APPRENTICESHIP COSTS IN GERMANY, AUSTRIA AND ENGLAND: A MATCHED PLANT STUDY

A REPORT TO THE GATSBY FOUNDATION

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EXECUTIVE SUMMARY

The study provides a comparison of the costs borne by the employer in delivering apprenticeships in two occupations: heating, ventilation and air conditioning (HVAC) engineers and chefs. A comparison is provided across three countries: Germany, Austria and England. The findings are based on case studies of one employer in each occupation in each country. The findings are therefore indicative rather than definitive. The respective employer case studies were matched, as far as possible, by size, product market and local labour market area. The case studies of chef apprenticeship training were conducted in hotels of the same company.

The cost-benefit estimates were derived from using a tried and tested methodology based on the one used by the Federal Institute for Vocational Education and Training (BIBB) in Germany.

The study demonstrates that there are differences in the content, delivery and assessment of each respective apprenticeship in each country. Not least with respect to the way in which the activities of the vocational school are supervised by the employer, or on behalf of the employer, and the way in which apprentices are assessed. In the case of England, the employer appears to face more transactional costs in ensuring that vocational school meets their requirements and that apprentices are ready to commence the assessment process. In the cases of Germany and Austria, the role of the chamber (statutory bodies responsible for overseeing training quality and examinations) removes some of these costs. It is also apparent that in the case of Germany and Austria, more time is spent in off-the-job training than is the case in England.

The costs to the employer of delivering an apprenticeship are relatively high in the case of England as shown in the tables below. These results are presented on a per-apprentice average rate across the entire duration of the training period. This is driven in part by the relatively high wages paid to apprentices, which is not offset by their productive contribution. To some extent this is explained by the fact that the case study of chefs in England was one where the apprenticeship was being used to improve the skills of existing employees whose wages were relatively high, as a consequence, compared to the cases in Germany and Austria, though the duration of training was shorter. In the case of HVAC engineers, the company in England paid the wage it considered necessary to acquire apprentices with the qualities it required.

Cost-Benefit Analysis for Delivery of HVAC Apprenticeships in HVAC Firms

	Value	Germany	Austria	England
Total Costs	GBP	65,218	60,279	121,552
Total Benefits	GBP	50,986	68,255	80,973
Costs-Benefits	GBP	14,232	-7,976	40,579

Cost-Benefit Analysis for Delivery of Chef Apprenticeships

	Value	Germany	Austria	England
Total Costs	GBP	55,833	68,232	67,358
Total Benefits	GBP	50,869	70,617	45,176
Costs-Benefits	GBP	4,963	-2,385	22,182

The results of the study are indicative based on a few case studies. Nevertheless, they indicate that employers in England, compared to their counterparts in Germany or Austria, are at a cost-disadvantage with respect to skill acquisition through apprenticeships.

1. INTRODUCTION

Apprenticeships play a critical role in workforce development by facilitating skill acquisition and easing the transition from school to work. Individuals are given the opportunity to receive structured training while earning real-world experience, and employers can build a skilled workforce tailored to their needs. The skills acquired during training are certificated, which enhances clarity and facilitates better skill matching for individuals and employers. Costs and benefits of operating an apprenticeship system are distributed across individuals, firms and society, which, in turn, are determined by the institutional structures and economic contexts within which apprenticeship systems operate.

In particular, the incentive structure for employers to engage in the apprenticeship system can vary significantly across national settings. In coordinated market economies with strong regulatory frameworks, there tends to be more sustained investment from firms in training and developing their workforces because national or sector wage bargaining reduces the risk of former apprentices being recruited by non-training employers at the end of the apprenticeship. While in liberal market economies, weaker regulatory frameworks, such as the absence of wage bargaining, can disincentivise skill development because employers are wary of the potential for poaching former apprentices (because the public returns are in advance of the private ones). Such distinctions raise important questions about the economic viability and value of apprenticeship training at the firm-level depending upon the type of regulatory framework that prevails.

