NFER
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Education Pathways, Skills Development and Occupational Outcomes

Working paper 8 of The Skills Imperative 2035: Essential skills for tomorrow's workforce

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The Skills Imperative 2035

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Glossary

Term	Our definition
Essential Employment Skills (EES)	Six skills identified earlier in this programme as being most in-demand by employers in 2035. They are (1) communication, (2) collaboration, (3) problem solving and decision making, (4) organising, planning & prioritising work, (5) creative thinking and (6) information literacy (Dickerson et al., 2023).
Standard Occupational Classification (SOC)	The SOC system is the main system for classifying occupational information in the UK. Jobs are classified by their skill level and context. The UK introduced this classification system in 1990 (SOC90). It has been revised every ten years, with the latest update taking place in 2020. There are four levels to SOC: major groups (1-digit level), sub-major groups (2-digits), minor groups (3-digits) and unit groups (4-digits). Jobs are classified by their skill level and context.
Qualification Levels (e.g. Level 3, Level 4+)	Qualifications are classified using the Regulated Qualifications Framework (RQF) - No qualification: Entry level qualifications below level 1; Level 1: Low grade GCSE (grade 3 and under) and equivalent; Level 2: High grade GCSE (grade 4 and above); Level 3: A level and equivalent; Level 4-6: Higher education, including undergraduate degrees; Level 7-8: Postgraduate degree level and equivalent.
Post-16 Education Pathway	The pathway people followed through Further Education, typically between the ages of 16-18/19, reflecting the choices they made after completing lower secondary education at age 16 and taking GCSE examinations. As described in Section 3.8, we focus on type of qualification to define pathway, with qualification type categorised as whether academic (A levels taken in a school or college setting), vocational (work-based learning taken place mostly in a college setting, e.g. BTECs, T-levels), or apprenticeship (work-based learning that is largely workplace-based together with some college-based education).
VET	Vocational and Employment training – a combination of the vocational and apprenticeship qualification classifications.
Risk Quintiles	We categorise all occupational minor groups in the Standard Occupational Classification into five quintiles based on their projected proportional change in employment (PCE) and change in employment share (CES), with risk quintile one being the category most exposed to employment risk and risk quintile five being the least exposed.
High-Risk Occupations	Occupations in risk quintiles Q1 and Q2.
Low-Risk Occupations	Occupations in risk quintiles Q3, Q4 or Q5.

Executive Summary

Introduction

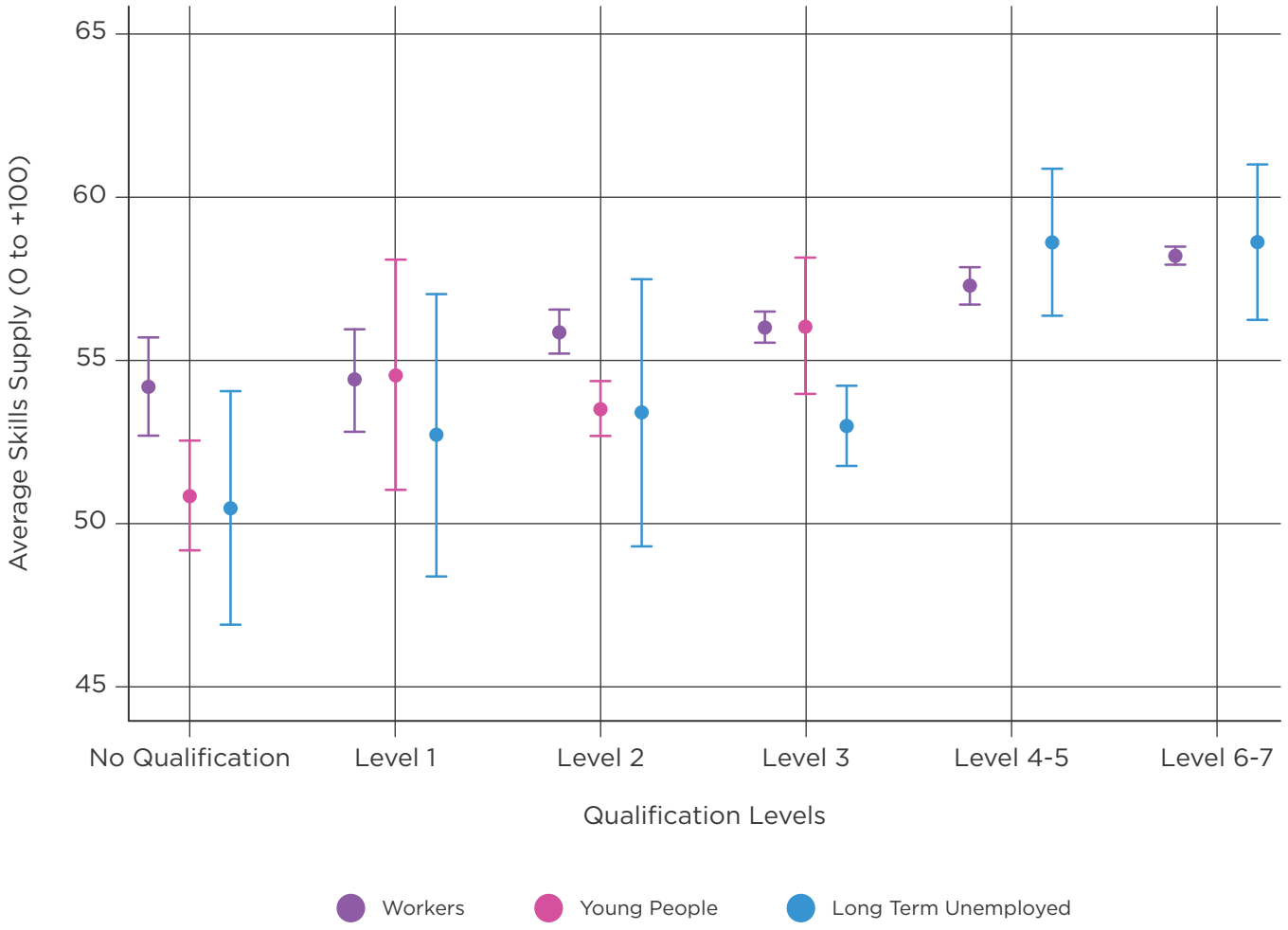
Evidence published earlier (Working Paper 2) in The Skills Imperative 2035 suggests the structure of the labour market is changing, impacting the jobs that will be available in future and the skills needed to do these jobs (Taylor et al., 2022; Wilson et al., 2022). Job growth will be concentrated in professional occupations, whereas most low- and mid-skilled occupations will decline (Scott et al., 2024).

Earlier evidence (Working Paper 3) identified a set of transferable 'Essential Employment Skills' (EES) – which include socio-emotional skills, cognitive skills and self-management skills – which are already widely utilised across the labour market, but which will become even more vital in the future (Dickerson et al., 2023). For Working Paper 4, we gathered data from over 11,000 individuals on the EES they possess and the skills requirements of their jobs. Our data suggested that, despite the critical role they will play in meeting future skills needs, EES deficiencies are already widespread, especially in high-skilled professional occupations (Bocock, Del Pozo Segura and Hillary, 2024). One in five workers in these occupations self-report behaviours and skills requirements that indicate they have substantial EES deficiencies which could jeopardise their ability to do their jobs. Job growth in these occupations, coupled with projected increases in how heavily these workers will be required to utilise their EES, could mean that, without action, the number of workers in England with substantial EES deficiencies nearly doubles to seven million people (Bocock, Del Pozo Segura and Hillary, 2024). It is therefore vital that we understand the determinants of EES development and how best to support young people to develop a strong early base of these skills as they progress through the education system. This has been a focus of Working Papers 6 and 7, and is similarly the focus of this report.

In Working Paper 5, we identified the occupations in which workers are at greatest risk of being displaced from their jobs due to changes in employment and skills requirements (Scott et al., 2024). We also showed that mismatches, between the qualifications and skills of workers in high-risk occupations and the job demands of growth occupations, pose significant barriers to workers successfully transitioning from declining to growing areas, which reinforces the importance of ensuring that more young people leave education equipped to enter growth occupations. In this report - the eighth working paper from The Skills Imperative 2035 - we build on our previous findings by exploring whether people's likelihood of working in a high-risk occupation varies depending on the 'pathway' (academic, vocational, mixed, or an apprenticeship) that they took through education.

We have already shown, earlier in this programme, that people with higher qualification levels have higher EES, on average (see Figure 1 below, reprinted from Working Paper 4 Bocock, Del Pozo Segura and Hillary, 2024). This was the case amongst 'Workers', 'Young people' and the 'Long term unemployed'. This could be because qualifications create opportunities for people to develop their EES and evidence them to employers, or, alternatively, young people with higher EES may be more likely to pursue a higher qualification in the first place, or other factors may explain the relationship. In this paper, we build on this evidence by investigating whether EES also varies, amongst adult workers and young people, according to their pathway through each qualification level. We also extend our analysis of differences between pathways to cognitive skills (numeracy, literacy and problem-solving), and non-economic outcomes, specifically people's attitudes to trust and politics, patience, and volunteering.

Figure 1: Average levels of EES by highest qualification achieved, broken down by sub-population of the NFER EES survey sample



Source: Analysis of NFER Essential Employment Skills survey.

Note: Qualifications are classified using the Regulated Qualifications Framework (RQF) – see Glossary for more information. Average Skills Supply for young people at Level 4 and above are not displayed because very few young people aged 19 in our sample had yet achieved qualifications at these levels.

Previous evidence (Working Papers 6 and 7) also presents a mixed picture regarding the relationship between young people's EES development and their cognitive skills, such as literacy and numeracy (Bocock, Del Pozo Segura and Hillary, 2024, 2025). In Working Paper 6, we investigated the determinants of young people's behavioural and cognitive development between birth and age 17 and showed that young people's cognitive and behavioural skills are inter-related, in that children who exhibit behavioural difficulties are more likely to have lower cognitive outcomes later in childhood (and, to a lesser extent, the reverse is also true). However, in Working Paper 7, we also showed that, at the country level, average socio-emotional skills are not significantly associated with average levels of reading, maths or science skills amongst 15/16 year olds, and socio-emotional skills and cognitive skills are only weakly correlated at the individual level. Whilst young people in England typically have better maths, reading and science skills than the OECD average, their socio-emotional skills at age 15/16 are much worse than the OECD average, and inequalities in these skills are substantial. Given this mixed picture, we investigate - in this paper – the relationship between individuals' cognitive skills and their EES at the same age, amongst young people under 21 and adults over this age.

Research design and methodology

In this paper, we draw on data from the NFER Essential Employment Skills survey (see 'Technical Supplement Part B to Working Paper 4' for more details), which provides data on the EES that over 11,000 people possess coupled with the skills requirements of their jobs. We match the responses to this survey to administrative datasets that allow us to classify the pathway that individuals followed through the Further Education system, as well as their prior attainment from secondary school, and their participation in Higher Education. The Survey of Adult Skills (PIAAC Cycle two) provides data on the cognitive skills and attitudes of those who responded to both surveys. Finally, we explore the relationship between occupation and post-16 pathway using data from the Annual Survey of Hours and Earnings (ASHE) linked to the Longitudinal Education Outcomes (LEO).

Together, these data sources enable us to extend the knowledge base by:

- Comparing the education pathways of individuals in high-risk occupations with the pathways of people in lower-risk, growing areas of the economy (Section 4).
- Exploring the relationship between the education pathways that individuals followed and their cognitive skills, EES, attitudes, and their job and life satisfaction in 2023.
- Investigating the relationship between people's EES and their cognitive skills and attitudes at the same age.

Our analysis was, however, subject to the following data limitations:

- Limited variability in our EES survey data coupled with a modest match rate between this and administrative sources, may have restricted our ability to detect significant differences between pathways in people's EES, particularly between HE subjects (and we were not able to assess the effects of Level 4-5 vocational courses)
- Only 307 individuals are observed in all three of our EES survey data, PIAAC and administrative sources, limiting our ability to detect significant relationships between individuals' EES and their cognitive and attitudinal outcomes.
- Our EES survey sample represents a cross-sectional, multi-age sample – this allows comparisons between age groups at a point in time, but not comparisons between groups when they were the same age, or of skill development over time.
- Analysis of the relationship between occupations and education pathways was of data supplied by the DfE which observed pathway once for each individual (as opposed to once for each year in education). The pathways used in this analysis therefore differ from those used in other strands of the research.
- For our analysis of pathways, we used data about respondents to our EES survey who were aged between 16 and 38. Some of the older adults in this range will have progressed through the education system some time ago. It is possible that differences between education pathways taken and an individuals' subsequent EES, or other outcomes, have changed over time as the focus on developing these skills while in education may have increased. If so, this may have affected our ability to detect a relationship between pathways taken and levels of EES.

Given these limitations, findings should be interpreted cautiously.

Key findings from our research

The key findings from our research are:

1. The higher someone's qualifications, the less likely they are to work in a 'high-risk' occupation. However, college leavers who followed different post-16 pathways but did not progress to university do not differ substantially in how likely they are to work in a high-risk occupation.

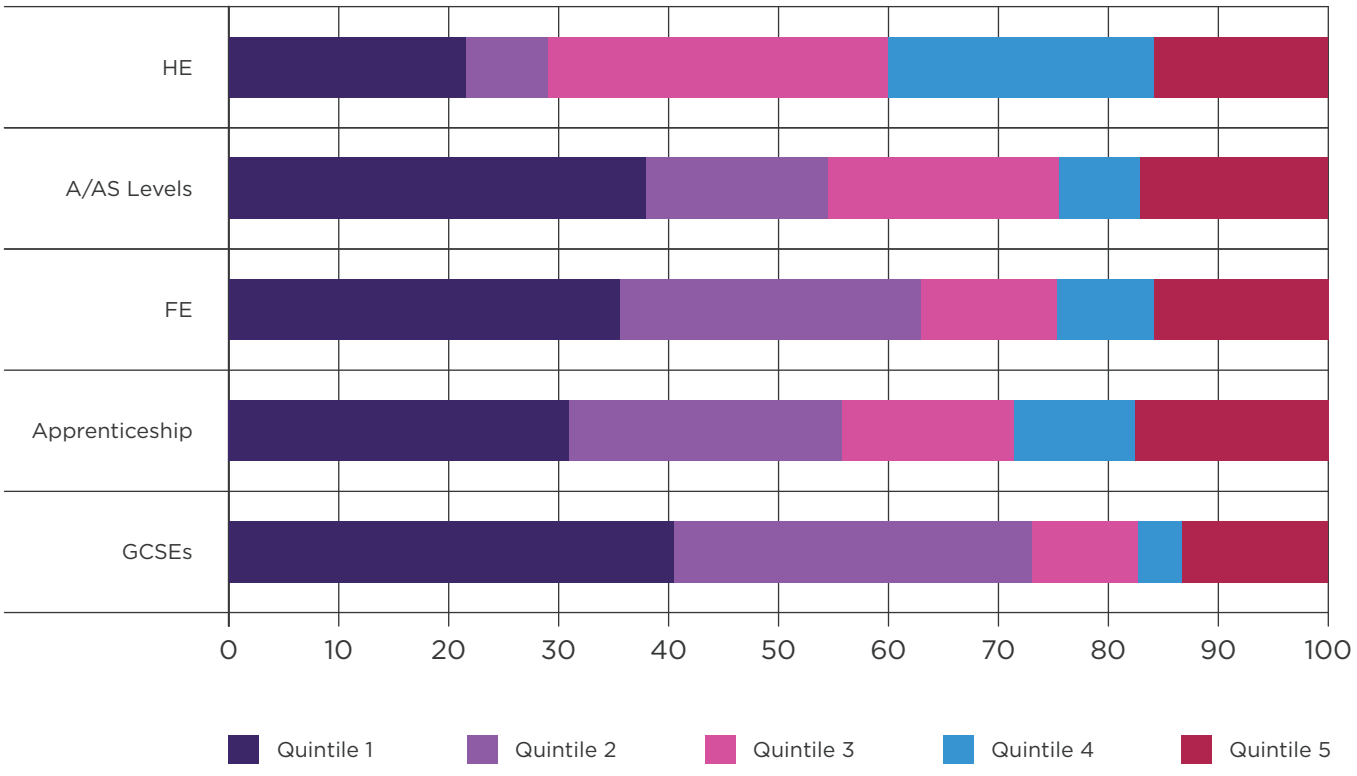
Individuals with degrees are more likely to work in 'low-risk' occupations, as shown in Figure 2 below, in which Quintiles 3-5 represent low-risk occupations and Quintiles 1-2 are 'high-risk' occupations. Over 70% of employees qualified to Level 6 (predominantly Bachelor's degrees[1]), work in a low-risk occupation and this rises to over 80% of those qualified to Level 7 or above (Master degrees or PhDs).

By comparison, between a half and two-thirds of people who attended a college and followed an A/AS-level, FE or apprenticeship route through upper-secondary education, but did not attend HE, work in a high-risk, declining occupation. This proportion does not vary substantially by post-16 pathway (academic, vocational, mixed or apprenticeship).

Lower qualification levels are associated with an increased likelihood of working in a high-risk occupation within every pathway, but particularly within the academic pathway where the proportion of individuals in high-risk jobs rises steeply as we descend the qualifications hierarchy.

Overall, this suggests that the level of qualification an individual reaches is a far better predictor of whether they will later work in a high-risk occupation, compared to the pathway they followed through upper-secondary education.

Figure 2: Percentage of employees in each job risk quintile, by qualification pathway



1 *Whilst our sample of 21+ year olds includes people that achieved a Level 6 qualification through FE, less than 10 individuals achieved this qualification level via an FE route, which compares with 910 people observed in HESA data as having achieved a Level 4-6 qualification through the university route, 877 of which achieved at least a Bachelor's degree (with none of these observed as having completed a degree apprenticeship). Consequently, we are primarily observing the effects of Bachelor's degrees on the risk profile of people's occupation.*

2. Whilst people with degrees are far less likely to end up in a high-risk occupation, a significant minority of them do, nevertheless, work in these occupations.

A significant minority (nearly 30%) of employees aged 21-38 with a degree work in high-risk occupations. These occupations are mid- and low-skilled roles, which include admin/secretarial jobs, some skilled trades and operator jobs, sales and customer service roles, and elementary jobs, rather than higher skilled professional or associate professional occupations which people with a higher level qualification tend to work in. This does not mean they have never worked, or will never work, in a growth occupation – some workers who start in an high-risk occupation will progress into a higher-skilled occupation at a later age, others might have done the opposite. Workers with a degree may also choose to work in a non-graduate job for a variety of reasons, including flexibility, location or family reasons, and the effects of the Covid-19 pandemic may have forced some people to accept jobs below their skill level, even if just temporarily. Nevertheless, the wider literature does suggest that skills mismatches - that is, mismatches between the skills that employers are looking for and the skills that graduates have - may also play a role in explaining why a significant minority of degree-educated people work in occupations they are over-qualified for (e.g. Britton et al., 2020). Greater focus is needed on encouraging young people to pursue degree subjects that best prepare them for growth occupations.

