Skills shortages and funding gaps
An analysis of the costs of under-investment in skills
May 2019
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Introduction

A consensus has emerged in the last 18 months or so that we need to do more as a country to improve education and skills if we are to have an inclusive and vibrant economy. This paper takes that premise, sets out some of the evidence which supports it, measures it up against the Government's policy ambitions and shows, quite simply, that current funding levels are inadequate. It then goes on to show the impact of that lack of investment as a cost to our economy.

The Government's Industrial Strategy aims to boost productivity across the whole country by backing business to create good jobs and increase earning power via investment in skills, industries and infrastructure. It does so in the context of stubbornly low UK workforce productivity, falling investment in skills and growing skills shortages. These will get worse as experienced people retire and because employers will not be able to rely on the same flow of skilled workers from the rest of Europe in the 2020s nor from young people entering the labour market.

The government's education policies to tackle these issues include T Levels at Level 3, Higher Technical Qualifications at Levels 4 and 5 and the National Retraining Scheme for adults. This paper simply shows how the lack of funding will undermine the chances of these succeeding.

We have looked specifically at Level 3 programmes for 16 to 19-year-olds in order to make the case. In this area alone, our analysis suggests that there could be £3.3 billion in lost output between 2019 and 2024 if funding issues are not addressed. £1.7 billion of this lost output relates to STEM-relevant T Level routes of Engineering and Manufacturing, Digital, Health and Science.

AoC will publish a 2019 spending review paper in June 2019 which identifies the wider investment and policy actions required to tackle the issues identified here.\(^1\)

One key recommendation we make here is for the base rate to increase by £1000 for all study programmes. T Levels will be an important part of a broader programme that includes A Levels, Apprenticeships, Higher Technical and sizable transition phase programmes.

Critically, we will push for this even if a full spending review does not happen. At the very least we will be urging the Chancellor to make it a ‘base-rate Budget’ in November even if the wider considerations we believe in have to wait for a further year.

David Hughes, Chief Executive Officer, Association of Colleges
May 2019

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The Association of Colleges (AoC) represents more than 90% of the 251 colleges in England incorporated under the Further and Higher Education Act 1992.
Logic chain

**Problem**
- Post-Sainsbury intensification of skills gaps
  - High HE RAB charge
  - Over reliance on migrant labour
  - Study programmes and T Levels unviable at maximum class and staff utilisation

**Inputs**
- Base rate uplift of £1000
- Formula driven capital funding
  - T Level reforms

**Outputs**
- Sufficient range and uptake of T Levels to meet the needs of the industrial strategy and local economies
  - Increase in uptake of level 4/5

**Outcomes**
- Avoidance of an extremely conservative estimate of £3.3bn in deadweight costs over a five year period
  - £1.7bn increase in NPV returns
  - Reduction in RAB charge
  - Improved social mobility

RAB = Resource Accounting and Budgeting (the estimated cost to government of borrowing to support the student finance system in loans not paid back), NPV = Net Present Value (gross).
Findings and recommendations

Findings

1. **Growing skills shortages**: Between 2011 and 2017, the Employer Skills Survey has shown an increase in the density of vacancies employers find hard to fill because of skills shortage, from 16% of all vacancies to 22%. In part one of this report, we set out projections suggesting that jobs relevant to T Level qualifications will have 2.5 million openings in the years to 2024, simply to meet the needs of growth and replace exiting workers for jobs requiring technical education to level 3 and above. The case for T Levels was made in 2016 in the Sainsbury review of technical education. Government endorsed this case in the Post-16 Skills Plan. Three years ago, the labour market had significant slack but this is no longer the case. By March 2019, the employment rate was 76.1% - a record high – while the unemployment rate at 3.9% was the lowest in 44 years.

2. **Migration patterns and higher education are unlikely to fill demand**: There has been a tendency in recent years to fill jobs from a growing population of EU nationals and from graduates, a tactic we will no longer be able to rely upon. The government’s immigration plans are likely to hinder international recruitment at intermediate skill levels but, even if there was no change in the rules, there will be shifts. Poland, for example, already has 12% of its population living abroad and has seen a 40% improvement in income per capita over 10 years resulting in less of an incentive to relocate abroad. Meanwhile, availability of degree-qualified graduates is constrained: DfE estimate a 5% fall in the volume of 18 to 24-year-olds starting a degree between 2017/18 and 2021/22. At the same time, there are already mismatches in the jobs that graduates fill. The Office for National Statistics recently classified 16% of people as over-educated for their role. This could add pressure on the already-expensive 45% RAB charge (Resource Accounting and Budgeting – the estimated cost to government of borrowing to support the student finance system).