This report addresses a critical gap in the literature by presenting a comparative analysis of the firm-level costs and the benefits of apprenticeship training in Germany, Austria and England.[1] Through in-depth case studies of matched establishments providing heating and ventilation (HVAC) apprenticeships and chef apprenticeships, in each country, a comparison is provided of the content, structure and costs of apprenticeship training.

RATIONALE FOR PROJECT

In countries with relatively high levels of employment regulation, employers can obtain relatively high returns from apprenticeship training (Muehlemann et al., 2010). Employment regulations impose relatively high adaptation costs on firms (because of the relatively high costs attached to laying off workers and/or recruiting new ones) which can be offset by training apprentices who provide the range of skills to adapt to future change. And because apprentices exhibit relatively low quit rates, recruitment costs are reduced. Labour market institutions in countries such as Germany and Austria, typically referred to as coordinated market economies in the varieties of capitalism literature, also reduce the free-rider problem (Thelen, 2004; Acemoglu and Pischke, 1999). In contrast, liberal market economies, as in the case of England, are less likely to reward long-term investments to training firms. Weaker employment regulation promotes labour mobility such that the firm's hold on its former apprentices in the post-training period is relatively weak. All firms, however, including those in liberal market economies, have a degree of monopsony power which allows net costs accrued during the formal training period to be returned over the longer term. This results from firm-specific mixes of

1 In the United Kingdom, skill development is a devolved power and therefore this study focuses only on England.

general skills (Lazear, 2009), information asymmetries and a range of attachments that the training firm instils in its former apprentices. Other things being equal, any monopsony power is likely to be less in England than in either Germany or Austria because England's liberal market allows for greater mobility and choice among apprentices, reducing an employer's ability, relatively speaking, to retain them after the training period.

There is a degree of uncertainty how the above plays out in practice. At face value, it suggests that the impact will be felt mainly in apprentice volumes by type of apprenticeship. From a theoretical perspective, England will have more people working towards completion of an apprenticeship where training costs can be recovered over the formal training period. This will include apprenticeships below European Qualification Framework (EQF) levels 3/4 and those delivered to existing employees engaging in continuing vocational education and training (CVET). This is largely borne out by the evidence. A relatively significant, though declining, share of apprenticeships in England are below EQF levels 3/4 compared to either Germany or Austria (Steedman, 2010; Cedefop 2021). And provision of apprenticeships as a form of CVET to existing employees is more or less non-existent in Germany and Austria, whereas in England, 37 per cent of employers with apprentices said some of their apprentices were existing employees at the commencement of their training (IFF Research, 2022).

As well as the impact on training volumes, the institutional context within which apprenticeship systems operate may well affect curricula and the structure of provision. Switzerland, a country with employment regulation which promotes labour mobility, has been able to maintain relatively high levels of apprenticeship training at EQF levels 3 and above by increasing the productive contribution of the apprentice while training to reduce the overall cost to the firm relative to the situation in Germany (Dionisius et al., 2009). In England, successive reforms have sought to make apprenticeships more attractive to employers, largely by granting them more influence over their content and structure. This potentially provides employers with the flexibility to reduce the net cost of apprenticeship delivery. Whether these types of reform offset the disincentives to invest in certain kinds of apprenticeships without any diminution of training/curricula content is largely untested.

STRUCTURE OF REPORT

Before providing information on the costs and benefits of delivering the apprenticeship in each country, a description is first provided of the research design and the characteristics of the apprenticeship systems in Germany, Austria and England. This provides the contextual information to assess the training content of HVAC and chef apprenticeships in each country, the costs and benefits to the employer of delivering the apprenticeship, and the institutional supports which might have some bearing on the overall cost-benefit estimates. Finally, a conclusion is provided which summarises the findings from the study and offers tentative explanations for the observed differences in the overall cost of delivering ostensibly the same apprenticeship in each country.

