187	104	37
NQF 1	229	-79	150	94	16
NQF 0	109	-86	23	45	-41
total	2,443	140	2,582	1,004	1,144
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	25.4	69.7	40.7	25.4	110.8
NQF 4	39.9	-13.6	32.6	39.9	27.5
NQF 3	10.6	27.9	12.8	10.6	69.0
NQF 2	10.4	-26.4	7.2	10.4	14.7
NQF 1	9.4	-34.3	5.8	9.4	6.8
NQF 0	4.5	-78.7	0.9	4.5	-37.6
total	100.0	5.7	100.0	100.0	46.8

United Kingdom: Health & social work

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	240	145	385	95	240
NQF 4	1,275	224	1,499	505	729
NQF 3	459	278	737	182	460
NQF 2	569	25	595	225	251
NQF 1	460	-164	295	182	17
NQF 0	221	-196	25	87	-109
total	3,224	312	3,536	1,276	1,588
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	7.4	60.5	10.9	7.4	100.0
NQF 4	39.5	17.6	42.4	39.5	57.2
NQF 3	14.3	60.5	20.9	14.3	100.0
NQF 2	17.7	4.5	16.8	17.7	44.0
NQF 1	14.3	-35.8	8.3	14.3	3.8
NQF 0	6.8	-88.8	0.7	6.8	-49.2
total	100.0	9.7	100.0	100.0	49.3

United Kingdom: Miscellaneous services

NQF category	Base year level 2004	Change 2004 - 2014	Projected level 2014	Replacement demand 2004 - 2014	000s Total requirement 2004 - 2014
NQF 5	139	114	253	51	165
NQF 4	465	191	656	171	362
NQF 3	353	116	469	130	246
NQF 2	409	-31	378	150	119
NQF 1	308	-61	247	113	52
NQF 0	197	-155	42	72	-82
total	1,871	174	2,045	688	862
	% share	**% change**	**% share**	**% share**	**% of base year level**
NQF 5	7.4	82.0	12.4	7.4	118.7
NQF 4	24.9	41.1	32.1	24.9	77.8
NQF 3	18.9	32.9	22.9	18.9	69.6
NQF 2	21.9	-7.6	18.5	21.9	29.2
NQF 1	16.5	-19.8	12.1	16.5	17.0
NQF 0	10.5	-78.7	2.0	10.5	-41.9
total	100.0	9.3	100.0	100.0	46.1

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

7.   Conclusions

A number of robust findings emerge from this analysis.

- Changing patterns of educational participation mean that the overall qualification profile will improve significantly over the next decade. The proportion and numbers of people qualified at higher levels will rise substantially. In contrast, the proportion and number of those in the workforce with qualifications at level 1 or below will fall.

- If the trends in qualification levels achieved over the period 1994 to 2004 continue then the results suggest that there will be a substantial improvement in the qualification profile of the population and the workforce over the forecast period 2004-2014. However, recently (1999-2004) the rate of improvement has slowed and if this trend continues in to the forecast period then rates of progress in the future will be considerably less.

- Nevertheless, qualification levels amongst the employed workforce are likely to rise significantly in either scenario. This will also reflect changing patterns of requirements in most jobs.

- The balance between demand and supply influences is more difficult to predict. The most recent evidence available suggests that rates of return to higher qualifications have shown signs of falling recently, although they still indicate significant positive benefits towards investing in such education and training.

- The benchmark projections are based on the assumption that patterns of unemployment by NQF level remain broadly unchanged from 2004 levels. In practice, those qualified at higher level may find it less easy to secure and retain employment compared with less well qualified people. The results are not however very sensitive to this assumption.

- There are some significant differences in qualification profiles across both sectors and spatial areas. These are primarily driven by differences in their employment patterns by occupation (and 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 NQF levels 4 and 5 and reductions at levels 0 and 1.

This report has presented for the first time a comprehensive consistent set of projections of qualifications across all occupations, sectors and regions. In the traditions of most good research, it raises almost as many questions as it answers.

There is considerable scope for refining both the demand and supply sides of the analysis, in particular focusing on some of the key flows (migration, new entrants and retirements) in greater detail and exploring further the sensitivity of behaviour to prices (wages). There is also further scope for refining the stock-flow model approach and applying it to a sub-UK level in combination with methods of modelling spatial qualifications.

The research demonstrates the potential for this type of analysis, but it also highlights the limitations of the available data. While the LFS offers a very valuable insight into changing employment patterns, its sample size is inadequate to provide robust results at the level of detail that many users would like to see. The case for advocating further increases in the sample size is very strong.

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Annex A: SOURCES and METHODS

A.1 Overview

The general approach to developing the projections involves a number of inter-related models and modules, which together cover various aspects of the supply of and demand for formal qualifications, at national and more detailed levels. Figure A.1 summarises the main elements and how these relate to the other models used in producing the main *Working Futures* results. Adding in a qualifications dimension to the analysis of employment trends raises a number of technical and conceptual issues. These problems are addressed in a variety of ways, depending upon the availability of data and the prime objectives of each particular element.

