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Employers and apprenticeships in England: costs, risks and policy reforms

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Abstract

Background: That so many employers in various sectors continue to train apprentices despite incurring substantial costs can be taken as *prima facie* evidence of there being ways to mitigate the investment risk. The main downside in the English apprenticeship system is that the overall levels of employer engagement and training volumes are considered sub-optimal and in reality there is a fine balance which can put the performance of the firm and the wider economy at risk due to insufficient skill development.

Methods: This paper draws on data from the Net Costs and Benefits of Training to Employers series of studies (carried out between 1994 and 2012). Each of the original studies consisted of case studies of employers in particular sectors in which the costs associated with training an apprentice were considered against the benefits employers obtain through this activity during the training period. Data in the original studies was collected in face-to-face interviews with the employers. The data were aligned with an accounting framework that captured the relevant costs and benefits of apprenticeship training from the perspective of the employer. Calculations were carried out to also indicate the payback period (i.e. the period after training has taken over which an employer could be expected to recoup any net cost they had incurred).

Results: We present the most comprehensive available estimates of the net costs of apprenticeship to employers in England to illustrate how costs vary across sectors and how, for most employers, engaging in apprenticeship training leaves them with a net cost at the end of the training period. The extent of this net cost at the end of the formal training period is found to vary substantially by sector and level of apprenticeship and over time, in real terms, the net costs of training have tended to increase across all sectors. Employers reported a range of rationales for training apprentices; from supply-led (e.g. where participation was prompted by training providers offering it for free) to more demand-led (e.g. where employers saw apprenticeship as necessary for acquiring needed skills) reasons. Employer sensitivity to various cost parameters depended upon where on the supply- to demand-led continuum they fell.

Conclusion: Despite various policy changes since the mid-1990s, employers' engagement in apprenticeships in England has not achieved a significant volume and there are still financial risks attached to investing in this form of training. Even with the latest reforms of funding and delivery embodied in the move to apprenticeship standards and the introduction of an employer levy, there is no guarantee that more employers will be willing to train apprentices or that those who already engage will train more. There is a need to consider various ways of reducing employers' risk without inducing unintended behavioural changes that counter overall policy objectives.

Keywords: Apprenticeship, Funding policy, England, Employers, Costs and risks

Background

Increasingly within policy circles across Europe apprenticeships are seen as a near panacea for solving two inter-related problems: (a) relatively high rates of youth unemployment; and (b) ensuring the supply of skills meets the needs of the economy (European Union 2014). Apprenticeships are much more established in some countries than in others. Accordingly, an important policy question focuses on how to develop this form of training in settings where it is not already embedded as a primary means of delivering initial vocational education and training (IVET). The example of England is instructive in this regard. England is a country which had little tradition of apprenticeship training until the introduction of publicly funded modern apprenticeships (MAs) in 1994. Modern apprenticeships—hereafter referred to as apprenticeships—were introduced to fill a gap in skills provision at the intermediate level which was thought to be acting as a drag on the country's competitiveness. Despite some initially promising signs that apprenticeships could increase the supply of vocational skills, policy makers quickly became concerned about both the quality of training and the levels of employer participation and engagement (DfEE 2001).

The past 20 years or so have seen a number of initiatives designed to make apprenticeships better meet employers' needs, and thereby induce employer participation, but results have been somewhat mixed (Hogarth et al. 2014). It has been relatively easy to increase the number of individuals participating in relatively low-skill, low-cost apprenticeships, but much more difficult to increase the numbers working towards completion of relatively high-cost, high-skill apprenticeships. It is the latter which often conforms to the concept of apprenticeship as understood in countries with established systems such as Germany, Austria, and Switzerland. Increasing the number of employers and apprentices participating in apprenticeships of relatively long duration and of relatively high skill remains an aspiration for policy makers even if its realisation has proved to be somewhat elusive (Richard 2012).

By drawing on a series of studies undertaken between the early 1990s and 2012 we can assess how the financing of apprenticeships has affected employer participation, especially in relatively high-cost, high-skill apprenticeships at level 3 and above. The evidence collected from employers indicates that:

1. employers are risk-averse in making investments in apprenticeship training. They want to be assured that they can appropriate the benefits of the training and recoup their investment;
2. employers are sensitive to the costs of training and are reluctant to accrue a net cost at the end of the training period unless they have in place measures that will allow that net cost to be recouped over the short- to medium-term;
3. apprenticeship training, especially at level 3 and above, is often planned on a just-in-time basis where training now is designed to meet anticipated demand in 1–3 years' time. This means there is relatively little slack in the system;

4. persuading more employers to take-on apprentices is dependent upon reducing the financial risk for employers either by: (a) reducing the costs that employers incur in training apprentices; or (b) increasing the costs faced by non-trainers of apprentices.

Creating a new equilibrium where more employers are willing to engage with apprenticeships—especially at level 3 and above—is, arguably, dependent upon being able to reduce the financial risk associated with taking on apprentices. The introduction of an apprenticeship levy is seen by policymakers as one way to increase employer demand for apprenticeships as is the move from apprenticeship frameworks to the development of standards through Trailblazer groups of employers setting out the skill development requirements of apprenticeships, but there are potentially other measures to consider, as well.

This paper draws together the latest evidence on the costs and benefits to employers of providing apprenticeship training and considers how the financial risk attached to this training investment might be overcome. We take, as *prima facie* evidence that there are ways to reduce this risk the fact that so many employers in particular sectors continue to train apprentices despite incurring substantial monetary costs. Nevertheless, we see that even when employers are inclined to train apprentices there is room for them to do more. In reality, employer engagement is very finely balanced which can put firm performance and wider economic performance at risk due to inadequate skills development.

This paper proceeds as follows. First, we present the theoretical background which substantiates the importance attached to apprenticeships for their role in skill development and economic performance. We describe the evolution of apprenticeship training in England and the UK with emphasis on the volume of this form of training and the uptake by employers. Then, we explain the conceptual framework used in assessing employers' behaviour in relation to training apprentices. Following this we provide an overview of the studies on which we base our analysis before providing estimates of the net costs employers face in training apprentices. We then consider the rationales employers report for their participation (and level of participation) in the apprenticeship programme as well as their sensitivity to costs. In light of our findings, we consider how financial concerns might be addressed in order to increase uptake of apprenticeships by more employers.

Context

Attaching importance to apprenticeships

The standard human capital model assumes increasing, though diminishing, returns to investments in education and training (Becker 1962, 1964; Schultz 1961). It stands to reason therefore, that those investments must have a positive impact on worker and firm output and productivity, otherwise how would the returns materialise? During the 1990s and 2000s, much of Britain's improving productivity performance relative to that of countries such as France, Germany, and Japan, was associated, and perhaps even conflated with increases in the percentage of working age people participating in training and acquiring qualifications (LSC 2007; UK CES 2009). There has certainly been recognition in policy circles, at least over the past 30–40 years, that a principal weakness of the UK's economy has been the country's education and skills system (Finegold and

Soskice 1988; Leitch 2006; Wolf 2011). In particular, that the system, despite massive expansion in the provision of higher and further education, has failed to deliver the vocational skills that the economy values quite as successfully as countries such as Germany or Switzerland. It is no coincidence that these are both countries with well-developed apprenticeship systems. Increasingly across Europe and North America, apprenticeship-style training is seen as a particularly effective means, from both employer and apprentice perspectives, of delivering vocational education and training (VET) (e.g. European Parliament 2014). UK policy makers share this view. The launch of publicly funded apprenticeships in England in 1994, reflected a frustration that the existing VET system was failing to produce the types of skill that would foster growth in relatively high-wage, high-skill employment (Hogarth et al. 2011). By 2015, there was still a firm belief, as signalled in the UK Government's stated ambition to bring about three million apprenticeship starts over the period 2015–2020, that apprenticeships provide the country with the best opportunity, certainly at the intermediate skills level, to equip itself with the type of skills that will provide it with some kind of competitive advantage (BIS 2016).