3. Amongst those with a degree, people from lower-income households are more likely to end up working in a high-risk occupation

Young people from lower-income households are both less likely to progress to university and also, our research suggests, more likely to end up working in a high-risk occupation after they graduate, relative to their more advantaged peers. This could reflect differences between socio-economic groups in graduates' expectations, access to networks, or other factors. This suggests students from more disadvantaged backgrounds may need additional support to help them to progress into a growth occupation after graduating.

4. Individuals who follow an academic post-16 pathway tend to have substantially higher literacy, numeracy and problem solving skills compared to those who followed a vocational pathway.

Amongst people who responded to both NFER's EES survey and PIAAC, those who followed an academic-only post-16 pathway appear to have the highest literacy, numeracy and problem-solving skills levels, followed by those who followed a mixed pathway, with those who followed a vocational-only pathway having the lowest skill levels. The raw differences between academic-only and vocational-only pathways are of the order of 50 points (on a scale from 0-500), so substantial. These differences between academic-only and vocational-only pathways remain statistically significant and substantial in absolute size (over 30 points) after controlling for other differences between pathways, including variability in individuals' prior attainment (KS4), their highest qualification achieved, the level of deprivation they grew up in and whether they have a special educational need or not. The differences between those on academic-only and mixed pathways are smaller and not statistically significant, except for literacy. This could suggest that academic-only pathways better support the development of literacy, numeracy and problem solving skills. Alternatively, it may be that young people with higher levels of these skills are more drawn to academic pathways in the first place, or other factors may explain the observed relationships.

5. People's levels of EES do not appear to vary significantly depending on the post-16 pathway they followed.

We were not able to detect a significant relationship between individuals' EES scores and their post-16 pathway, either based on raw differences or after controlling for other measured background variables. This was true both for adults aged 21+ and for young people aged 18-20. The exception to this is that following a 'Mixed-VET first' pathway may be associated with marginally higher EES – whilst overall EES scores for this group are not significantly different to the baseline academic-only pathway, their scores are significantly higher for problem-solving and decision-making and creative thinking.

Overall, this provides some suggestive evidence that no one pathway may disproportionately benefit adults' EES. However, caution is required when interpreting these findings - low variance in our EES survey data coupled with sample size limitations may be restricting our ability to detect statistically significant differences between pathways. Moreover, we are looking at a snapshot in time of the population - it is possible that people's EES develops at different rates depending on the post-16 pathway they chose, but we cannot test this hypothesis.

6. Degree-educated workers' levels of EES do not appear to vary significantly depending on the subject of their degree.

We find no evidence of any significant differences in mean overall EES between different degree subject groupings, either in the raw data or after controlling for other differences between degree subject groups. There are, however, some modest differences between different subject groupings on some of the six component EES. Our results suggest creative thinking skills are significantly higher amongst Engineering and Arts graduates, relative to our baseline category (Health graduates), holding constant background characteristics, whilst Health graduates have significantly higher levels of information literacy skills compared to graduates of Social Science, Arts, Education and Mixed (Combined) degrees. Other differences are not statistically significant. However, again these findings should be interpreted cautiously due to the data limitations described.

7. Individuals' EES do not appear to be significantly related to their literacy, numeracy or problem-solving skills.

Whilst individuals' EES and cognitive skills (literacy, numeracy and problem-solving) are positively correlated, correlations are small (0.06-0.09) and statistically insignificant. This is surprising – we might have expected literacy skills measured in PIAAC to be strongly correlated with communication and collaboration skills in our EES survey, or problem solving in PIAAC to be closely related to problem-solving and decision-making in the EES survey. However, these results are likely to be somewhat attributable to differences between the PIAAC and EES surveys in the attributes each measure and how they measure them (for example, PIAAC involves a performance-based assessment, whereas the NFER survey approximates skills from respondents' self-reported behaviours). Given these very material differences, readers should treat this finding with caution.

Taken together, these findings highlight the role having a level 6 or higher qualification plays in enabling people to enter growing, higher-skilled occupations. However, they also suggest that a significant minority of graduates do work in declining low- and mid-skilled occupations, and graduates from low-income households are less likely to work in a higher skilled occupation than their peers from more affluent backgrounds. Whilst our findings highlight that people's cognitive skills appear to vary substantially depending on the post-16 pathway they followed, the same does not appear to be true of their EES. However, caution is required when interpreting this final finding, which may be attributable to the data limitations described earlier in this chapter. Further research into the relationship between education pathways and EES development would be beneficial.

2. Introduction

This final working paper in The Skills Imperative 2035 project builds on and extends the previous work undertaken. Our focus here is on the supply of skills, looking at the extent to which the skills that individuals possess at the end of education vary according to the pathway they followed through their education system. This is important issue. If the country is to be ready for the new skill needs of a rapidly changing labour market, caused by a changing occupational structure and technology-driven changes in job tasks within occupations, then knowing how, or where, the key skills are produced will be beneficial for designing education policy, in order to guarantee a supply of the needed skills.

Working Paper 3 on The Skills Imperative 2035 project (Dickerson et al., 2023) focussed on projecting the skills that will be needed most in the labour market in 2035. This involved projecting changes, both in the occupational structure of employment between 2021 and 2035, and in the skills requirements of each occupation. Using these projections, the authors derived changes in skill requirements and identified six EES that are projected to be in most demand in the labour market in 2035.

These are:

- Problem-solving and decision-making skills
- Collaboration skills
- Organising, planning and prioritising skills
- Creative thinking skills
- Communication skills
- Information literacy skills.

Having identified these EES, the Skills Imperative 2035 project wanted to undertake further research, to understand the demand and supply of these skills, who has them, and how they are acquired. In order to undertake such research, a measure of these skills was needed that could assess the relevant skills levels of individuals. A survey was therefore conducted, that measures the EES individuals possess, via a series which asked out their behaviours in their working environment. This survey is described in detail in Working Paper 4 of the Skills Imperative 2035 project (Bocock et al., 2024). Using the statistical measures derived, that report showed the characteristics of individuals and jobs that are associated with the observed level of skills. Key findings demonstrates that workers in high skill occupations have the highest levels of EES, on average, though some in such jobs have skill deficiencies. Amongst the individual characteristics studied, the one most strongly associated with level of EES was the individual's highest level of educational attainment – as individuals' qualification levels increased, their EES levels also increased, on average.

Working Paper 5 on The Skills Imperative 2035 project (Scott et al., 2024) made further use of the occupation and skills projections discussed above, considering the implications of changes in jobs and skills requirements for workers in the labour market. It identified low-risk and high-risk occupations based on future employment projections (a classification we will also use in this report). It showed how workers in high-risk occupations are typically lower-skilled, meaning that individuals displaced from such declining jobs are unlikely to have the skills needed to transition into growth areas, which are typically more highly-skilled occupations.

Having thus considered those already in employment, the final three papers of The Skills Imperative 2035 project (this one, and the preceding two), consider the future workforce, by examining factors associated with young people's skill development as they progress through the education system. It is important that children and young people are equipped with the EES identified above during their education, so that they are well prepared for the changing nature of the labour market in the years to come. Working Paper 6 (Bocock, Del Pozo Segura and Hillary, 2025) extends existing research on child skill development, using a range of national longitudinal datasets to investigate the factors that are associated with young people's cognitive and behavioural development. The findings point to the importance of factors such as home environment, school progress and extra-curricular activity for children's behavioural and cognitive development, and stress that such development is a cumulative process throughout the years of education. This work is extended in Working Paper 7 (Lucas et al., 2025) by taking an international perspective. This paper uses Programme for International Student Assessment (PISA) data to identify countries that are high-performing in terms of the cognitive skills (literacy and numeracy) of school children at age 15/16, as well as taking account of skills progression between the ages of 15/16 and 20-24 by also using data from young adults in the Programme for the International Assessment of Adult Competencies (PIAAC) data. Having identified high-performing countries according to these criteria, the paper goes on to look at aspects of their school and education systems, to see if there are lessons that England could learn from.

This work on the supply of skills from the education system is completed in this new working paper. In particular, due to the absence of suitable data in the various datasets used in Working Papers 6 and 7, they were not able to consider the EES identified earlier in The Skills Imperative 2035 project, and listed above. However, such information was collected as part of our EES Survey, as discussed in Working Paper 4 (Bocock et al., 2024), as described above. We combine this information on skill levels with administrative educational data, in order to see how the EES vary by educational pathway followed. We therefore add to the analysis undertaken in Working Paper 4, which showed that EES are related to the highest qualification level attained, to also consider whether the pathway followed to that highest level of attainment is also important for essential skills development. This will help us to understand how and where in the education system the EES are produced, thus guiding policy-makers on where to focus their attention.

We also further extend the analysis of educational pathways, by investigating how cognitive and behavioural outcomes vary by pathway, to provide some insight as to whether the processes involved in developing EES are the same as for these other outcomes. Further evidence on this question is provided by determining the extent to which our EES themselves are correlated with these other outcomes.

Before this analysis, we first look again at the classification of current workers' occupations into high-risk and low-risk jobs according to their potential for decline or growth, as discussed above. In particular, we look at which education pathways are more likely to be associated with being in a high-risk or low-risk occupation. This is useful information for the analysis that then follows. If different pathways are shown to be more or less likely to be associated with job-risk, then to try to understand why, we need to know more about the skills and other worker attributes associated with those pathways.

The analysis presented in this report seeks to answer to the following research questions:

RQ1. How do people's probability of entering a 'high-risk' or 'low-risk' occupation vary by pathway?

RQ2. How do people's level of cognitive and non-cognitive skills vary depending on their pre- and post-16 education choices and attainment, and how do their levels of these skills relate to their levels of EES?

RQ3. How do people's level of EES vary depending on their post-16 education choices and attainment?

RQ4. How do people's level of EES vary by pre-16 education pathways and attainment?

RQ5. How does people's job and life satisfaction vary depending on their post-16 education choices?

RQ6. How do people's level of EES vary by HE subjects and attainment?

We begin to answer these questions, by describing the data and methods used in the following section.

3. Research design and methodology

Key Points

1. We draw our data on EES from responses to the NFER Essential Employment Skills survey (see 'Technical Supplement Part B to Working Paper 4' for more details).

2. Responses to the NFER EES survey are matched to various administrative datasets that allow us to classify the pathway that individuals followed through the Further Education system, as well as their prior attainment from secondary school, and their participation in Higher Education.

3. Further data sources provide data on the cognitive skills and attitudes of individuals who also participated in PIAAC Cycle 2 (2023), and the occupation in which individuals work (from ASHE).

4. The FE Pathways we identify in the data classify individuals' Further Education according to whether it was academic-only, both academic and vocational (and if so, in which order they were taken), vocational-only or an apprenticeship.

We use a variety of datasets to identify the education pathways and labour market outcomes discussed in the Introduction above. These include NFER's Essential Employment Skills survey, which was developed earlier in the programme to measure people's Skills Supply, Skills Requirements and Skills Gaps in relation to EES, as well as background information collected in that survey. This data was then matched to existing data sources, comprising administrative education datasets, and other national and international surveys. We describe each of these data sources in turn.

3.1 Essential Employment Skills Survey

This survey has been described in detail in previous Skills Imperative research reports (Kollias et al., 2024), and so is just briefly summarised here. The survey was an attempt to measure people's Skills Supply, Skills Requirements and Skills Gaps, in relation to EES. These skills were identified in an earlier Skills Imperative report (Dickerson et al., 2023) as those skills predicted to be the most in demand in 2035, based on the projected occupation trends and skills use within occupations, as described in that report.

These six skills are:

- Problem-solving and decision-making (PSDM)
- Collaboration (COCO)
- Organising, planning and prioritising (OPPR)
- Creative thinking (TCRE)
- Communication (COMM)
- Information literacy (INLI)

The NFER Essential Employment Skills survey collected data on individuals' behaviours at work and outside work. Their EES levels in the six areas listed are approximated from their self-reported behaviours rather than, for example, asking respondents to self-report their ability level in relation to each skill directly. The survey also asked respondents to report their satisfaction with their life and their job, and contained questions that elicited their background characteristics. The skills levels and satisfaction variables derived in this way then represent the main outcome variables in this current report, and are related to education data derived from matched administrative data, as listed below.

3.2 National Pupil Database

The National Pupil Database (NPD) is an administrative record of all children and young people in the state maintained school system. Its primary use in this report is to provide data on attainment in compulsory schooling up to the age of 16 (in the form of Key Stage 2 test scores at age 11 and GCSE exam results at age 16, Key Stage 4), as well as to identify those who participate in post-16 education within the state school system (i.e. Key Stage 5), primarily to follow academic Level 3 qualifications (A levels). The NPD also records the outcomes that they achieve at age 18, in terms of number and grades of A levels achieved. In addition, further information can be obtained about the pupils from the School Census part of the NPD, in particular whether they are eligible for Free School Meals, the IDACI score of their local area, which both act as indicators of family background/levels of social advantage and disadvantage experienced), and Special Educational Needs Status, as well as their gender and ethnicity. The NPD data was first collated for the cohort of pupils who took their GCSEs in 2002, meaning that the oldest respondents to the EES Survey for whom we also have NPD data are aged 38 at the time of the EES survey. We use NPD data from 2002 to 2022.

3.3 Individualised Learner Record

The Individualised Learner Record (ILR) is an administrative dataset that collects information on all individuals who are engaged in funded learning within the post-16 Further Education (FE) sector. This could be classroom-based education within a Further Education College, funded work-based learning with a training provider, or an apprenticeship, which typically combines the two. The ILR is organised in terms of 'learning aims', with detailed information provided about all learning aims being followed by an individual in a given academic year, such as the type of course, the level of study and the subject area. We aggregated these learning aims up to the individual level, in order to match to our other datasets, by taking the individual's highest level learning aim in any given academic year. We have ILR data for the same cohorts for whom we have NPD data (i.e. from GCSE cohort 2002 onwards) and so can observe any post-16 learning undertaken in FE by those young people.

3.4 Higher Education Statistics Agency

Data supplied by the Higher Education Statistics Agency (HESA) relates to information on individuals' participation and attainment in Higher Education (HE). Similar to the ILR data for FE, the HESA data provides detailed information about degree level qualifications being followed, including institution, level and subject area. The final degree classification is also recorded at completion. We have HESA data for individuals in all the GCSE cohorts discussed above for whom we have NPD data, and therefore can track all post-16 education undertaken by members of these cohorts, whether in FE or HE, as well as control for all attainment in the pre-16 phase of education. The HESA data covers the years 2005 to 2023.

3.5 Programme for the International Assessment of Adult Competencies

The Programme for the International Assessment of Adult Competencies (PIAAC) is an international research programme organised by the OECD, which aims to measure the skill levels of adult individuals using comparable instruments across a range of countries. We use data from the Great Britain survey undertaken in the second cycle of PIAAC in 2023. This is matched to the NPD-ILR-HESA-EES data discussed above. This was possible because the sampling frame for the EES survey deliberately included a proportion of those who had participated in the GB PIAAC survey, who were then asked to participate in the EES survey and indicated whether they were willing for their data to be linked. The PIAAC data provided measures of cognitive (literacy, numeracy, and problem solving) skills and non-economic attributes (political efficacy, social trust, voluntary work, general health, and patience).

3.6 Annual Survey of Hours and Earnings

The Annual Survey of Hours and Earnings (ASHE) is a national survey dataset, covering 1% of employees in the UK. Sampling for the survey is on the basis of National Insurance (NI) numbers, with those whose NI numbers end with a particular two digits being included. Given NI numbers do not change, this means that the same individuals are surveyed repeatedly, as long as they remain in employment, therefore producing a panel dataset. The survey is administered by employers, who report on their sampled employees via company records, which therefore means that ASHE is seen as a reliable source of labour market information. For our purposes, the variable of most interest in ASHE is the recording of employees' occupation, via Standard Occupational Classification (SOC) codes, information which is not available in any of the administrative datasets discussed above. When matched to those administrative datasets, we can then build up a picture of the qualifications attained and pathways followed by employees working in different occupations.

3.7 Methodology – Data Matching

Having outlined above the range of data available to us, we now describe how the various datasets were used, in order to answer the research questions set out in the Introduction.

The first stage of the research was to match together the various data sources. We began with the EES Survey as our base for the initial analysis (research questions 1-4), given that it relies on knowing people's EES or satisfaction, as observed in that dataset. We then looked for each of these individuals in the Key Stage 2 and Key Stage 4 NPD datasets and merged the NPD data into the EES Survey where a match was observed. The matching was undertaken for us by the Department for Education (DfE), with a strong match determined on the basis of a full match on name, date of birth and postcode. Fuzzy matching was also used when a full match was not possible, based on a full match on some characteristics and similar matches on others, with manual checks to ensure confidence in the ensuing match.

As described above, the NPD was first reported for the 2002 GCSE cohort, who were 16 that year, and so any individual in the EES Survey who was older than 16 in 2002 would necessarily not be found in the NPD data. Of the 11,364 respondents in the EES Survey, around half were of the required age. Of those who could potentially be matched, the matching procedure outlined above provided a match in just over half (52%) of cases. This resulted in a dataset of 3,184 individuals with matched EES-NPD Key Stage 2 and 4 data. Those matched were more likely to be male, from a white ethnic background, from outside of London and from less deprived areas. We take account of this non-random likelihood of being matched by including weights in all analyses, to make the used sample representative of the population.

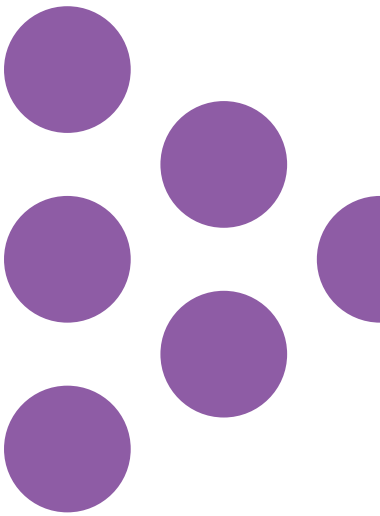
Given that the EES Survey deliberately over-sampled 16 year olds, this meant that a significant number of the 3,184 matched individuals were age 16 at the time of the EES Survey and so were in the NPD Key Stage 4 dataset, but necessarily could not be observed in the post-16 education datasets (NPD Key Stage 5, ILR and HESA) because of their age.

We, therefore, further restricted our matched sample to those aged 18+, and then subdivided them further into two groups: those aged 18-20 (754 individuals) and those aged 21+ (1,497 individuals). The latter group are the main focus of the analysis, given that many in the former group will not have completed their education at the time they are observed in the EES Survey, whereas most in the latter group will have done so.

The 2,251 individuals aged 18+ in the matched EES-NPD survey were then searched for in the post-16 education datasets (NPD Key Stage 5, ILR and HESA), in order to identify their participation and attainment in FE and HE. Those for whom no match was found in the post-16 datasets were retained within the analysis, as a group of interest who chose not to participate in post-16 education at all. It is assumed that such individuals did not participate in post-16 education, rather than a result of a failure to find a match in the post-16 datasets. Recall that all of the used sample have been located and matched within the administrative education records, in the NPD at Key Stages 2 and 4. Once identified within the administrative datasets, the matching success rate across datasets (e.g. NPD to ILR) is very high.

For those who did participate in post-16 education, they might be observed in any one, or all, of the post-16 datasets, or any combination of two of them, depending on their post-16 education choices and pathways followed. Of the 1,497 individuals aged 21+, all but 30 were observed in some form of post-16 education, in either the NPD Key Stage 5 or ILR datasets, or in both. Of these, 910 were also observed in the HESA data, having progressed to HE.