Figure A.1: Qualification and Related Models
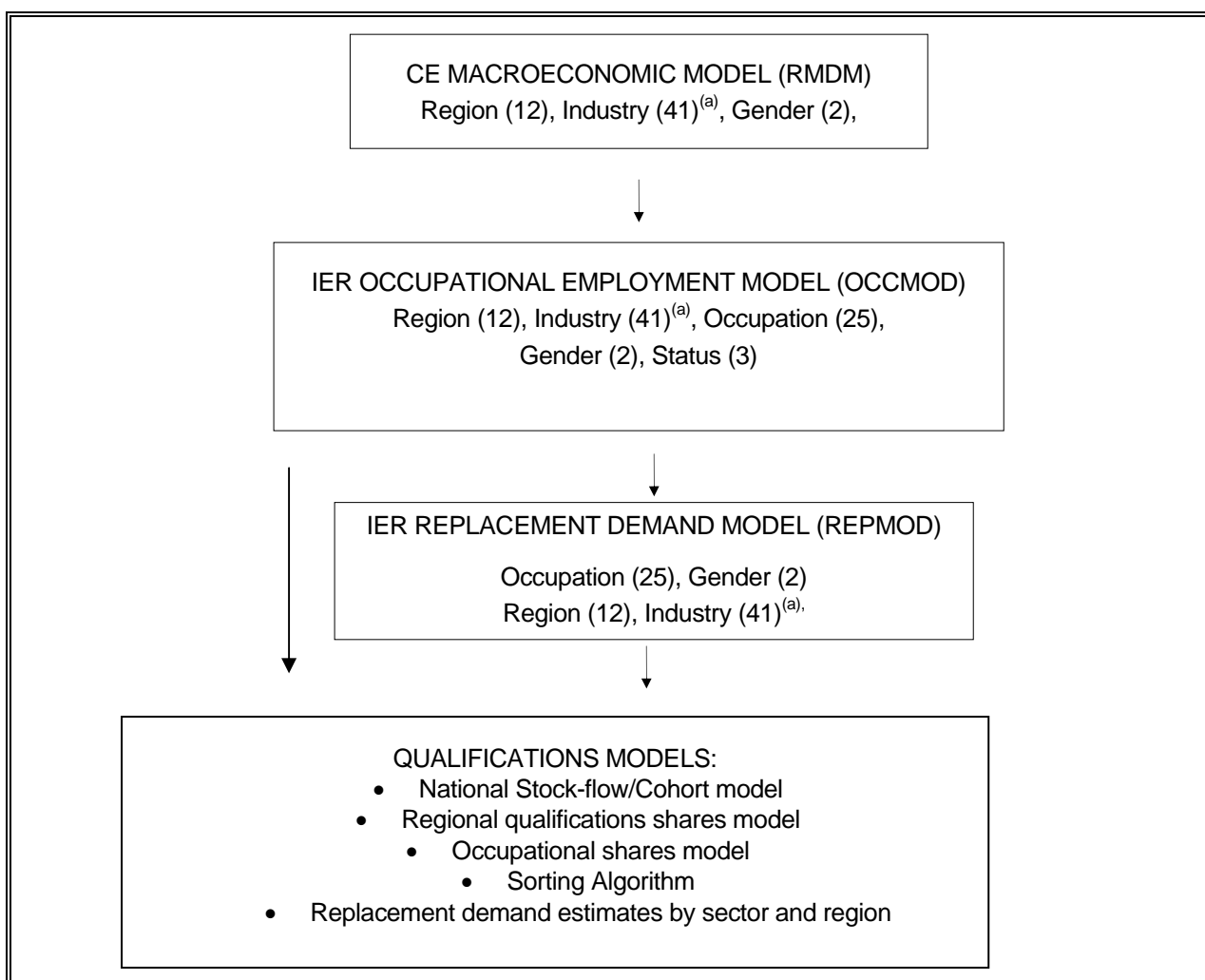
Source: Wilson *et al.* (2006b) (*Technical Report*).
Notes: (a) The sectoral dimension is also extended to cover all two digit SIC categories.

The different modules and models that have been developed in order to project numbers of people holding qualifications and qualification shares at various different

levels include the following:

I. a ***National level stock-flow/cohort model,*** which extends previous work by IER and DfES to produce projections of number of people qualified at broad NQF level;

II. a ***Regional qualification model,*** which produces equivalent regional results (including results all for the individual countries and regions within the UK);

III. an ***Occupational/qualification shares model,*** which develops projections of qualification shares within occupations;

IV. a ***Sorting algorithm,*** which sorts people into occupations such that the results from II and III can be made consistent with those from I; and finally,

V. an extended ***Replacement demand module,*** which generates estimates of qualification numbers for detailed industries and geographical areas.

These are each discussed in more detail in the separate *Qualifications Technical Report* (Wilson and Bosworth, 2006).

A.2   Definitions

Qualifications are defined by reference to the *National Qualifications Framework*. This is the framework into which all QCA-accredited qualifications fit. The framework has six levels and three categories for types of qualification. The three categories of qualifications are general, vocationally-related and occupational. The different levels are:
- NFQ 0 (Entry and none)
- NFQ 1 (Foundation)
- NFQ 2 (Intermediate)
- NFQ 3 (Advanced)
- NFQ 4 (Degree level or equivalent)
- NFQ 5 (Postgraduate level)

Levels 4 and 5 relate to higher level qualifications (e.g. degrees and other higher level awards at Levels 4 and 5). Entry Level is defined as being pre-Level 1 and is aimed at those learners who are not yet able to attain a Level 1 qualification. These include academic as well as vocational qualifications. For brevity the five levels are referred to as NQF 1-5. In addition a 6th category for those with no formal qualifications is defined, NQF 0. For most purposes, the focus is upon the highest qualification held.

Box A.1 summarises the various definitions of employment and related labour market indicators used. Table A.1 and A.2 set out the definitions used for Sectors and Occupations.

Box A.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 2004-2014* 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).

Table A.1 Classification of 27 SSDA *Sector Matrix* Industries

	Industries	SIC2003
1.	Agriculture, etc	01-02, 05
2.	Mining & quarrying	10-14
3.	Food, drink & tobacco	15-16
4.	Textiles & clothing	17-19
5.	Wood, pulp & paper,	20-21
6.	Printing & publishing	22
7.	Chemicals, & non-metallic mineral products	23-26
8.	Metals & metal goods	27-28
9.	Machinery, electrical & optical equipment	29-33
10.	Transport equipment	34-35
11.	Other manufacturing & recycling	36-37
12.	Electricity, gas & water	40-41
13.	Construction	45
14.	Sale & maintenance of motor vehicles	50
15.	Wholesale distribution	51
16.	Retailing	52
17.	Hotels & restaurants	55
18.	Transport	60-63
19.	Communications	64
20.	Financial services	65-67
21.	Professional services	70, 71, 73
22.	Computing services	72
23.	Other business services	74
24.	Public administration & defence	75
25.	Education	80
26.	Health & social work	85
27.	Other services	90-99

Table A.2: SOC2000 Classification of Occupational Categories (Sub-major Groups)