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3 “… we have a serious shortage of technicians in industry at a time when over 400,000 16-24 year olds are unemployed.” p.6, D Sainsbury et al (2016). Report of the Independent Panel on Technical Education. London: Gatsby Charitable Foundation.
5 Data from UN Population Division for 2015 and Eurostat for 2008-2018, respectively.
3. **Positive economic benefits from acquiring medium skill levels:** The further education system is a critical contributor to raising the life chances of young people across England, and in meeting the needs of employers for technically proficient workers. Economic evidence demonstrates high and sustained returns to further education courses; estimates in 2013/14 suggest that for every Level 2 and 3 college-taught qualification started, £66,000 - £68,000 of net present value is created. In the same year, aggregating NPV (Net Present Value) across delivery volumes for these qualifications resulted in a total of £41 billion, rising to £54 billion with the inclusion of lower level qualifications including English and maths, and £79 billion with the inclusion of apprenticeships.\(^8\) Although the largest direct return from technical education is in opening career opportunities, there are wider benefits of learning. Longitudinal studies have demonstrated concrete gains for learners in improved health, lower risk of unemployment, and improved community participation.\(^9\)

4. **Government’s technical education reforms are at risk because of these funding constraints:** The technical education reforms have been designed to improve the alignment of the further education system with labour market demands, and to create a higher quality, more sustainable system. The treasury allocated extra funds for these reforms in the autumn 2017 budget but T Levels will be more expensive to deliver because they will be demanding and specialist. If government does not address the gap between need and resources, the likelihood will be a drop in the positive economic impact created by the FE system.

5. **Current Level 3 study programmes and new T Levels are unaffordable, even at maximum efficiency** – We show in this report that funding levels for existing Level 3 study programmes are unaffordable at current funding rates. Specialist and technical provision is generally lossmaking for a college. The more demanding, resource intensive and specialised T Levels will add to delivery costs and result in even greater losses at the current funding rate. As T Levels are introduced, colleges are likely to respond in two ways:

- Limit their commitment to T Levels by putting a cap on student numbers and/or specialisms to ensure programme viability. Colleges have a social purpose but must also be financially responsible. They can only cross-subsidise lossmaking provision within limits.

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• Focus delivery on cost-efficient courses. Colleges may be prompted to focus on T Levels with lower costs or more generic skills outcomes rather than STEM programmes which are more costly, specialised and have high-quality features.

The additional £500 million allocated to T Levels in the spring budget of 2017 will fund a 50% increase in programme hours and will bring the English technical education system in line with other (overseas) successful technical education systems in terms of contact hours. This will not address the structural underfunding of further education as it is based on the current base rate on per head and hour basis.

6. **The economic impact of this gap could be £3.3 billion in lost output in the next 5 years:** Modelling on the basis of typical rates of job turnover against projected demand from growth and replacement of exiting workers for each T Level Route, and using skills shortage densities from the Employer Skills Survey 2017, we calculate £3.3 billion in lost output between 2019 and 2024. We used conservative assumptions in reaching these figures, relating them only to relevant occupations where level 3 or higher qualifications are the norm. We assumed no worsening in the prevalence of skills shortages impact in high value-added sectors. We estimate a £1.7 billion economic impact in the STEM-relevant T Level Routes of Engineering and Manufacturing, Digital and Health and Science.

**Headline recommendations**

1. The current base rate is insufficient and will undermine the important T Level reform programme, the transition phase programme and ultimately the industrial strategy. A 16-19 base rate increase of £1000 is needed to ensure colleges can viably offer a range of programmes that meet the needs of employers and local communities.

2. Programme cost weightings need immediate review for STEM based programmes.

3. A new capital budget is needed to support these reforms.

4. Further research on the sufficiency and viability of apprenticeships, adult education and college HE programmes needs to be undertaken.
Growing skills shortages

1. There is a high demand for skills covered by existing and future Level 3 technical qualifications.

An analysis of job openings

2. EMSI's labour market intelligence dataset contains estimates of jobs by occupation, industry and location using time series regressions of past data drawn from the following public sources:
   - Business Register Employment Survey (jobs by industry by area)
   - Annual Business Inquiry (jobs by industry by area before 2009)
   - Labour Force Survey (staffing patterns, occupation demographics)
   - Working Futures (occupation replacement rates)
   - DEFRA statistics (jobs for the agricultural sector by area)

3. The dataset contains estimates of job numbers using job totals from the Business Register and Employment Survey (defined using the Standard Industrial Classification or SIC codes). Each industry’s jobs are allocated to occupations using a staffing pattern matrix constructed from Labour Force Survey data. Projections are based on past trends up to 2017, Workforce Jobs data for 2018 and then extrapolated into the future to evaluate future job demands.

4. For this analysis, we used a set of T Level occupational maps to map occupations to T Level routes using Standard Occupational Codes (SOC). The Gatsby Charitable Foundation produced the first versions of occupational maps with SOC coding. The Institute for Apprenticeships and Technical Education (IFATE) keeps the official England version of these maps but without SOC codes. EMSI supplied codes which are used in this

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10 EMSI is company that provides data analysis to organisations in the education, economic development and employment sectors in the US, Canada, UK and Australia
11 All sources originally ONS. Data are estimated for England only.
12 Gatsby is a Charitable Foundation set up by David Sainsbury to achieve his charitable objectives. Gatsby’s work in education is intended to strengthen science and engineering skills in the UK by developing innovative programmes and informing national policy
13 The Institute for Apprenticeships and Technical Education is an employer led crown Non Departmental Public Body. IFATE oversees the development, approval and publication of apprenticeship standards and assessment plans as well as the occupational maps for T Levels and apprenticeships.
analysis; reflecting the move to focus T Levels on Level 3 qualifications, all occupations where workers typically hold Level 2 or lower qualifications have been removed from the analysis. Note T Levels are not available in all routes (some are covered by apprenticeships) and policy decisions around higher technical qualifications are still to be made.