Apprenticeships in England provide an interesting example of policy invention and reinvention that, arguably, has never quite succeeded in achieving the goal of providing a mass participation apprenticeship system comparable with those found in countries such as Germany or Switzerland. The reasons for this are multifaceted, including the limited tradition of this form of training in the UK, the relatively poor standing in which vocational education is held, and the level of employer demand for skills. As the next section demonstrates it has been difficult to drive up participation levels.

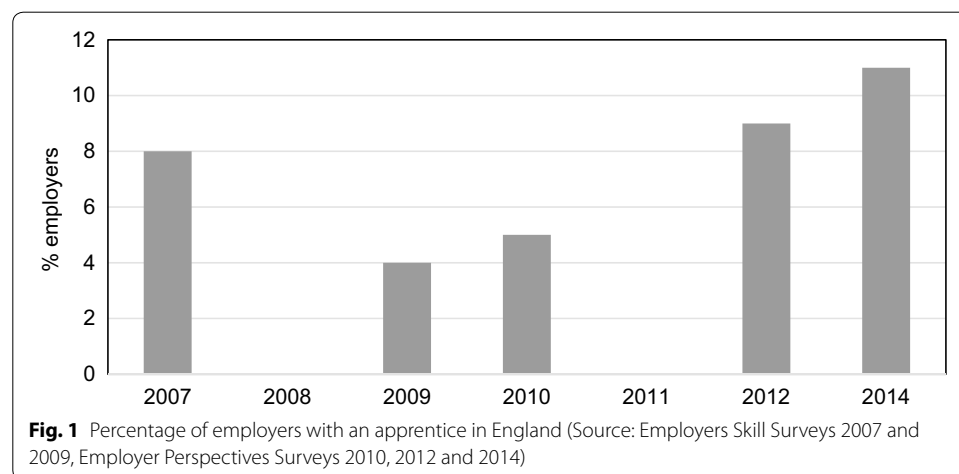
Apprenticeship training volumes

Prior to 1994, when publicly funded apprenticeships were first introduced, England had had an apprenticeship system but it had largely fallen apart by the early 1990s. During the 1970s, the then manpower services commission (MSC) had become increasingly frustrated at the inability of the existing apprenticeship system to recruit a relatively large volume of apprentices and at the tendency for companies to use the existing system as means to supply itself with relatively low wage labour. The duration of apprenticeship training was often elongated so that the employers could delay moving apprentices onto full adult pay rates (Haxby 1989). The MSC's frustrations ultimately led to the expansion of vocational education and training in further education (FE) colleges which, even more than the decline in employment in relevant sectors, all but sounded the death knell of traditional, industry funded apprenticeships.

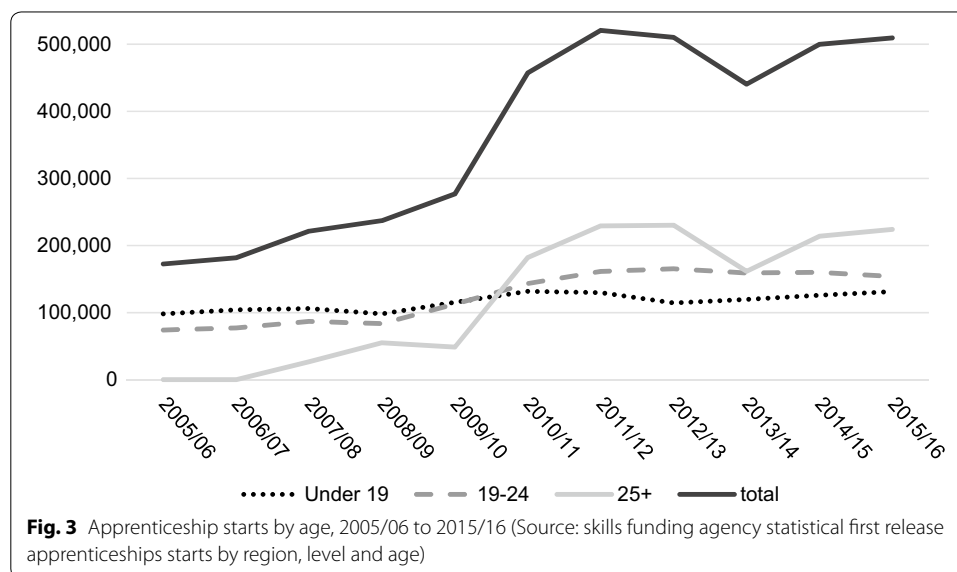
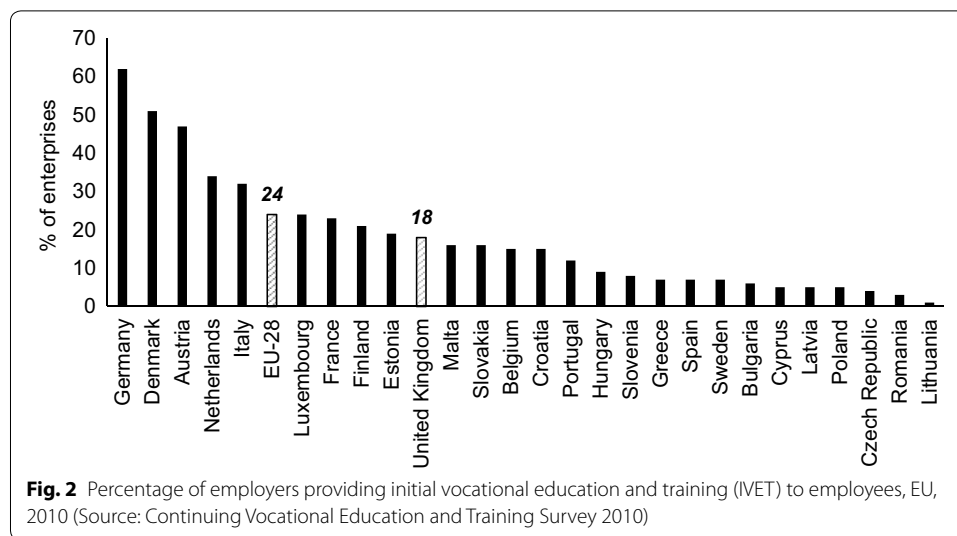
The government's decision to introduce publicly funded apprenticeships in the early 1990s effectively signalled that the expansion of the FE sector over the 1970s and 1980s had not sufficiently increased the supply of the types of skills that would tackle either high and persistent levels of youth unemployment or the country's productivity gap. With the introduction of MAs in 1994 there was every expectation that the introduction of accredited work-based learning, especially in those sectors with little tradition of this form of training, would ratchet up skills supply, in turn, improving company performance and thereby stimulating increased skill demand. Following their introduction, initial signals were positive. Analysis conducted in 1997 and 2003 suggested that MAs had: (a) increased the overall volume of training delivered once deadweight had

been accounted for; (b) resulted in training being accredited where previously it would not have been; and (c) increased the level at which training was being delivered. In a survey undertaken at the time MAs were introduced, around 80% of employers would have taken on apprentices at level 3 in any case (Hasluck et al. 1997).¹ A later study indicated that by 2003, when MAs were more established, 54% of employers providing training leading to a level 3 apprenticeship would have provided that training in the absence of MAs (Riley and Metcalf 2003). The equivalent figure for level 2 apprenticeships was 44%. At face value the evidence suggests that in their early days, MAs had increased employer participation in apprenticeships. The survey evidence also points to qualitative gains too, including the use of externally accredited qualifications (i.e. NVQs) and use of more structured training. But even if there were modest gains over the early stages, more recent evidence points to low percentages of employers, at any one point in time, reporting that they were currently training an apprentice—a high point of 11% was reached in 2014 (see Fig. 1). This compares with an EU average of around 24% of employers IVET to employees (Cedefop 2014). In fact, employers in England would appear to have an aversion not just to apprenticeships but IVET in general when compared with EU counterparts (see Fig. 2).