	Sub-major groups	Occupations	Occupation minor group number[a]
11	Corporate managers	Corporate managers and senior officials; production managers; functional managers; quality and customer care managers; financial institution and office managers; managers in distribution and storage; protective service officers; health and social services managers	111, 112, 113, 114, 115, 116, 117, 118
12	Managers/proprietors in agriculture and services	Managers in farming, horticulture, forestry and fishing; managers and proprietors in hospitality and leisure services; managers and proprietors in other service industries	121, 122, 123
21	Science and technology professionals	Engineering professionals; information and communication technology professionals	211, 212, 213
22	Health professionals	Health professionals, including medical and dental practitioners and veterinarians	221
23	Teaching and research professionals	Teaching professionals, including primary and secondary school teachers and higher and further education lecturers; research professionals (scientific)	231, 232
24	Business and public service professionals	Legal professionals; business and statistical professionals; architects, town planners, and surveyors; public service professionals; librarians and related professionals	241, 242, 243, 244, 245
31	Science and technology associate professionals	Science and engineering technicians; draughtspersons and building inspectors; IT service delivery occupations	311, 312, 313
32	Health and social welfare associate professionals	Health associate professionals, including nurses and other paramedics; therapists; social welfare associate professionals	321, 322, 323
33	Protective service occupations	Protective service occupations	331
34	Culture, media and sports occupations	Artistic and literary occupations; design associate professionals; media associate professionals; sports and fitness occupations	341, 342, 343, 344
35	Business and public service associate professionals	Transport associate professionals; legal associate professionals; financial associate professionals; business and related associate professionals; conservation associate professionals; public service and other associate professionals	351, 352, 353, 354, 355, 356
41	Administrative and clerical occupations	Administrative/clerical occupations: government and related organisations; finance; records; communications; general	411, 412, 413, 414, 415
42	Secretarial and related occupations	Secretarial and related occupations	421
51	Skilled agricultural trades	Agricultural trades	511
52	Skilled metal and electrical trades	Metal forming, welding and related trades; metal machining, fitting and instrument making trades; vehicle trades; electrical trades	521, 522, 523, 524
53	Skilled construction and building trades	Construction trades; building trades	531, 532
54	Other skilled trades	Textiles and garment trades; printing trades; food preparation trades; skilled trades n.e.c.	541, 542, 543, 549
61	Caring personal service occupations	Healthcare and related personal services; childcare and related personal services; animal care services	611, 612, 613
62	Leisure and other personal service occupations	Leisure and other personal service occupations; hairdressers and related occupations; housekeeping occupations; personal service occupations n.e.c.	621, 622, 623, 629
71	Sales occupations	Sales assistants and retail cashiers; sales related occupations	711, 712
72	Customer service occupations	Customer service occupations	721
81	Process plant and machine operatives	Process operatives; plant and machine operatives; assemblers and routine operatives	811, 812, 813
82	Transport and mobile machine drivers and operatives	Transport drivers and operatives; mobile machine drivers and operatives	821, 822
91	Elementary occupations: trades, plant and machine related	Elementary occupations: agricultural trades related; process and plant related; mobile machine related	911, 912, 913, 914
92	Elementary occupations: clerical and services related	Elementary occupations: clerical related; personal services related; cleansing services; security and safety services; sales related	921, 922, 923, 924, 925

Notes: (a) Standard Occupational Classification, ONS 2001.

A.3 Stock-flow Model

Key elements

At the heart of the system of projecting the changing numbers of people holding formal qualifications is a **Stock-flow Model**. This is primarily built upon LFS data, although other information is also required, not least of which relate to population forecasts. The main characteristics of this model are that it focuses explicitly on the inflows to the active population of individuals with different levels of qualifications, allowing for medium to long-term trends in rates of acquisition of qualifications and economic activity rates, while also allowing for the outflows of individuals from the active population as they come to the end of their working lives.

The principal data source is information from the LFS from 1992 to 2004 (in some cases 1993 to 2004, because of comparability problems with 1992), broken down by gender, year of age and level of qualification (aggregated to broad NQF level, plus a no qualifications group) The LFS also provides information on activity rates (i.e. the proportion of the population of working age that are economically active). These are the main source of information for transforming Government Actuary Department (GAD) forecasts of the future population of working age into estimates of the future active population

Full details of the methodology for constructing the Stock-flow Model are provided in the *Qualifications Technical Report*. The main elements are as follows:

(i)   The LFS data for the population of working age (i.e. active and inactive combined) are disaggregated by gender, year of age and qualification level. This gives the number and proportion of individuals with different qualification levels. The baseline is the actual LFS 2004 estimates.

(ii)   The baseline figures for 2004 are "rolled-on" year by year to allow for the aging of the population to 2014 for each gender age and qualification category.

(iii)   These figures are then adjusted for the typical acquisition of qualifications that take place as a 16 year old becomes 17, a 17 year old becomes 18, and so on. These changes reflect the patterns observed over the period 1993 to 2004 (based on pseudo-cohorts). Qualifications acquisition is mainly concentrated amongst the under-30 year olds and any further changes in later years are assumed to be insignificant.

(iv)   The population of working age is then adjusted for changes in activity rates as the population ages (e.g. increasing activity amongst younger people as they age and reduced activity rates amongst older people as they approach retirement).

(vii)   The overall numbers of active males and females are then adjusted to be consistent with those used in the remainder of *Working Futures*.

(viii) The forecasts by age are then aggregated into bands, 16-24, 25-34, 35-44, 45-59 and, for males, 60-64.

(viii) As all the estimates sum either to the GAD population of working age or the active population of working age, there is an implicit assumption in the model that emigrants have the same qualification mix as immigrants. The GAD forecasts are for only 135 thousand net immigrants per annum and no substantive data on qualifications are available. This is one area that might benefit from refinement as better migration information becomes available.

## Simulations around the Baseline

A variety of simulations around the baseline results have been explored during the course of the construction and testing of the model in order to assess sensitivity to the various assumptions. These include changes to starting assumptions for 2004, differences in rates of improvement in qualification levels and different assumptions regarding changes in activity rates.

Together these results have been used to explore alternative scenarios. A key question is whether rates of qualification acquisition will continue at the pace observed over the whole of the decade 1994-2004 or if they will slow down to the much slower rates achieved over the second part of that decade. The benchmark stock-flow model results relate to the UK, and are based upon trends over the full period 1994 to 2004.

Population Forecasts

The total population of working age (e.g. males aged 16-64 and females aged 16-59) is forecast by the Government Actuary's Department (GAD) to grow over the period 2004 to 2014 from 36.8 million to 38.0. For males the increase is from 19.1 million in 2004 to 19.8 million in 2014 and for females from 17.8 to 18.1 million. These relatively small overall changes mask somewhat larger variations by age group, as shown in Figures A.2 to A.4. While there are some differences between males and females, the main growth amongst both is in the 45 to 59 year old groups. In the case of males, this group rises from 5.7 million in 2004 to 6.3 million in 2014; in the case of females it rises from 5.8 million in 2004 to 6.5 million in 2014. In both males and females the 25-34 and 35-44 year old groups roughly mirror each other, with the former a shallow 'u-shape' and the latter a shallow inverted 'u-shape'. None of the trends are overly dramatic at this level of aggregation.