5. The occupational maps include cases where the same SOC unit group is found in more than one route. To account for this, we divide the number of jobs in that occupation according to its industry composition, so for example if the occupation was found in the Agriculture route and the Management route, the share of relevant jobs in SIC section A would be allocated to the Agriculture route, and the remainder to the Management route. There are also cases where the same occupation can be split across the two qualification levels used for the route mappings (Technical – Level 3, and Higher Technical – Level 4-5). To account for this, we use the existing proportions of each occupation's workforce up to Level 3 and above Level 3 to divide occupations where they appear at more than one qualification level.

6. The result of this analysis is show in Chart 1 which reports the openings over the years 2019 to 2024 for each of the T Level Routes, broken down between Technical (RQF level 3) and Higher Technical (RQF level 4-5) levels.

7. There are a number of findings:
   - In 2018, there are 9,155,000 jobs in England in occupations which feature in a T Level route at either technical or higher technical level.
   - There are likely to be 447,000 new openings in 2019 created by industry growth and the replacement of workers leaving the workforce.
   - In the five years to 2024, the EMSI estimate is that there will be 2,482,000 job openings to be filled.
   - 916,000 of these job openings are at Technical level and 1,567,000 job openings at Higher Technical level, showing the need for progression between levels.
   - The largest route is Health and Science, with 428,000 projected openings, followed by the more general Business and Administration, and Sales, Marketing and Procurement. Engineering and Manufacturing and Digital come in fourth and fifth. Each route has been designed to represent a domain of technical expertise, with
several constituent pathways to allow for career specialisations. Specialist staff will need to be found and trained to deliver these pathways.

8. Job openings as set out here are a conservative measure of labour demand. They account strictly for the need to fill jobs created by an industry’s expansion or to replace workers who are leaving the labour market entirely; they do not account for workers moving to other occupations, or for straightforward job turnover as workers move between jobs and employers.

Chart One: Projected job openings 2019-2024 by T Level Route and Occupation Level
An analysis of job openings

9. While openings provide an idea of the underlying ‘pull’ of labour demand, they are therefore some distance from the day-to-day reality of labour demand as employers experience it. For this reason, it is also worth exploring data from online job postings to see the volume of recruitment activity associated with each T Level Route and how this has evolved over recent years.

10. Online job postings are collected from thousands of job boards every month, Emsi’s Job Posting Analytics are gathered by trawling the Internet for job boards advertising positions in the UK. As boards are identified, they are added to the list for checking each day, and every posting is subjected to a deduplication process to allow for the high level of repeat posting of online job opportunities. The de-duplicated set of job postings are then categorised across a range of taxonomies:

- Occupation and role (down to SOC 4-digit and Emsi’s own job title taxonomy)
- Location (down to town level)
- Skills (using Emsi’s own skills taxonomy)
- Company

11. EMSI also monitor further, job postings to count the duration in days from initial appearance online to their disappearance, allowing a degree of measurement of how long employers are waiting to fill their vacancy. Salary data is also available for more than 60% of postings, a level fairly consistent across the occupational hierarchy.

12. Job postings do not give a perfect representation of recruitment activity, as some jobs are not openly advertised online, and others are advertised on a one-to-many basis. But during the last few years, there are strong indications that most externally recruited jobs are advertised online, and the volumes of advertised jobs found though online postings (averaging 638,000 per calendar month in England, Scotland and Wales) is relatively stable across time.14


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14 All job postings in the data source are tagged by location and job title, categorised to UK SOC occupations. For this analysis, they are then categorised from UK SOC occupations to the T Level Routes using occupational maps. This allows for analysis at the Route level. Postings data are for England only.
There has been growth in postings for Level 3 and above jobs in most routes apart from Care and Hospitality (-15%) and Hair and Beauty (-6%). All others have grown, with the fastest growth in postings for Legal, Financial and Accounting (41%); Engineering and Manufacturing (24%) and Health and Science (21%).
15. While most growth was achieved in the 2016/2017 period, postings in 2018 have for the most part maintained the levels seen in 2017.

Job openings and job postings

16. A comparison of job openings and job postings helps identify areas with high recruitment turnover and job mobility. Chart 3 compares openings and postings for each route:

Chart Three: Online job postings vs job openings
17. The most technically intense labour markets – Digital; Legal, Financial and Accounting; Engineering and Manufacturing – have a high level of postings relative to projected job openings. In Digital, for example, there were 601,000 job postings in 2018, compared to a projected 243,000 job openings in the years to 2024. This reflects the intensive recruitment activity in Digital and similar fields relative to the underlying need – and therefore the need to allocate skilled labour efficiently as a critical scarce resource for those labour markets. Getting skills in the right places at the right time is particularly critical in fields such as software production or engineering and manufacturing.