The final data matching involved searching in the PIAAC data for those individuals in our core aged 21+ EES-NPD-ILR-HESA data, who were in PIAAC and were re-surveyed for EES, gave their permission to link data, and were also observed in some form of post-16 education. This resulted in 307 individuals, which represented a full match for those who met these criteria.



3.8 Methodology – Identifying education pathways

The first piece of analysis, in Section 4, addresses the first research question as to pathways followed by individuals who are currently working in high-risk or low-risk occupations, according to the project growth or decline in employment in that occupation. This analysis made use of the Annual Survey of Hours and Earnings (ASHE), as described in Section 3.6 above, which provided the required information on occupation, not available in any of the other datasets listed above that we used. Respondents in ASHE (a 1% national sample) were matched to their education records in the administrative datasets by the DfE, who kindly gave us permission to access this matched data. The data were restricted to those aged 23-30 and observed in ASHE in 2017-2019 (using the latest year within this period in which they were observed), which produced a sample of 33,197 individuals. Individuals who were still studying, or who had missing data, were excluded.

The data supplied to us by DfE had pathway as a variable already in the dataset, with one observation per individual recording this pathway (as opposed to an observation for each academic year in some form of education, with which we could derive our own pathway variable). We therefore used the pathways as classified in the data supplied to us, which differed slightly from the pathways used later in the report, as described below. In particular, the pathways did not just focus on the Further Education (FE) stage, but also took into account Higher Education (HE). Specifically, the pathways are classified in terms of their end point (i.e. the highest qualification attained), as:

- Higher Education (HE)
- A/AS Levels
- Further Education (FE)
- Apprenticeship
- GCSEs

For all of the other research questions listed earlier in the Introduction, we derived our own pathway classifications, making used of the merged administrative dataset as set out in the previous sub-section. With this dataset, we could follow the individual cohort members throughout their post-16 education journey, and so map out the pathways that they followed. The main focus initially is on pathways followed in Further Education, between the ages of 16 and 18/19, with which we can address research questions 2-5 listed in the Introduction above. The NPD Key Stage 5 and ILR data are of the primary datasets of interest for this purpose. We later add in the Higher Education stage, using the HESA data.

Pathways could be defined in terms of their type (academic, vocational or work-based apprenticeship), their level, and their subject area. We initially considered all of these, in addition to whether individuals completed or withdrew from their programme of study. Given the sample size available (1,497 individuals aged 21+), clearly it was not possible to create separate pathways taking into account combinations of all of these characteristics, as the individuals would be spread too thinly across such pathways, precluding feasible analysis. We therefore focussed on type of post-16 qualification as the primary characteristic identifying individuals' education pathways, as previous research (looking at highest attainment level as opposed to pathway as here) has shown the importance of this distinction for labour market outcomes such as earnings (e.g. McIntosh, 2006).

We therefore distinguish between individuals who followed an academic route post-16 (A levels), those who undertook a college-based vocational qualification (for example, a BTEC) and those who participated in work-based apprenticeship. There is also a significant proportion of young people who undertake more than one of these qualification types. Given that we observe their full education history in our data, we can determine the timing of such combinations of qualifications. In the final classification of pathways followed, we therefore distinguished between whether such individuals undertook an academic qualification and then at a later point in time were observed undertaking a vocational qualification, whether they took both academic and vocational concurrently (taking one A level and a BTEC for example), or whether they completed a vocational qualification and then at a later point in time returned to academic education.

Of the other characteristics that could have been used to define pathways, we control for level of qualification reached in the main multivariate analysis below. Subject of FE qualification is not included in the analysis, due to the wide range of subjects followed across all academic, vocational and apprenticeship options. In the following analysis of HE (Section 5), we will explicitly consider broad subject grouping of degrees.

Applying this classification of pathways through FE, we arrived at the distribution of aged 21+ individuals in the matched dataset across pathways as shown in Table 1.

Table 1: Individuals Aged 21+ by Further Education Pathway Followed

Pathway	Weighted Percent
No post-16 education	3.8%
Academic	27.2
Mixed – VET first	4.1
Mixed – concurrent	19.1
Mixed – academic first	27.1
Vocational	15.2
Apprenticeship	3.5
Total	**100**

Table 1 shows that a slight majority (54%) of young people in the sample pursued exclusively academic education as the first entry on their post-16 pathway, split almost equally between those who did and did not follow this by taking a vocational qualification. Almost 1 in 5 individuals took both these types concurrently. Taking a vocational qualification and then returning to academic study is more rare, with similar small percentages taking an apprenticeship or not engaging in post-16 education at all.

Applying this classification of pathways through FE, we arrived at the distribution of aged 21+ individuals in the matched dataset across pathways as shown in Table 1.

Table 2: Composition of young people aged 21+ following each pathway

Pathway	Weighted Percent				
	Male	Ethnic Min.	SEN	Eligible FSM	IDACI *(Most Deprived Quartile)*
No post-16 education	50.4	*	*	*	*
Academic	53.4	13.7	13.6	12.1	24.0
Mixed – VET first	46.1	*	25.1	31.1	47.2
Mixed – concurrent	51.2	9.6	16.5	20.7	31.2
Mixed – academic first	53.8	5.5	24.1	16.1	29.4
Vocational	49.1	4.6	36.3	35.6	41.1
Apprenticeship	60.0	*	*	*	16.9
Total	**52.3**	**8.1****	**19.6**	**19.6**	**31.2†**

** Not reported for disclosure reasons*

*** This figure is lower than the current proportion of the population from an ethnic minority background because individuals in our sample were born between 1986 and 2006 w(hen ethnic minorities made up a smaller proportion of the population), and because our sample is based on those with a full NPD record and therefore excludes individuals who have immigrated into the country, who are more likely to be from an ethnic minority.*

† Individuals are not evenly distributed across quintiles because IDACI is only updated every 5-7 years and birth rates differ by IDACI quintile.

Gender differences by pathway are small, with apprenticeships having the most gendered profile, with 60% male. Young people from an ethnic minority background are over-represented on academic pathways, and under-represented on vocational ones. Those who progress to take A levels post-16 are much less likely to have been identified as having Special Educational Needs (SEN) during compulsory schooling, while those who were identified are more likely to be observed on vocational pathways. The final two columns in Table 2 provide indicators of the socio-economic background of the young people. Eligibility for free school meals (FSM) is restricted to those living in low income households in receipt of benefits. The Income Deprivation Affecting Children Index (IDACI) is an area-based indicator, measuring the proportion of children in the area living in low-income households. This continuous variable was divided into quartiles, and Table 2 reports the percentage on each pathway found in the lowest (i.e. most deprived) quartile. Both the FSM and IDACI measures make clear that young people raised in more disadvantaged households/areas are more likely to take vocational qualifications post-16, and less likely to follow academic routes.

Table 3 examines educational attainment by post-16 pathway, looking at prior attainment in compulsory education (GCSE points score at age 16), attainment within FE (A levels) and attainment subsequent to participation on the pathway (degree attainment).

Table 3: Educational Attainment, by Pathway

Pathway	Weighted Percent			
	% passed Level 2	% passed Level 2 *(with English & Maths)*	% passed at least 1 A Level	% reaching HE
No post-16 education	45.0	*	–	*
Academic	97.6	92.1	96.2	75.0
Mixed – VET first	68.5	66.1	51.9	47.2
Mixed – concurrent	87.9	77.6	61.6	50.7
Mixed – academic first	80.1	66.0	49.1	23.1
Vocational	28.7	18.1	–	6.6
Apprenticeship	62.5	50.3	–	*

** Not reported for disclosure reasons.*

– Not applicable.

In terms of prior attainment, almost all following an academic pathway have reached Level 2 at age 16 (i.e. achieved 5 or more GCSEs are grade A*-C/9-4), including with English and Maths. This is to be expected, since reaching such a level is a prerequisite for individuals to continue to study for A levels in most schools. Amongst those who take a vocational qualification with their A levels, they have slightly lower attainment at age 16, with a further fall to those who take academic and vocational qualifications successively (particularly when the latter is taken first). Still around two-thirds of such groups reached Level 2 with English and Maths at age 16. This proportion falls to around half for those who undertake an apprenticeship, while fewer than 1 in 5 of those who follow vocational pathways only attained this level.

During the FE phase, clearly only those whose pathway included academic qualifications could attain at least 1 A Level. The rate is highest, and is close to 100%, for those who followed an academic-only pathway, and is lowest for those who initially undertook an academic qualification, followed by a vocational one.

A lack of A level attainment could be one reason for their switch to the vocational track. Finally in terms of participating in HE, three-quarters reach this level after following an academic-only pathway. This proportion is around half for those taking academic and vocational qualifications either concurrently or with the former as the following qualification. For those who start with an academic qualification but then move to a vocational one, only around one-quarter subsequently progress to HE. For those with only vocational qualifications in FE, very few progress to HE.

The next section begins our analysis of EES and other outcomes associated with individuals who followed each of these pathways.

4. Differences in the Probability of Entering 'High-Risk' or 'Low-Risk' Occupations by Education Pathway

Key Points

1. The higher someone's qualifications, the less likely they are to work in a declining 'high-risk' occupation.

2. However, college leavers who followed different post-16 pathways do not differ substantially in how likely they are to subsequently work in a high-risk occupation, unless they also went to university.

3. When comparing people that followed the same post-16 pathway, socio-economic status, as measured by free school meal eligibility, does not relate closely to differences in people's likelihood of working in a high-risk occupation. The exception this is that, amongst those who do progress to university, people from lower-income households are more likely to end up working in a high-risk occupation.

4. Within a given pathway or level of education, men are more likely than women to work in a high-risk occupation (risk quintiles 1 and 2 combined), particularly if they followed pathways with a vocational element.

This section of the report focuses on the labour market outcomes associated with different education pathways. In particular, we look at differences between individuals who followed different education pathways in their probability of working in 'high-risk' or 'low-risk' occupations. Because occupation is not observed in the administrative datasets, we used Annual Survey of Hours and Earnings (ASHE) data, matched to administrative education data, and the pathway classification created by DfE, as described in Section 3.8 earlier.

The 'high-risk' and 'low-risk' occupations were identified in an earlier report of the Skills Imperative 2035 project (Scott et al., 2024). This involved categorising occupations, defined at the 3-digit (minor group) level, based on a single composite factor score that used the projected proportional change in employment and change in employment share for each occupation. Each minor group was assigned to a risk quintile based on its factor score, with the first quintile containing the occupations that are most at risk and the fifth quintile comprising the occupations at least risk. Occupations in quintiles 1 and 2 were named 'high-risk occupations', and occupations in quintiles 3, 4 and 5 were named 'low-risk occupations'.

This analysis proceeds by looking at the distribution of employees in 2019 across occupations, and relating their occupational risk level to their highest qualification, pathway, and combinations of the two.

Figure 3 below shows the distribution of individuals across job-risk quintiles, according to the level of their highest qualification. There is a clear monotonic relationship whereby individuals with higher level qualifications are more likely to work in low-risk occupations, for example 70% of those qualified to Level 6, and over 80% of those qualified to Level 7 or above work in low-risk (Quintiles 3-5) occupations. By contrast, those with lower level qualifications are more likely to work in high-risk occupations; around half of those qualified to Level 3, 70% of those qualified to Level 2, and over 80% of those whose highest qualification is Below Level 2 work in high-risk occupations. The big differences are that lower qualified individuals are most often observed in high-risk quintile 2 jobs, such as elementary manufacturing and service sector jobs, and semi-skilled production jobs, while higher qualified individuals are most often seen in quintile 3 jobs (for example, associate professional jobs) and quintile 4 jobs (for example, many professional occupations).

Figure 3: Percentage of employees in each job risk quintile, by highest qualification level

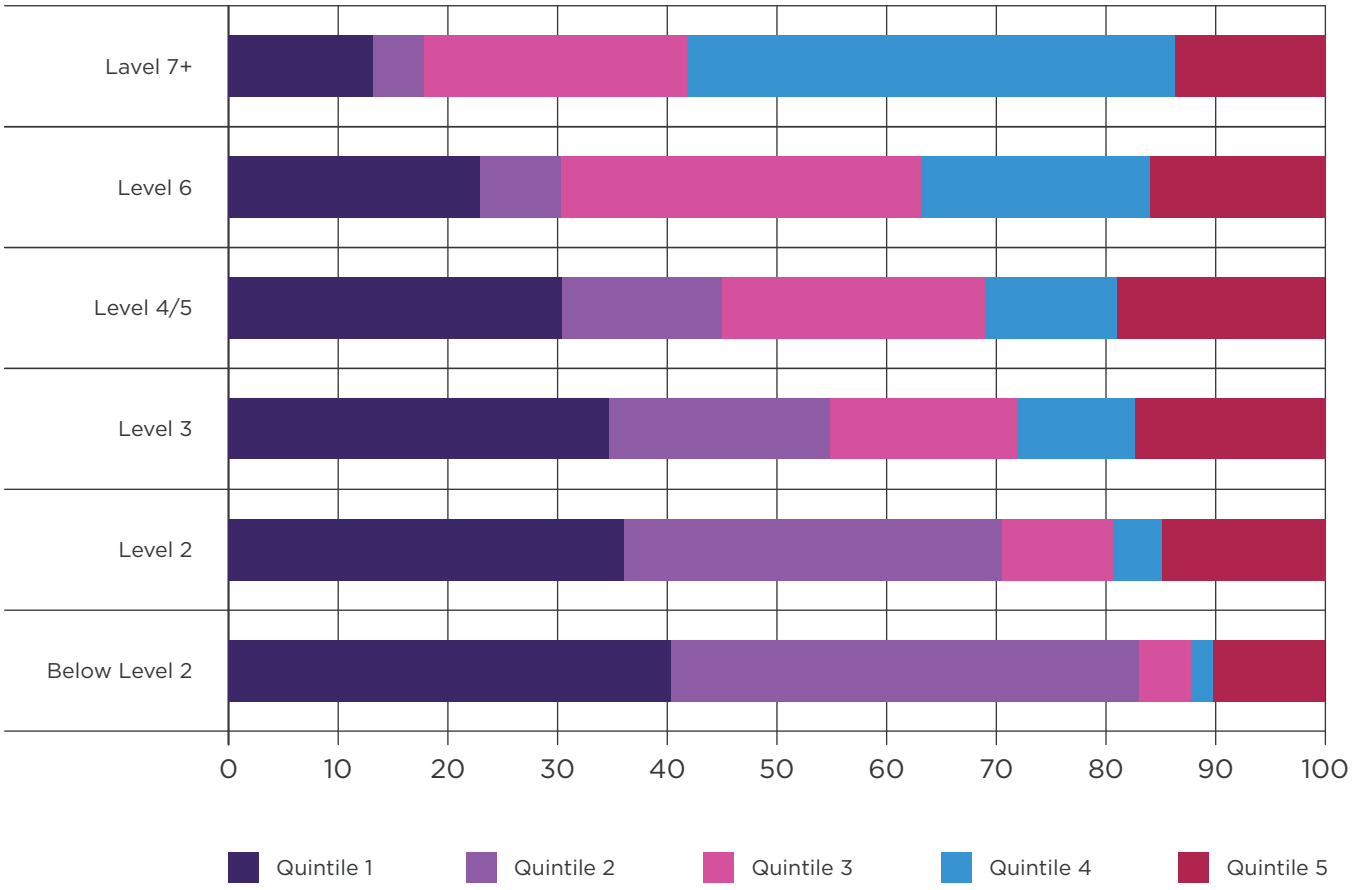
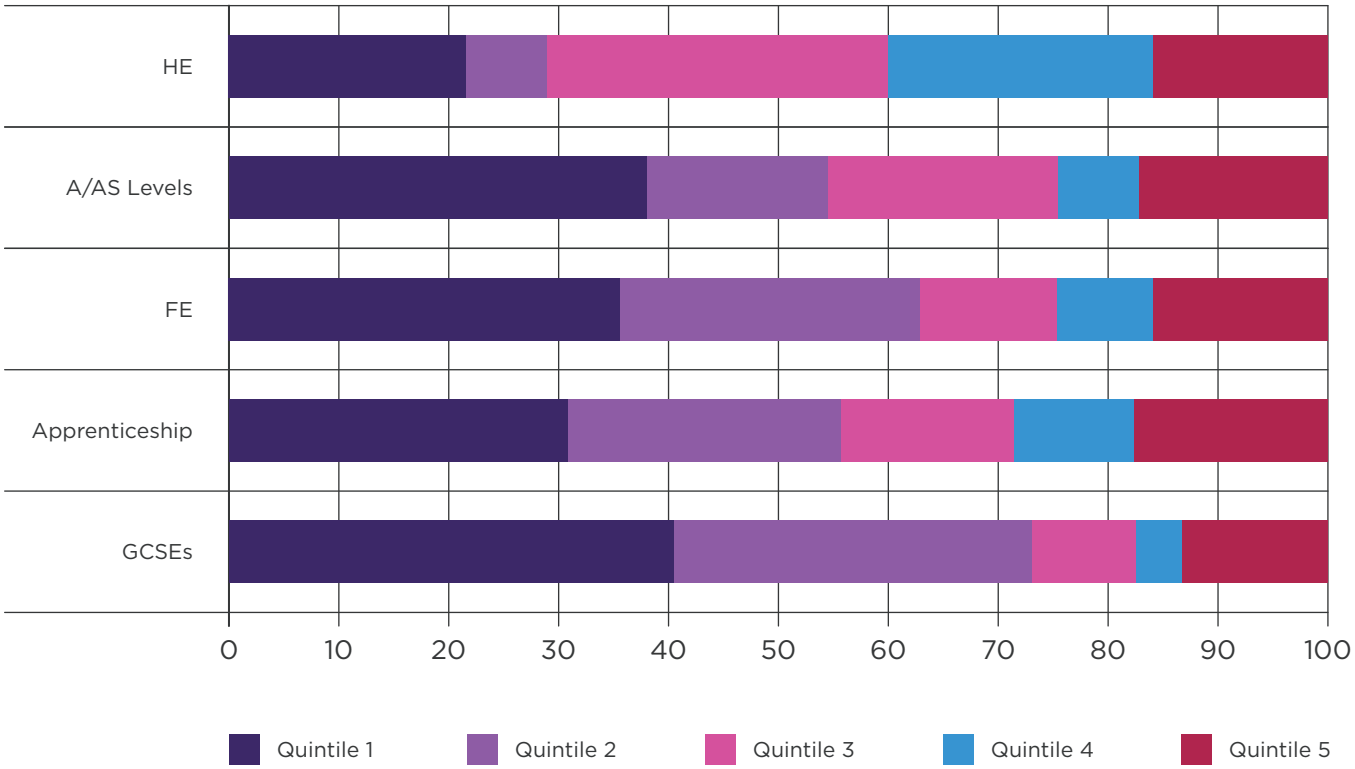


Figure 4 shows the distribution of individuals across job-risk quintiles, according to the pathway they followed to their highest qualification, rather than level of qualification. The differences between pathways are not quite as stark as they were between levels in Figure 3. Pathways that lead to higher levels of qualifications (i.e. the HE pathway) are associated with a smaller proportion working in high-risk jobs (i.e. quintiles 1 and 2). But amongst other pathways that end following the completion of upper-secondary education, the proportions in high-risk jobs are quite similar. It is interesting to note that each pathway has a similar proportion in the lowest risk quintile (which includes a number of managerial type jobs, IT, business, caring and customer service roles). The main differences between the pathways are that the HE pathway has significantly more jobs in quintile 3 (classified as low risk) and fewer jobs in quintile 2 (classified as high-risk) than other pathways.