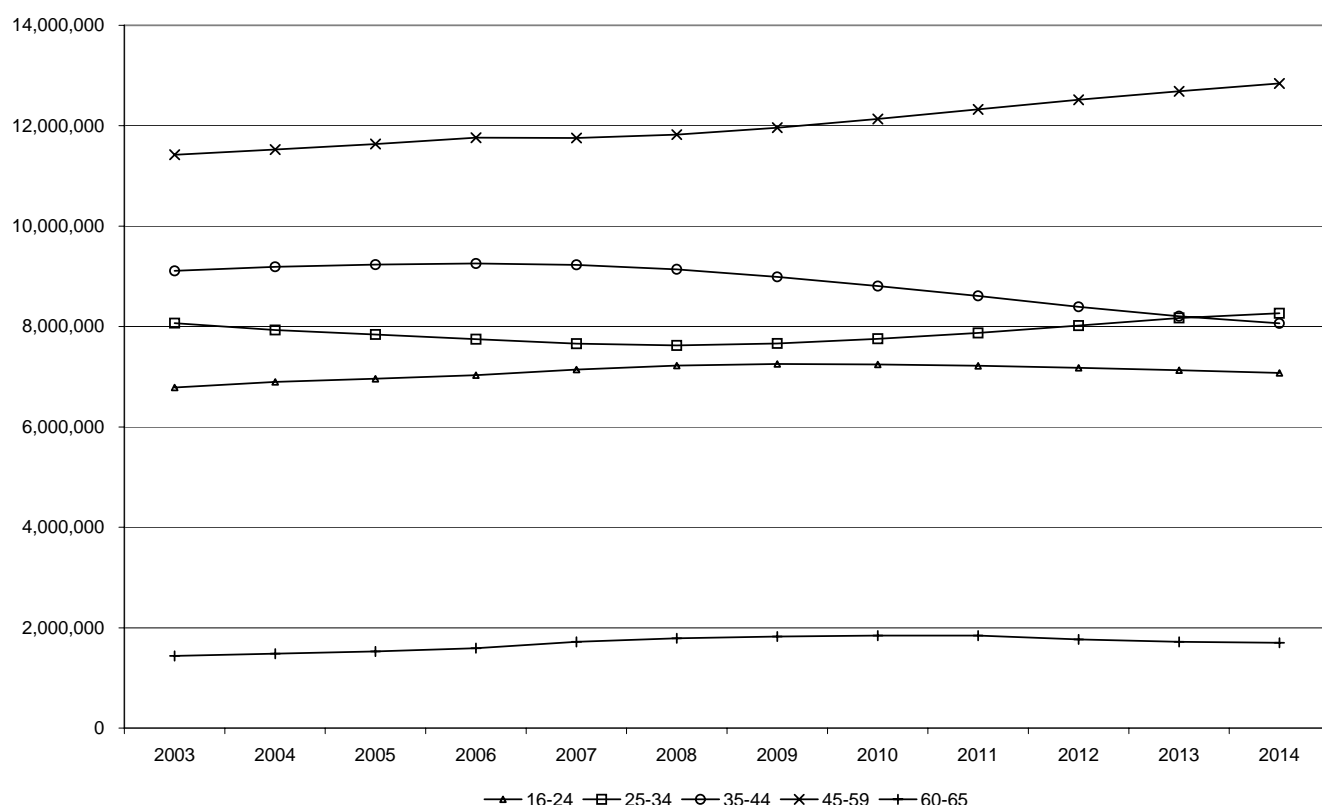**Figure A.2 : Trends in Male Population (GAD estimates)**

Legend: 16-24, 25-34, 35-44, 45-59, 60-65
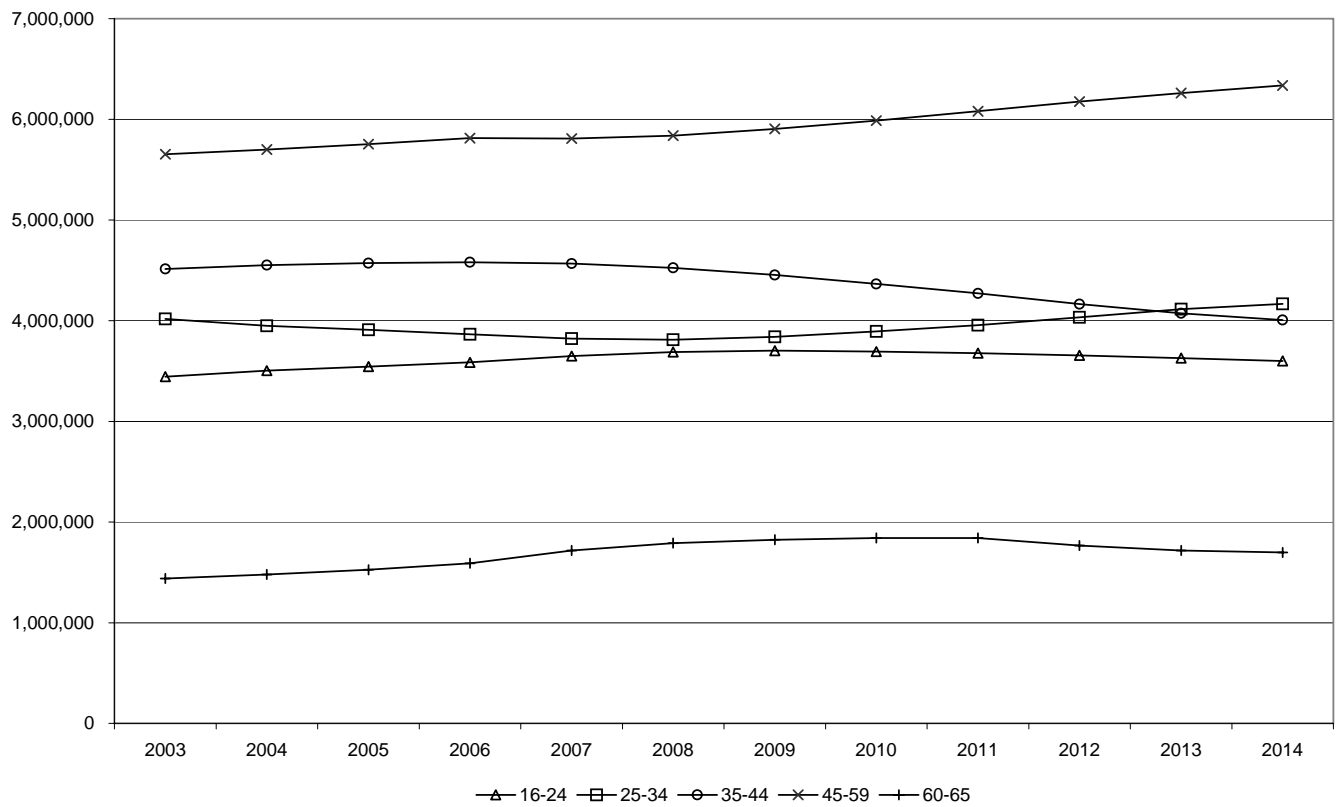
Source: IER estimates, based on LFS data (stock-flow model).