Skills shortages acute for many intermediate roles

18. The next analysis combines data collected in government’s large annual survey of employers with EMSI’s job posting analysis. The Employer Skills Survey 2017\(^\text{15}\) measures skills shortages in each occupational area. Chart 4 identifies the composite skills shortage vacancy density by T Level Route. The data presented is a set of multiples of skills shortage densities by total postings across the year, and then grouping them into the T Level groupings created for the earlier analysis.

19. There are a number of findings:

- Density rates (that is, the%age of vacancies ‘hard to fill because of skills shortages’) ranging from 7% for Protective Services at the Higher Technical level, through to 43% for Engineering and Manufacturing and 42% for Hair and Beauty, both at the Technical level.

- Digital has a density rate of 37% at the Higher Technical level, and 30% at the Technical level.

- The data suggests that skills shortage apply at both levels of the T Level Routes: overall, 31% of Technical level T Level Route vacancies are hard to fill because of skills shortages, and 27% of Higher Technical T Level Route vacancies.

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Chart Four: Skills shortage vacancy densities, by T Level Route and Level

20. Chart 5 looks at the total number of vacancies for each T Level Route, bringing the Employer Skills Survey skills shortage vacancy density rates together with the Emsi UK Job Posting Analytics numbers of online postings.
Chart Five: T Level Route skills shortage vacancies, estimated volumes 2017

Data: Emsi Job Posting Analytics and analysis of DfE Employer Skills Survey 2017
21. In this analysis of recruitment challenges, despite their relatively lower profile within the total number of job openings, many of the STEM fields rise to much higher prominence: in 2017, Digital had an estimated 210,000 vacancies facing significant skills shortages, the largest number in any route. Engineering and Manufacturing was second (196,000) and Health and Science fourth (140,000).\(^\text{16}\)

**Lower unemployment, Migration and higher education unlikely to meet demand**

22. In the first section, we established that:

- the technical education labour market is substantial.
- this labour market is seeing sustained growth in underlying demand.
- As a result, there are skills shortages, which are most acute in the STEM-intensive T Level Routes.

23. All of this *could be* a problem if the T Level channel of labour supply is impeded either through colleges opting to lower their overall delivery volumes or guiding students to less expensive and more generic course choices. But it should be remembered that those leaving education are only one source of labour supply, and so in this section we explore prospects for other sources of supply. For example, the higher education system has been an unintended supply for intermediate skills roles for a number of years.

**Lower unemployment**

24. As of writing, the latest ONS (Office for National Statistics) Labour Market Overview (March 2019) estimates a UK employment rate of 76.1%, the highest on record, and an unemployment rate of 3.9%, the lowest since January 1975. The labour market is as tight as the current workforce has ever known it, with very little slack – while pay is only showing early signs of response to the labour market’s tightness, non-pay measures of job quality have seen more persistent improvement – e.g. the number reporting part-time work because they couldn’t find full-time work has fallen from 1.4 million to 0.9 million over the last 5 years; and the number reporting

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\(^{16}\) Possible because of the availability of monthly postings data, the volumes of skills shortage vacancies in this report are estimated as a flow across the year 2017 and therefore differ to the stock approach of the Employer Skills Survey 2017.
temporary work because they couldn’t find permanent work has fallen from 0.6 million to 0.4 million over the last 5 years.

25. It is perhaps not surprising that this macroeconomic tightness translates down to a sharp tightening of most local labour markets. Chart 6 uses data from November in 2013 and 2018, shows the decline in the number of jobseekers seeking work in occupations relevant to each T Level Route. In all Routes there have been extremely sharp declines in the labour market position over that five year period, meaning that there is no spare capacity within the labour market to adjust to any positive shocks to demand.

![Chart Six: Claimant count by route](image)

17 Data are from the Nomis Jobseeker’s Allowance by occupation table, mapped from SOC 2000 to SOC 2010, and then mapped over to T Level Routes.
Migration

26. Another potential source for filling T Level Route-relevant jobs is through migrant workers. The UK has had a pronounced reliance on migrant labour supply over the past decade, and especially since workers from EU accession states were granted freedom of movement. From September 2008 to September 2018, the English labour market added into employment a net increase of 1.05 million British nationals, 414,000 ‘A8’ nationals, 405,200 ‘Other EU15’ nationals, 301,000 ‘A2’ nationals, and then 72,000 from the rest of the world, moving from 92% British nationals in the workforce to 88% British nationals in that time.

27. At the margin then, English employers have relied slightly more on foreign national labour supply than domestic labour supply to meet expanding labour demand over the past decade. But regardless of its value over that decade, the signs are that migrant labour supply is likely to be constrained in the years ahead, for a combination of reasons:

- The government’s immigration white paper sets out plans to end freedom of movement from the EU and maintain controls on migration.
- Brexit has already, through a combination of currency depreciation, perception and prospective restrictions on residency, led to a fall in the net inflow of EU workers.\(^{19}\)
- Limits to the potential EU migrant workforce, given cumulative migration, especially from accession states\(^{20}\) and the rapid growth in their own economies which will attract some migrants to return\(^{21}\).