2. RESEARCH DESIGN AND METHODS

MATCHED PLANT STUDY DESIGN

This project utilises a matched plant design wherein similar firms are selected across different contexts to facilitate meaningful comparison. The purpose of the matched plant case study is to test the extent to which different institutional arrangements in place at a country level influence on cost, content and delivery of apprenticeships in a given occupation. In this instance, firm characteristics are matched across Austria, England and Germany thereby allowing the analysis that focuses on the cost of delivery of matched apprenticeship programmes at matched plants. Findings therefore reflect real differences in cost in how the apprenticeship systems are designed and delivered in these particular country contexts. While this approach allows for cross-national comparison to highlight differences in the delivery of particular apprenticeships, it is not representative of the national system nor of all apprenticeships within this track. Instead, this project is designed to indicate the possible areas of difference and similarity across national contexts to test the extent to which different institutional arrangements influence the cost, content and delivery of an apprenticeship in a given occupation.

RATIONALE FOR THE THREE COUNTRY DESIGN

The study addresses the costs of delivering apprenticeships in three countries which exhibit a degree of experimental variation: Germany, Austria and England. England is characterised by relatively low levels of employment regulation, which makes it difficult for employers to recoup their training costs post-training (Gambin and Hogarth, 2017). In Germany, regulation of the labour market inhibits the mobility of the apprentice (and workers more generally) which reduces the number of vacancies to the extent that firms feel relatively more secure in making long-term investments in training. In Austria, firms experience similar training costs to Germany, but there are differences. Apprentice net pay in Austria is relatively high compared to Germany, and the level of public subsidy in Germany is lower. This is partially due to competition between the dual system and full-time vocational schools in Austria. However, a primary reason for the higher wages is the success of Austrian trade unions in negotiating favourable collective agreements, which reduces the risk of apprentices being used to replace regular workers (Wolter and Joho, 2018; Moretti et al., 2017).

The external regulatory environment might explain in part the propensity of firms to invest in apprenticeships, but there are a range of other factors to consider as well, including:

- the inter-relationship between curricula and work organisation (for example, whether patterns of work organisation which require higher levels of skills utilisation are reflected in curricula and/or the delivery of training)
- the economic value of the skills produced
- the extent of cost-sharing between individuals (apprentices), firms, vocational schools and the state in practice
- the efficiency with which apprenticeships are delivered (for example, with respect to the transaction costs between various parties, such as between firms and vocational schools)

- the nature of the social contract within which apprenticeships are delivered (for example, the idea of an apprenticeship as a social good versus that of an investment good).

These are some of the wider interests of the matched plant study. Evidence provided below compares the costs of delivering an apprenticeship in Germany, Austria and England at EQF[2] level 4 along with a comparison of the curricula for: (a) chefs and (b) heating and ventilation engineers (HVAC) in the three countries.

RATIONALE FOR OCCUPATION SELECTION

This project selected apprenticeship training for two occupations: chefs and heating, ventilation and air conditioning (HVAC) engineers at the EQF level 4. These are two apprenticeships which typically require around two to four years to complete. The demand for chefs exceeds supply in many countries. While this should, other things being equal, increase the supply of apprenticeship places, it might in some situations either increase the rate of drop-out because apprentices can find better paid non-training jobs before completing their training, or increase the wages paid to apprentices to retain them in training. Heating and ventilation engineers differ insofar as it is, at least to some degree, a licensed occupation in all three countries where completion of apprenticeship training is a prerequisite to entry. In this case, completion of an apprenticeship is not necessarily optional in the same way as it might be for chefs. There is some variation across countries in the breadth and structure of training content and job profiles.

CASE SELECTION

Case selection is critical in a matched plant study as it enables like-for-like comparison. In the case of chef apprenticeship training, an international hotel chain which employs chef apprentices in their kitchens was recruited to participate in the research project. With help from their corporate offices, hotels from this chain were identified in each country and recruited to participate. In this way the sector, corporate structure and firm size are matched for chef apprenticeship firms in each of the three countries.