To some extent the early stages of the publicly funded apprenticeship programme exemplified a desire to gain volume. Training providers, funded directly by government to deliver apprenticeships, were signing up employers to take on apprentices based on the promise that it would cost the employer little or nothing. Moreover, the employer could register existing employees as apprentices to accredit their existing skills rather than confer new ones upon them. This, to be fair, is something of a caricature of the system but it captures the essence that too much apprenticeship training was taking place that failed to substantially add to the stock of skills held by the individual and, in aggregate, the economy as a whole. Figure 3 shows the trend in apprenticeship starts over time. Much of the growth has been amongst those 25 years of age and older, many



¹ 12% of employers said they would not have taken on apprentices, and of those who would have taken on apprentices, a further 4% of employers overall said they would have taken on fewer employers, so the estimate of additionality is 16%.



of whom are likely already employees of the company: 64% of apprentices were already employed by the training company before starting their apprenticeship and this rises to 91% for those aged over 25 years of age (Ipsos 2014). As will be seen, offering apprenticeships to existing employees is a relatively risk free decision for the employer, especially considering the speed at which such apprenticeships can be completed.

Conceptual framework and approach

How might one begin to explain employer participation in apprenticeships? There is a substantial corpus of research that has sought to explain the types of vocational education and training employers are willing to invest in, and their reasons for doing so. Wolter and Ryan (2011) highlight that whilst human capital theory does not offer a specific theory for apprenticeships, this form of training has been used to illustrate various

predictions of human capital theory and has also stimulated development of further implications of the theory. Human capital theory implies that employers are willing to pay for training that provides them with non-transferable, organisation specific skills but not training that delivers skills that can be readily transferred to other organisations (Becker 1964; Schultz 1961). Whether any training is actually firm specific is a moot point, it is certainly the case that apprenticeship training is mainly concerned with delivering transferable skills. In a perfectly competitive market, employers providing apprenticeship training would need to ensure that at the end of the formal training period they had accrued no net cost. If there was a net cost there would be no way of recouping it in the post-training period, since the only means of doing so would be to pay former apprentices a wage below their marginal product. Since employers not engaged in apprenticeships would be able to pay a wage equal to the ex-apprentices' marginal product, the ex-apprentices would move to them. The way around this dilemma is for the employee (or apprentice) to implicitly fund their general training by accepting a wage in the training period that is equal to their marginal product less the cost of training. To avoid the training wage becoming unfeasibly low, the State has subsidised the cost of apprenticeships by paying for much of the direct training. But even then employers are observed to pay for a large part of the costs of the apprenticeship given the sizable net costs that accrue to them at the end of the formal training period (Gambin and Hogarth 2016). Wolter and Ryan (2011) analyse firms' behaviour in offering and financing apprenticeships, setting out the various implications of the training literature and human capital theory for this form of training. Amongst the explanations of why employers would be willing to incur significant net costs at the end of apprentices' training period, are the following:

1. where labour market institutions bring about a degree of wage compression and encourage employers to invest in general training because there is a greater incentive to train unskilled workers (Acemoglu and Pischke 1999);
2. informational asymmetries resulting in non-training firms being unaware of the value of training delivered by the training firm such that the net benefits an employee can obtain by switching employers is reduced (Katz and Ziderman 1990; Barron et al. 1999);
3. the bundling of transferable, generic skills in a way that they are near organisation specific (Lazear 2009; Gambin and Hogarth 2016);
4. the presence of non-remunerative factors—at least in the initial post-apprenticeship period—developing a bond between employer and apprentice that contributes to high retention rates post-training (Hogarth et al. 2012a, b).

From the foregoing, employers will be able to accrue a potentially substantial net cost at the end of the apprenticeship if they are able to place their own stamp on apprenticeships so that the non-training employer may have a degree of uncertainty about the skills that the apprentice has acquired. The 'stamp' becomes all the greater the longer the training period. A longer training period entails greater costs for the employer, making the level of investment riskier which inhibits investment by employers.

Data collection

To consider the investment decisions of employers, we draw on data from the net costs and benefits of training to employers series of studies (hereafter the Net Costs Studies) (see Hogarth et al. 1996; Hogarth and Hasluck 2003; Hasluck et al. 2008; Hogarth et al. 2012a, b; Hogarth and Gambin 2014). The first of these studies was undertaken in 1996 and further studies in: 1998; 2003; 2008; and 2011/12 (with some later publication). Each study consists of case studies of employers in particular sectors in which we consider the costs associated with training an apprentice under a given apprenticeship framework (i.e. the rules governing the content and structure of training to be delivered). The exact sampling design for each study over the years has differed with regards to some specific details however the initial sampling frame was obtained from administrative records (i.e. supplied by the skills funding agency) or the employer skills surveys and employer perspectives surveys. All sources provided a sample of employers that currently or recently had employed and trained apprentices. The goal for each study was to obtain a target number of interviews with employers in each sector and also across different sizes of employers and different regions.

Face-to-face interviews were held with the person responsible for apprenticeship training in the workplace as well as with those responsible for delivering specific frameworks, such as the supervisors of apprentices. In a given sector, the focus is upon apprenticeships that in some way reflect the main types of job carried out in that sector. In this way, the employer-provided responses were indicative of their core training activity or the training in the core area of their business. So, for instance, in the engineering sector, the emphasis was upon production engineering jobs, and in retailing, on customer service roles. Table 1 shows the sectors covered in the various studies and the framework focus of the employer case studies. In any given year of study a minimum of eight employer case studies were conducted. Given this relatively small number of observations the evidence should be regarded as indicative rather than definitive. Whilst not considered representative, the consistency in the approach and the results over a period since the mid-1990s–2012 and across different case study employers provides some assurance that

Table 1 Sector coverage in the Net Costs Studies 1996–2011. Source: Net Costs Studies 1995–2014

Sector	1996	1998	2003	2008	2011	Main sector/framework focus of case studies
Engineering	✓	✓	✓	✓	✓	Production engineering
Construction	✓	✓	✓	✓	✓	Bricklaying/carpentry
Retailing	✓	✓	✓	✓	✓	Customer service
Hospitality					✓	Chef; customer service/reception
Logistics					✓	Lorry driving
Financial services	✓	✓	✓	✓	✓	Financial advisers
Social care	✓	✓	✓	✓	✓	Care assistant
Business services (cross sectoral)	✓	✓	✓	✓	✓	Business administration
Health care					✓	Auxiliary nursing
Accountancy					✓	Accountancy (level 4)

the approach captures meaningful and comparable data providing important insights into employers' costs, benefits and decisions when it comes to apprenticeship training.