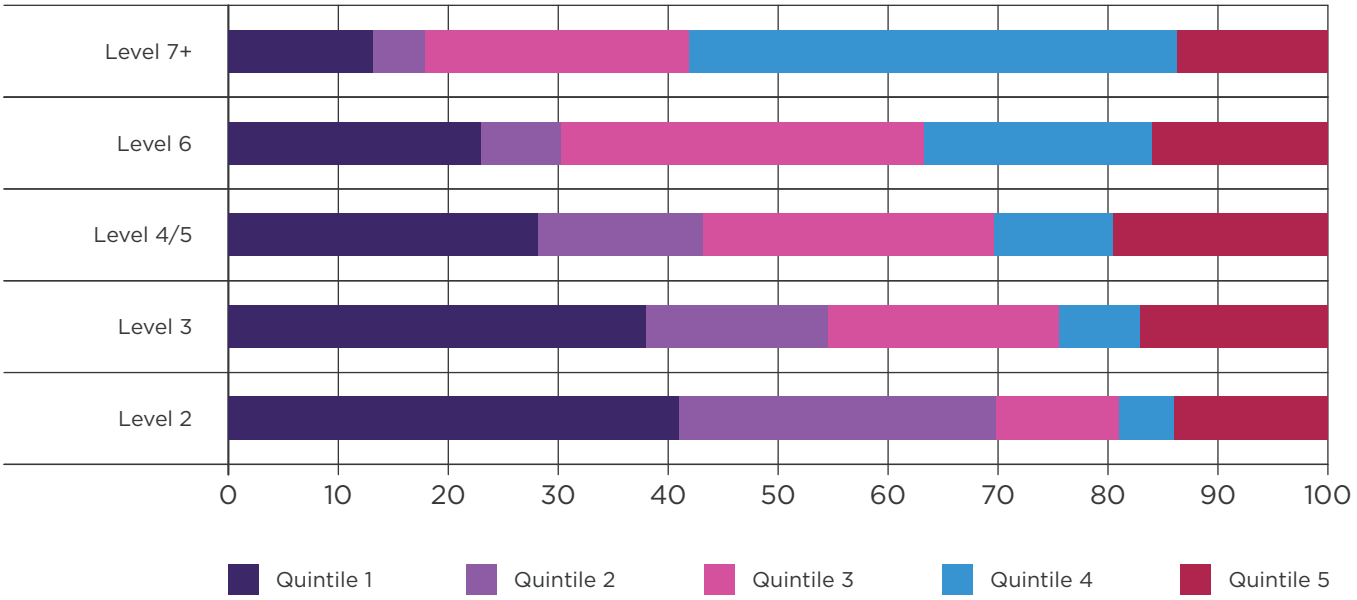
Figure 4: Percentage of employees in each job risk quintile, by qualification pathway



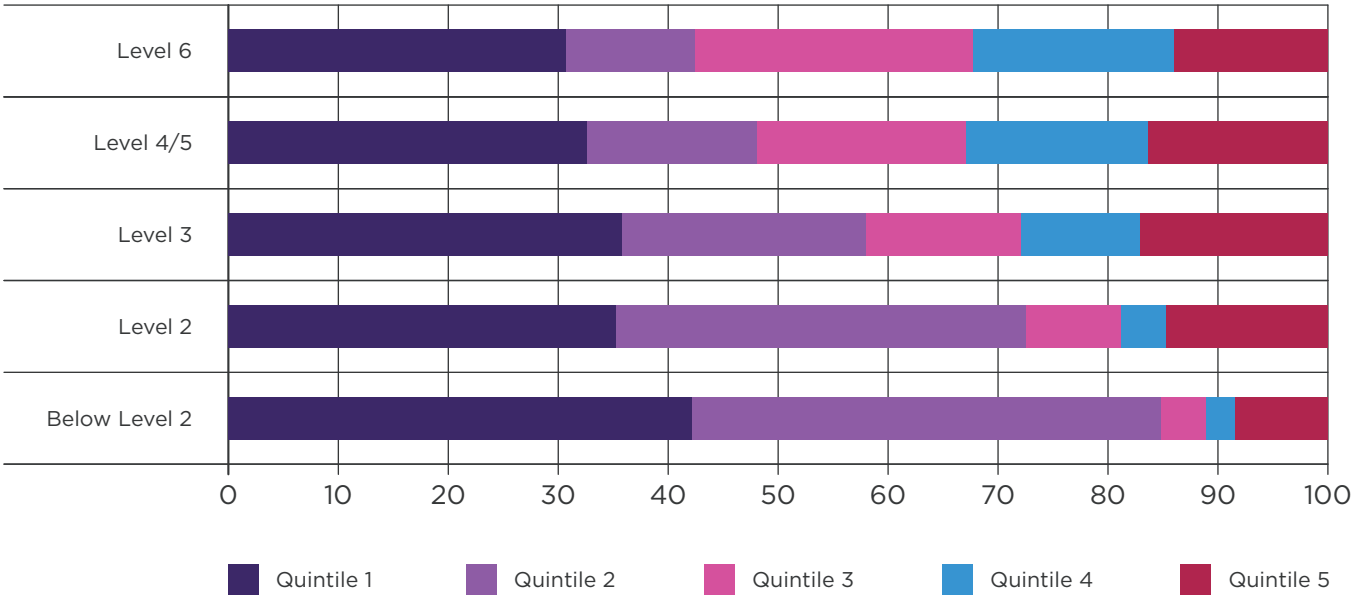
One of the challenges with interpreting the above graphs is that pathway and level are related, making it hard to discern the separate effects of each. In the following figures, we therefore further investigate which is more associated with job risk – level of qualification or pathway – by combining these two categories. First, we separate individuals by pathway, and then we look at the distribution of jobs across risk quintiles by levels within pathway. The results are shown in Figure 5. They show that the relationship between lower qualification levels and increased likelihood of working in a high-risk occupation exists within each pathway. This is particularly evident within the academic pathway, where the proportion of individuals in high-risk jobs rises steeply from below 20% at Level 7, to around 70% at Level 2, with many people whose highest qualification is Level 2 working in quintile 1 jobs (typically administrative). This pattern is also observed in the FE and apprenticeship pathways, where the dominant factor is the rising proportion of workers in quintile 2 (typically elementary or semi-skilled occupations) as qualification levels fall.

Figure 5: Percentage of employees in each job risk quintile by highest qualification level, within pathways

Academic Pathway



FE Pathway



Apprenticeship Pathway

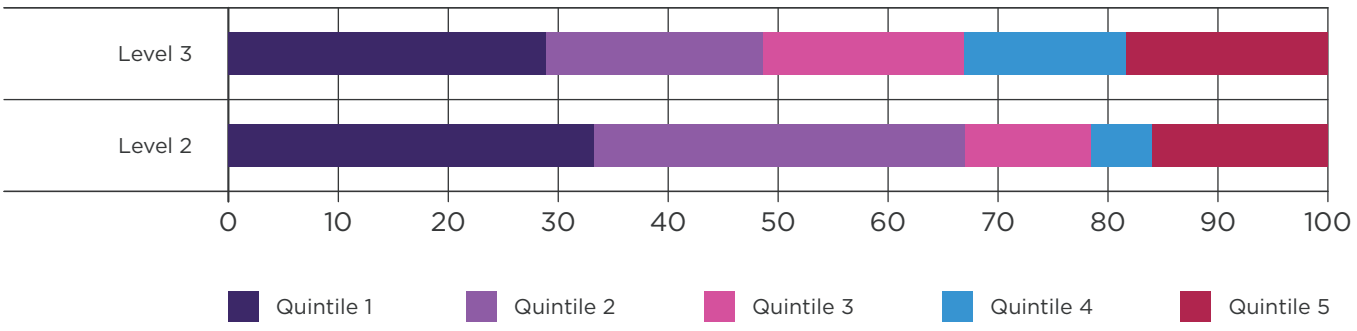
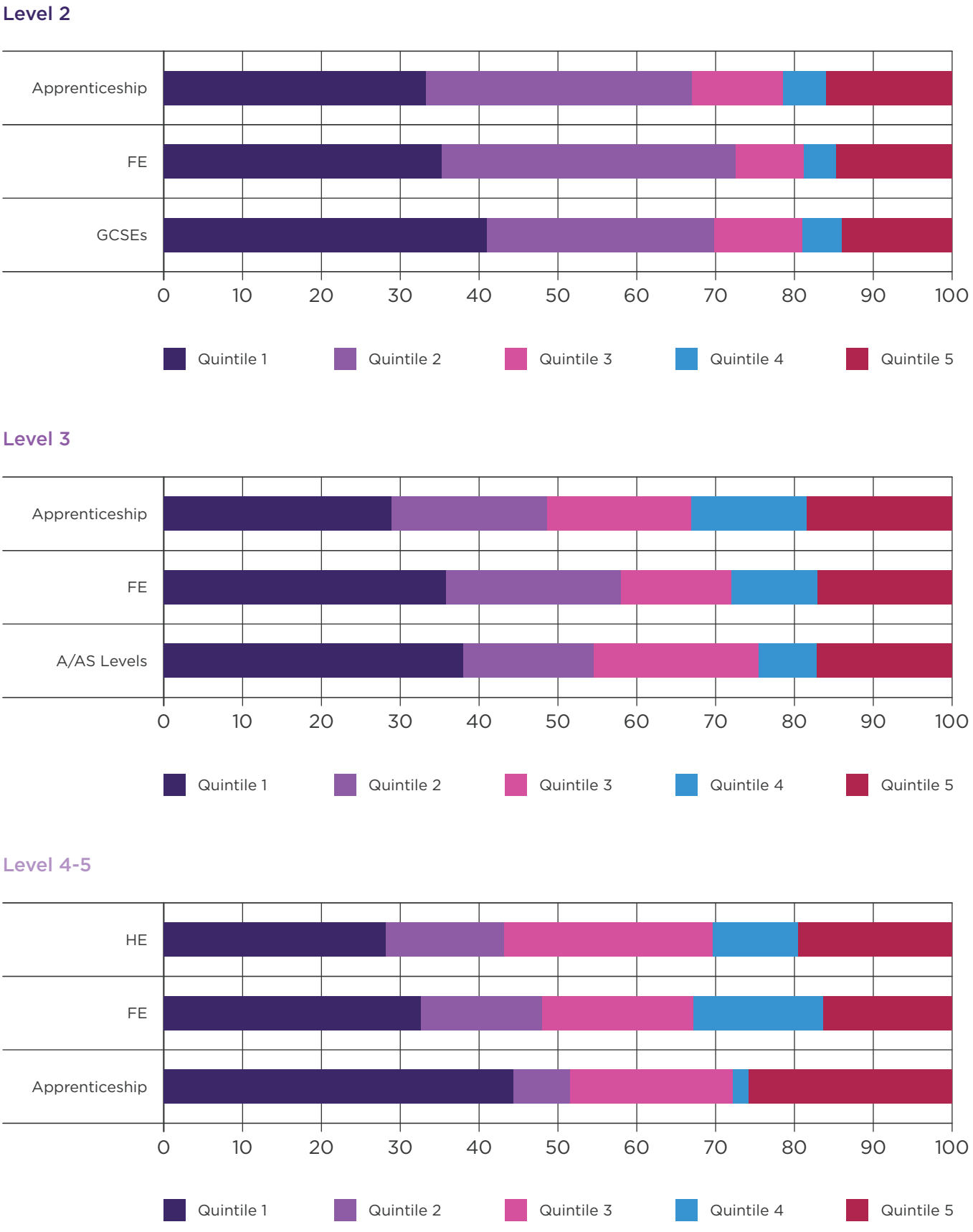


Figure 6 looks at the relationships the other way, and asks how job-risk varies by pathway, within qualification levels.

Figure 6: Percentage of employees in each job risk quintile by pathway, within qualification levels

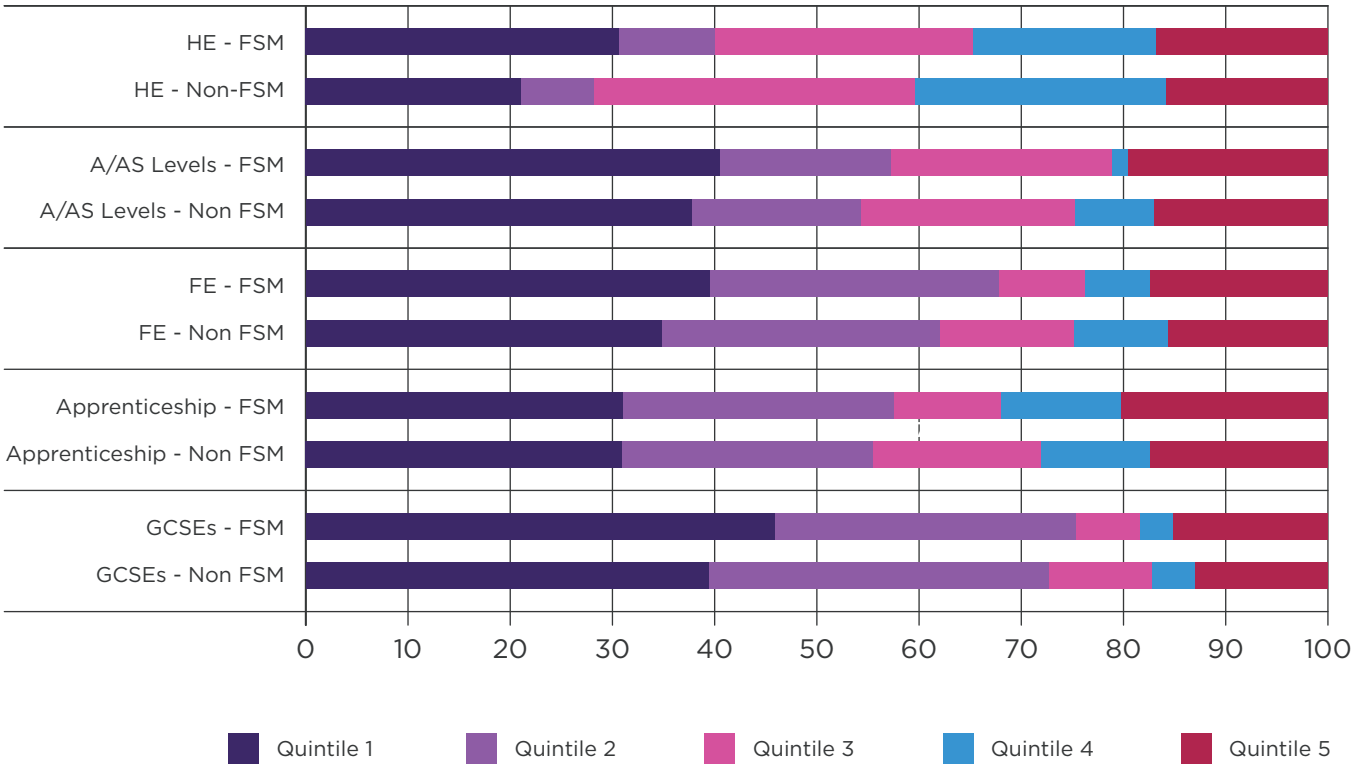


It is very clear from Figure 6 that, within education levels, it does not matter too much which pathway an individual follows, as far as their likelihood of being in a high-risk or low-risk job is concerned. This is particularly the case within Level 2 and within Level 3, where the distribution of jobs across risk quintiles is very similar regardless of pathway.

From the analysis in Figures 5 and 6, we can therefore say that the level of qualification an individual reaches is far more important than the pathway they followed to reach that level, as far as their risk of being in a declining 'high-risk' occupation is concerned.

The remaining analysis in this section looks at the interaction between education levels and pathways, and characteristics of individuals. We focus on two characteristics – free school meal (FSM) eligibility, as an indicator of socio-economic background, and gender. Figure 7 re-estimates the relationship between education level and job-risk quintile, but this time separately for those ever eligible for FSM, and those never eligible.

Figure 7: Percentage of employees in each job risk quintile, by qualification pathway and FSM status



The results show that, within education pathways, there is little difference in individuals' chances of being in a high-risk or low-risk job, between those eligible or not for FSM. Thus, the main effect of coming from a disadvantaged background on individuals' likelihood of working in a high-risk occupation or not is the effect of disadvantage on the qualification pathway followed because disadvantaged young people are more likely to follow vocational pathways and academic post-16 pathways are associated with higher rates of progression to HE, which is associated with a lower likelihood of working in a declining, 'high-risk' occupation.

The exception to this is that, amongst those that have followed the HE pathway, individuals from low-income households (those ever eligible for FSM) still have a higher probability, by about 10 percentage points, of working in a high-risk occupation. This could suggest that disadvantaged young people that complete university face additional barriers to accessing, or progressing into, growing professional and associate professional occupations.

Finally, we consider the interaction with gender, in Figure 8.