28. The prospects are for external labour supply to play a smaller part than has been the case over the past ten years, and so relying upon migration to compensate for a shortfall in domestic skilled labour supply around technical roles would seem ambitious.

29. Many have highlighted the impact Brexit could have on many forms of foreign investment\(^{22}\), government will need to step-in and invest in skills

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\(^{18}\) Analysis using the Nomis Annual Population Survey - regional - nationality table.

\(^{19}\) The ONS Long Term International Migration statistics (down to 2009 levels, see ONS Migration Statistics Quarterly Report, February 2019).

\(^{20}\) Trends in International Migrant Stock: Migrants by Destination and Origin, Table 16, UN Population Division Department of Economic and Social Affairs estimates the are 4.5 million Poles living abroad (12 per cent of resident population); 3.4 million Romanians (17 per cent); 1.2 million Bulgarians (17 per cent)

\(^{21}\) GDP per capita, euro per capita, chain linked volumes, via Eurostat sdg_08_10. Reports 40% growth in GDP per capita in Poland over the last ten years; 30% growth in Romania and 27% in Bulgaria compared to 5.5% for the UK on the same measure.

\(^{22}\) Dhingra et al (2016), The impact of Brexit on foreign investment in the UK, [https://cep.lse.ac.uk/pubs/download/brexit03.pdf](https://cep.lse.ac.uk/pubs/download/brexit03.pdf)
infrastructure to ameliorate impact that Brexit will have on the supply of intermediate and higher technical skills.

**Higher education: high costs and exacerbating ‘over-education’**

30. The higher education system has been an unintended supply for intermediate skills roles. At the the ‘higher technical’ level (levels 4 and 5 of the Regulated Qualification Framework), there is a past pattern of using degree-educated graduates (level 6 on the Regulated Qualifications Framework) to meet many of these demands. A continued expansion in the graduate supply could compensate for a shortfall in domestic skilled labour supply around technical roles. Although graduates may not have skills aligned to those roles, their higher levels of human capital may allow for sufficient adaptability to perform in them. In practice, this argument fails on the ground of feasibility, efficiency and efficacy.

31. On feasibility, HE participation has recovered well from its fall following the move to the current tuition fee cap, reaching a new high 49.8% on the 2016/17 HE Initial Participation Rate. While further progress may be achieved, it is unlikely that a substantial upward shift in participation is achievable unless we have a substantial change to the financial regime. At the same time, demographic trends over the coming years will not allow for a substantial increase in the volume of participation; in fact, DfE forecasts for OfS funded full-time HE undergraduate course entrants suggest a decline over the years to 2022/23 driven primarily by declining cohort population.

32. In terms of efficiency, any increase in participation that could be achieved would at the very least incur significant Exchequer costs given the current estimated RAB charges. Current estimates from DfE is that students on full-time HE courses will incur a 45% RAB charge; this level has grown in recent years, in part because of disappointing improvements in graduate earnings since the end of the 2008-09 recession. This level of the RAB charge means that although students pay a high cost through tuition fees, the effective level of public subsidy also remains high as well.

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24 DfE Student loan forecasts, England 2017-18, “the number of 18-24 year olds [entering HE] is expected to fall by 5% between 2017/18 and 2021/22”.
Finally, in terms of efficacy, there is already substantial evidence that skills mis-matches are frequent within the UK labour market. The latest analysis by the ONS, comparing workers’ qualifications to their occupations, has 16.1% of workers overeducated and 15.1% undereducated in 2015. As we have already seen, technical roles already face high levels of employer-reported skills shortage despite the perception of an ‘overeducated’ workforce, casting doubt on the ‘adaptability’ thesis.

Leaving aside the contestable arguments of overeducation, an important rationale for the technical education reforms is to create a labour market at levels 4 to 5 (T Level ‘Higher Technical Level’), responding to a long-identified need to develop this part of the English technical education system.

Institutes of Technology (IoTs) may help fill some of this gap, but more needs to be done to support all colleges to expand their higher technical offer. Revenue funding for colleges and IoTs needs to be put in place to help develop a more substantial higher technical offer.

Current study programmes and new T Levels are unaffordable, even at maximum efficiency

AoC carried out research into the costs of running study programmes and T Levels in the following subject areas:

- Engineering
- Construction
- Science
- Digital
- Business Administration

This research is applicable to both technical, applied general and other study programmes as they are funded by the same rate per hour and use

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28 https://www.ifs.org.uk/publications/10531

29 Smith and White (2017) Where do all the STEM graduates go, https://www2.le.ac.uk/departments/sociology/people/pwhite/TheemploymenttrajectoriesofSTEMgraduatesFINALREPORT20180801.pdf


the same programme cost weighting factors. It will also apply to the proposed transition phase programme which be an important pipeline in to T Levels.

38. These subject areas were chosen to provide a wide range of assumed delivery costs per programme.

There is no official guidance to colleges on budget setting, but work carried out by McKinsey\(^\text{32}\) for HM Treasury in 2015 confirmed that the main drivers of teaching costs are:

- Staffing mix.
- Teacher salaries.
- Teaching contact hours.
- Class or group size.
- Teaching hours per learner.