Figure A.3: Trends in Female Population (GAD estimates)

Legend: 16-24, 25-34, 35-44, 45-59
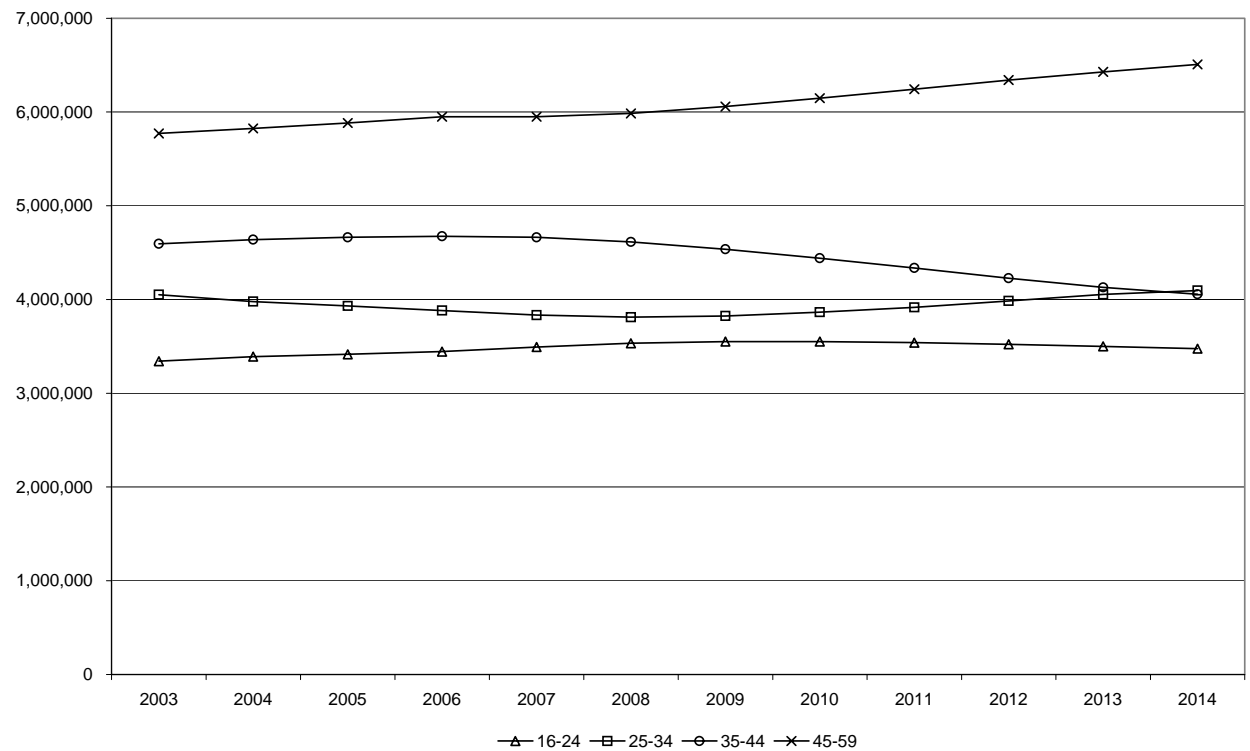
Source: IER estimates, based on LFS data (stock-flow model).

Figure A.4: Trends in Total Population (GAD estimates)

Source: IER estimates, based on LFS data (stock-flow model).

Qualification acquisition

As individuals age, they typically acquire more formal qualifications. These qualification transitions are estimated using pseudo-cohort data from the LFS. Pseudo cohorts are not the same as actual cohorts. In a true cohort, the same group of individuals is tracked through time. In a pseudo-cohort, these individuals can be different, but because the survey is a representative sample of the population in each year, it is possible to link and compare the sample of 16 year olds in one year with 17 year olds in the next year. In order not to rely on the results of any single cohort, the cohorts of ages between 17 and 23 were averaged. This resulted in estimates of the proportion of each age group that attain a certain level of qualification. These averages are then adjusted so they sum to 100%. The adjustments necessary are small.

Qualification Forecasts

The stock-flow model also requires projections of the qualification proportions over the forecast period. These are based upon trends in qualification proportions (Qual%) over the period 1993 to 2004. This was carried out by estimating a series of simple linear relationships,

$$Qual\%_{ijk}=a+bt$$

where Qual% is disaggregated by gender (i); qualification level (j), j=1-6 for the six levels of qualification); and the age of the individual (k), where k is by year. These values are then extrapolated to 2014, $\overset{\grave{E}}{Qual\%}_{ijkt}$.

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The resulting forecasts of qualification proportions are made consistent by summing to 100%. In addition, the numbers of individuals in the population with different levels of qualifications are always made to sum to the GAD population estimates.

Activity Rate Forecasts
The final step in the stock-flow model relates to estimates of activity rates over the forecast period. These are produced in an analogous fashion to the qualifications proportions, by undertaking a sequence of simple regressions using past LFS data, 1992 to 2004.

$$Act\%_{ijk} = a' + b't$$

Once the trends are established they are applied to the actual activity rates for 2004, allowing extrapolation to 2014, $\grave{\text{Act}}\%_{ijkt}$. The activity rates are applied to the whole population data, both broken down by gender and qualification level. Minor scaling of the numbers of active population is undertaken to make them consistent with the rest of *Working Futures*.

A.4   Benchmark Forecasts based upon the Stock-Flow Model

The projections generated by the full stock-flow model for males are set out in Figure A.5, while the corresponding trends for females appear in Figure A.6. NQF3 and NQF4 are the dominant qualification levels amongst males. Both increase in importance over the forecast period, although the growth in the proportion at NQF3 is projected to tail-off towards the end of the period. Likewise, NQFs 1 and 2 show projected declines for males, while the proportion with no qualification shows a more significant fall. Finally NQF5 shows a significant rise over the period 2004 to 2014. These all reflect strong trends in the patterns of qualification acquisition, especially for younger people, combined with changing demographic patterns.