Figure 8: Percentage of employees in each job risk quintile, by qualification pathway and gender

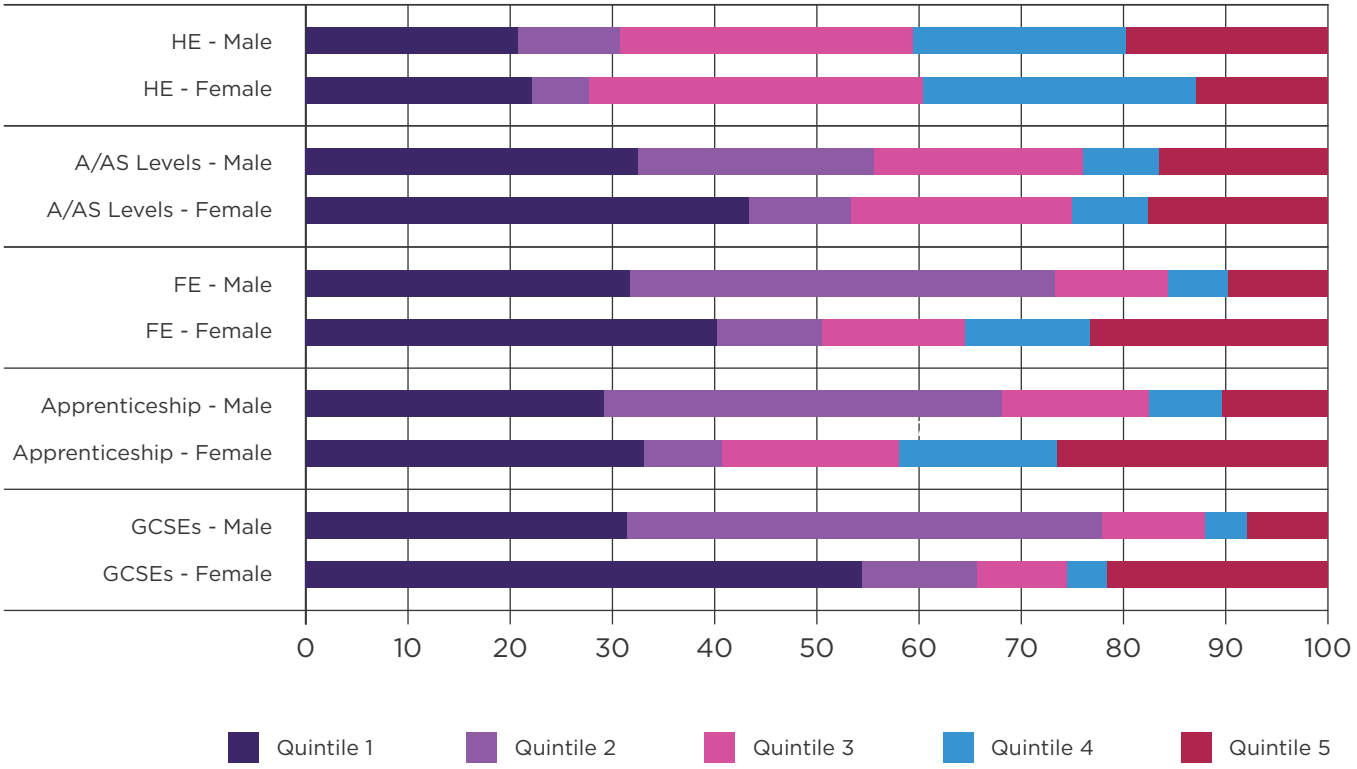
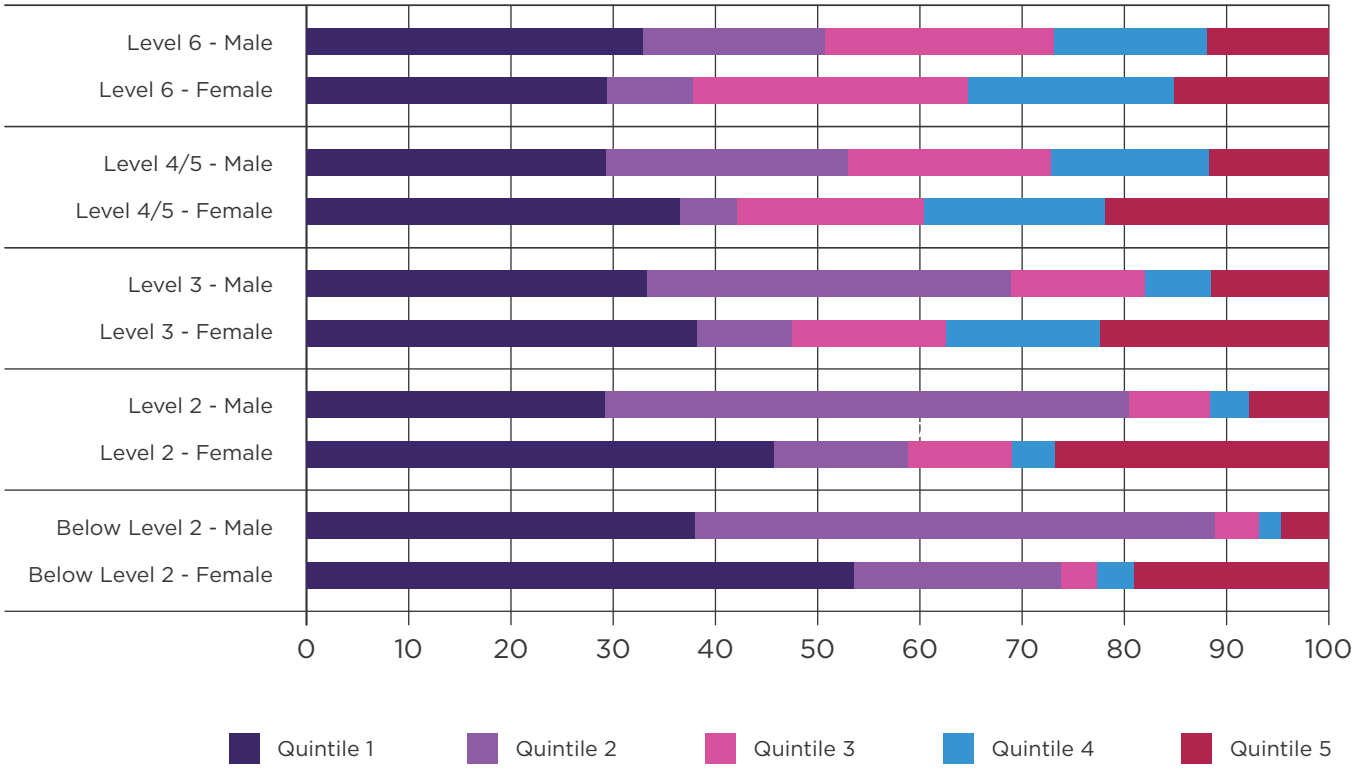


Figure 8 shows that amongst those achieving a HE qualification, there is little difference between the job-risk distributions of men and women. Below that level, however, we can see that women are more likely to be in the highest risk quintile, whereas men are more likely to be in the second-highest risk quintile. Overall, a larger proportion of male workers are in quintile 1 and quintile 2 combined, relative to female workers, as reported in Working Paper 5 (Scott et al., 2024). This is particularly so for the vocational pathways – FE and Apprenticeships - where the proportion of men in high-risk jobs is around 70%, compared to 40% (for Apprenticeship) and 50% (for FE) for women. This is largely because women are more likely than men to work in administrative and secretarial jobs, which are mostly in quintile 1, whereas men are more likely to work in skilled trades and as operators (e.g. machine operators), most of which are in quintile 2 and customarily accessed via FE and apprenticeships.

Figure 9 explores this relationship further by looking at the percentage of employees who followed an FE pathway through upper-secondary education who end up in each job risk quintile, broken down by qualification level and gender. Amongst both genders, we see the likelihood of working in a high-risk job falls as qualification levels rise. However, within levels, a higher proportion of men than women work in quintiles 1 and 2 combined. This is particularly the case at Levels 2 and 3 (the most commonly-observed levels for vocational qualifications), where we see 70% (Level 3) to 80% (Level 2) of men being in a 'high-risk' (quintile 1 or 2 combined) occupation, compared to 50-60% of women.

Figure 9: Percentage of employees in each job risk quintile by qualification level and gender, amongst those that followed an FE pathway through upper-secondary education



Summarising the results in this section, the key finding is that the level of qualification attained is strongly related to the likelihood of working in a high-risk or low-risk job. This is observed consistently, both for overall attainment, and within particular types of pathway (academic or vocational) – higher qualification attainment is always associated with a lower likelihood of working in a job with a high-risk of decline.

The reverse is however not the case. For a given level of education, it makes little difference what pathway was followed to reach that level, in terms of the likelihood of working in a job with a high-risk of decline, although readers are reminded that it was not possible to compare pathways amongst those that reached Level 6 or above qualifications (for example, comparing those that did a traditional undergraduate degree to those that did degree apprenticeships) due to data limitations.

Thus, the focus of policy-makers and stakeholders should be around providing the right opportunities and encouragement to help young people to reach the highest level of education that they can, including letting them follow the pathway most suited to their abilities, interests and career plans.

Despite the importance of the level of educational attainment, a high-level qualification is not a guarantee of facing only a low risk of occupational decline. Even amongst those qualified to Level 6 (most of which will be via an undergraduate degree), we still observe 30% to be working in jobs at high-risk of decline. Individuals from a disadvantaged background are over-represented within this group, but the risk could be there for individuals from any background. Such high-risk jobs are typically lower skilled, mostly in administration or in manufacturing. While there can be numerous reasons for a well-qualified individual taking a job classed as low-skilled, for example due to constraints or requirements of their lifestyle, or simply personal preferences, another possibility could be not having the appropriate skills for higher level jobs, with their skill levels not having been appropriately developed while learning for their qualification.

The remainder of this report will therefore focus on the association between skills and education. Our key contribution is to focus not just on the final level of education reached, but to also make use of the administrative data available to us to consider the pathway followed to that final qualification too. In the next section we look at the skills that have been most often considered in the literature, most likely to due to ease of measurement, namely the cognitive skills of literacy, numeracy and problem solving. We also consider a range of other attitudes that were also measured in the PIAAC dataset that we use. Following that, in Sections 6 and 7, we extend this research area by looking at the EES that were defined in earlier stages of the Skills Imperative 2035 project, and which we were measured using our own bespoke survey. Section 6 considers the relationship between these skills and the pathway followed through FE between the ages of 16-19. Given the importance of reaching HE, Section 7 then focuses exclusively on this level, looking in more detail at whether EES vary by level of attainment within HE, or by subject area studied.

5. Differences in Cognitive Skills by Education Pathway

Key Points

1. People who follow an academic post-16 pathway tend to have substantially higher literacy, numeracy and problem solving skills compared to those who followed a vocational pathway, and these differences remain substantial after controlling for prior attainment, highest qualification, and level of childhood deprivation.

2. There is no evidence that behavioural and attitudinal traits differ systematically across individuals who follow different post-16 pathways.

3. Individuals' EES are not significantly related to their literacy, numeracy or problem-solving skills, except in that 'Information literacy' is strongly associated with all three of these cognitive outcomes.

4. By contrast, individuals' EES are strongly related to other attitudinal and behavioural traits.

5.1 PIACC Outcomes and Post-16 Pathways

In this section, we focus specifically on the post-16 education pathways created in Section 3.8 above, and examine how they relate to cognitive skills (in literacy, numeracy, and problem solving) and non-economic attributes (political efficacy, social trust, voluntary work, general health, and patience). We make use of the fact that the EES survey resampled some of the respondents to the 2022-23 PIAAC survey, as so to compare the relationship between individuals' education pathways and their EES (that follows in Section 6) relative to the relationship between their education pathways and other cognitive and non-economic outcomes measured in PIAAC.

The sample of observations available for this analysis is small, at 307 individuals. Only a proportion of EES survey respondents were resampled from the PIAAC survey, and of those that were, they also needed to be in our matched NPD-ILR-EES data, which means they needed to be under the age of 38 and have had their EES survey responses successfully matched to administrative datasets.

With this small sample size, we could not analyse all of the separate pathways that were created in Section 3.8. Instead, we collapsed the pathways down to three different routes through FE – academic only, mixed, and VET only. The weighted proportions of the usable sample found on each pathway are shown in Table 4.

Table 4: Percentage on each pathway

Pathway	Weighted Percent
Academic only	30.6
Mixed	53.9
VET only	15.5

Small cell sizes and disclosure rules make it difficult to report background characteristics by pathway. In particular, those individuals on the VET-only pathway clearly differ from individuals on the other two pathways, in terms of being less likely to proceed to HE, having lower prior attainment at age 16, being more likely to have Special Educational Needs (SEN) and being more likely to live in a more deprived area.

The average values for the various outcome variables in PIAAC are shown by pathway in Table 5.

Table 5: PIAAC outcome variables by pathway

Outcomes	Pathway		
	Academic only	Mixed	VET only
Literacy	316.7	300.0	268.9
Numeracy	318.5	296.9	253.2
Problem solving	300.2	285.0	252.3
Political system effective - % above median	44.7	48.5	36.3
Trust - % above median	62.4	47.6	25.2
Patience - % above median	69.9	52.2	33.0
Frequency of voluntary work	0.73	0.50	0.16
Health	3.87	3.79	3.42

PIAAC data measures literacy, numeracy and problem-solving skills using tests administered as part of the survey, and compares the results across OECD countries. Here we focus on data from England. Each skill level is measured on a scale from 0-500. The average skill levels across all participating OECD countries were 260 points for literacy, 263 points for numeracy and 251 points for problem-solving. For England, average skill levels were 300.3 for literacy, 296.7 for numeracy and 284.6 for problem-solving. Our sample from England are therefore observed to be above the OECD average on each measure, though it must be remembered that our sample contains only young people under the age of 38.

Looking across pathways, there are clear differences and a clear pattern for each of the three PIAAC cognitive skills. For literacy, numeracy and problem-solving, the observed skill levels are highest amongst individuals who followed an academic-only pathway, next highest for those who follow a mixed pathway, and lowest for those who follow a vocational-only pathway. The differences from academic-only to vocational-only are of the order of 50 points.

The next three outcome variables in Table 5 measure attitudes. 'Political system effective' reports responses to the question 'How much would you say the political system in Britain allows people like you to have a say in what the government does?' 'Trust' reports answers to the question 'Generally speaking, would you say that most people can be trusted?' 'Patience reports responses to the question 'How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?' In each case, respondents answered on a scale from 0 to 10. In order to make the answers easier to interpret and to analyse in a multivariate setting later, the answers were collapsed to whether the response was above or below the median response for that question. The results in Table 5 again show very clear differences across the pathways. In each case, the lowest percentage answering above the median was observed amongst those who followed a vocational-only pathway. For trust and patience, the percentage answering above the median was highest for those who followed an academic-only pathway, with the mixed pathway being between the academic-only and vocational-only pathways. For political effectiveness, those on the academic-only and mixed pathways scored similarly.

The next two variables measure elements of social capital, related to frequency of voluntary work and health. Both are measured on a five-point ordinal scale, from 1=never to 5=every day for voluntary work, and from 1=excellent to 5=poor for health. Table 5 reports the

average responses by pathway for each of these variables. Again, consistent patterns are observed. With respect to voluntary work, though 1 (=never) is the most common response across all pathways, those who do voluntary work are more likely to have followed an academic-only education pathway post-16, and least likely to have followed a vocational-only pathway. With respect to health, though the differences are smaller, the pattern is the same, with a highest mean value for the academic-only pathway and the lowest mean value for the vocational-only pathway.

Having looked at these various outcomes in the raw data, the next stage was to estimate multivariate equations that control for other factors that might be correlated with both the pathway variables and the outcome variables. These control variables were the now familiar demographic, prior attainment and highest educational attainment variables. There were further controls available in the PIAAC survey that we could use, and we experimented with adding them to the estimated equations. This did not qualitatively change the pathway results, however, and so we do not report these coefficients here, for reasons of consistency with the previous sections. The estimated equations were all estimated by OLS regression, with the exception of the two social capital variables (voluntary work and health) that were measured on five-point scales and so were estimated by ordered probit, in order to take account of the discrete, qualitative nature of these variables.

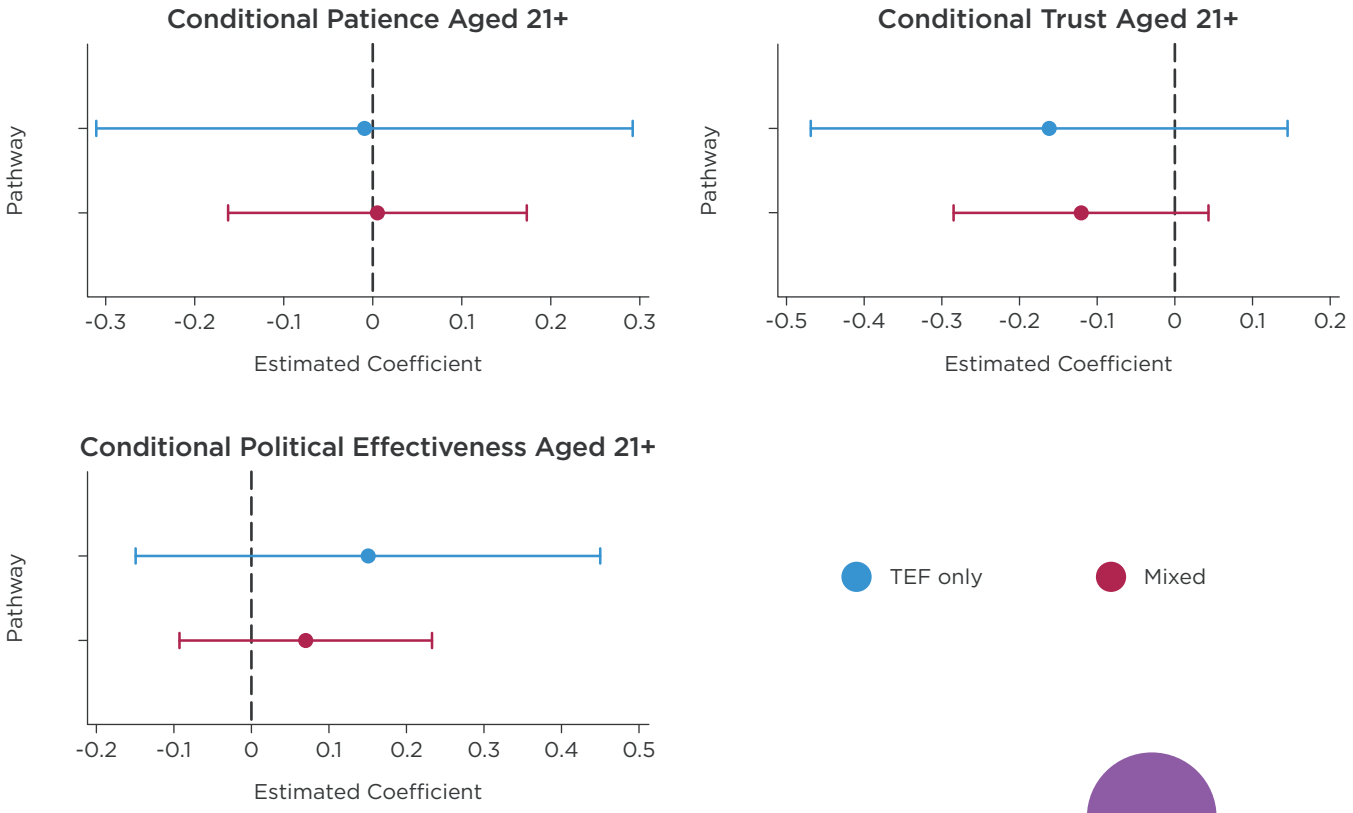
The results for the variables of interest, the pathway variables, are shown in Figures 10-14, which illustrate the conditional differences between the respective pathway and the reference category, which is the academic-only pathway in each case.

Figure 10: Conditional differences in PIAAC skills by pathway

Figure 10 shows that the differences in PIAAC literacy, numeracy and problem-solving skills that were observed in the raw data between those on academic-only and vocational-only pathways all survive after controlling for the wide range of control variables. They remain statistically significant and substantial in absolute size (over 30 points). The differences between those on academic-only and mixed pathways are smaller and not statistically significant, except for literacy.

