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TECHNICAL EDUCATION AND THE FURTHER EDUCATION SECTOR

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INTRODUCTION

The UK labour market has a clear need for scientists and for scientifically trained workers (UKCES, 2010). As such, science, technology, engineering and mathematics (STEM) education is an important part of the system. In England, the Further Education sector (FE) is a major contributor to STEM education, and the principal provider of technical education (the vocational strand of STEM). This evidence-based opinion paper provides an overview of some of the major issues facing technical education in FE, with particular focus on qualifications leading to technician roles. We start by describing briefly the scale of technical education in England and how it fits within the broader FE sector, before discussing the demand for these skills in the labour market and how we might judge the quality of provision. We then ask how past and current funding arrangements in FE are likely to impact on the ability of the sector to provide technical education and training at the level and quality demanded by employers, and hence to provide individuals with the necessary skills needed for the labour market.

This paper is in fact a starting point as many of the questions we are seeking to answer require further research and we highlight where there are evidence gaps.

DEFINITIONS AND SCALE OF TECHNICAL EDUCATION

The FE sector in England is a broad church. It offers vocational qualifications (NVQ and BTEC), traineeships, apprenticeships and courses of an academic nature such as Advanced levels (A levels) and foundation degrees. For the purposes of this paper, however, we focus only on technical education, which we define loosely as vocational qualifications taken in STEM subjects. Much technical education is designed to prepare workers for particular technician roles and this form of technical education is a particular focus of this paper: we therefore use the terms technical and technician education somewhat interchangeably.

So what are the technician jobs that these qualifications might prepare workers for? The Standard Occupations Classification (ONS, 2010) defines four minor occupation groups which contain a majority of technician occupations, though within these groups there are occupations which would not be traditionally classed as technicians (e.g. paramedics, which are classified in the same minor group as medical and dental technicians). Technician roles are also evolving. UKCES (2014) suggest that the technical profiles of previously manual crafts occupations have recently increased and will continue to do so, essentially creating new categories of technicians. There is therefore some ambiguity about what constitutes an FE course for future technicians.

In any case progression from STEM vocational qualifications into STEM occupations varies greatly: many individuals with STEM qualifications will not go on to work in technician roles or other STEM occupations (DIUS, 2009). This partially reflects the strong demand for STEM skills in a wide range of occupations (CBI, 2011). Some estimates (Greenwood, Harrison and Vignoles, 2011) suggest that only around 40% of those with STEM qualifications go on to work in STEM professions. Further, those with lower level STEM qualifications, such as NVQ2, are even less likely to go on to work in a science, technology or engineering occupation (only approximately 25% do so). The scale of technical education in FE and its impact on the labour market is therefore difficult to quantify.

We do know that technical education is a relatively small part of the system. In 2010/2011 a total of 6.67 million qualifications were achieved by learners aged 16 and over in FE and of these, only 25% (1.65 million) were classified as STEM (Royal Academy of Engineering FE STEM Data report, 2012, p. 4; the figures are for qualifications taken, not numbers of students). This might give the impression of a sizable STEM education system, however, much of this provision consists of either A levels, or low-level vocational qualifications, rather than technical education. For instance, the Royal Academy of Engineering's FE STEM Data report (2011) indicates that within the FE sector, an overwhelming majority of mathematics or numeracy (92%) qualifications were achieved at or below Level 2. In technology, 72% of qualifications achieved were at Level 2 or below and in engineering this was 64%.

In science and hybrid qualifications (any combination of STEM subjects and numeracy) only 30% were achieved at or below Level 2 but most qualifications in mathematics and science at Level 3 are academic (A levels) rather than vocational.

Apprenticeships are an important source of technician education. Engineering and manufacturing, the core of STEM and technician professions, constitute the third-largest group in the apprenticeship programme: approximately a fifth of all apprenticeship starts in 2012-13 were in this sector. Apprenticeship starts in Health and Public Services constitute 14% of the total number of apprenticeship starts, though not all of them will be in technician positions. Starts in Construction, Planning and the Built Environment constituted 9% of all starts in 2012-13 (ONS, 2013). Clearly therefore a significant proportion of apprenticeships involve training for technician roles. However, there is arguably scope for further growth of technician apprenticeships, particularly in sectors such as information and communication technology (4% of all starts). Further, the vast majority of STEM apprenticeships are at Level 2 and 3, with relatively few STEM Higher Apprenticeships since their introduction (ONS, 2013).