Figure A.5: Trends in Qualifications in the UK (all active males)

Legend: No qualifications — NVQ1 — NVQ2 — NVQ3 — NVQ4 — NVQ5
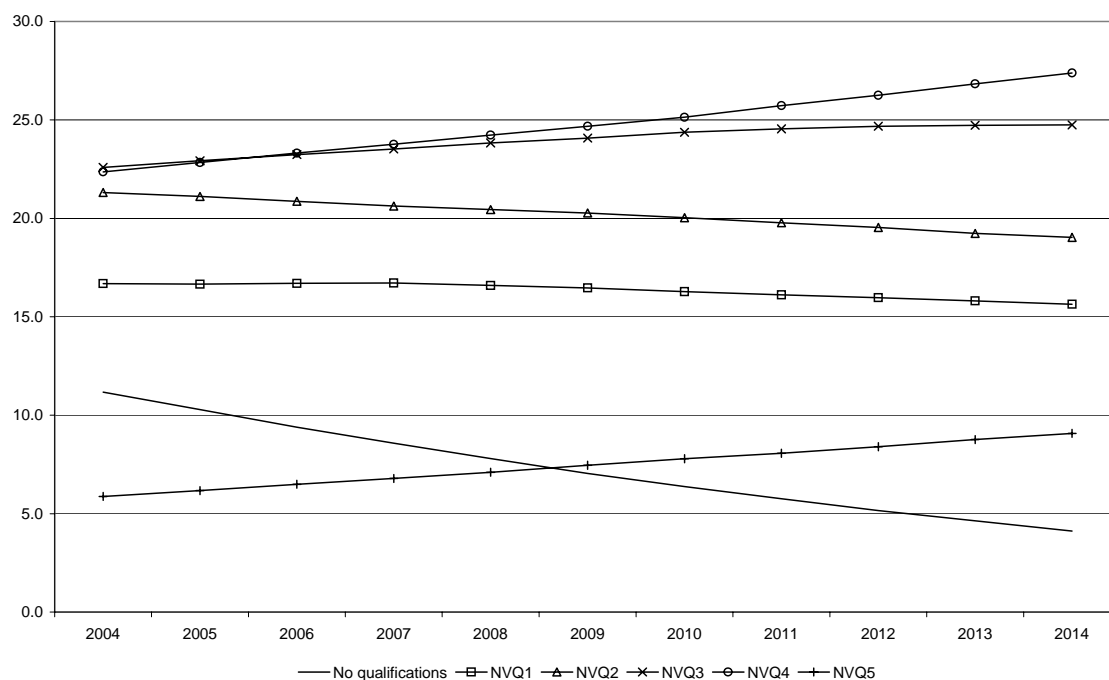
Source: IER estimates, based on LFS data (stock-flow model).

The trends for females look similar to the results for males, although there are a number of differences. While for males NQF3 and NQF4 are of similar importance, the proportion of females with NQF3 qualifications is much lower at the beginning of the forecast period, but grows strongly, albeit slowing towards the end of the period. The projected decline in the numbers of those with no qualifications and with NQF1 qualifications are much stronger for females than males.

Figure A.6: Trends in Qualifications in the UK (all active females)

Legend: No qualifications — NVQ1 — NVQ2 — NVQ3 — NVQ4 — NVQ5

Source: IER estimates, based on LFS data (stock-flow model).

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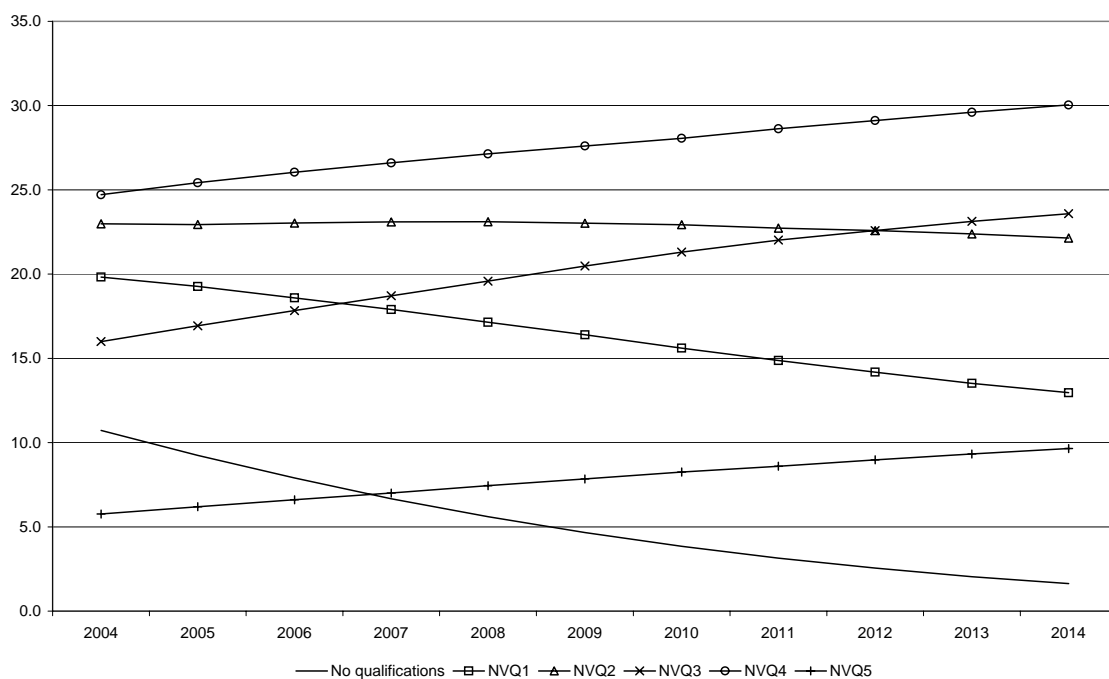
Table A.3 presents an overview of the total number of people in the population holding qualifications at different levels. It covers all individuals, both economically active and inactive. While the patterns for the whole population are generally very similar to that of the active population (Table A.4), there are some differences. One example of such a difference concerns those with NQF1 level qualifications. In the case of the active population, this group declines marginally over the forecast period, but in the case of the whole population, it rose marginally. While the figures for all the other qualification levels move in the same direction, they do so at different rates, reflecting changes in the underlying activity rates (see Table A.6 below).