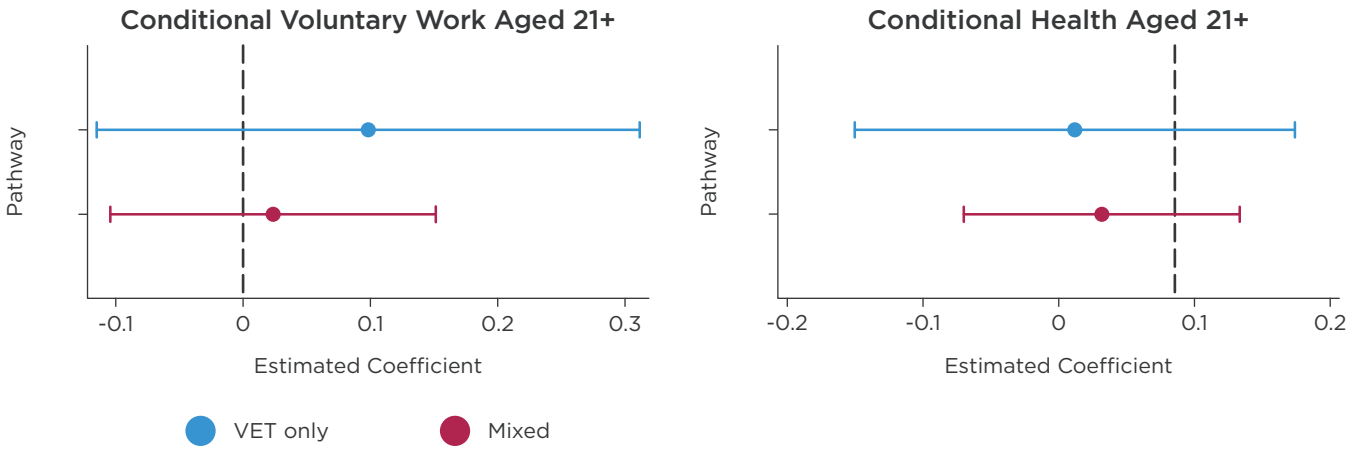
For the three attitude outcome variables, they measure on a yes/no basis whether the individual's response is above or below the median for that variable. The estimated equations are therefore linear probability models, and the interpretation of the coefficients on the pathway variables is the average difference in probability of giving an above-median response for that variable. Figure 9 shows that, after controlling for our range of background variables, the raw differences between pathways in these variables disappear. The political effectiveness differences reverse in sign relative to the raw differences, so that the academic-only pathway records the lowest conditional score, while for the patience variable, the coefficients become zero. All conditional differences, for all three attitude variables, are statistically insignificantly different from zero.

Figure 11: Conditional differences in PIAAC attitude variables by pathway



As described earlier, the two social capital variables are measured on a 1-5 discrete scale, and so their multivariate equations were estimated by ordered probit. The results were reported, respectively, as the difference in probability of being in the 'never' category for voluntary work, and being in the 'excellent' category for health, and are shown in Figure 10. For both variables, both pathway coefficients are positive relative to the reference category of the academic-only pathway, representing a higher probability of being in these categories, though none are statistically significantly different from zero.

Figure 12: Conditional differences in social capital variables by pathway



5.2 PIAAC Outcomes and Essential Employment Skills

In this subsection, we investigate the extent to which the PIAAC outcomes described above related to individuals' EES, as measured by the NFER Essential Employment Skills survey. We therefore first calculated the correlation coefficient between the overall EES score and each of the PIAAC outcome variables. These are reported in column 2 of the Table 6. As well as the sign and size of the correlation coefficient, it is also reported whether the correlation is statistically significantly different from zero. We can see that our EES are positively related to the key cognitive skills (literacy, numeracy and problem-solving) measured by PIAAC, but that the correlation is small (0.06-0.09) and statistically insignificant.

Further analysis performed regressions of the PIAAC outcomes variables, on (i) overall EES and (ii) the six component EES scores. These are reported in the remaining columns of Table 6, where only statistically significant coefficients are reported, in order to visually highlight where relationships are, and are not, present. We can see that, although the overall EES score is not significantly correlated with cognitive skills, there is one component EES that is positively and significantly correlated with all three of the cognitive skills, namely Information Literacy. Of all the component EES, this one seems to be picking up cognitive attributes of the individuals, more so than the other ones.

It is surprising that some component EES are not more highly correlated with literacy, numeracy or problem solving skills measured in PIAAC. In particular, we might expect communication (COCO) and collaboration (COMM) skills to be correlated with literacy, given language and literacy skills enable people to process information and communicate effectively. We might also have expected numeracy skills to be highly correlated with problem-solving and decision-making (PSDM), given numeracy underpins decision-making and the ability to interpret complex data. Above all, we might expect problem solving, as measured in PIAAC, to be highly correlated with PSDM from the NFER EES survey, given the overlap in the skills being measured. It is hard to explain the lack of correlation observed in these cases, but differences between the two instruments in the attributes each measure[2] and how they measure them (PIAAC involves a performance based assessment, whereas the NFER survey relies on self-report) are likely to be at least partially responsible.

Where we do observe significant relationships for overall EES is with the attitudinal variables in PIAAC, specifically patience and trust. Overall EES is positively associated with both trust and patience. In the case of patience, it appears that good organising, planning and prioritising skills and collaboration skills are associated with higher patience scores.

2 *PIAAC measures 'adaptive problem solving' skills needed for societal and economic participation, whereas the NFER survey measures a broad set of behaviours related to problem solving.*

Table 6: Raw relationship between PIAAC Outcomes and EES

PIAAC Outcome	Overall Corr.	Overall EES	PSDM	OPPR	COMM	COCO	TCRE	INLI
Literacy	+0.087							0.82* (0.36)
Numeracy	+0.064							1.03* (0.41)
Prob solve	+0.081							0.78* (0.31)
Politics effect.	-0.025							
Trust	+0.109*							
Patience	+0.118*	0.011* (0.004)		-0.009† (0.005)		0.008† (0.005)		
Voluntary work	-0.008							
Health	+0.041							

*** significant at 1%, * significant at 5%, † significant at 10%.*

Table 7 repeats the regression analysis of Table 6, but now controlling for the usual range of background variables, namely demographic characteristics, prior attainment, education pathway, and highest educational attainment. Comparing this with the previous table, we can see the significant relationships between information literacy and problem solving, numeracy and literacy all disappear after controlling for background variables, as does the relationship between trust and overall EES. However, the relationship between overall EES and patience remains significant, and thinking creatively is now positively associated with literacy skills once differences in background variables are accounted for.

Table 7: Conditional relationship between PIAAC Outcomes and EES

PIAAC Outcome	Overall EES	PSDM	OPPR	COMM	COCO	TCRE	INLI
Literacy						0.69* (0.34)	
Numeracy							
Prob solve							
Politics effect.							
Trust							
Patience	0.013** (0.005)				0.012† (0.006)		
Voluntary work							
Health							

*** significant at 1%, * significant at 5%, † significant at 10%*

6. Differences in Essential Employment Skills and job & life satisfaction by Further Education pathway

Key Points

1. People's levels of EES do not appear to vary significantly by the pathway that they followed through upper-secondary education, either in the raw data or after controlling for a range of background demographic and attainment characteristics.

2. There is some weak evidence that the six component EES are generally higher amongst individuals whose post-16 pathway involved a vocational element, although the differences are small and statistically insignificant.

3. Individuals' EES are positively related to their socio-economic background and educational attainment, with the former dominating when both are included as determinants in a multivariate equation.

4. Life and job satisfaction do not vary to any significant degree across individuals following different pathways, although there is some evidence that average life satisfaction is marginally but significantly higher amongst those who followed an exclusively vocational pathway.

This section begins our analysis of the EES observed for our survey respondents, as well as looking at their life and job satisfaction, looking at how they are associated with the post-16 educational pathways. For each outcome variable, we first look at the raw differences across the various pathways identified earlier in Section 3.8. We then undertake a multivariate regression analysis, allowing us to control for background characteristics that differ between individuals across the pathways, as was also seen in Section 3.8, and that might also influence the outcome variables of interest. For each outcome, we gradually build up the list of included control variables across four estimated model specifications.

The variables included and added at each stage are:

- X Pathway variables only
- \+ Add controls for gender, age and age2, ethnicity, FSM eligibility, SEN status, IDACI quartile
- \+ Further add controls for prior Key Stage 4 attainment
- \+ Further add controls for highest qualification level reached
- = We report the results on the pathway variables, while noting in the text any results of interest on the other variables, and also the effect on the pathway results from adding such controls.

Table 8: Raw differences in EES and satisfaction by pathway, aged 21+ sample

Pathway	Overall EES	Mean Life Satisfaction Score	Mean Job Satisfaction Score
No post-16	58.0	7.2	6.8
Academic	56.4	6.7	6.3
Mixed – VET first	58.2	6.8	6.4
Mixed – concurrent	56.9	6.8	6.7
Mixed – academic first	56.8	6.6	6.5
Vocational	55.8	6.5	6.2
Apprenticeship	55.3	6.5	6.0

Table 8 reports, for each pathway, the scores for overall EES, as well as for life and job satisfaction. The sample in this section is those aged 21+, and so in most cases will have completed their education. The second column shows that differences in EES across the pathways are small, with a range from 55.3 (Apprenticeship) to 58.2 (Mixed – VET first). There is no pattern in terms of academic or vocational pathways being associated with higher or lower EES.

In terms of satisfaction, somewhat surprisingly our results suggest that those with no post-16 education report having the highest life satisfaction, though recall that this result is based on a small number of individuals. Across the other pathways that do involve post-16 education, there is very little difference in their life satisfaction, ranging from 6.5 to 6.8. There is slightly more variation in reported job satisfaction across pathways, though no discernible pattern by type of pathway, with the highest satisfaction again reported by the small number of individuals who did not participate in post-16 education at all.

We also considered the separate components of the overall EES measure, to see how they varied across pathways. The results again show only minor differences in each type of skill, according to pathway followed. As with overall EES in Table 8 above, the highest average score is observed for those who followed the Mixed-VET first pathway, for every one of the component skills, with the exception of Collaboration and Cooperation skills, where the highest is observed for those who followed the Mixed-Academic first pathway. The lowest average skill score by pathway is observed either for those on the Apprenticeship pathway (4 skills), or for those on the Vocational pathway (2 skills) for every skill type.

6.1 Conditional differences in essential employment skills by pathway, aged 21+

We now turn to the multivariate analysis of EES, controlling for a range of background characteristics that may be associated with both pathway choices and skill outcomes, and so may be masking the true relationship between them. As described above, the matched dataset allows controls for individual background characteristics, prior attainment, and final highest qualification level reached.

Looking first at overall EES, the results for the key variables of interest - the pathway variables - are shown in Figure 13 below.

The estimated coefficient for each pathway is represented by the circle, showing the difference in overall EES between that pathway and the reference category (the academic pathway). 95% confidence intervals are shown by the line extending from each circle. If a confidence interval extends across the dotted vertical line at zero, then that estimated coefficient is not statistically significantly different from zero. Similarly, if the confidence intervals for different coefficients overlap, then those coefficients are not statistically different from each other.

Figure 13: Conditional differences in overall EES by post-16 pathway - aged 21+

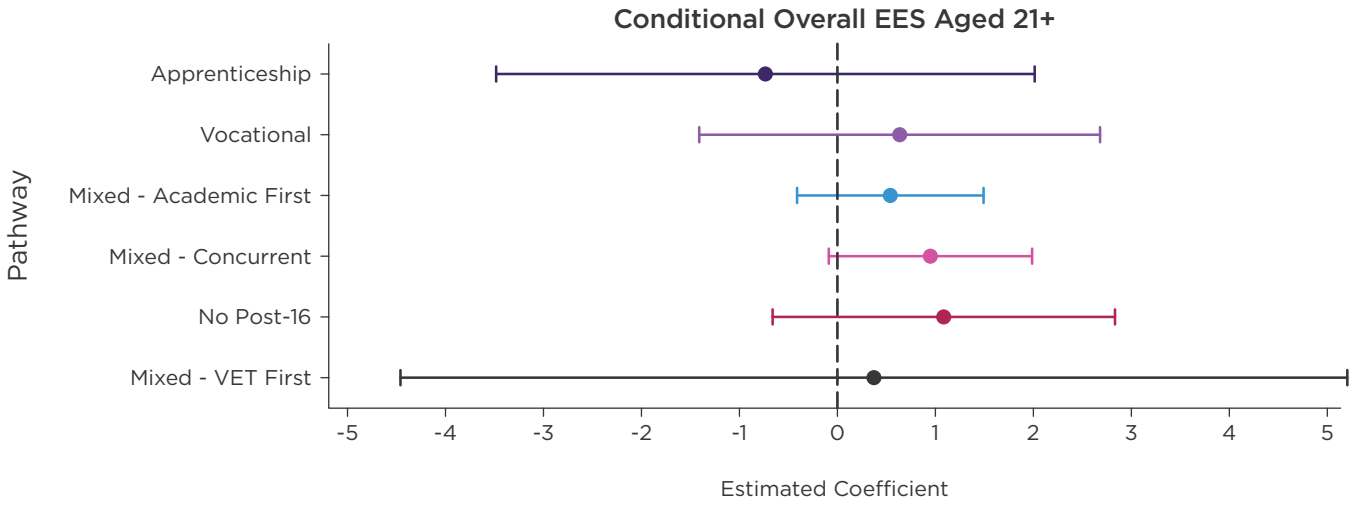


Figure 13 shows that undertaking a multivariate analysis does not change the conclusions reached when looking at the raw averages above. None of the conditional differences in overall EES are statistically significantly different from zero or from each other, with all being at most 1 point on a standardised scale different to the academic pathway reference category.

Considering the coefficients for the control variables, and focussing on those that are statistically significant, our results show that overall EES increase with age, but at a declining rate. They are significantly higher for those young people from the most advantaged backgrounds (IDACI quartile 4), relative to the most disadvantaged, though the actual difference is only just over 1 point. No other explanatory variable attracts a statistically significant coefficient. This includes the educational attainment variables (Key Stage 4 performance and final highest qualification attainment). Both of these variables are positively related to overall EES in the raw data, as was found previously in Skills Imperative Working Paper 4 (Bocock et al., 2024). In a multivariate equation however, with all of the other included explanatory variables, they fail to attract statistically significant coefficients. It is noticeable that it is when the confounding variables measuring socio-economic background (FSM eligibility and in particular IDAQI status) are added to the estimated equation that the education attainment coefficients lose their statistical significance. It can be concluded, therefore that educational attainment is related to overall EES, though to the extent that educational attainment is itself a function of socio-economic background, then the latter is ultimately a key factor determining the level of EES acquired.

Figure 14: Conditional differences in component EES by post-16 pathway - aged 21+

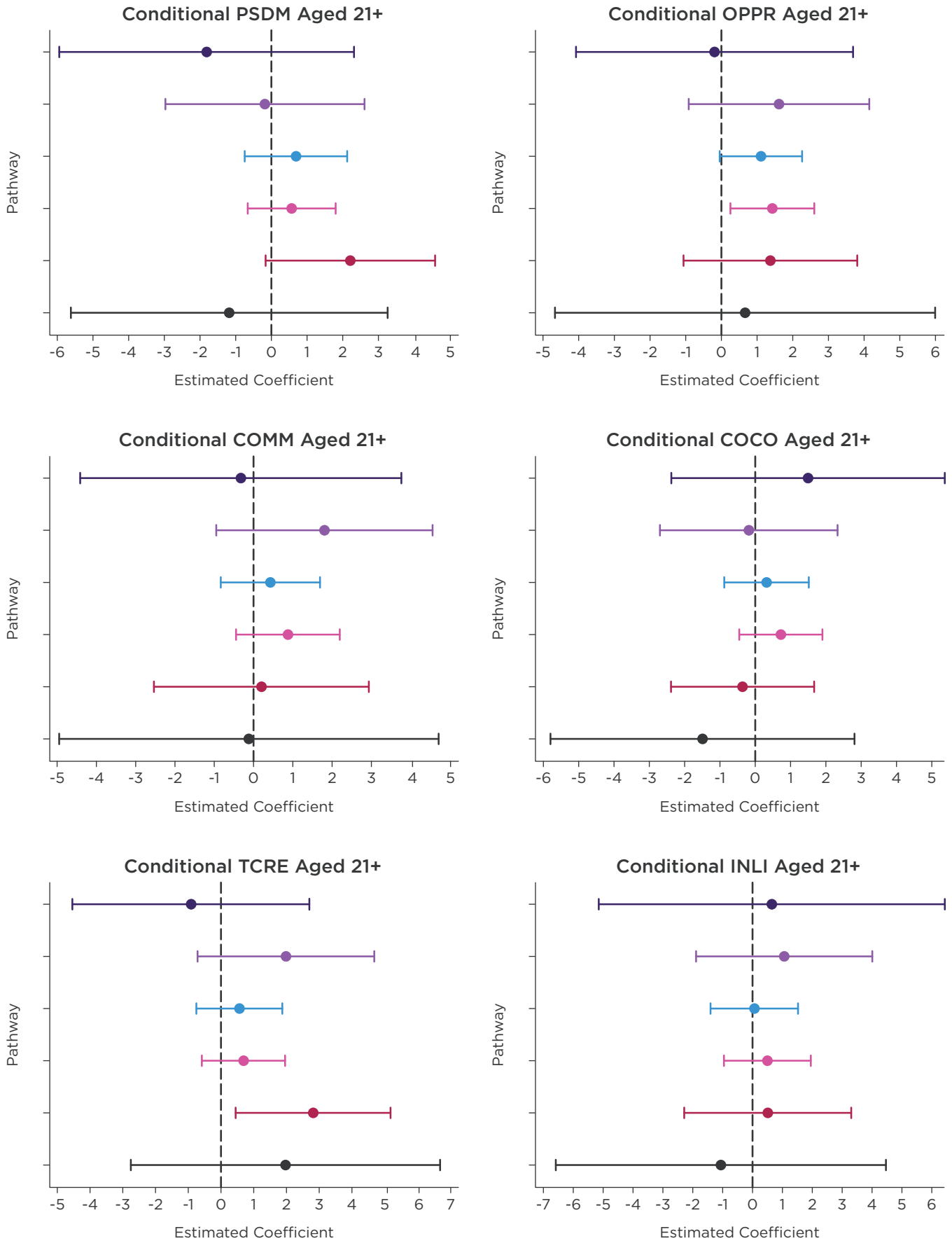


Figure 14 shows similar results for each of the component EES. The pattern of results is very similar in each case to that described above for overall EES, with most conditional differences not being statistically significantly different from zero or from each other, and being less than 1 point in absolute size.

Exceptions to this general statement include:

Those individuals on the Mixed-VET first pathway reporting problem-solving and decision-making skills that are over 2 points higher than those on the academic pathway (though the difference is not statistically significant).

Those individuals on the vocational pathway reporting communication skills that are over 2 points higher than those on the academic pathway (though the difference is not statistically significant).

Statistically significantly higher organising, planning and prioritising skills for those on the mixed-concurrent pathway, with other mixed and vocational-only pathways reporting similarly sized but not statistically significant differences, all relative to individuals on the academic pathway.

Statistically significantly higher creative thinking skills, of almost 3 points, for those on the mixed-VET first pathway, with the vocational and no post-16 pathways reporting differences of 2 points, but not statistically significant, all relative to individuals on the academic pathway.

6.2 Conditional differences in satisfaction by pathway, aged 21+

Turning briefly away from skills to consider satisfaction, similar multivariate equations to those estimated above were run using life and job satisfaction as the dependent variables. The satisfaction scores, on a scale of 0-10, were treated as continuous variables and the equations were estimated by OLS regression. Taking account of the discrete nature of the satisfaction scores, and estimating by ordered probit, did not change the nature of the results. We therefore only report the OLS results, for ease of interpretation. These results, for the pathway variables of interest, are reported in Figure 15 below.