In the case of HVAC apprenticeships, small to mid-sized firms are the norm. Three independent HVAC companies were selected for inclusion in the study. They were matched by employment size, range of services provided and location (i.e. non-rural).

DATA SOURCES

Data for this analysis includes desk research and original data collection through interviews with the firms and, in some instances, apprentices undergoing training. Desk research was undertaken to: (a) assess and describe the structure of apprenticeship systems in each country and (b) assess the content of training included in the relevant apprenticeship programmes in each country.

Following on from this desk research, a series of firm-level case studies were undertaken, led by members of the research team based in each country. An approach was used that is based on a methodology that was originally developed in Germany in the 1970s in order to estimate the costs and benefits

2 In England, a Level 3 apprenticeship, sometimes referred to as an advanced apprenticeship, is the equivalent to Level 4 in the European Qualifications Framework (EQF).

to apprenticeship training.[3] This has since been further developed by the Federal Institute for Vocational Education and Training (BIBB) in a number of representative establishment surveys (Pfeifer et al., 2020). Since the 2000s, it is also applied regularly in Switzerland, which also allows for comparisons between the two countries. The BIBB-CBS methodology for estimating the costs and benefits of apprenticeships has been adhered to as far as possible. It has not, however, been possible to fully implement this methodology because the data required to do so was not available in some instances.

In this study researchers undertook interviews with members of staff from each of the single cases applying the BIBB-Cost Benefit (BIBB-CBS) approach as it has been undertaken in previous comparative case study-based designs (Grollmann et al., 2017; Jansen et al., 2017; Jansen & Pineda-Herrero, 2019). This included a qualitative interview with staff and the collection of detailed costs and benefit data for each firm. Interviews at the case sites often included managing directors, human resources officers, members of the finance team and head chefs/fully qualified HVAC engineers.

3 Sachverständigenkommission Kosten und Finanzierung der beruflichen Bildung, 1974

3. COMPARISON OF APPRENTICESHIP SYSTEMS

The following section briefly reviews the apprenticeship systems in the three countries of this study. This includes an overview of the system, its funding mechanisms and governance structures and the role of chambers, responsible for overseeing training quality and examinations, or other intermediaries.

Germany's apprenticeship system is a highly structured, classic dual system with significant involvement by intermediary institutions (chambers). The foundation of the system is the concept of the occupation. Apprentices receive training in a formally recognised occupation that will equip the learner with the abilities, skills and knowledge necessary to work in the occupational field (BIBB, 2024a). In the German model, the federal government, states and social partners cooperate in the apprenticeship system. A distinctive feature is the role of the chambers. The Chambers of Industry and Commerce and of Crafts are formally involved in the development and updating of training regulations (curricula) at the national level. They contribute experts to working groups and committees that, together with employer associations, trade unions (social partners) and government representatives, define and regularly revise the occupational standards and training content. Chambers also ensure that company-based training content is aligned with national standards and participate in pilot projects and quality initiatives.

The Austrian apprenticeship system closely resembles Germany's dual model with significant adaptations in the governance. Responsibilities are split between the Ministry of Economy, which oversees the company-based training, and the Ministry of Education, which oversees the part-time vocational schooling (BIBB, 2024b). Social partners, particularly the Chamber of Commerce and the Chamber of Labour play an important role in the designing of training content and administering the system. The Austrian apprenticeship system is fully embedded within the industrial relations system with apprenticeships an integral part of the formal education system. Wages and employment conditions (including the apprenticeship contract) are regulated by universally binding collective agreements at the sectoral level. The apprenticeship system in Austria, unlike in Germany, competes with a highly differentiated landscape of full-time VET schools, including VET colleges that prepare students for higher education.

A feature of the German model, whereby young people may opt for an apprenticeship after completing general upper secondary education (Abitur) instead of pursuing higher education, is virtually absent in Austria. Instead, VET colleges are the more common pathway for combining general education with the attainment of a recognised occupational qualification, which is in high demand, as graduates from VET colleges easily find well-paid jobs and experience life-time income on a par with higher education graduates (Hefler et al., 2012).