Other authors have estimated the net costs to apprenticeship programmes in other countries and in particular, there has been much analysis of the Swiss and German systems (e.g. Schweri et al. 2003; Wolter et al. 2006; Pfeifer et al. 2009; Muehlemann 2014). Studies of these two systems have been carried out since the mid-1970s and since then, a number of surveys of both have been conducted through which the methodologies for capturing and assessing the costs and benefits of apprenticeship training have been refined and the overall methodology of such analyses has been progressed. As noted, a particular strength of a number of studies from Switzerland and Germany, besides there being a longer period of development, is the use of large-scale, representative data. The approach in this paper however is based on employer case studies rather than large scale surveys of employers. Whilst this is a limitation of the present analysis, the data collected in the employer case studies is rich and the research still represents the most thorough and up to date analysis of employer costs and benefits of apprenticeship training in England.

Despite differences in sampling and sample sizes, most cost items captured here are similar to those collected in studies carried out elsewhere. One key common feature across the analysis presented in this paper and work for Germany and Switzerland is that only costs that are directly attributable to the training of apprentices (i.e. that would not have been incurred without apprentices being employed) are incorporated in the cost–benefit calculations. Across all of the studies for England considered in this paper, an accounting framework was used to estimate the net cost of training, where the various cost elements employers face are monetised. These include:

- apprentice wages;
- training course costs;
- supervision costs (time spent by various staff supervising and training the apprentice).

These costs are set against the various benefits employers derive over the training period. These are principally any income received for training an apprentice and the value attributed to an apprentice's productive contribution. The latter is measured by obtaining information from employer respondents about the percentage of the relevant fully trained worker's task repertoire, on average, the apprentice can complete in each year of their training. This is adjusted to account for any time when an apprentice is not engaged in productive work (i.e. when on day or block release at college). This measure is monetised by taking the wage of fully experienced workers and multiplying it by the proportion of their task repertoire that the apprentice can competently fulfil.

The data were collected using a semi-structured interview schedule. Respondents were sent a list of the data required before the interview and at the interview they were shown the results of the cost–benefit calculation to consider whether it accurately reflects the costs and benefits experienced by the establishment (e.g. whether any items are missing in the calculation). Respondents were asked about their decision to invest in apprenticeships, the structure of training, their relationship with their training provider (where one was used), and the benefits they obtained from training apprentices and how these

benefits arose. The data were analysed by summarising the data for each establishment for each topic and placing in a thematic grid. The estimates for costs, benefits and net costs are summarised in the next section. This is followed by a summary of responses to other elements of the case study questions.

Results and discussion

Table 2 shows the extent to which employers sustain a net cost at the end of the formal training period. The amounts vary substantially depending upon whether one is looking at a typical 3-year apprenticeship at level 3 in engineering (£39,600) or construction trades such as joinery (£34,600), or a 1-year to 18 month apprenticeship at level 2 in retailing (£3000) or social care (£3800) or health care (−£750). All figures reported in Table 2 also incorporate the cost of apprentices dropping out of the programme.²

Over time, in real terms, the net costs of training have tended to increase across all sectors. For instance, in 1996, the net cost of completing a Level 3 apprenticeship in engineering was £13,500, in 2003 it had risen to £16,000. By 2008 it stood at £29,500 and in 2011 the net cost had increased to £39,600 (all 2011 prices). In contrast, a level 2 in retailing cost the employer −£308 (a net benefit rather than cost) in 2003, £2350 in 2008, and £3000 in 2011 (all 2011 prices). The increase in net costs has been proportionately greater in sectors with relatively low-cost apprenticeships such as retailing. To some extent the relatively large increase in the net costs to employers in sectors such as retailing reflects the fact that government has ceased to fund apprenticeship training for individuals age 25 years and older where such training was often used to accredit existing skills as much as develop new ones. Increasingly too, government has sought an employer contribution towards the costs of training delivered by training providers previously fully funded by the state. This change in policy is unlikely to account for the increase in the cost to the employer of delivering relatively high-cost apprenticeships such as those in engineering. Rather, it is more likely that the content of such apprenticeships are becoming more demanding resulting in higher net costs accruing to the employer.

Reasons employers are willing to bear net costs of training

The willingness of employers to accept a net cost, of differing magnitudes, is explained at least in part by the rationales they put forward for engaging in apprenticeship training in the first place. As Muehlemann and Wolter (2014) note “the provision of apprenticeship training by firms largely depends on economic factors, such as the costs and benefits associated with training apprentices during the training period, but also on the expected benefits that arise after the training period” (p. 18). Aside from the cost–benefit estimates for employers in England, the reasons our samples of employers provided for investing in apprenticeships typically encompassed one or more of the following:

² Drop out rates were provided by the interviewed employers. Rates varied across sectors and employers. The highest drop-out rate, on average, was reported in hospitality (20%) and the lowest (0%) in social care. The average reported drop-out rate for engineering, construction and financial services was 9%. The average reported drop-out rate was 5% for retail, 2% for transport and 11% for business administration. Most employers reported that drop-out was relatively low for their apprentices and some did not include very early drop outs in their figures. Employers also reported the drop-out figures based on their most recent experiences with apprentices thus the relatively low figures may partially reflect the best scenarios as many employers had done much to reduce apprentice drop-out.

Table 2 Summary of Employers' Net Training Costs in 2011. Source: Net Costs Studies 1995–2014

Sector	Level	Net cost of training	Imputed annual cost
Engineering	2 + 3 (combined)	£39,600	£11,300
Construction	2 + 3 (combined)	£34,600	£9000
Retailing	2	£3000	£3000
Hospitality	2	£5050	£3350
Transport and logistics	2	£6200	£3100
Financial services	2; 3	£7250; £11,400	£5350
Business administration	2	£4550	£3050
Social care	2	£3800	£2550
Health care	2	—£750	—£500
Accountancy	4	£2150	£2150

Data have been rounded to nearest £50. In 2011 prices (deflated using education sector CPI as appropriate)

- To meet current and future skills demand:
 - the need to maintain an inflow of young people being trained in the occupations on which the organisation is dependent;
 - an inflow of new skills—which can be cascaded through the existing workforce—which are incorporated within an apprenticeship;
 - obtaining an optimum fit between the skills of the employee and the needs of the workplace by being able to shape apprentices' and trainees' approaches to their work and the organisation in which they are employed;
 - providing a pool of skilled employees from which supervisors and managers could be internally recruited.
- To aid recruitment and retention:
 - a means of attracting the best quality recruits by being able to offer a period of training leading to a widely recognised qualification;
 - a recognition that people who undertake their initial vocational education and training with a given employer are more likely to stay with that employer;
 - a means of retaining existing staff by providing on-going training designed either to raise their skill levels, or accredit existing ones.
- To meet industry norms:
 - in sectors such as engineering and construction, apprenticeships were seen as the primary means of supplying initial vocation education and training.
- To provide training in absence of better alternatives:
 - for some employers there was no alternative to apprenticeship training if they wanted to develop certain skills (e.g. in engineering/construction), whereas in other sectors there were alternatives available (e.g. retail, accountancy) but the apprenticeship was seen as more cost-effective.

In practice, the reasons varied between types of apprenticeship and were strongly related to the net costs incurred by employers. In practice there were two contrasting

primary models in operation. Firstly, a demand side approach was discernible where employers engaged in apprenticeships because it provided them with the skills they needed to meet their business objectives and because there is no alternative forms of training available. Typically in these cases, the apprenticeship had become the industry standard in demonstrating that the workforce possessed the skills required to undertake work competently. This may be contrasted with the second approach, a supply-led one where training providers were instrumental in persuading employers to engage in apprenticeships rather than provide, for example, unaccredited in-house training. Typically, providers would persuade employers that there would be no additional cost of participating in apprenticeships compared with existing training, but there were additional benefits from making the switch (e.g. in improving staff recruitment and retention).