In summary, there is a great deal of STEM provision at Level 2 but only a modest proportion of FE students take higher level STEM courses and a relatively modest proportion of those who do take these higher level courses end up working in STEM occupations, though this varies by particular subject area.

LABOUR MARKET DEMAND

So if the scale of technical education is modest, is this because there is a lack of demand for technical skills in the labour market? Certainly there has been concern amongst academics and policy makers about a "hollowing out" of the labour market, with growth in both low level jobs and in graduate jobs, and reductions in the number of mid-ranking roles thereby reducing demand for intermediate qualifications. Technician roles tend to be at intermediate level and hence this hollowing out has been cited as evidence of reduced demand for technician skills. Against this background however, technicians make an important contribution to the UK economy and, contrary to what is often said, there is evidence of strong demand for technician skills (UKCES, 2011). For example, those working in science, technology or engineering occupations earn on average 20% more than those working in other occupations (Greenwood et al., 2011). Whilst this is an average across all types of occupations and encompasses individuals with a range of qualifications, the premium largely arises at intermediate and lower level occupations consistent with high demand for technician level STEM skills.

The evidence also indicates that many but not all qualifications provide a wage premium for holders if they are in a STEM subject (compared to having the same qualification in any other subject). For instance, engineering qualifications such as City and Guilds or NVQ2 attract a wage premium, though BTECs in technology subjects do not (Greenwood et al. 2011). However, on average most lower-level and intermediate science, technology and engineering qualifications (essentially those used in technician occupations) do attract additional wage benefits, more so in engineering and technology than in science. Some technical qualifications also bestow considerable additional value if they are then used in a STEM occupation. For example, those with HNC or HND qualifications in STEM earn a considerable additional wage premium (11%) if they work in a related occupation (Greenwood et al., 2011). The apprenticeship scheme also produces individuals with skills that are in demand in the labour market at least at Level 3, judging from the relatively high returns to these apprenticeships (McIntosh, 2007).

The main message therefore is that, with few exceptions, it makes economic sense to pursue technician qualifications, particularly if one goes on to secure employment in a technician occupation. It is important to note however, that the high premium for such qualifications arises from strong demand from employers for particular skills embodied in these qualifications. There is good evidence of strong demand for numeracy, mathematical and analytical skills for instance. Further, these skills are in demand across a range of STEM and non-STEM occupations, again pushing up the price paid to workers with these skills. In other words employers may seek workers with STEM qualifications even if they do not need higher level specific STEM skills but rather just want workers with good analytical skills.

The high return to STEM education is of course also suggestive of insufficient numbers of individuals training in STEM. Why, given the high value of technician education, are too few individuals taking such options? There are a number of possible causes for this. Firstly, there is insufficient quantity and quality of scientific and mathematical education at school and so students are not prepared for or interested in pursuing STEM. Secondly, in the case of apprenticeships, despite their strong labour market value, insufficient numbers of employers are willing to provide apprenticeship training. This suggests some kind of market failure since firms seem willing to pay for such skills through higher wages but not willing to provide the opportunity for individuals to acquire them, because of fear of poaching and other costs associated with training. Thirdly, it is also true that young people in Britain are often unaware of the real status, remuneration and progression opportunities of technician occupations (Gatsby, 2014). This is indicative of the disproportionately low social status of these occupations, despite the high level of skill required and the competitive wages paid. This too might limit the numbers going into STEM vocational education and would suggest more could be done to properly inform students of the benefits of these qualifications.

The CBI (2013) reports that the proportion of employers finding it difficult to fill all their technical positions with adequately-qualified individuals (currently reported by firms to be at 25%) is set to grow to 40% in the next three years. Predicting shortages is notoriously difficult so these estimates may not come to pass. However, given that some estimates put the additional number of science, technology and engineering professionals required by the UK economy by 2020 at one million, the risk of a shortage of technicians should not be underestimated. The *Future of Work in 2030* from the UK Commission for Employment and Skills (2014) suggests that technology will continue to be central to UK economic development and to the ongoing changes to the labour market. The report argues that some of the technical skills currently associated with specific occupations (for instance, IT technicians) will be required of a much broader range of employees. In that respect, it is imperative that both the FE and the HE sector recognize and respond to the increase in demand for these skills.