The results show that, conditional on background characteristics, prior attainment and highest qualification level, there are two pathways which show significantly higher life satisfaction relative to the Academic pathway, namely the No Post-16 pathway (over 1.5 points higher on the 0-10 satisfaction scale) and the Vocational pathway (around 0.5 points higher). All coefficients are positive, suggesting that those on the Academic pathway report the lowest life satisfaction. With respect to job satisfaction, however, all of the observed conditional differences between pathways are small and statistically insignificant.

We also note in passing that, of the control variables, individuals brought up in the most economically advantaged areas report significantly higher life satisfaction, while life satisfaction rises with highest qualification attained. No other control variables acquire statistically significant coefficients in the life satisfaction equation, while none do at all in the job satisfaction equation.

Figure 15: Conditional differences in life and job satisfaction by post-16 pathway - aged 21+

6.3 Pathway analysis for the aged 18-20 sample

The focus so far has been in individuals aged 21+, as they are more likely to have completed their education and so will not still be on their FE Post-16 pathway. However, as outlined in Section 3 earlier, the EES Survey over-sampled young people and so there are significant numbers in our sample aged below 21 who may still be in education and so still on their pathway, who we do not want to ignore, but need to analyse separately to those aged 21+ who have, by and large, completed education. Clearly, we cannot yet identify a full FE pathway for those aged 16 and 17, and so the analysis was restricted to those aged 18-20 inclusive, which represented 754 individuals. This was a smaller sample size than the group aged 21+, which meant we could not separately identify each of the education pathways studied in the previous section due to small cell sizes. We therefore considered only two pathways – an Academic-only pathway, and a VET-only or Mixed pathway. The handful of individuals with no observed post-16 education in this age group were dropped from the analysis.

Table 9 reports the demographic characteristics of the young people on each of these pathways, weighted as usual to ensure the sample is representative of the population at this age. We can see that those on an Academic pathway are less likely to be male, belong to an ethnic minority group, to have been eligible for FSM or identified as having SEN, and much more likely to have had an economically advantaged upbringing. Their prior attainment is significantly higher in terms of reaching Level 2 at age 16, and, unsurprisingly, they are much more likely to achieve an academic A Level qualification.

Table 9: Composition of young people aged 18-20 following each pathway

	Academic Only (sample size = 497) %	VET only/Mixed (sample size=246) %
Male	50.2	56.5
Ethnic minority	23.2	31.8
Ever eligible for FSM	22.2	29.2
Ever SEN no statement	32.9	41.1
IDACI quartile 1	22.1	36.9
IDACI quartile 2	15.6	28.0
IDACI quartile 3	31.5	20.6
IDACI quartile 4	30.7	14.6
Passed Level 2	90.3	67.8
L2 with English and Maths	88.8	63.7
With at least 1 A level	83.0	50.2

Turning to outcomes for the sample of young individuals on the two pathways, these are reported in Table 10. These are (weighted) raw differences in the respective outcomes. We can see that, as with the older age group, the differences in the average levels of EES between the pathways are minimal. There is also no clear pattern, with individuals on the Academic pathway reporting behaviours that are suggestive of slightly higher organising, planning and prioritising, communication and collaboration skills, while individuals on VET-only or Mixed pathways report behaviours suggestive of slightly higher problem solving and decision-making, creative thinking and information literacy skills. These difference balance out in the overall EES score, for which the averages are within 0.3 points across the two pathways.

In terms of satisfaction, there is at least a clear pattern across pathways, with the average satisfaction score being higher for both life and job satisfaction amongst those following an academic pathway.

Table 10: Raw differences in EES and satisfaction by pathway, aged 18-20 sample

	Academic Only (sample size = 497)	VET only/Mixed (sample size=238)
Overall EES	54.9	54.6
Problem solving and decision-making	55.3	55.6
Organising, planning and prioritising	55.0	54.8
Communication	55.6	54.1
Collaboration	54.8	54.1
Creative thinking	55.3	57.0
Information literacy	52.9	54.1
Life satisfaction	6.85	6.34
Job satisfaction	6.35 (sample=361)	5.42 (sample=175)

We also estimated multivariate regression equations to control for other characteristics, as was done for the older group above. However, none of the key variables attracted statistically significant coefficients, perhaps not surprisingly given the relatively smaller sample size, and the small differences in EES in the raw data observed above. We therefore do not report these conditional differences for the younger age group here.

7. Differences in Essential Employment Skills and Job & Life Satisfaction by Higher Education Attainment and Subject Area

Key Points

1. EES are positively related to attainment at university, with those who achieve a first class degree observed to have, on average, the highest skill levels, both overall and for each component skill. This remains the case even after controlling for prior attainment, socio-economic status and other background characteristics, though differences are not statistically significant.

2. With respect to subject of study, there is little observable pattern in observed EES across different degree subjects.

3. Neither level of attainment nor subject of degree study are strongly related to life or job satisfaction.

In this section, we turn our attention to focus in more detail on those who reached Higher Education (HE), making use of the information available in the HESA data in our matched dataset. Specifically, we will consider differences in EES and satisfaction by highest level of attainment in HE and the subject area studied.

7.1 Highest attainment in HE

HESA data records all individuals participating in HE in any given year, and so the same individuals are observed in multiple years of data, sometimes with a gap of multiple years. We therefore tracked our EES sample across all years in the HESA data (2005-2023), in order to observe the highest qualification that they attained within HE. When individuals' highest qualification was an undergraduate degree, we recorded their degree classification. This produced an HE attainment variable with the categories shown in Table 11, which also reports the weighted percentage of the sample (of overall size 910) observed in each category. Reporting restrictions with HESA data require that percentages are reported to the nearest whole number.

Table 11: Percentage in Each HE Attainment Category

Attainment	Weighted Percent
PhD	4
Masters	29
UG 1st class	21
UG 2:1	28
UG 2:2	10
UG other	4
Below degree	4

Table 11 shows that around one-third of our sample achieved a postgraduate qualification. Amongst those who achieve at best an undergraduate degree, most received a first class or upper second class degree. Only a small number did not reach Level 6 (a completed undergraduate degree) having entered HE.

Looking at background characteristics by level of HE attainment, many unfortunately cannot be reported, due to the overall relatively small sample size of 910 individuals reaching HE, as well as the stricter requirements for minimum cell sizes imposed when using HESA data. In terms of what can be reported, the proportion that are female is larger at higher levels of attainment. There is also evidence that HE attainment is related to socio-economic background – 22% of the sample whose highest HE qualification was a first class undergraduate degree were brought up in an area in the lowest quartile (most deprived) of IDACI scores, compared to 29% who received an upper second class degree and 33% who received a lower second class degree.

Similarly, there is strong evidence that attainment at university is related to prior attainment at age 16, suggesting the importance of academic ability. The average decile position in the distribution of GCSE points scores of those who went on to achieve a first class degree is 6.7 (i.e. the mean position of first class degree holders was a third of the way down from the top of the GCSE points distribution). For upper second class degree holders, this average GCSE decile position was 6.3, while for lower second class degree holders, it was 4.9.

Table 12: Raw differences in EES and satisfaction by HE attainment, aged 21+ sample

Attainment	Overall EES	Mean Life Satisfaction Score	Mean Job Satisfaction Score
PhD	58.5	6.9	6.9
Masters	56.7	7.2	6.6
UG 1st class	57.9	7.1	6.4
UG 2:1	56.0	7.0	6.5
UG 2:2	57.2	6.6	6.2
UG other	55.7	6.6	7.0
Below degree	53.6	7.3	6.4

Table 12 shows limited evidence of a relationship between the level of HE attainment and overall EES, given that the highest level of attainment (PhD level) is seen with the highest overall EES score, while the lowest level of HE attainment (below degree level) is seen with the lowest score. However, it should be remembered that these two are the smallest of the various groups by levels of attainment, and note that between these two levels, there is little evidence of a relationship, with overall EES scores varying within a narrow range of 55.7-57.9, and no discernible pattern with attainment levels.

Similarly with the satisfaction scores, there is only small amounts of variation across HE attainment levels, and what variation there is seems to be unrelated to those levels.

We next proceed with a multivariate analysis, to determine whether conditional relationships exist between HE attainment and the outcomes of interest, holding constant a range of factors that could be correlated with both. These control variables are mostly the same as used in the previous section, namely demographic characteristics (gender, age and age^2, ethnicity, FSM eligibility, SEN status, IDACI quartile), and prior attainment at age 16. For this analysis of HE attainment, we further add controls for the post-16 pathways followed.

Figure 16 shows the estimated coefficients on the HE attainment variables, and 95% confidence intervals, revealing the conditional differences in overall EES scores for each attainment level, relative to the omitted category (undergraduate 'other' degree, i.e. a pass below lower second class level). As can be seen, the largest coefficient is on first class undergraduate degrees, revealing a positive conditional difference of over 2 points relative to the reference category. This coefficient, however, just fails to achieve statistical significance at the 5% level. The remaining coefficients are all less than 2 points in size, not statistically significant, and show no monotonic pattern across attainment levels.

The coefficients on the other explanatory variables are very similar to those reported in Section 6 earlier, unsurprisingly since the dependent variable is unchanged, and so will not be discussed again here.

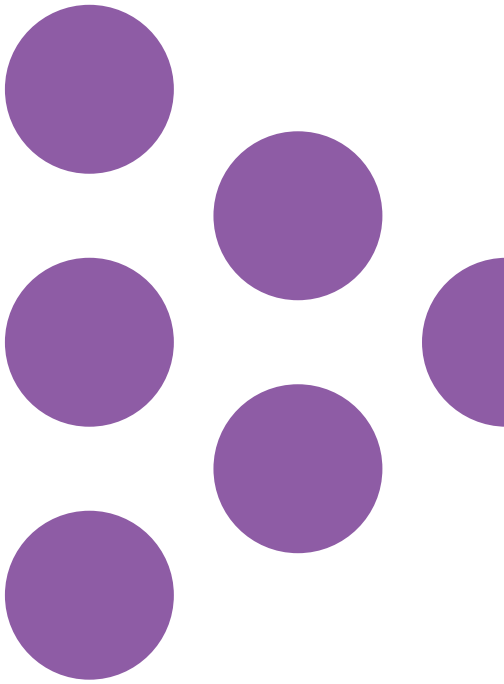
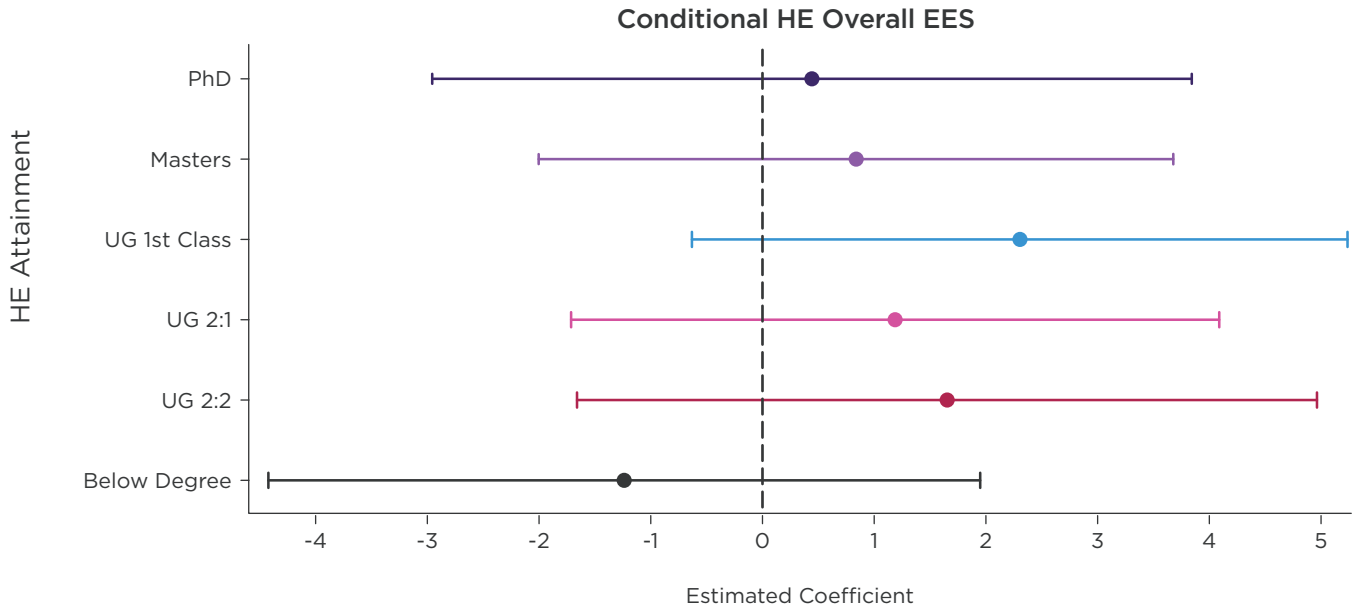
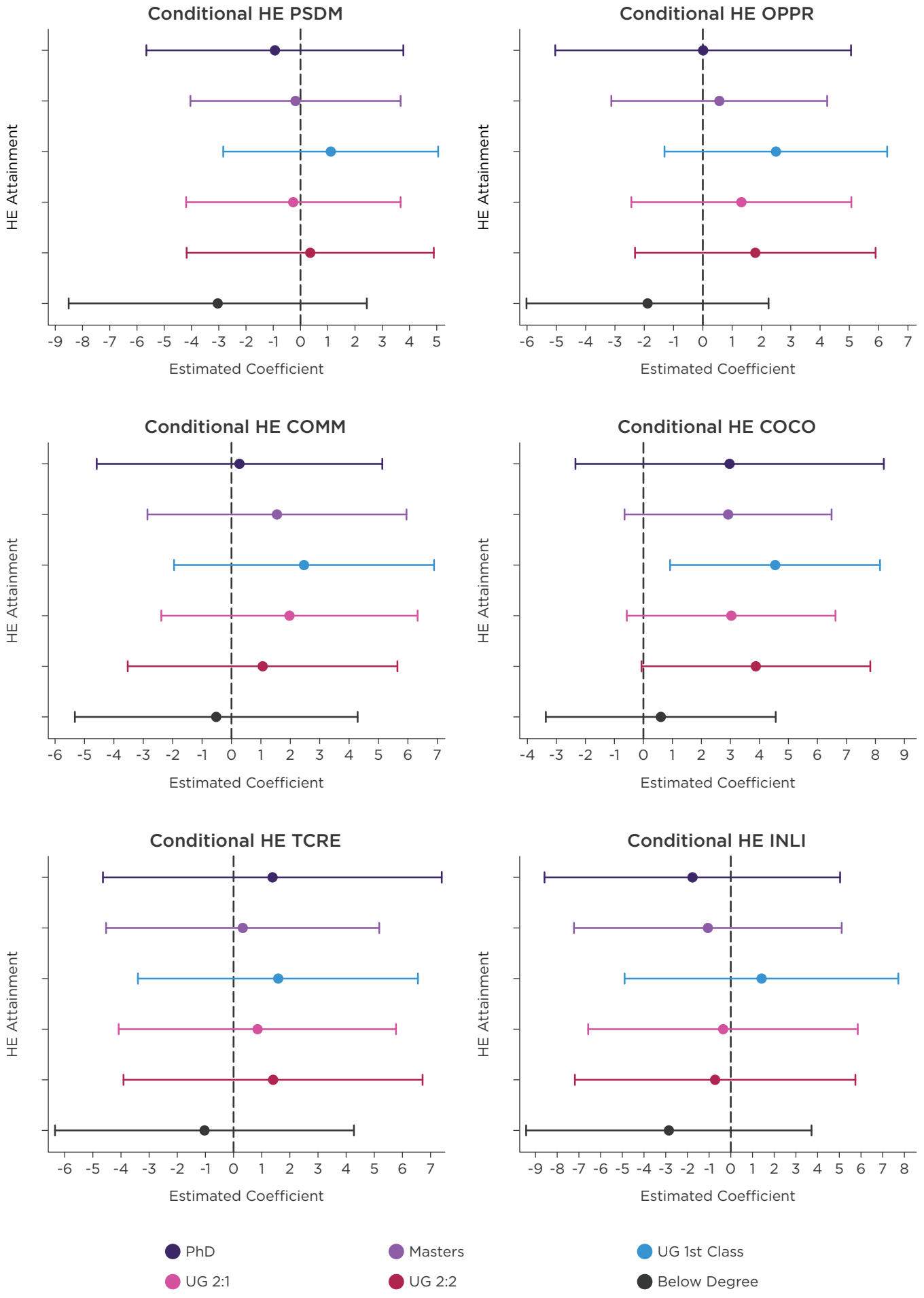


Figure 16: Conditional Differences in Overall EES by HE Attainment Level



As in Section 6 for the pathways analysis, we again broke the overall EES score down into its six separate skill components, and estimated regression equations for each one. The coefficients on the HE attainment variables are shown in Figure 17.

Figure 17: Conditional differences in component EES by HE attainment



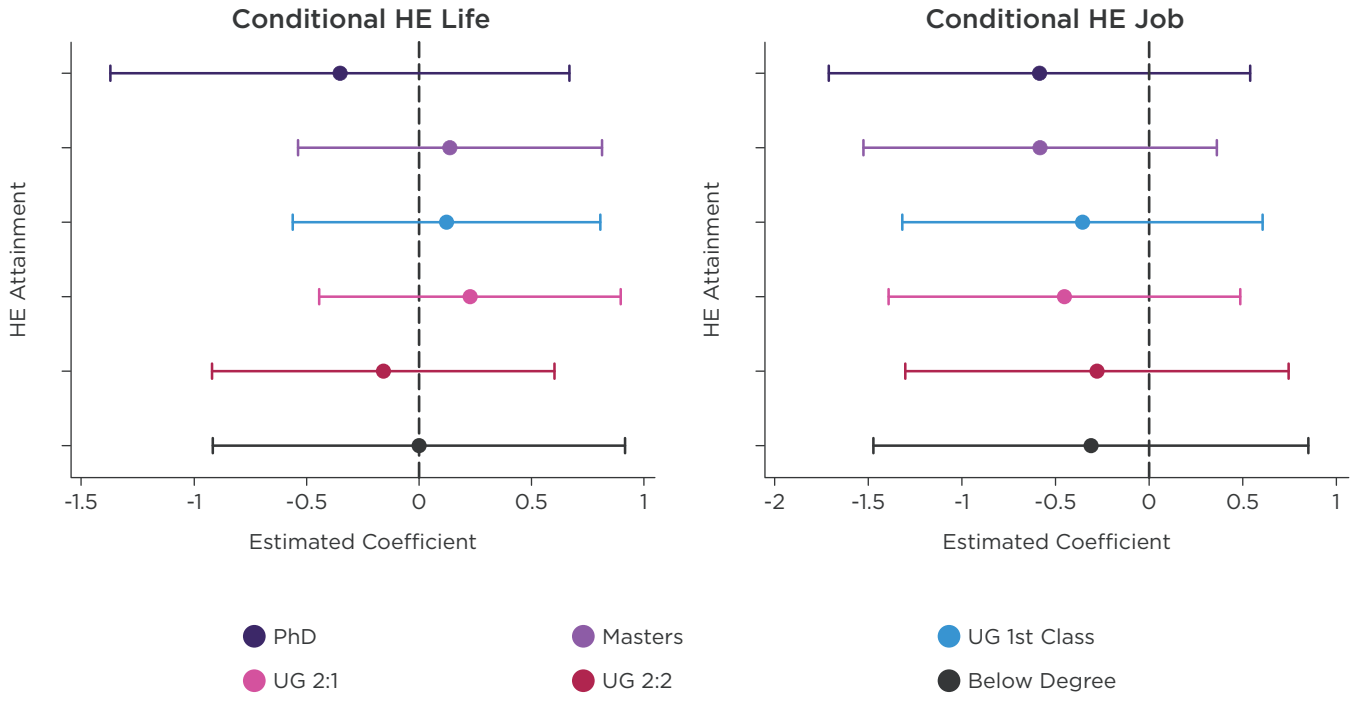
As can be seen, the finding of higher EES amongst those who achieve a first class undergraduate degree is observed for every single component EES. Of these results, the one for Collaboration skills is statistically significantly different from zero. This is in fact the only statistically significant finding across the six skills for any attainment level. While we therefore cannot read much into the other findings given their statistical insignificance, we note that differences across attainment levels appear to be largest for collaboration skills, followed by communication and organising planning and prioritising skills, and smallest for problem solving and decision-making skills.