The demand- and supply-led approaches as described above may be seen as poles of a continuum but are useful in understanding the degree of investment—and thereby the amount of actual skills training—that employers are willing to engage in. The supply-led approach is essentially one designed to persuade employers who have not previously engaged in much structured, accredited training to do so. It is an external agency that is making the case, at least initially, for apprenticeships. In contrast the demand side approach is one that arises internally from within the firm and is related very much to quantifying future skill needs and using apprenticeships to satisfy that need.

It tends to be the case that high-cost apprenticeships are associated with employers that have a demand-led approach, whereas the low-cost ones are associated mainly with the supply-led one. This means, in practice, that many employers, where they are engaged in level 2 apprenticeships are particularly sensitive to the net costs they are likely to face in delivering that training and the capacity of the training provider to deliver and structure training such that many costs the employer might face are offset in some way. As the Government moves to creating a more demand-led approach to delivering apprenticeships, the aim is to ensure that the employer meets proportionately more of the overall cost of training than currently (Leitch 2006; Richard 2012; Hogarth et al. 2014).

Employer willingness to meet relatively high net costs

The example below is typical of the rationale employers engaging in relatively high net cost apprenticeships provided for their investment in this form of training (see Box 1). It is an example of a company working in the aerospace sector where it took a period of 3–4 years to complete the apprenticeship.

Box 1: Employer case study—aerospace company providing level 3 apprenticeships in electro-mechanical trades

The establishment employed 400 people in manufacturing aerospace components. It recurrently recruited around two to three apprentices each year in order to replenish the skills of the workforce and to ensure that upcoming retirees were replaced. At the time of the study, the company had ten apprentices.

The establishment had a long history of training apprentices. It tended to adapt its apprenticeship programme to ensure that it met the standards required by the publicly funded programme but in practice they had had to make very few changes to their preferred mode of training. The apprenticeship was typically 3–4 years in duration with apprentices spending a large part of the first year on block release at a local FE college followed by day release over the remainder of the training period.

The establishment found that the apprenticeship was well suited to their needs. Not only was the apprenticeship adept at delivering the skills that the employer required but it also had the impact of developing a bond between the employer and the apprentice which tended to ensure that the apprentice stayed with the employer at the end of the formal training period. It also allowed the company to train in the way it wanted—the skills being delivered were largely transferable ones across the aerospace industry, but they were delivered in a way that specific to the employer. In other words, the employer was able to imbue its' apprentices in its way of working and its' values. This was important in developing the relationship between apprentice and employer.

The investment in apprenticeships was seen as a long-term one. Whilst the number of apprentices taken on each year was related to the future short-term demand for skills bearing in mind anticipated business and retirements over the next 3–5 years, the apprenticeship programme was also designed to provide a cadre of skilled employees from which future managers and supervisors could be selected. Accordingly various career progression routes were open to apprentices once they had completed their training. This included the opportunity to study at university on a part-time basis—funded by the employer—to gain a bachelor's degree in electrical or mechanical engineering.

The establishment recognised that there was a significant net cost of training apprentices but that this cost could be recouped over time if the former apprentice stayed with the company. Moreover, there was seen to be no alternative to obtaining the skills the employer required other than through apprentices, especially as skills acquisition needed to be tested and accredited.

Source: Net Costs Studies 1996–2014

The cost to those employers providing engineering apprenticeships was relatively high, as Table 3 illustrates. At the end of the formal training period the net cost to

Table 3 Net costs of training an apprentice in engineering at Level 3, 2011. Source: Net Costs Studies 1995–2014

	Year 1	Year 2	Year 3	Year 3.5	Total
Background information					
Drop out rate (%)	11	9	9	0	29
Apprentice salary (£ pa)	£11,423	£13,369	£15,492	£7975	£48,259
Salary of fully experienced worker + NI (£ pa)	£24,831	£24,831	£24,831	£12,415	£86,908
Apprentice productivity (% of skilled worker tasks undertaken by apprentice)	28	54	69	78	
Supervision (per trainee)					
% Training manager's time spent training (pa)	7	7	7	7	
% Line manager's time spent training (pa)	9	6	4	1	
% Supervisor's time spent training (pa)	15	11	10	2	
Training manager's salary (£ pa)	£41,750				
Line manager's salary (£ pa)	£29,600				
Supervisor's salary (£ pa)	£25,800				
Total labour costs of supervision (including employer NI contributions)	£9515	£7739	£6642	£1867	£25,764
Total training costs per apprentice (£)					
Costs of recruiting the apprentice	£750	£0	£0	£0	£750
Course fees	£558	£558	£536	£1081	£2734
Supervision costs	£9515	£7739	£6642	£1867	£25,764
Administrative costs/other costs	£500	£389	£389	£563	£1840
Total cost	£22,747	£22,055	£23,060	£11,486	£79,348
Total benefit to employer per apprentice					
Trainee product	£6299	£12,347	£15,622	£8787	£43,055
Other income (please specify)					
Total benefit per trainee	£6299	£12,347	£15,622	£8787	£43,055
Net cost per apprentice	£16,448	£9709	£7438	£2699	£36,292
Net cost including drop out	£18,179	£10,591	£8114	£2699	£39,582

the employer was around £40,000. Employers recognised that this cost needed to be recouped and were confident that it was recovered in the post-training period because the apprenticeship was instrumental in both providing the employer with the skills it sought, in a way that ensured that they were specific to the way the employer operated and, in doing so, was able to foster a bond between employer and former apprentice that would ensure that the former apprentice would remain with the employer post-training. Moreover the employer saw little alternative to training through apprenticeships: engineering graduates were not suited to the work required on the shopfloor and there were difficulties recruiting fully experienced worker from the external labour market. Hence, the £40,000 net cost was seen as an investment that would generate a return for the employer, but this return would take time to materialise.

Employer sensitivity to training costs, even relatively low costs

In sectors such as retailing, hospitality and social care the rationale for investing in apprenticeships was oriented towards improving recruitment and retention. The duration of training was of relatively short at around 12 months on average, with training delivered almost wholly on-the-job. These were all sectors which experienced relatively high degrees of labour turnover. Offering an apprenticeship to would-be recruits was seen as an important means of attracting better quality of applicants (i.e. someone with relatively good qualifications and the personality type required to work in, for example, retail sales). It was also seen as an aide to labour retention, too. By being able to offer existing employees the opportunity to undertake an apprenticeship—again delivered wholly on-the-job and which included accrediting existing skills—the employer was offering a free good to employees. This was important in signalling to employees that the company valued their contribution to the business which was considered to be a boon to retention. The example below (Box 2) illustrates this type of approach.

Box 2: Employer case study—retailer providing apprenticeships in customer care

The establishment belonged to a UK retail store chain. It had used apprenticeships—level 2 in customer service—as a means of developing the skills that staff needed to work on the shopfloor. The apprenticeship took between nine and 12 months to complete. Staff turnover was considered by management to be high—at 45%—and it had used apprenticeships to try and attract new recruits who were more likely to possess the skills and attributes the company sought. It felt that by introducing apprenticeships it had been able to achieve this goal. Potentially completion of the apprenticeship offered scope for progression into supervisory and management positions should be individual be interested in advancing their careers. Some existing employees had also been placed on apprenticeships in order to accredit their existing skills and provide them with a qualification. This was seen as an important element of the company's human resource development strategy—i.e. the company seen to be doing something for the employee.

Most of the training was undertaken on-the-job though there was some online learning undertaken in the training room. Responsibility for the apprenticeship had been contracted to a private training provider which took responsibility for delivering training and that the various elements of the apprenticeship were completed. The company made no payment for training as all costs of the private training provider were met by the state.