THE QUALITY OF TECHNICAL EDUCATION IN THE FE SECTOR

So what are the main quality issues in technical education in FE? Observing the quality of technical education in FE directly is difficult at scale. FE colleges are now inspected by OFSTED and in their most recent statistical release, OFSTED (2014) report that around one third of colleges inspected in academic year 2013/2014 were in need of improvement or inadequate. These judgments do not however, pertain specifically to STEM provision and hence are of limited use for our purpose. Further one might need to consider whether current OFSTED assessments that were developed primarily for the school environment are entirely appropriate for the quite different environment of vocational education. In order to judge the quality and adequacy of technical education we might need to consider what other additional information we could use, such as student destinations, employer satisfaction and other measures of quality. This is one area where further work is needed to determine how best to judge quality in vocational education and whether one might use the same or different metrics to the quality measures used in the school system.

One could just conclude of course that the evidence presented above of the high value of STEM vocational qualifications in the labour market must indicate high-quality provision. Yet high returns can simply indicate a relative shortage of such skills. It is entirely possible that high returns to technician education may coexist with concerns about quality. That said, the price employers are willing to pay for technical qualifications is informative and does suggest such qualifications on average impart skills of value in the work place. The Royal Academy of Engineering report (Greenwood et al., 2011) did, however, find considerable variation in the return to different types of STEM qualification. For example, in the subject area of engineering a very wide range of qualifications attract an additional wage premium; by contrast fewer qualifications in science confer a wage premium. This may be indicative either of quality differences between different types of qualifications or different levels of demand in the labour market for specific skills. In any case, qualifications that yield no wage benefit at all, particularly at level 2, should be examined more closely since it would appear they have quite limited labour market value.

Perhaps the most major quality issue for technical education is that so much vocational provision is only at level 2. To develop a thriving technical education provision we need to have a larger proportion of training taking place at level 3 and particularly level 4, hence progression from level 2 is key. We also need to further develop the post A level route into vocational training but there are a number of reasons why we don't have large numbers taking this route. Firstly, up to now the school leaving age of 16 has provided a natural break point for those interested in pursuing vocational education to switch to vocational qualifications in FE. These students have tended to take level 2 or at best level 3 qualifications in FE. Progression beyond that to level 4 has been relatively limited, partly because such students have often lacked the basic skills (literacy and numeracy) to continue to level 4. Further, students with lower achievement at 16 have tended to follow this route. This is because of the particularly low status of vocational options and indeed reinforces the view that this route is for lower achievers. There are also issues in the funding system that may distort student choices.

The school system is funded more generously than FE and places in schools beyond 16 have been rationed to some degree, thereby ensuring that those with the lowest achievement end up in FE (either for A levels or for vocational qualifications). This prioritization of the academic route continues beyond 18 since HE study comes with considerable financial subsidy. Despite tuition fees, students are actually well supported doing their higher education studies and there is a well-developed financial mechanism for them to repay loans (income contingent loans). Hence at the moment a student with weak attainment at A level still prefers, on average, to continue down the academic route and pursue a degree, even if the returns to some of the vocational qualifications they might take are high. Of course some elements of the vocational system do provide very attractive support for students, such as the apprenticeship scheme. Apprentices are supported with wages during their study. Students are indeed rational and given this, there is excess demand from students for apprenticeships, but this is the exception not the rule in vocational education.

There are also known problems relating to quality with regards to apprenticeships. In particular there is an ongoing need to ensure that quality of provision remains high in the face of rapid expansion of apprenticeships and difficulties getting employers to train apprentices. The Government has responded by attempting to eliminate very short-term apprenticeships which do not provide adequate training or skills development to apprentices, increasing the number and quality of Level 3 apprenticeships on offer and providing better information on choice of apprenticeship as well as routes for subsequent progression. Despite all this there remains a quandary. Governments want to expand the apprenticeship programme, yet the challenge is to ensure that expansion does not dilute the quality of the provision. In particular, the desire to give low skilled school leavers some practical skill and work experience had led to pressure to expand lower level apprenticeships. This carries with it a danger that low-level apprenticeships of variable quality produce apprentices that come onto the labour market with limited skill, which in turn dilutes the "apprenticeship brand".