England's apprenticeship system has a more market-driven governance structure, a marked difference from the German and Austrian cases. Instead of chambers or formal social partner governance, England relies on employer groups and state agencies such as the Institute for Apprenticeships and Technical Education (IfATE) (Erickson and Hogarth 2025).[4] Employer groups, or Trailblazers, develop the content of apprenticeships which IfATE then approves. Training is delivered by

4 In 2025, IfATE functions were transferred to Skills England, an agency of the Department for Education.

private training providers or colleges in a competitive marketplace. The government national inspectorate Ofsted (Office for Standards in Education) is charged with quality assurance at the training provider or college, but there is no formal monitoring of training that occurs at the workplace.

There are similarities between the three countries insofar as the state (Federal and State governments in Germany and Austria) more or less meets the costs of the vocational schools/training providers, and firms are responsible for the apprentices' activities within the firm. England differs in that the employer indirectly pays for the vocational element, or at least a part of it, through the Apprenticeship Levy introduced in 2017. The levy is designed to obtain a contribution from larger employers to cover some of the costs previously met by the state; smaller employers are not subject to the levy. The amount of time spent in the vocational schools is at least 25 per cent in the cases of Germany and Austria, though this may be supplemented by other employer-sponsored training, which can bring the percentage of time spent in training as high as 50 (Field, 2018). Whereas in England, the amount of time spent in off-the-job training is more difficult to determine, but the minimum is set at 20 per cent. In England, off-the-job training may be undertaken in the workplace – especially if an employer is also an approved training provider – whereas in the other countries, the off-the-job element is undertaken in vocational schools.

There are a few exceptions that are partly specific to the respective occupations in Austria and in Germany. In Austria, the state largely covers the full costs of the supra-company apprenticeship. Since the early 2000s, especially in the wake of the 2008 financial crisis, there has been excess demand for apprenticeships by young people. In 2008, the Austrian social partners agreed to implement a Training Guarantee which offers a training place in so-called 'supra-company training' sites to every school leaver who cannot find a regular apprenticeship (Atzmüller and Knecht, 2018). Supra-company training provides either (i) the entire delivery of the apprenticeship in a training centre or (ii) training in a simulated company for one year with a view to eventually transferring the apprentice to a regular apprenticeship. Around 10 per cent of all apprentices are enrolled in supra-company apprenticeship programmes. In addition, since 2003, there has been the Integrated Vocational Training (IBA, Integrierte Berufsausbildung) which allows young persons with special needs or school leavers from schools that serve this group to be provided with an extended period of time to complete the apprenticeship or to choose only certain modules. Since 2017, participation in education or training until 18 is mandatory (Ausbildungspflicht bis 18) for everyone who has not completed any form of upper secondary education. Employers must not employ young people below 18 who are not taking part in school-based formal education or an apprenticeship.

In the case of heating and ventilation training in Germany, there is a 10-week programme that takes place in different institutional settings, depending on the respective chamber district. The inter-company training courses (überbetriebliche Unterweisung, ÜLU) ensure that all trainees can familiarise themselves with the relevant skills of their occupation in sufficient depth, regardless of the incoming orders and the main activities of their respective training companies. Financing models vary, but in general, costs are shared between public and private budgets.[5]

5 Costs are partly incurred by the companies (see Annex, Table 4).

4. THE CASE STUDIES

This report is based on data collected from six unique case sites across the three study countries. Each of these cases is an employer offering apprenticeships in HVAC or chef occupations. This section introduces each firm (three HVAC firms and three hotels), providing a short overview of the company and their engagement with the delivery of apprenticeships. The data collected from each of these six cases provide the documentary evidence that will be presented in subsequent sections.

To protect the anonymity of individuals and firms that have voluntarily participated in this research project, some details have been removed and pseudonyms have been applied to each firm. For reporting purposes, cases will be referred to in the following format: Nationality + Firm Type.