The role of training providers was seen as instrumental in persuading the employer to engage in apprenticeships in the first instance. It was a provider who had indicated how apprenticeships could be accommodated within the business and meet a variety of business goals.

Source: Net Costs Studies 1995–2014

It was apparent that over time the net costs to those in sectors such as retailing had increased. Whereas the data from 2003 suggests that employers encountered no net cost in delivering a level 2 apprenticeship in customer service, by 2011 this had increased to around £3000 (see Table 4).

Arguably, at £3000 the employer would consider the investment in apprenticeship was relatively risk free compared with the engineering example cited above. It was also apparent that employers in sectors such as retailing were particularly sensitive to movements in the cost of apprenticeship training. Whereas employers in engineering had no alternative to apprenticeships as a means of developing the skills they needed—because of scarce supply of skills in the external labour market and the requirement to demonstrate that employees' skills met industry standards—this was not the case in sectors such as retailing. This group of employers reported that at above a certain threshold they would look to alternative models of staff development; usually that of in-house, unaccredited training. Employers in the service sector were particularly aware of the highly competitive occupational labour market in which they operated and this meant that they would have relatively little chance of hanging onto ex-apprentices with improved or new skills that could be used throughout the sector thus making it difficult to recoup any net cost in the post-training period. Employers in engineering or construction on the other

Table 4 Net costs of training an apprentice in customer care at level 2 in retailing, 2011. Source: Net Costs Studies 1995–2014

	Year 1
Background information	
Drop out rate (%)	5
Apprentice salary (£ pa)	£11,056
Salary of fully experienced worker + NI (£ pa)	£11,795
Apprentice productivity (% of skilled worker tasks undertaken by apprentice)	100
Supervision (per trainee)	
% Training manager's time spent training (pa)	1
% Line manager's time spent training (pa)	5
% Supervisor's time spent training (pa)	13
Training manager's salary (£ pa)	£19,000
Line manager's salary (£ pa)	£19,667
Supervisor's salary (£ pa)	£12,400
Total labour costs of supervision (including employer NI contributions)	£3028
Total training costs per apprentice (£)	
Costs of recruiting the apprentice	£0
Course fees	£0
Supervision costs	£3028
Administrative costs/other costs	£11,605
Total cost	£14,633
Total benefit to employer per apprentice	
Trainee product	£11,975
Other income (please specify)	£0
Total benefit per trainee	£11,975
Net cost per apprentice	£2838
Net cost including drop out	£2977

hand could be willing to bear a greater cost at the end of the apprenticeship as, given the nature of the skills and the lower degree of competition in their labour markets, they were more likely to be able to retain ex-apprentices and thus recoup their investment over some time after the end of the apprenticeship. Others (e.g. Muehlemann and Wolter 2014) have also found that the importance firms place upon the cost–benefit ratio (or the net costs or benefits) during the apprenticeship training period varies by the degree of labour market competition in which the employer operates.

Employers providing relatively low-cost apprenticeships at level 2 also pointed out they had limited scope to look to the long-term benefits. Staff turnover was such that many apprentices would leave within a few years and there were limited career opportunities beyond supervisory level jobs. Accordingly the apprenticeship training was meeting a demand for skills that were in immediate demand in the workplace. The apprentice would be able to meet this demand within a few weeks or months of training. So long as that goal was met, the apprenticeship was meeting the business needs of the workplace.

Sensitivity of estimates to cost parameters

Given the relatively small sample of employers on which our estimates are based, it is important to be aware of the sensitivity of these estimates to the various parameters used, particularly in producing sector averages. The estimates provided above incorporate the employer-reported drop-out rates for their apprentices. Overall, the reported drop-out rates ranged from 0 to 20% but the typical level of non-completion is not known with certainty. Where employers encountered low net costs of training apprentices, an increase in the proportion of apprentices that start their training but do not complete it would increase the cost. Take for example a level 2 apprenticeship in retail which, with a drop-out rate of 5% results in a net cost of around £3000 for the employer. If however one in ten apprentices dropped out then the net cost would rise to around £3140 per apprentice trained. A drop-out rate of 20% would imply an average net cost of £3430 and with 50% drop out the net cost would rise to over £4250. For an employer that is highly sensitive to the costs of training, an increase in the net costs attributable to worsened drop-out during the apprenticeship could decrease the likelihood that they would engage in apprenticeships to begin with. Some employers, in sectors where staff turnover is high, noted that putting employees onto apprenticeships often helped improve staff retention, at least for the duration of the apprenticeship. If drop-out were to be higher during the apprenticeship then the firm would incur greater net costs and presumably it would be encountering a higher risk on the investment.

Taking the example of a high-cost apprenticeship employer, such as one training apprentices at level 3 over around 3 years, the average cost estimate of around £39,600 incorporates a drop-out rate for apprentices of around 9%. A lower drop-out rate of 5% would see the net cost estimate decrease by around £1400. If drop out were higher, say at 20% then net costs would increase by nearly £4000 per apprentice. If half of all apprentices dropped out before completing the apprenticeship then the employer would on average incur a net cost of training of around £54,500 per apprentice. Employers engaged in apprenticeship training in engineering and other similar, high-cost sectors, already

report that they put considerable resource into ensuring they recruit suitable candidates and into supporting their apprentices so as to minimise the risk of drop out or non-completion. The rationale for such behaviour is clear when one considers the additional costs that higher levels of drop out could entail for the firm.

Comparison to other systems

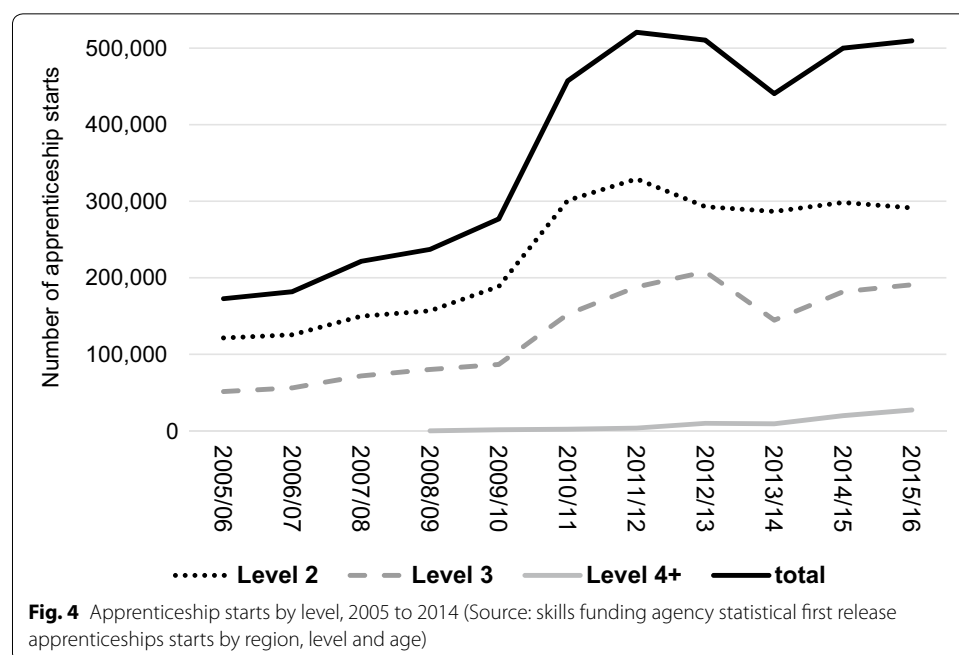
Our results, based on relatively small samples of employers in England, cannot be directly compared with results from studies in other countries that use larger, representative surveys however noting some of the findings from cost–benefit estimates for other systems alongside those for England can be useful nonetheless. Typically, comparisons are drawn between the English apprenticeship system and that of Germany and Switzerland. Muehlemann and Wolter (2014) draw together findings from a number of countries, but especially consider the German and Swiss experiences where a longer history of analysis and larger samples of employer data are available. They highlight the difference in structures of apprenticeship training (including apprentice wages and relative pay levels, use of apprentice labour during the training period, etc.) and political and economic contexts in helping to explain employer behaviour in terms of offering apprenticeships. Some particular comparisons between our research on the apprenticeship program in England and particular aspects found by others for Germany and Switzerland are noted below.