Another quality problem is that training courses (including some apprenticeships and NVQs) are too narrow to allow a smooth transition from the FE sector into a broader range of occupations, essentially narrowing down the possibilities of employment to those strictly aligned with the studied subject (Skills Commission, 2011) This is not to imply that specialist knowledge and skills should not be at the centre of technical education, but that the set of skills students in education are provided with should be both deep and broad enough to afford them access to more jobs and occupations, especially in the case of employer-led apprenticeships.

POLICY CONTEXT

In terms of policy, FE has long been the Cinderella sector, often overlooked in terms of funding and policy reform. However, there are signs that FE is garnering significantly more attention, with several initiatives and/or policy changes currently or soon to be implemented. Recent developments of note include the creation of University Technical Colleges, as centres of high-quality training in technical professions, based upon collaborations between local schools, universities and employers, all of which become involved in the development of the curriculum and assessment of core and technical skills.

The Government has also introduced ways in which academic and technical education can be blended. Specifically, they have introduced Tech Levels and The Technical Baccalaureate, whereby students will be able to study for a series of recognized Level 3 vocational qualifications alongside core academic subjects and obtain the Technical Baccalaureate upon completion of those two components and an extended project.

Again relatively recently the Government has introduced changes to the funding structure of all Apprenticeships, with the aim of increasing employer financial contributions to some apprenticeships and ensuring that employers drive the content of apprenticeships. The strengthening of the Higher Apprenticeships scheme, including the Trailblazers initiative, also attempts to increase the role that employers play in deciding the content and structure of both the classroom-based and workplace-based learning. Indeed employer associations could potentially play a central role in both promoting the value of technical education to students and also in encouraging employers to invest in more technician education, particularly apprenticeships. Sectors that currently have relatively low levels of apprenticeships, such as IT, may particularly benefit from efforts by employer associations to boost the number of firms willing to offer apprenticeships.

Another major policy change that has also been implemented this year is the raising of the participation age to 18. Students will be required to remain in some kind of education or training until the age of 18. Currently around 30% of students leave full time education at age 16. Going forward this group is highly likely to enrol in FE and will potentially want to engage with vocational and technician education. However, this group is low skilled and realistically will have a long journey to a technician Level 3 qualification. Nonetheless this important policy change may well impact on FE provision since accommodating this group and maintaining quality of provision whilst doing so will be challenging, particularly given the financial constraints facing the sector, of which more below.

Some of the policy developments described above appear, at least at first glance, as promising for technical education. The establishment of University Training Colleges (UTCs) seems to strengthen the position of technician education in the system. Described as state-funded technical schools that operate within a partnership agreement with local universities and employers (UTC Brochure, 2013), UTCs are meant to focus specifically on technical and scientific subjects and to provide the higher-level skills that are in demand from employers. Only 17 such institutions are currently functioning, with 30 more planned to open by 2016 (UTC Brochure, 2013). Given their recent development, there is thus far no evidence as to their influence on the provision of highly-skilled technicians in the labour market. They provide, however, an indication that the current Government is interested in expanding the technician education sector, despite the high costs which have been cited as major drawbacks of the scheme (Corrigan, 2013).

Yet these efforts to strengthen the vocational offer, and in particular technical education, come against a backdrop of important changes to funding arrangements, which will affect the entire FE system in fundamental ways. We now consider the challenges in funding faced by FE and the implications for technical education specifically.

FUNDING

The funding challenge in FE remains acute (Keep, 2014). In recent years there has been a sharp decrease in real terms in the funding available for FE colleges in general, and by extension for technician education. The budget for FE has been hit in two ways. Over the period 2010-2015, there will have been an anticipated 25% decrease in the budget of the Department of Business Innovation and Skills for provision in skills and FE, largely affecting older learners. Equally there has been a reduction of just under 8% in the budget for the Department for Education (DfE). However since the DfE kept the schools budget stable, this implies a larger reduction in the DfE's funding for younger learners in FE.

Not all forms of technical education will have experienced a reduction in funding however. Apprenticeship funding was increased, partly to support other initiatives to increase the quality of the scheme. At the same time most forms of adult learning in FE have seen cuts, though again parts of the budget were earmarked for boosting science and innovation, fields directly linked to the training of technicians (Keep, 2014; 157 Group, 2012). Overall there is no doubt that FE colleges are under increased financial strain and this is likely to impact on the provision of technical education. Specifically, it raises the question of whether current arrangements whereby 'cheaper' courses in FE are used to offset the high cost of technical courses will become unfeasible.