Our research collected the actual teaching costs by undertaking deep dives in to a group of colleges from across England. Only direct delivery costs (primarily teacher/technician pay plus direct non-pay costs) were collected.

This model does not cover the full costs of running colleges. Colleges are self-governing organisations and have full responsibility for the provision of education and everything that supports it.

This means that college income needs to cover a range of non-teaching costs including:

- the costs of running buildings (premises, maintenance and security).
- administrative services like finance and HR, IT, enrolment and examination administration.
- support services to students including guidance, careers advice and mental health services.
- catering and transport subsidies for lower income students where these are not covered by grants.
- employer engagement and work experience co-ordination.
- enrichment courses.
- the revenue costs of keeping buildings and equipment up to date (capital finance, depreciation).

\(^{32}\) BiS (2015), DFE and HMT Joint review of further education cost drivers.
• contributions to cover the costs of pension deficits.
• management costs.

These costs typically account for 50% of a college’s income which means that courses need to make a minimum 50% contribution after teaching costs to avoid a loss. This model is under pressure with recent pension increases and on-going inflation.

39. We then created viability models using two sets of class size data:

• average class sizes from the research group.
• class size data collected in 2018 from a national class size survey.

The model used current staff utilisation data (98%) which shows that colleges are already operating at capacity when it comes to deployment of teaching staff.

This class size data identifies the average, maximum and reason for maximum class size by level and subject sector area. In most cases the reason for the maximum class size at level 3 (differentiated by subject) was due to physical or health and safety restrictions in classrooms workshop spaces. Class sizes and maximums are typically smaller for more ‘specialist’ provision such as engineering and larger for more general provision such as business studies.

The results of this analysis are show in the following table. This shows that all five programmes make a contribution below 50% which means that they do not make an adequate contribution to central running costs and are therefore loss-making but to varying amounts.

Key findings:

• Our small sample of colleges achieve an average class sizes of 17 in each of the five learning areas. On current funding rates and cost weighting factors and the new T Level formula, this produced contribution rates ranging from 44.6% in digital to 31.6% in science.

• The national data for current class sizes for a wider range of colleges are lower than our sample, ranging from 16 in digital to 12 in construction. This reduces contribution rates to a range of 41.5% in digital to 19.3% in science.
• A very small number of colleges in our national survey achieve higher class sizes in the five areas, ranging from 18 in construction to 20 in digital. The second table describes the sectors maximum class sizes. This represents the maximum number of students that can be occupied, due to health and safety or physical constraints.

• If these were achievable in all college across the country, then this would secure a contribution rate just over 50% in two areas: business administration and digital. The other three areas would still have contribution rates well below that level, Construction and Science being both below 40%.

<table>
<thead>
<tr>
<th>Learning Area</th>
<th>Actual Class Size (for the research sample)</th>
<th>National Class Size</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contribution</td>
<td>Cost Weighting Factor</td>
<td></td>
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<tr>
<td></td>
<td>Class Size 17</td>
<td>CWF 1.3</td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>41.4% contribution</td>
<td>Class Size 13</td>
<td></td>
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<tr>
<td></td>
<td>CWF 1.3</td>
<td>26.9% contribution</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>CWF 1.3</td>
<td></td>
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<tr>
<td>Construction</td>
<td>Class Size 17</td>
<td>CWF 1.3</td>
<td></td>
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<tr>
<td></td>
<td>41.1% contribution</td>
<td>Class Size 12</td>
<td></td>
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<tr>
<td></td>
<td>CWF 1.3</td>
<td>21.9% contribution</td>
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<tr>
<td></td>
<td>31.6% contribution</td>
<td>Class Size 14</td>
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<tr>
<td></td>
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<tr>
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<td>Class Size 15</td>
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<td></td>
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<th>% age Contribution</th>
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<td>Business Administration</td>
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40. A number of observations follow:

- It is highly unlikely that all colleges could achieve this maximum class size because of physical constraints in buildings and because of the difficulties associated with recruiting and retaining enough students on new qualifications.

- On three different alternatives in terms of class size, the productivity enhancing STEM subjects are unviable in terms of their contribution to overall finances.

- In the short-term colleges, like other education organisations, cross-subsidise different courses in their portfolio. This is just about sustainable if a course covers a niche subject with a small proportion of total student numbers and can also be done if other activities are generously funded. The financial environment for colleges is no longer benign (if it ever was) and the ambitions to attract more young people to take T Levels suggests the qualifications will occupy more than a niche.

- It is within the capacity of government to adjust the funding rates to ensure that T Levels and study programmes cover necessary costs. One option for doing this would be to increase the cost weighting factors from current levels. We calculate that the cost weighting for digital would need to rise from 20% to 35% to secure a 50% contribution whereas construction cost factors would need to rise from 30% to 100%. We think that cost weightings would create unhelpful incentives for colleges and other providers to run courses and would make the funding system harder to administer. A better alternative would be to increase the core funding rates and adjust upwards a number of STEM programmes.

- Our calculations suggest that the core 16 to 18 funding rate would need to rise from £4000 to £5000 take account of pay trends, pension contribution increases and inflation.