Our research indicates that employers in England are typically left with a net cost at the end of an apprentice's training period and the same is found for Germany (Dionisius et al. 2009). The opposite is true for Switzerland where employers typically at least break-even on their training outlay by the end of the apprenticeship. This difference may be, in part, due to the fact that apprentice wages tend to be higher in England and Germany than they are in Switzerland. Research has found however that the more important difference is that apprenticeship training in Switzerland tends to be organised so that employers can maximise the productive contribution of their apprentices during their training and thereby break-even, or even gain, on their investment by the end of the apprenticeship (Dionisius et al. 2009). On the other hand, apprentices in Germany and England, especially in relatively high-cost apprenticeship sectors, are not engaged in as much productive work during their training. There are some exceptions to this in England however, such as in health and social care where, on average, employers have more than recouped the costs of the apprenticeship by the end of the training period. For level 2 health and social care apprenticeships, many employers reported that apprentices were fulfilling a full job role and thus were highly productive throughout their training. Similarly, for apprenticeships in accounting where employers report that apprentices are engaged in many productive tasks and that despite there being relatively high wage costs, the overall net cost of training is low by the end of the apprenticeship. Employers in England appear to be more aligned with the Swiss approach in the case of level 4 accountancy apprenticeships, for instance, where employers, on average, incur a relatively low net cost (around £2000) and the productive contribution of apprentices is relatively high throughout their training period. The organisation of on- and off-the-job activities and time for apprentices is one means through which employers can reduce the net costs of training they incur by the end of the apprentice's training period.

Changes in policy and public funding over time

Over time apprenticeship policy in England has shown a marked shift. At the beginning the goal was very much oriented towards increasing the number of apprentices and the number of employers offering apprenticeships and, in order to achieve this goal training providers were given considerable leeway in how they signed up employers. Hence the emphasis on relatively short-duration apprenticeships, often delivered to existing employees where existing rather than new skills were being accredited. This was seen to reflect a major failing of the VET system in England—one where provision was determined by the supply side rather than meeting actual employer demand (Leitch 2006). In order to make the system more demand led, employers were expected to make an increased contribution to the overall costs of apprenticeship training. By requiring employers, under certain circumstances, to meet some of the costs of the training provider previously met by the State, it would stand to reason that employers would ensure that the training they paid for met a business need (Banks Review 2010). This was at the core of the decision to route funding for apprenticeships through employers rather than the public funding going directly to training providers (Hogarth et al. 2014). There was also a preference for apprenticeships to be delivered at level 3 and above, rather than at level 2, such that the standard of training had more in common with apprenticeship training in countries such as Germany, Austria, and Switzerland.

Whether the policy shifts have had their desired effect is somewhat moot (Gambin and Hogarth 2015). Apprenticeships at level 3 and above are still a relatively small part of overall provision (see Fig. 4). But the evidence does point to employers increasingly paying more for their training as the Net Costs Studies demonstrate. Whether this has had the desired effect of making training more demand led is also somewhat moot. In many respects, what is most remarkable about employer behaviour observed in the Net Costs Studies is how little it has changed.



In the first net costs study, it was apparent that employers with a demand for level 3 skills, typically in engineering and construction, had translated their existing 'apprenticeship' programmes of training into the newly installed publicly funded MA programme. At the time they saw little alternative to continuing to provide apprenticeships if they were to obtain the skills they needed. If their existing training providers were moving over to MAs, then employers providing apprenticeships might as well do likewise and in so doing benefit from the public funding being channelled through providers. In many respects, for the employer, the most important aspect of the MA was the acquisition of various city and guilds and HNC qualifications rather than the apprenticeship per se. And under the rubric of MAs these continued to be provided; this would still appear to be the case today.

Employers are able to flex the existing apprenticeship frameworks to meet their particular business needs and in doing so obtain training that is uniquely suited to their particular circumstances. They are, of course, willing to pay a relatively large amount to achieve this particular outcome.

There was also a group of employers in sectors which had little tradition of apprenticeship training who were a lot more circumspect of the relevance of this type of training to their particular needs. They were won over by being provided with a form of training that was, more or less, a free good. A training provider would, at no cost, take a leading role in organising apprenticeship training for an employer and ensure that their apprentices met the required standards. And where this training was at level 2 it could be delivered more or less wholly through on-the-job training with little disruption of productive activities. Twenty-five years on the situation would not appear to have changed much at all. This group of employers are paying more but they remain acutely sensitive to the costs of training and whether they will be able to quickly recoup any net cost at the end of the formal training period. This is because there is little scope to recoup any costs over the longer-term, so training remains low cost, delivered on-the-job, and predominantly at level 2.

Fast forward to 2017 and the enduring problem appears to be same as in the mid-1990s when modern apprenticeships were first introduced: how to persuade more employers to offer apprenticeships at a higher level. The funding of apprenticeships would appear to be a large part of the problem; an issue that has remained a central policy focus and is a key part of apprenticeship reforms as evidenced by the introduction of the apprenticeship levy on employers.

Conclusions

This paper has sought to show that the main problem facing apprenticeships in England is the difficulty of persuading more employers to participate in this form of training. At the current cost to the employer the level of demand for apprenticeships remains subdued. This is because employers are risk averse when it comes to investing in apprentices, especially where the level of investment is relatively high. Some employers have developed the means to ensure that they can recoup the costs or appropriate the benefits of their training investments but these are likely to be a relatively small group that recurrently take on apprentices. If the financial risk to the employer could be reduced in some way then this should increase the demand for this type of training. At the moment

apprenticeship policy is very much oriented towards the employer meeting more of the overall cost of training via employer routed funding model and the new apprenticeship levy.³ Unless these changes to funding apprenticeships however are able to reduce the overall cost of the apprenticeship to the employer sufficiently so that even where the employer is meeting more of the overall cost, the cost to the employer is lower than hitherto, then the net impact of the reforms on employer participation levels is still uncertain. Whilst the levy takes away some of the risk of trained apprentices being poached by non-training employers since all employers will pay at least some of the costs of training (whether they choose to employ apprentices or not) it may not be an adequate mechanism for altering the behaviour of all (or even many) employers (or at least not in the way intended by policy).

One of the ways in which employers' costs can be reduced is through reducing some of the direct costs, such as apprentices' wages, but this may make apprenticeships less attractive to would-be apprentices, especially those of a quality sought by employers. Reducing the amount of off-the-job training (and at the same time increasing the amount of time in which apprentices are engaged in productive tasks in the workplace) would also reduce costs, but in some sectors the amount of off-the-job training is either already considered to be at a minimum (e.g. in hospitality or retail) or is considered essential given the nature of skills and knowledge to be acquired (e.g. in engineering and construction). Alternatively, if apprenticeships could be made more bespoke to the needs of individual employers then by limiting the mobility of apprentices post-completion the employer has more of an opportunity to recoup its investment. This appears to underlie part of the reforms within the apprenticeship system with the move from frameworks to employer-led and employer-designed standards. Aside from this, and as noted earlier, most skills in practice are transferable; it is the way that they are bundled together that makes them more organisation or sector specific. It is likely that this bundling or specificity of skills sets along with other measures used by the employer to establish a bond with their apprentice helps to explain why many employers in England continue to incur significant net costs of training despite the country having little labour market regulation in comparison to other countries. Of course, limiting apprentices' mobility comes with some adverse allocative impact however gains are to be made in terms of overcoming skills mismatches reported by employers and providing the skills firms may need to move up the value chain and to enter other market segments. It may be that a degree of labour market mobility needs to be sacrificed if apprenticeships are to be taken up by many more employers than currently but this may be partially offset by employers offering their ex-apprentices further training opportunities and progression within the business, too.