Proposed solutions to the funding challenge in FE reflect a growing recognition that the same pressures that have been brought to bear in higher education now apply to FE and that additional funding may need to come from students themselves (BIS, 2013). This was the thinking behind the introduction of loans for advanced and higher apprenticeships for older learners, for instance. At the time there were fears that high-cost apprenticeships, which tend to be high-quality, intensive schemes with high employer involvement and high running costs, would put students off enrolling. Indeed following the introduction of loans uptake was low, with only around 500 loan applications being made in the 2013 year-long trial. The government reversed their position on this and at the time of writing higher-level apprenticeships have returned to being publicly funded (SFA, 2014). This raises a fundamental question about the extent to which we can encourage greater student investment in FE. It is unclear whether the issue is that students are simply not prepared to pay for their FE course or whether the loan mechanism and financial arrangements are insufficiently developed and poorly explained and hence put students off. Perhaps a transparent and properly designed student loan system that is well understood by students could succeed.

Of course some of the motivation for greater student contributions is driven by the standards agenda as well as funding pressures, linking back to quality issues. Introducing a market in FE may result in improved responsiveness and better choice for learners and employers. Further, competition between FE providers for students and the ability of students to purchase their FE qualification from any number of different providers, should ensure that fees are kept at a competitive level. Certainly the theory is that by enabling students to determine where they study they are more likely to secure training that is appropriate, high quality and at the right price. Unlike in the case of HE however, in FE there is a question about the extent to which employers, rather than students themselves, should pay for qualifications. Many students in FE are employed (25% of FE provision is in the workplace) and, particularly given the doubts about securing additional student investment, one might naturally look to employers to contribute to the costs. Further, having the direct involvement of employers might also encourage FE colleges to be more responsive to the needs of employers and encourage innovation in the design of courses, and indeed their delivery. Again, the theory is that the quasi-market approach will ensure that the better FE providers will thrive and grow, and innovative new entrants will compete and push up quality.

The real-life experience of how quasi-markets work in the school system and indeed in HE suggests that there are potential problems and risks with this approach. Student choice is often uninformed or at least determined by factors unrelated to quality, such as location. This dampens any market forces that might emerge. If price competition does emerge and if students find it difficult to judge the long term value of different types of qualifications then it may be that they will tend to opt for the lower cost options, which are generally non-STEM. This risks students being even less likely to choose technical education, despite its benefits. Essential to increasing contributions from students will be regulated information to inform students about the value of technical education relative to the cost.

The assumption that employers will be willing to contribute more to the cost of training is also potentially problematic and needs to be tested. It also raises a number of specific issues for technical education. First there is the poaching problem. If employers pay for workers to be trained in technician skills, the employee may be lured away by other firms. This is more likely to happen when skills are in short supply, as appears to be the case with technician skills. Second, the price of delivering technical education is already high[1] and is likely to steadily grow as the different technical occupations (and implicitly courses) become more specialised and as employers expect higher levels of skill from technicians. It remains to be seen whether employers will be willing to bear the cost of this training without state subsidy. Mason and Bishop (2010) found that training volumes are decreasing and have been doing so on a long-term trend that predates the occurrence of the 2008 financial crisis. If the overall skills system becomes demand-led, then the sector may well shrink if employer demand is limited.

Employer-led provision is however, also a quality issue. Attempts to get employers more involved in the design of vocational qualifications have been long standing, with sector skills councils being the latest attempt to do so. Despite this, employer involvement in England is weaker than in many other countries. Clearly one way to increase employer engagement is through the funding system. A demand-led system might make the system more responsive to employers. Equally we must be mindful that employers may underinvest and hence continued subsidy is likely to be necessary in the area of high cost STEM. We can also use other levers. We can provide greater incentives in the tax system for employers and employees to commit their own resources to training. We can find ways of ensuring that when employers invest, they can be sure of reaping a return, either through paying lower training wages or through locking in employees for a longer time period post training. We can also stimulate employer demand for specific types of training through regulation, such as mandated occupational licensing. This may also serve to improve the status of some technical occupations and associated vocational qualifications, which are currently under-valued despite their good labour-market prospects. Some of these alternatives require us to identify the provision we want to subsidise: clearly we do not want to offer blanket subsidies for provision that is not economically valuable. This is however very difficult terrain – manpower planning is notoriously difficult and the appeal of demand led provision is that it avoids the need for this. Going forward at a minimum we must monitor closely the impact of a "demand-led" system on technical education.