41. There are further issues which will constrain the uptake and viability of T Levels:

- Exit requirements for English and maths will limit the number of students able and willing to take courses due to the fact that achievement and progression rates will be damaged if the student does not pass.
• Placements – limited by the number of local employers regardless of national or international demand for skills.
• Workshops and some classrooms have fixed maximum class sizes. These limits are in place due to both space restrictions and health and safety requirements.
• Colleges cannot currently afford to recruit or retain staff to deliver more specialist areas, let alone to meet the needs of T Levels\textsuperscript{33}.

42. The higher demands and greater specialisms of T Levels will add to delivery costs and result in even greater losses at the current funding rate. As T Levels are introduced, colleges are likely to respond in two ways:

• Limit their commitment to T Levels by putting a cap on student numbers and/or specialisms to ensure viable groups. Colleges have a social purpose but must also be financially responsible. They can only cross-subsidise lossmaking provision within limits.
• Focus delivery on cost-efficient courses. Colleges will be prompted to focus on those T Levels with lower cost or more generic skills outcomes rather than STEM based programmes which are more costly, technically specialist and have high-quality features.

43. Cost and unit price pressure may drive colleges and other providers away from specialist provision as it will be deeply unviable. Without increases in the base rate and programme cost weighting factors, colleges will not be able to supply the range of programmes the economy needs which will damage productivity and exacerbate skills gaps and shortages.

44. A typical engineering workshop will need to be equipped with lathes, milling machines, grinding machines and CNC machines to meet the requirements of industry. Significant capital funding for equipment will be required to meet the needs of industry. The equipment will then need to be maintained, staff will need to be trained, and accommodation adjusted to continue to meet the on-going requirements of employers. Colleges cannot rely on employers to subsidise equipment on a long-term basis.

\textsuperscript{33} \url{https://www.et-foundation.co.uk/wp-content/uploads/2019/05/SIR26-Workforce-Data-report.pdf}
Quantifying increasing skills shortage – a forecast

45. A shortfall in delivery of technical education will have substantial consequences for labour market performance, impeding growth and improvements in productivity. Financial constraints are likely to result in colleges reducing delivery volumes and/or shifting delivery away from more expensive, technically specialist provision. As we have seen in the previous sections, the labour market has a high and sustained demand for roles requiring intermediate technical education. This demand has increased in recent years because the labour market has tightened. Previous reliance on migration or higher education to provide supply is not a practicable way forward in the years ahead.

46. The consequence of a shortfall in delivery therefore seems likely to be an increase in the scale and degree of skills shortage in technical occupations.

47. In this section, we quantify the impact of increasing skills shortages caused to business which result from shortfalls in the supply of new skilled workers with technical education at levels 3 to 5. We model the problem as an increased search cost to employers, representing a deadweight loss as skills move more slowly to their most valuable use. In our model, the deadweight cost to employers is the cost of time resulting from having to wait longer or work harder to find the right workers than they do at present. The components of the analysis are as follows:

- Opportunity costs are modelled on the basis of typical salaries for each route and Level combination, on the assumption that if employers are willing to pay that salary for that role, then they must value its output by at least that much. We apply a 3% increase in salary costs (2% to cover inflation plus 1% real change) for each year from 2018.
- Those salary costs are applied for a ‘time penalty’ from failing to recruit, which is modelled here as a one-quarter increase in the typical time to recruit. Job Posting Analytics measure the median number of days job postings are online, and this provides the baseline for measuring the ‘time penalty’; salary costs are then applied pro rata.
- These opportunity costs are then applied to a modelled estimate of skills shortage vacancies over the period 2019 to 2024. To arrive at this estimate, we use the ratio of job postings to job openings from
2018 and project this forward across openings for the period 2019 to 2024; we then apply the latest (2017) skills shortage densities to arrive at annual estimates of skills shortage vacancies for each year.

48. We use vacancies rather than openings as the measure for this analysis, acknowledging that the primary impact of skills shortages is allocative rather than in aggregate: employers suffer skills shortages wherever they have difficulty in filling new posts, whether these posts are entirely novel, whether they are replacing workers exiting from the workforce, or they are replacing workers moving to other employers.

49. We are not seeking to estimate the current cost of the level of skills shortage, only the marginal increase caused by a deterioration in supply. We assume the opportunity cost of skills shortage only applies to the share of vacancies currently experiencing skills shortage, and do not assume any increase in the skills shortage density. This is a conservative assumption, especially given the densities date from 2017 and the labour market has already tightened since then. Our task here is to quantify the potential impact of a slowing of matching between skilled labour supply and demand, and we leave aside any assumptions about matching challenges becoming more widespread.

50. From this exercise, across the years 2019/2024 the modelled deadweight cost is £3.3 billion; as noted, this is a conservative estimate reflecting a modest increase in recruitment times for only the levels of skills shortage currently reported. As the chart above shows, costs are highest for Engineering and Manufacturing; Digital, and Sales, Marketing and Procurement – each of these would face an impact of around £600 million over the period. There is some variation in the skill levels affected, with Sales, Marketing and Procurement and Digital seeing the largest impacts at ‘Higher Technical’ level, and Engineering and Manufacturing seeing the largest impact at ‘Technical’ level; across all T Level Routes, £2.1 billion of impact is at ‘Higher Technical’ level, and £1.2 billion at ‘Technical’ level. Taken together as STEM categories, Engineering and Manufacturing, Digital and Health and Science see £1.7 billion in estimated impact.