Using institution codes, we also classify all universities into Russell Group or non-Russell Group and look at differences in overall EES, and each component EES between these groups. Differences were very small, and not statistically different either for overall EES or any of the component EES at the five percent level, and hence are not reported here.

Finally in this sub-section, we consider the conditional differences in satisfaction across HE attainment levels, treating the satisfaction scores as continuous variables as in the previous section. Again, estimating ordered probit equation instead made no difference to the qualitative pattern of results.

The coefficients on the HE attainment variables are illustrated in Figure 18. In terms of life satisfaction, the lowest scores, conditional on demographic, prior attainment and FE pathway variables, are observed for those who achieved a PhD, while for job satisfaction, all the conditional differences are negative relative to the reference category of low level undergraduate degrees. All of the differences, across both satisfaction measures, are small however, and none are close to achieving statistical significance.

Figure 18: Conditional differences in life and job satisfaction by HE attainment



7.2 Subject area studied in HE

We also observed in the HESA data the subject that individuals studied. Although this was recorded to a very disaggregated level in the data, because of our relatively small sample size, using such a disaggregated classification would have left us with very small cell sizes. We therefore grouped subjects together into much broader groups, roughly equating to 'faculties' observed in universities. Some students studying for a combined degree studied subjects that straddled these faculty groupings. In such cases, we used the HESA variable indicating the proportion of the degree allocated to each subject, and classified each individual's subject as the one they devoted the larger part of their degree to. When the split was 50:50, or when the HESA data itself allocated degree subject to 'Mixed', then we similarly classified such individuals' subjects as 'Mixed'. For those individuals observed in the data obtaining multiple degrees (for example an undergraduate and a postgraduate qualification) we allocated to them the subject associated with their highest degree. When an individual had two or more degrees at the same level (for example, two Masters degrees) then we allocated to them the subject associated with their most recent degree.

There were 895 individuals in the matched dataset with an observed subject. This number is slightly less than the 910 used for the attainment level in the previous sub-section due to missing subject data for a small number of individuals. Table 13 shows the distribution of these individuals across the seven subject groupings, with the percentages as usual weighted to make the sample representative.

Table 13: Percentage of individuals in Each HE subject category

Subject Group	Weighted Percent
Health	10
Science	16
Engineering	9
Social Science	31
Arts	18
Education	12
Mixed	3

There is a good spread across the subject groupings, with the largest group (representing just under one-third of the sample) belonging to Social Sciences and the smallest group (excluding the 'Mixed' category) being Engineering.

As in the previous sub-section, small cell sizes and HESA reporting restrictions mean that background characteristics by subject group cannot be reported here in detail. In terms of gender, as expected Health and Education are strongly female-dominated, while Engineering is heavily, and Science somewhat, male-dominated. Social Sciences and Arts are quite evenly divided between the genders. There is little evidence of strong differences across subject groups in socio-economic background or in prior attainment.

Table 14 summarises raw average values for the key outcome variables, by subject group.

Table 14: Raw differences in EES and satisfaction by degree subject, aged 21+ sample

Subject	Overall EES	Mean Life Satisfaction Score	Mean Job Satisfaction Score
Health	57.4	7.1	6.3
Science	56.4	7.0	6.5
Engineering	57.5	7.0	7.0
Social Science	56.1	7.0	6.4
Arts	57.9	7.1	6.6
Education	55.9	7.0	6.5
Mixed	55.7	6.8	6.4

There is no evidence, in the raw data, of any significant differences in mean overall EES across the various subject groupings, with the range going from 55.9 for Education (or 55.7 for Mixed) to 57.9 for Arts. Similarly in terms of satisfaction, the average life satisfaction scores are extremely similar for all subject groupings. There is a little more variation in average reported job satisfaction, with Engineering graduates appearing the most satisfied with their jobs and Health graduates the least satisfied.

A multivariate analysis was undertaken, to examine differences by subjects when conditioning on background characteristics. The control variables used were the usual demographic and prior attainment ones used in previous sections, as well as controls for post-16 FE pathway and the highest level of HE attainment. Figure 19 shows the estimated coefficients on the subject variables in the overall EES equation, illustrating the conditional differences in such skills between individuals in the various subject groups, relative to the reference category which is Health degrees.

The results show that there is no evidence of differences in overall EES across the various degree subjects. None of the estimated coefficients are statistically significant, and all are less than 1 point in absolute size on the 0-100 ESS scale, with the exception of Education, which is just over 1 point below the reference category of Health degrees. We again omit discussion of the control variables here.

Figure 19: Conditional differences in overall EES by degree subject

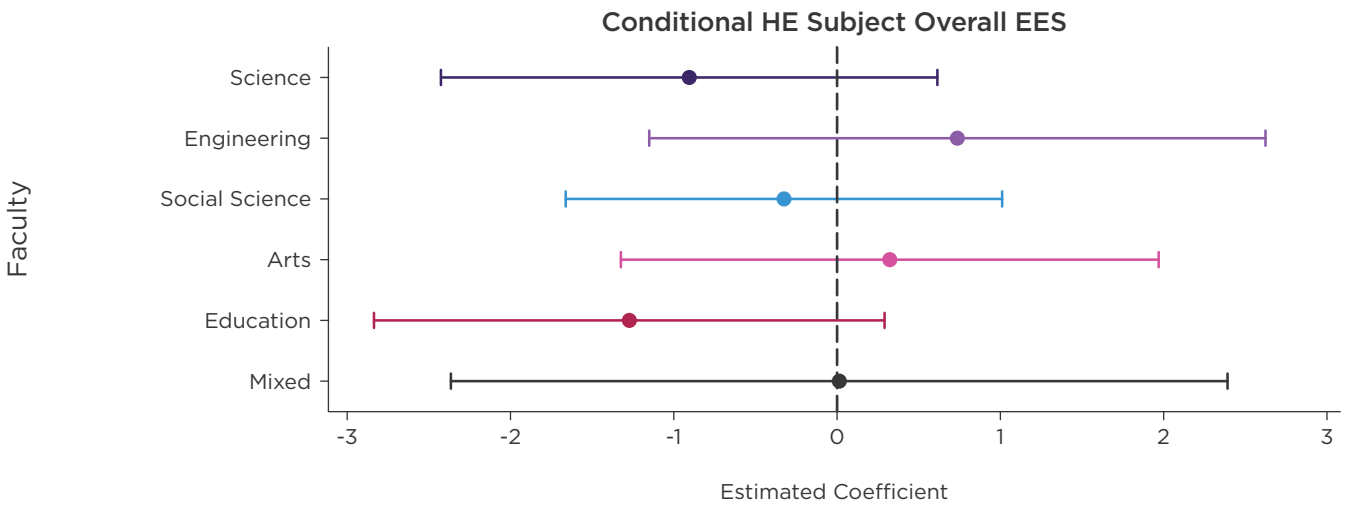


Figure 20 splits overall EES up into the six component skills, and estimates a regression coefficient for each one. The graphs in Figure 20 show the respective coefficients on the subject variables, relative to the reference category which is Health degrees.

Figure 20: Conditional differences in component EES by degree subject

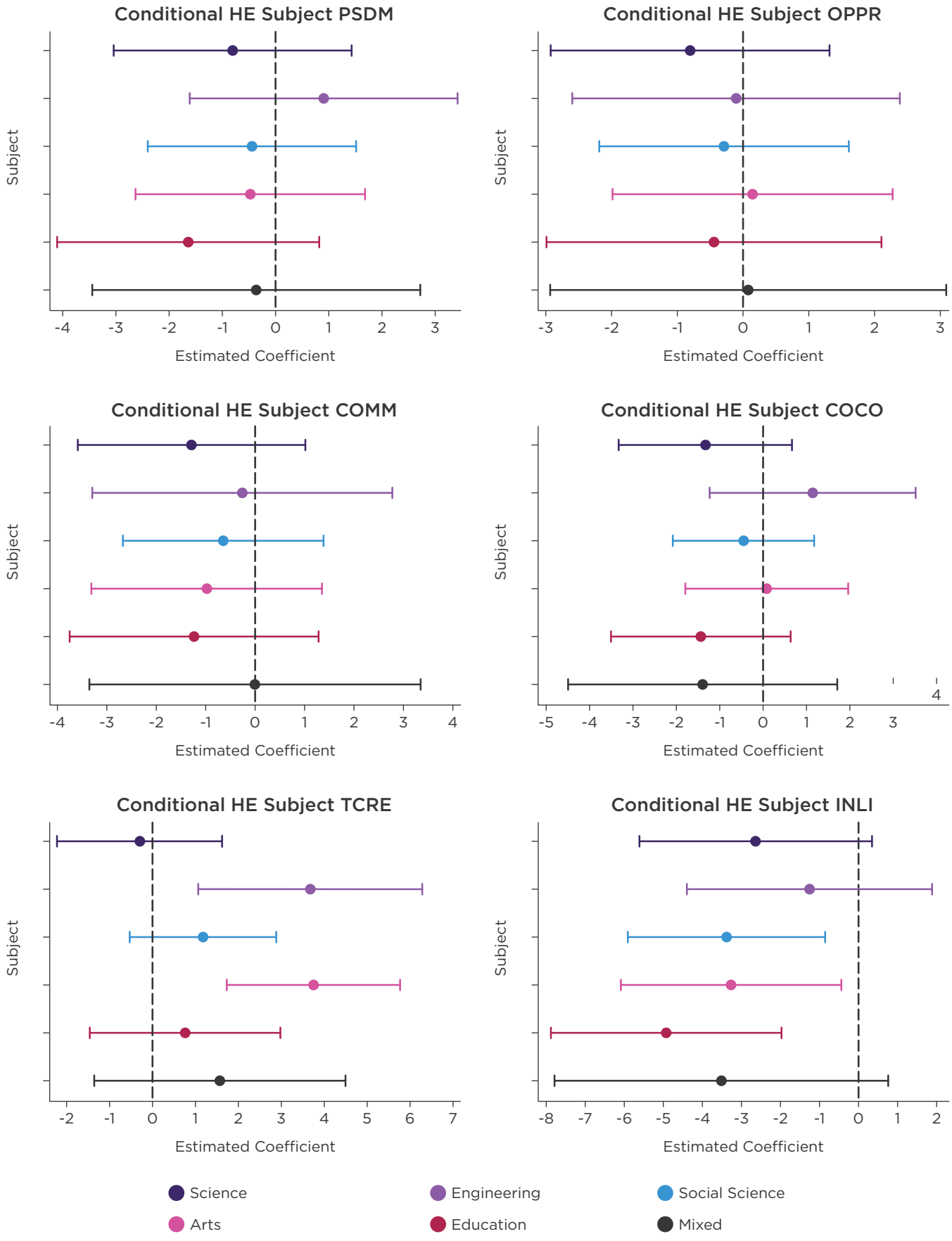


Figure 20 shows that graduates with different subject degrees do differ somewhat in terms of the specific EES that they have, though very few of the relationships are statistically significant and so not too much should be made of them. The findings that are statistically significant show that creative thinking skills are significantly higher amongst Engineering and Arts graduates, relative to Health graduates, holding constant background characteristics, by between 3 and 4 points. For information literacy skills, on the other hand, Health graduates are observed to have the highest level of skills, significantly higher than for Social Science, Arts and Education graduates. Amongst the remaining skills, the highest problem-solving and decision-making skills are observed amongst Engineering graduates, the highest organising planning and prioritising skills amongst Arts graduates, the highest communication skills amongst Health graduates, and the highest collaboration skills amongst Engineering graduates. None of these differences are statistically significant, however, and all are small in size (at most 1 point). Finally, we categorised all degrees as being either academic or vocational. Neither overall EES nor any of the component EES differed significantly between individuals that had completed vocational degrees relative to their peers that completed academic degrees, and hence these results are not reported here.

Turning to the satisfaction variables, the conditional differences by subject relative to Health degrees are graphed in Figure 21. As was seen with the raw differences in Table 14 above, the conditional differences in average satisfaction across degree subjects are very small, particularly for life satisfaction, and none of the estimated coefficients are close to statistical significance.

Figure 21: Conditional differences in life and job satisfaction by degree subject

8. Conclusion

This report primarily focuses on the relationship between young people's pathway through education and their later employment outcomes and skill levels, particularly their EES.

The profile of young people varies between pathways. Those that follow an academic rather than a vocational qualification are likely to have higher prior attainment, less experience of special education needs, and to be from a socio-economically advantaged position. Those following pathways that include an academic component are more likely to progress to HE, even if initially starting out with a vocational qualification, or undertaking one concurrently. This is likely to be all the more important if young people's skill development and the risk profile of their future occupation varies depending on the post-16 pathway they took.

We first considered the relationship between individuals' educational attainment and their likelihood of working in a high-risk or low-risk occupation, where occupational risk is based on projected growth or decline over the next decade. The findings of this analysis showed that level of education is far more important in determining whether an individual later works in a high- or low-risk occupation than the pathway followed. Thus, we observe those young people who have reached Higher Education being most likely to work in a low-risk occupation, whereas those with lower level qualifications are more likely to work in a high-risk occupation, increasingly so as their qualification level falls. Within levels, it makes virtually no difference to job-risk likelihood what pathway was followed to reach that level.

This suggests that policy efforts to reduce the flow of young people into declining, high-risk occupations should focus on qualification levels, rather than on a specific pathway(s). Individuals in high-risk occupations are much more likely to have a lower level of qualifications and mismatches between their qualifications and the job demands of growing occupations post significant barriers to them transitioning.

Nevertheless, a high level qualification is not a guarantee of working in a low-risk job, and 30 per cent of those qualified to Level 6 still work in a high-risk occupation. Although some workers with a degree will choose to work a non-graduate job for a variety of reasons, including flexibility, location or family reasons, and the effects of the Covid-19 pandemic may have forced some people to accept jobs below their skill level, the wider literature does suggest that other individuals may not have developed the skills required by employers to enter, or progress, into high-growth occupations.

Using PIAAC data, we showed that individuals who followed an academic post-16 FE pathway are observed to have significantly higher skills in literacy, numeracy and problem solving, compared to individuals who followed a vocational pathway. However, when switching focus to young people's EES, we uncovered no evidence that these vary across educational pathways. Young people following the variety of pathways emerge with very similar observed levels of EES, on average. Controlling for demographic characteristics, prior attainment and highest final educational attainment does not change this conclusion – differences in average overall EES are still small and insignificant across pathways. Caution is needed, however, when drawing conclusions given the limited variation in our EES data may have made it too difficult to identify significant differences between pathways.

Looking across the six component EES, in general, individuals' observed skills are slightly higher when they followed a post-16 pathway that involved a vocational element. This is particularly so for problem-solving and decision-making skills, organising, planning and prioritising skills, communication skills and creative thinking skills, and less so for collaboration skills and information literacy skills. All differences remain small, though, and rarely statistically significant.

Life and job satisfaction also are not observed to systematically vary across post-16 education pathways, with the exception of a small positive and significant difference in life satisfaction for those who followed vocational FE pathways relative to academic pathways.

We therefore do not observe variation in EES across individuals on different pathways, whereas we did observe differences between pathways in individuals' cognitive skills. This could indicate that the factors which influence the development or expression of cognitive skills differ from the factors that influence EES, a conclusion further evidenced by the absence of any significant correlation observed between cognitive skills and EES.

Finally, for the approximately two-thirds of our sample who reached Higher Education (HE), we saw some evidence that those who achieve higher levels of attainment at university also emerge with stronger EES. Even controlling for demographic characteristics, prior GCSE scores and FE pathway - so holding constant their attainment before entering university - those who achieved a first class degree were observed with the highest levels of EES. The difference was statistically significant for collaboration skills, with the differences for organising, planning and prioritising skills and for communication skills also being noticeable though not statistically significant, potentially owing to sample size limitations.

When looking at subject of degree rather than level of attainment in HE, we observe some differences in component EES, though not in the overall EES measure. Different subjects are associated with different levels of component EES, but these differences balance out in the overall measure. The strongest findings are that creative thinking skills are significantly higher amongst Engineering and Arts graduates, relative to Health graduates, holding constant background characteristics and prior attainment, by between 3 and 4 points. For information literacy skills, on the other hand, Health graduates are observed to

have the highest level of skills, significantly higher than for Social Science, Arts, Education and Mixed (Combined) graduates. For the other skills, the differences are small and statistically insignificant, with the highest problem-solving and decision-making skills being observed amongst Engineering graduates, the highest organising planning and prioritising skills amongst Arts graduates, the highest communication skills amongst Health graduates, and the highest collaboration skills amongst Engineering graduates.

In terms of life and job satisfaction, no statistically significant relationships with either attainment level or subject grouping are observed amongst graduates.

Overall, we have not found any evidence that some pathways are more successful than others in terms of developing young people's EES, whereas cognitive skills vary substantially between individuals on different pathways. The pathway followed seems to be less relevant than the level of education reached. Similarly, when looking specifically at graduates, the subject studied seems to be a weaker predictor of individuals' EES than their level of attainment at university. This suggests that supporting young people to access further and higher education is more important for raising EES levels in the working population, rather than pushing young people towards particular pathways. As far as EES are concerned, it would be best for young people to follow the type and subject area of education that best suits their interests and abilities, since that will provide the most likely setting for progression and attainment. A range of viable alternatives leading to intermediate and ultimately higher levels should be available from which young people can choose, in order to select the most appropriate pathway for them. For those designing such programmes, it should be the case that they are continue to provide the EES required by the future labour market, which should be built into their curricula.

A proviso to these results is that we have been careful to say that there is no evidence found that EES vary by educational pathway, not that they definitely do not. The analysis undertaken here has relied on relatively small samples, of individuals observed in all of the various datasets, and so cell sizes for some of the disaggregations have been relatively small. Nevertheless, the lack of statistical significance does not seem to be caused by a lack of precision (high standard errors), with the differences in EES, as measured by the instruments in our survey, appearing to be very small.

For the workforce to have the EES that occupation, task and technology trends predict will be needed in the labour market of 2035, education, and in particular the level of education attained, remains important. All qualification types and levels should include a focus on EES development and young people should be encouraged and supported to follow the pathway that best matches their abilities, interests and career aspirations.

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