Another important issue is the parity between the FE and HE sectors, which is particularly pertinent to technician education. Not only are the two sectors funded at different rates for STEM education but additionally the student support systems for FE and HE are currently quite different, with far higher levels of student support and state subsidy for HE. This potentially provides an incentive for students to undertake higher education instead of technical education, despite the relatively high value of the latter in the labour market. It no doubt costs more to teach an engineering degree at Imperial

[1] Evidence from the 157 Group, a consortium of FE Colleges (157 Group, 2012) suggests that due to the need for laboratory space, specialised and highly paid teachers and smaller group sizes due to health and safety issues, STEM courses in FE are certainly more expensive.

College than a mechanics course in a local FE college and such comparisons are not useful. However, we do need to better understand the real costs of delivering STEM technician qualifications in FE as compared to lower-end STEM (and non-STEM) provision in HE. We need to compare the outcomes from these different types of provision and ask whether a high-quality technician qualification taken in FE is cheaper and provides a higher return than say a degree from a lower ranked university.

In the case of higher education the introduction of higher tuition fees has not yet had a negative impact on demand (Chowdry et al., 2012). This is partly because the design of the funding system has been such that it has protected low income students from the full impact of fees via tuition fee waivers, bursaries and the income contingent nature of loans. It is critical that we learn the lessons from this and ensure that any increased contribution from students for technician education in FE provides sufficient protection and subsidy for lower income students. This is however costly. For every pound spent on HE financial support the government only reaps around 30-40 pence back in loan repayments (Crawford et al. 2014). This raises serious questions about whether we could afford such a system for FE even at lower levels of fees.

Equally we can also learn the lessons from HE about provider behaviour. If an income-contingent loan system is introduced then the implicit state subsidy that this provides (in terms of underwriting the loans) tends to reduce the incentive for providers to compete on cost and for students to purchase on the basis of cost. We might expect to see colleges charging fees up to the maximum allowable by any income contingent loan system and this might substantially increase, rather than decrease the costs of any system to the Treasury. Further, if the returns to some specific technician qualifications are relatively low compared to the cost of delivery then there are serious questions as to whether loans of a substantial nature would be repaid. Society might accept this level of subsidy for some qualifications (perhaps STEM qualifications) given that we expect a high social return on such education. If however, this became a problem across the FE system as a whole, with students generally unable to repay their income contingent loans then the state would save very little introducing this kind of scheme.

CONCLUDING COMMENTS

Much technical education is valuable in the labour market, suggesting that it is high quality or at least producing skills that employers demand. Further, there are a number of recent and potentially exciting policy developments that may improve the quality of technical education still further, such as University Technical Colleges and reform to the apprenticeship system. However, despite these positive developments, we have argued that the funding threat going forward poses some significant dangers to the quantity and quality of technical education on offer in FE. This is because whilst a demand-led system does have advantages (it may indeed make FE more responsive to employers) there is reason to believe that individuals and employers may underinvest in technical education. In the case of students we deduce this from the experience of loans in FE so far (for adult apprenticeships) which students were reluctant to take up loans. For employers, we deduce this from the high return to technician and apprenticeship qualifications which coexists with the great difficulty of getting employers to fund provision and offer apprenticeship training. Understanding and addressing the market failures that cause this lack of willingness to invest is key.

Just as in HE, there is clearly a need to regulate the supply side, both in terms of the quality of overall provision and in terms of ensuring that FE colleges do not withdraw from STEM education altogether because of high costs. Additionally, a demand-led system needs good information for both students and employers. Further work is needed to provide far better information on the costs and value of technical education relative to other FE and HE options, building on the work that has already been done in HE to improve information available to students. The failure of loans for age 24 + apprenticeships may well reflect confusion on the part of students either about the nature of the loans or about the value of apprenticeships, or both.