Abbreviations

FE: further education; HNC: higher national certificate; IVET: initial vocational education and training; MA: modern apprenticeship; MSC: manpower services commission; NVQ: national vocational qualification; VET: vocational education and training.

Authors' contributions

The manuscript has been co-authored by LG and TH. Both authors read and approved the final manuscript.

³ All employers with a payroll of more than 3 million GBP pay a 0.5% levy.

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References

- Acemoglu D, Pischke JS (1999) Beyond Becker: training in imperfect labour markets. *Econ J* 109:F112–F142
- Barron JM, Berger MC, Black DA (1999) Do workers pay for on-the-job training? *J Hum Resour* 34(2):235–252
- Banks Review (2010) Independent review of fees and co-funding in further education in England: co-investment in the skills of the future. Department for Business Innovation and Skills, London
- Becker G (1962) Investment in human capital: a theoretical analysis. *J Political Econ* 70(5):9–49
- Becker G (1964) Human capital: a theoretical and empirical analysis with special reference to education. The University of Chicago Press, Chicago
- BIS (2016) English apprenticeships: our vision 2020. Department for Business, Innovation and Skills, London
- Cedefop (2014) On the way to 2020: data for vocational education and training policies. Country statistical overviews—update 2013. Publications Office of the European Union, Luxembourg
- DfEE (2001) Education into employability: the role of the DfEE in the economy. Speech by David Blunkett to the institute of economic affairs, 24 January 2001
- Dionisius R, Muehleemann S, Pfeifer H, Walden G, Wenzelmann F, Wolter S (2009) Cost and benefit of apprenticeship training: a comparison of Germany and Switzerland. *Appl Econ Q* 55(1):7–37
- European Parliament (2014) The EU's youth initiatives: focus on education and employment. European Parliament Briefing, October 2014. European Parliamentary Research Service, PE 538.949
- Finegold D, Soskice F (1988) The failure of training in Britain: analysis and prescription. *Oxf Rev Econ Policy* 4(3):21–53
- Gambin L, Hogarth T (2015) The costs and benefits of apprenticeships to employers: policy, funding and training quality. In: Shipton H, Budhwar P, Sparrow P, Brown A (eds) *Human resource management, innovation and performance*. Palgrave Macmillan, London
- Gambin L, Hogarth T (2016) Employer investment in intermediate-level STEM skills: how employers manage the investment risk associated with apprenticeships. Gatsby Foundation, London
- Hasluck C, Hogarth T, Pitcher J, Maguire M (1997) Modern apprenticeships: survey of employers. Department for Employment/HMSO, London
- Hasluck C, Hogarth T, Baldauf B, Briscoe G (2008) The net benefit to employer investment in apprenticeship training. Apprenticeship Ambassadors Network/Department for Education and Skills, London
- Haxby P (1989) Apprenticeship in the United Kingdom: from ITBs to YTS. *Eur J Educ* 24(2):167–181
- Hogarth T, Gambin L (2014) Employer investment in higher apprenticeships in accounting. BIS Research Paper Number 175. Department for Business, Innovation and Skills, London
- Hogarth T, Hasluck C (2003) Net costs of modern apprenticeship training to employers. DfES research report RR418. Department for Education and Skills, Nottingham
- Hogarth T, Siora G, Briscoe G, Hasluck C (1996) The net costs of training to employers (0-11-270926). HMSO, London
- Hogarth T, Gambin L, Hasluck C (2011) Apprenticeships in England: what next? *J Vocat Educ Train* 64(1):41–55
- Hogarth T, Gambin L, Baldauf B (2012a) Employer investment in apprenticeships in the health sector. Department for Business, Innovation and Skills, London
- Hogarth T, Gambin L, Winterbotham M, Koerbitz C, Hasluck C, Baldauf B (2012b) Employer investment in apprenticeships and workplace learning: the fifth net benefits to employers study. BIS research paper number 161. Department for Business Innovation and Skills, London

- Hogarth T, Adams L, Gambin L, Garnett E, Winterbotham M (2014) Employer routed funding: employer responses to funding reform. BIS research paper number 161. Department for Business, Innovation and Skills, London
- Ipsos MORI (2014) Apprenticeships evaluation: employers. BIS research paper number 204. Department for Business, Innovation and Skills, London
- Katz E, Ziderman A (1990) Investment in general training: the role of information and labour mobility. *Econ J* 100(403):1147–1158
- Lazear EP (2009) Firm-specific human capital: a skill-weights approach. *J Political Econ* 117(5):914–940
- Leitch S (2006) Prosperity for all in the global economy—world class skills. Final report of the Leitch review. HM Treasury/Stationery Office, London
- LSC (2007) Skills in England 2006. Learning and Skills Council, Coventry
- Muehleemann S (2014) The costs and benefits of apprenticeship training: evidence from swiss firms. Canadian apprenticeship forum working paper. <http://caf-fca.org/wp-content/uploads/2014/09/The-Costs-and-Benefits-of-Apprenticeship-Training-Evidence-from-Swiss-Firms.pdf>. Accessed 21 July 2017
- Muehleemann S, Wolter SC (2014) Return on investment of apprenticeship systems for Enterprises: evidence from cost-benefit analyses. *IZA J Labor Policy* 3:25
- Pfeifer H, Dionisius R, Schoenfeld G, Walden G, Wenzelmann F (2009) Kosten und Nutzen der betrieblichen Berufsausbildung (costs and benefits of in-company vocational training). Forschungsbericht BIBB 2.1.203. Bundesinstitut fuer Berufsforschung, Bonn
- Richard D (2012) The richard review of apprenticeships. Department for Business Innovation and Skills, London
- Riley R, Metcalf H (2003) Modern apprenticeship employers: evaluation study, research report RR417. Department for Education and Skills, London
- Schultz T (1961) Investment in human capital. Presidential address delivered at the annual meeting of the American Economic Association, Saint Louis, MO, December 1960. *The American Economic Review*, 51: 1–17
- Schweri J, Muehleemann S, Pescio Y, Walther B, Wolter SC, Zürcher L (2003) Kosten und Nutzen der Lehrlingsausbildung aus der Sicht der Schweizer Betriebe (costs and benefits of apprentice training from the perspective of swiss enterprises). Beiträge zur Bildungsökonomie, Band 2, Rüegger, Zürich
- UK CES (2009) Ambition 2020: world class skills and jobs for the UK. UK Commission for Employment and Skills, London
- Wolf A (2011) Review of vocational education: the wolf report. Department for Education/Department for Business Innovation and Skills, London
- Wolter SC, Ryan P (2011) Apprenticeship. In: Hanushek EA, Machin S, Wossmann L (eds) *Handbook of the Economics of Education*, vol 4, 1st edn. Elsevier, Amsterdam
- Wolter SC, Muehleemann S, Schweri J (2006) Why some firms train apprentices and many others not. *German Economic Review* 7(3):249–264

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