Table A.4 presents a comparison of the changes in the number of economically active individuals holding different levels of qualification over the forecast period. The number of males with no qualifications is significantly higher than for females in 2004 and declines somewhat more slowly through the forecast period. Perhaps the more important difference, however, is in the NQF1 category. In this case, the number of males and females holding NQF1 level qualifications are very similar in 2004, but the improvement amongst females is much larger than in the case of males. As in the earlier graphs, there is clear evidence of significant improvements in the numbers of males and females holding higher level qualifications, although the upward trends are stronger for females than for males. The results suggest the need for some special initiative amongst males if their rate of improvement is to be brought into line with females.

Table A.5 suggests that there is always a pool of individuals at different qualification levels that are not economically active (i.e. the difference between Table A.3 and A.2). In 2004, the inactive pools of those with no qualification and those with NQF1 were amongst the largest. In part, this is because they comprise a large number of young people outside of the labour force, in the process of acquiring formal qualifications. In addition, however, the pool also includes a considerable proportion of older individuals who have never acquired formal qualifications. Economic activity rates for the latter are considerably lower for those individuals with poorer qualifications, particularly females. What the data also show is that, by the end of the period, the absolute size of the pool is larger for the NQF3 category than for any of the other qualification levels, with the NQF2 category the second largest.

Finally, Table A.6 gives the associated activity rates. These rates are generally higher for those with higher level qualifications in 2004. The only exception to this is that, by 2014, the projected reduction in activity rate is negative amongst those qualified at level NQF5 which brings it into line with NQF4 by the end of the forecast period. At first sight it may seem surprising that the change in the activity rate for each qualification level for all individuals (males and females) is negative, while the overall change in activity rate for all age groups combined is positive at 1.48 percentage points. However, this is possible because the qualifications acquired over the period lead individuals to progress from NQF categories with lower activity rates to NQF categories with higher rates. A further interesting feature concerns the NQF categories in which the main declines in activity rates occur. It can be seen that these are predominantly amongst those with no qualifications and in NQF1. This is the result of the increase proportion of individuals in these categories seeking higher level qualifications whilst outside of the labour force.

Table A.3: Forecast Numbers of Individuals UK, Active and Inactive, by Level of Qualification

			000s
	2004	2014	Change 2004-2014
Males			
No qualifications	2,786	1,323	-1,464
NQF1	3,148	3,173	25
NQF2	4,075	3,781	-294
NQF3	4,267	4,873	607
NQF4	3,895	4,973	1,078
NQF5	1,018	1,687	670
Total	19,189	19,811	622
Females			
No qualifications	2,923	702	-2,221
NQF1	3,620	2,687	-933
NQF2	4,002	4,075	74
NQF3	2,734	4,204	1,470
NQF4	3,722	4,918	1,197
NQF5	832	1,553	721
Total	17,832	18,140	307
Total			
No qualifications	5,710	2,025	-3,685
NQF1	6,768	5,860	-908
NQF2	8,076	7,856	-220
NQF3	7,001	9,077	2,077
NQF4	7,617	9,892	2,275
NQF5	1,849	3,240	1,391
Total	37,021	37,950	929

Source: IER estimates, based on LFS data (stock-flow model).

Table A.4: Forecast Numbers of Active Individuals UK, by Level of Qualification

			000s
	2004	2014	Change 2004-2014
Males			
No qualifications	1,738	669	-1,069
NQF1	2,594	2,536	-58
NQF2	3,314	3,086	-228
NQF3	3,511	4,013	501
NQF4	3,476	4,442	965
NQF5	913	1,472	559
Total	15,546	16,217	671
Females			
No qualifications	1,381	220	-1,161
NQF1	2,554	1,748	-806
NQF2	2,962	2,986	24
NQF3	2,062	3,182	1,120
NQF4	3,183	4,051	868
NQF5	742	1,301	559
Total	12,884	13,489	605
Total			
No qualifications	3,119	889	-2,230
NQF1	5,148	4,284	-864
NQF2	6,276	6,072	-204
NQF3	5,573	7,195	1,622
NQF4	6,659	8,493	1,834
NQF5	1,654	2,773	1,118
Total	28,430	29,706	1,276

Source: IER estimates, based on LFS data (stock-flow model).

Table A.5: Forecast Numbers of Inactive UK, by Level of Qualification

			000s
	2004	2014	Change 2004-2014
Males			
No qualifications	1,048	654	-394
NQF1	554	637	83
NQF2	761	695	-66
NQF3	755	861	105
NQF4	419	531	113
NQF5	105	216	111
Total	3,643	3,594	-49
Females			
No qualifications	1,542	481	-1,060
NQF1	1,066	939	-127
NQF2	1,040	1,089	50
NQF3	672	1,022	350
NQF4	538	867	329
NQF5	90	252	162
Total	4,948	4,651	-298
Total			
No qualifications	2,590	1,135	-1,455
NQF1	1,620	1,576	-44
NQF2	1,801	1,784	-17
NQF3	1,428	1,883	455
NQF4	957	1,398	441
NQF5	195	468	273
Total	8,591	8,244	-347

Source: IER estimates, based on LFS data (stock-flow model).

Table A.6: Forecast Activity Rates, by Level of Qualification

			(%)
			Change
	2004	2014	2004-2014
Males			
No qualifications	62	51	-12
NQF1	82	80	-2
NQF2	81	82	0
NQF3	82	82	0
NQF4	89	89	0
NQF5	90	87	-2
Total	81	82	1
Females			
No qualifications	47	31	-16
NQF1	71	65	-6
NQF2	74	73	-1
NQF3	75	76	0
NQF4	86	82	-3
NQF5	89	84	-5
Total	72	74	2
Total			
No qualifications	55	44	-11
NQF1	76	73	-3
NQF2	78	77	0
NQF3	80	79	0
NQF4	87	86	-2
NQF5	89	86	-4
Total	77	78	1

Source: IER estimates, based on LFS data (stock-flow model).

A.5   Other Models & Modules

There are 4 other main models and modules used to produce the projections, which are discussed here in turn.

Spatial qualifications share model

Limitations in sample sizes preclude extending the full stock-flow approach to the individual countries and regions of the UK. In order to assess changing patterns within the UK a simpler model for developing projections of qualification structure at regional and country level has been developed.[14]   This model focuses upon qualifications currently held as reported in the Labour Force Survey (LFS).[15]   The model focuses on the highest qualification held by age group, gender and country or English region. It identifies separate time trends for the propensity to hold a given level of qualification (NQF level 1-5 or no qualification). The 'highest qualification' is defined in terms of NQF level equivalents. The time trends are then used to generate projections of qualification attainment over the forecast period to 2014. The data on qualifications shares are then mapped onto labour force projections to project numbers holding qualifications by age category and gender.