Careful design of the funding system is needed, to both increase the resource coming into FE and to align the incentives the system provides to study in HE or FE. Students should be guided by the appropriateness and value of a particular qualification not differences in student financial support. Yet providing the kind of support that students receive in HE to FE will be very expensive and so employers must play a major role here. Action is therefore also needed to stimulate employer investment and avoid major reductions in the amount of technical education provided. These might include directed subsidy into technical education specifically, tax relief on training, occupational licensing and designing ways to ensure that employers get back a return on their investment and avoid their staff being poached. Options that do not require manpower planning per se are likely to be more successful. In any case, we need a better evidence base to draw on to inform these developments.

Finally, it is worth considering one of the major repercussions of the funding cuts to FE, namely the smaller role the state is playing in the provision of post-compulsory education and training. Politicians need to be aware that in reducing subsidy for FE they are inevitably ceding control too. The state loses its ability to direct investment into areas considered socially productive and FE colleges will develop activities that help their finances rather the social good. They may also be increasingly unable to justify to their funders (students and employers) any cross subsidy of technical education from other courses. These are risks that need careful monitoring.

FUTURE RESEARCH

Our concluding remarks suggest a number of ways in which policy needs reform and to do that we need a better evidence base. FE, and within that vocational and technical education, has historically been an under-researched area. This article has suggested a number of important and pressing research questions which would form part of a research agenda to improve our understanding of this crucial part of the education system.

1. Perhaps the most pressing question is what is the relative economic value of different types of vocational and technical education, as compared to different higher education qualifications? Is the economic return higher for some technical qualifications in FE as compared to some foundation or bachelor degree options and if so what qualifications provide a higher return? To answer this requires research into the relative wage benefits of the different qualifications *and* more data and analysis of the costs of provision. There is already a large evidence base on the wages of those with degrees and various technical qualifications. However, this evidence has its limitations. For example, it does not generally use data on lifetime earnings. Cross section data may misrepresent the lifetime value of different options as wages in some careers grow more slowly, partly because firms continue to invest in workers and hence pay them less in the earlier years of their careers. Secondly, much of the evidence does not account for differences in costs of provision. Thirdly, some of the studies do not fully account for the fact that students taking different options may be different in a number of ways and hence would earn different amounts regardless of their qualifications. Research using longitudinal administrative data on earnings and taking account of the different costs of provision and selection issues is urgently needed.

2. The next urgent requirement is a model of the funding system in FE (a number of models of the HE funding system already exist). There is currently much consideration of the funding problems in HE and discussion of whether we can continue the current level of subsidy. Is this an opportunity to simultaneously consider the funding options for FE and whether we can level the playing field with FE in terms of state funding arrangements? Alongside research into the benefits and costs of different FE and HE qualifications, this requires better understanding of:

- current and potential funding mechanisms in FE and their likely impact on demand;
- the degree of subsidy and cross subsidy currently in the system for different technical qualifications;
- the acceptability of cross subsidy across institutions and subjects;
- the acceptability of charging different prices by subject and institution for the same level of qualification;
- the extent to which we can, and indeed should, prioritise some subjects in FE and not only differentially subsidise them but also enable institutions to charge students different prices for them? Is this level of manpower planning really desirable, feasible and what are the dangers?

3. Another major research question in technical education is why we have observed a significant decline in the numbers of adult students studying part time. This mirrors a marked decline in the number of part-time students studying in HE. There are some obvious potential reasons for having fewer part-time students. First, as has been noted, there has not been parity of funding between full-time and part-time students in either FE or HE. Second, employers may be increasingly less likely to invest in their employees particularly post the 2008 recession. We urgently need research into the reasons for the decline in part-time technical education because if the major cause is lack of employer engagement and funding, this raises serious doubts about a strategy to get greater employer engagement in designing, providing and funding technical education. It also raises the question of what we can do to overcome the market failures that may prevent employer investment in technical education? For instance, are there ways of reducing the poaching problem discussed earlier in this paper? How can we encourage employer partnerships and associations to play a genuine and greater role in the design, delivery and funding of technical education?

4. Lastly other countries have already addressed some of the problems outlined above, including the market failures associated with providing vocational and technical education. We need to learn from their experiences. For this we need research that specifically addresses the question of how other countries have overcome market failures in this area, though ever mindful of other institutional differences across countries and the potential pitfalls of "borrowing" policy from other institutional settings. There is cross-country systems analysis of vocational education already of course but it would be interesting to identify some specific testable innovations from other countries that could be trialed here in England, with the aim of producing robust evaluation of their impact.

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