HVAC CASES

A summary of the HVAC case sites is provided in Table 1.

Table 1: Overview of HVAC Case Study Sites

	German HVAC Firm	Austrian HVAC Firm	English HVAC Firm
Number of Employees	10	35	20
Current number of apprentices	1	7	2
Geography	Semi-urban	Urban	Semi-urban
Sector	Primarily residential (new and refurb)	Residential (new and refurb)	Commercial and Industrial (new and refurb)
Years in Operation	20+	100+	50+
Motivation	Apprentice training essential for talent pipeline; little or no external hiring	Commitment to the profession	Recruitment and commitment to the profession

GERMANY

The German HVAC firm is based in the Cologne-Bonn region of Germany and has been in operation since the early 2000s. The small firm currently employs ten members of staff, one in the office and nine in the field. The firm offers plumbing, heating and ventilation, and bathroom installations and renovation services, principally to residential clients.

As is common in German craft sectors, a distinction is made between 'journeyman' and 'senior journeyman'. At the German HVAC firm, one becomes senior after approximately five years of professional experience. Senior journeymen take on management roles such as customer service and project planning.

Apprenticeship training plays an important role in the German HVAC firm's operation. Typically, the firm takes on one apprentice at a time in the plumbing and heating installation programme. These opportunities are advertised on the firm's website. The German HVAC firm sees apprenticeships as a means of securing skilled labour in the long term and therefore takes an active role in mentoring apprentices. Typically, apprentices are integrated into teams and gradually introduced to real-world projects under the guidance of more experienced colleagues. Long-term retention is the norm at the German HVAC firm, with every apprentice trained by the firm still in employment there. Hiring external, fully qualified staff would be a challenge due to increased demand for skilled workers and a shortage of skilled labour. The reliance on creating its own skilled labour and retaining them, rather than looking outside, was reflected upon by the Managing Director who explained: 'Ultimately, good people stay where they are and no one will let them leave, and they won't change now either' (MD Interview, German HVAC firm, translated from German to English).

For the days that the apprentices are in the workplace, they work under the instruction of a journeyman. The journeyman explains processes and oversees the apprentices' work. Their work covers the entire range of what the firm engages in, ranging from new installations to services. There is only limited interaction between the German HVAC firm and the VET college where the apprentices receive classroom training. The Managing Director regards it as the duty of the apprentice to make the best use of the VET school instruction. Generally, the firm is satisfied with the institutional setting within which the apprenticeships operate.

AUSTRIA

The Austrian HVAC firm is based in the Vienna region and has been in operation for more than a century. The mid-size firm employs between 30 to 35 members of staff across multiple sites. All members of staff who are based in the offices are fully qualified HVAC engineers, most in plumbing and installation technology or comparable apprenticeships. The Austrian HVAC firm offers a range of services including bathroom installations and renovations, new construction, refurbishment of existing installations, heat pumps and heating systems installation and replacement.

Work is organised around small teams overseen by one of four master craftsmen who serve as foremen overseeing and supporting these work teams. While these work teams are relatively stable, apprentices will rotate between teams to gain broader experience. Apprentices are expected to gain experience across all work areas whenever possible.

At the time of data collection, four members of staff were former apprentices. While apprentices are often retained after the mandatory post-apprenticeship employment period (six months), they generally do not remain with the company long term. Instead, some pursue further education and change career paths or move to larger firms within the same sector. While recruitment is important, the primary motivation for the Austrian HVAC firm to offer apprenticeships lies in a strong sense of identification with the trade and a commitment by management to preserve and further the development of the profession.

ENGLAND

The English HVAC firm is a family-owned company based just outside London. It has been in operation for more than 50 years and provides building and engineering services to commercial and industrial clients, primarily working on large projects such as hospitals and schools. Currently the English HVAC firm employs about 20 people; however, this is down substantially following economic downturns the Managing Director attributed to Covid and Brexit. Approximately half of the staff are 'on the tools' working in the field, while the other half are office staff and office-based engineers. For those in the field, job classifications range from apprentice to plumber, pipefitter or supervisor.