The propensity to hold a given level of qualification is modelled at the individual level using a pooled cross sectional data set drawn from the LFS between 1997 Q1 and 2003 Q4. The model uses data covering all of the UK. Variables are introduced into the model to specifically capture 'spatial effects' (including country/region specific intercept and time trend for each qualification level). This modelling strategy makes maximum use of the limited sample size. It also recognizes that many aspects of educational attainment can be expected to have common structure across the regions and countries within the UK.   The focus is not on *explaining* attainment *per se*, instead it is upon using the estimated trends by qualification level to project future attainment, whilst controlling for other influences. The time trend variables drive the projections after 2004, and the inclusion of the age-gender categories allows independent projections by age and gender. Within individual countries and regions the proportions are again constrained to sum to unity, while the overall results are constrained to match the UK results form the stock-flow model.

Occupational/qualifications share models

The focus in the previous section has been upon the numbers of people entering and leaving the total population of those with formal qualifications. The other side of the coin is the way qualification profiles are changing within those employed in particular occupations. LFS data from 1991-2004 were used to explore these trends. Changing qualification shares SOC sub major groups were explored.

This detailed analysis cannot be extended across all other dimensions such as sector and spatial area because of limited sample sizes. The LFS has been used to develop qualification profiles and projections at the more aggregate level of the 25 industries used in the *National Report*, and for the 12 countries and regions distinguished in the *Spatial Report*. These are constrained to match the results from the more detailed

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[14]   The spatial dimension is defined to include Wales, Scotland and Northern Ireland as well England and the regions within it.
[15]   It is based on a model originally developed by IER for Future Skills Scotland. See Dickerson *et al.* (2004).

analysis described above as well as with the outcomes from the stock-flow model. This is achieved in the **Sort** model described below

Qualifications sorting model (sort)

The results obtained from the stock-flow and the occupational/qualification shares models are initially developed quite independently. This reflects in some respects the way the labour market operates. Supply driven changes in educational participation and the acquisition of credentials operate quite independently of changing demand side patterns that affect the typical qualification requirements in jobs offered by employers. Typically, market forces will tend to operate in such a way as to bring supply and demand into balance. Generally, those who are better qualified will tend to find and retain employment more readily than those less well qualified. As shown in the *Qualifications Technical Report* there is a clear monotonic relationship between unemployment rates and the level of qualification held. Although the differentials between NQF levels have narrowed over the past decade, the probability of unemployment for somebody with no formal qualifications is still almost 4 times as high as for someone with a PhD (NQF level 5).

The way in which people find jobs, once they acquire their qualification, is very complex. However the typical outcomes can be proxied by a very simple sorting algorithm which "shuffles" qualified people into jobs (occupations). This is described in more detail in the *Qualifications Technical Report*. The algorithm allows for the differential unemployment probabilities as described above. Based on the overall projected level of unemployment, and the implications for how this is shared between those qualified at different levels, this iterative procedure adjusts the total numbers qualified from the occupational/qualification shares results to match the results from the stock-flow model. This process of scaling changes the occupational employment totals. The occupational totals are then readjusted to match the original levels. The qualification levels are then readjusted and the process repeated until a solution is reached in which both the qualification profile matches the stock-flow model results and the original occupational results are restored.

Qualifications replacement demand module

The final element in the modelling framework is an extended version of the Replacement Demand module developed in *Working Futures*. This adds a qualifications dimension which enables users to produce projections for any geographical area or sector. The benchmark projection produced by the module match the results for sectors and regions obtained as described above. However the module enables alternative scenarios to be explored, using different qualification profiles.

A.6   Sensitivity to Key Assumptions

Demography and migration

The demographic forecasts used in the present study are those provided by the Government Actuarial Department.   These are based on underlying assumptions about fertility rates, deaths, etc. across the population of different ages.   Births continue to exceed deaths (by about 77,000 in 2003) and this is forecast to continue. The absolute number of deaths has fallen year on year since 1979, but this trend is expected to tail off and stop in the early 2010s.   What is more difficult to forecast is migration.   While trends in inflows and outflows do not appear particularly volatile, the net inflow (which is the difference between two much larger numbers) shows more volatility.   On average this has been around 135,000 per annum net inflow in recent years. The assumption of a constant 135 thousand per annum may be the source of some inaccuracies, but this figure is very small compared to the size of the active population.   The overall results will therefore not be very sensitive to this assumption. However, it is the difference between the qualifications of the outflow and inflow that is crucial to the net impact on qualification trends, but little or nothing is known about this.

The final set of results are constrained to match the overall demographic and labour force projections set out in the main *Working Future*s National and Spatial Reports.

Activity Rates

Activity rates over the period 1992 to 2004 were estimated using linear trends for each age group and qualification level. Modifications to these trends at aggregate level have been made on the basis that the downward trend in activity amongst the young age groups would slow as more and more people attain higher and higher qualification levels and also that older people will increase their activity rates because of the need to raise pensions with the longer life expectancy.

Rates of achieving qualifications

In the stock-flow model, qualifications are dealt with in two ways: first, as young people age, they are allowed to gain higher qualifications according to the historical patterns observed (using pseudo-cohorts) from the period 1992 to 2004; second, the trends towards improved qualifications over the same historical period are applied to the forecast period. Again, the rate of increase in qualifications may not be as high over the forecast period as, on balance, the population becomes increasingly qualified. A slow-down in the rate of improvement to qualifications would clearly lead to smaller increases in the numbers of those with higher level qualifications and an increased number of mainly those with no qualifications or NQF1, compared with the current forecast. The effect of this is quite complex, however, as activity rates are higher amongst the more highly qualified.   Some of the reduction in forecast qualification levels will also lower the active workforce.

Unemployment rate assumptions

If alternative unemployment rate assumptions are adopted for different qualification categories in 2014 then this would affect the projected overall levels of those in employment in 2014 (given the numbers projected in the economically active labour

force). Table A.7 illustrates that changing the unemployment rates drastically has only a marginal impact on the employment proportions.

Table A.7: Sensitivity of employment shares in 2014 to unemployment rates

	Unemployment rate	
NQF level	benchmark	alternative
5	3.6	7.0
4	3.1	6.0
3	4.4	5.0
2	6.7	7.0
1	10.0	8.0
0	19.5	10.0
Total		
NQF level	Employment shares	
5	9.5	9.3
4	29.4	28.7
3	24.5	24.6
2	20.2	20.3
1	13.8	14.2
0	2.6	2.9
Total	100	100

Source: IER estimates.