51. FE economic evidence base offers only limited insights on lifetime earnings but HE research shows that degree returns by subject are skewed heavily in favour of more technical skills, with e.g. medicine, economics, computing and business seeing the greatest return and English, creative arts, language
and philosophy seeing low and even negative returns. It seems a reasonable assumption that further education qualifiers see the same pattern, and so a shift from specialist to generic provision will lower the NPV achieved per qualification, representing substantially poorer returns to the student in lower life chances, and to the taxpayer in future fiscal payoffs to the investment in their education. The latest FE Longitudinal Education Outcomes study give strong suggestive evidence in the same direction, with Engineering and Manufacturing Technologies Level 3 qualifier earning a median £27,800 after five years, while the average Level 3 qualifier earns £18,200.

Chart Seven: Projected cost of increased skills shortage

Data: various, see text
Quantifying the return on investment – a forecast

52. The UK government’s Department for Business Investment and Skills (BIS) published research in 2011 which quantified the economic returns associated with different further education qualifications less direct and opportunity costs. BIS updated this research in 2015, calculating that £66,000-£68,000 of net present value is created for every level 3 college-taught qualification started\(^{36}\). The BIS research also found that economic returns for Level 3 apprenticeships was higher with a net present value of £88,000 per aim started, approximately £20,000 more than college taught Level 3 qualifications.

53. T Levels have been introduced in part to help align qualifications to the industrial strategy, to fill skills gaps and shortages and to improve productivity. A key feature of T Levels is a high-quality industrial placement of between 45 and 60 days that are occupationally specific and focused on developing the practical and technical skills required for entry into an occupation.

54. It is clearly too early to assess the economic returns on T Levels, but it seems reasonable to assume that due to the occupational focus of T Levels the Net Present Value per aim will be greater than existing Level 3 college taught qualifications. If T Levels generated an economic return halfway between existing Level 3 college based courses and apprenticeships, for example, this would create an additional £10,000 Net Present Value per aim started.

55. The total long term economic benefits to the economy will increase as T Levels are introduced across all routes and the number of learners taking T Levels increases.

56. For illustration purposes, RCU (Responsive College Unit) have forecast the number of students on T Level courses which are population adjusted using the following datasets:

- Demograhic Trends - ONS National Population projections by single year of age.
- Baseline learner numbers including learners by Technical Route – AoC/MiDES ILR 2017/18\(^{37}\).

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\(^{37}\) AoC and RCU co-operate to collect and analyse Individual Learner Record data directly from colleges via the MIDES service. This provides more up-to-date data than the official ESFA statistics.
57. The analysis sets a minimum baseline of T Level volumes equal to learners currently taking Level 3 core aims that are not Academic or Applied General. This is based on the DfE Progress Measure Eligible Qualifications for both year ending 2016 and 2017. In subsequent years this is scaled up and down according to 16-year-old population changes.

58. In 2017/18, the proportion of starts on the ILR for Academic Aims was 30% and Applied General was 38%. T Level number projections take into account that the new qualifications will be phased in over several years. By 2024/25 the extra demand for T Level is set at 10%, this conservatively anticipates de-funding of a third of applied general qualifications.

Chart Eight: Numbers of students on level 3 courses

59. Combining these participation projections with the net present value premium for T Levels of £10,000 per aim started suggests an extra £1.7 billion in NPV for the economy in 2024/25 and each year onwards.
Conclusions

60. The government has a set of education policies in England designed to support the UK industrial strategy and enhance productivity. These include T Levels at Level 3, Higher Technical Qualifications at Levels 4 and 5 and the National Retraining Scheme for adults.

61. There is firm evidence to support the T Level programme in that there are large, costly and growing skills shortages in key sectors. Technical education is needed to fill current gaps and avoid future ones because unemployment is already low, net skilled migration is likely to reduce and higher education is not suitable as an alternative.

62. Government’s funding plans may undermine this programme because funding levels are insufficient. Funding is insufficient now for all study programmes and will be even more unworkable for T Levels. Specialist technical education comes at a cost. It generally involves smaller groups sizes, world class facilities and staff with up-to-date sector expertise who have the passion and skill to teach.

Recommendations

63. The current base rate is insufficient and will undermine the important T Level reform programme and industrial strategy. A 16-19 base rate increase of £1000 is needed to ensure colleges can viably offer a range of programmes that meet the needs of employers and local communities.

64. Programme cost weightings need immediate review for STEM based programmes.

65. A new capital budget is needed to support these reforms.

66. Further research on the sufficiency and viability of apprenticeships, adult education and college HE programmes needs to be undertaken.

In you have any questions about this publication, please e-mail David Corke, Director of Policy at the Association of Colleges – david.corke@aoc.co.uk.