The English HVAC firm has been offering apprenticeships for over 40 years. Talent development and supporting the profession were cited as the motivation for the firm's engagement with the apprenticeship system. As the Managing Director explained, the apprenticeship programme they deliver 'brings new blood into the industry' while allowing the firm to 'mould apprentices to work we do' (MD Interview, English HVAC firm). Currently the firm has four apprentices working on two different programmes.

Although the English HVAC firm does not work in residential heating or plumbing, it trains apprentices through the plumbing and domestic heating apprenticeship programme as there is no apprenticeship available in commercial or industrial plumbing in England. This creates some challenges for both the apprentice and the employer. For example, the apprentice may be asked to submit evidence of work completed within a given time frame – say installing sinks and taps. Domestic plumbers may be undertaking this type of work on a weekly basis, but the flow of work in industrial plumbing means that these types of activities may take place months apart. This requires flexibility on the part of the college, the apprentice and the English HVAC firm, though to date they seem to navigate the issues tolerably well.

The nature of the work at the English HVAC firm means that members of the team are spread across various worksites. Apprentices rarely work alongside other apprentices. Instead, they are distributed across sites and supervisors. The work of the apprentice is overseen by the site supervisor. The content of what the apprentice learns is determined by the various work projects the firm has at a given time. While the English HVAC firm's supervisors will informally assess and provide feedback to the apprentice on their progress, this information is not fed back to the college.

Apprentices who complete their training with the English HVAC firm tend to stay on with the firm. All are offered permanent contracts at the end of their training and nearly all stay for at least a few years. The Managing Director estimates that the average apprentice continues with the firm for three years, after which most leave, not to join a rival firm but to establish their own business. Some who stay with the firm continue their training. At the time of data collection, a former plumbing and domestic heating apprentice was enrolled on an EQF level 5 programme in building services engineering. The apprentice programme allows for the English HVAC firm to maintain a trained workforce that understands the nuances of their work. While the firm occasionally hires fully qualified staff, the apprenticeship is the primary means of recruitment and staff development.

CHEF CASES

A summary of the chef case sites is provided in Table 2.

Table 2: Overview of Hotel Case Study Sites

	German Hotel	Austrian Hotel	English Hotel
Number of Employees	200 (26 chefs and apprentice chefs)	40 chefs and apprentices	400+ (60 chefs and apprentice chefs)
Current number of apprentices	11	4	3
Geography	Berlin Area	Vienna Area	Midlands
Motivation	Training, development and recruitment	Recruitment	Use of levy, staff retention

GERMANY

The German hotel, based in Berlin, is part of a large internationally recognised hotel chain. It has been in operation for more than ten years and has trained chef apprentices since the beginning. Chef apprentices at the German hotel work in the multiple domains of culinary crafts within the hotel, including an à la carte restaurant, a breakfast restaurant and a banqueting facility.

The chef apprenticeship programme plays a central role in the German hotel's long-term personnel development strategy. Chef apprentice training at the worksite follows a structured pathway, with apprentices beginning in the breakfast kitchen and progressing toward the à la carte restaurant. Within daily operations, the apprentice is assigned to a fixed station and receives guidance from more experienced members of staff.

The corporate structure of the hotel chain prioritises training and development. At the German hotel, all staff, including apprentices, are invited to participate in internal training programmes such as Excel courses. On average, apprentices spend about three hours per month on such training, in addition to the time apprentices spend in the vocational college.

Apprenticeships at the German hotel, including those in the kitchens, play a strategic role in human resource development in the organisation. So long as the hotel is able to offer permanent positions upon the completion of the apprenticeship, it plans to keep taking on new chef apprentices.

AUSTRIA

The Austrian hotel, based in the Vienna area, offers hotel rooms and conference facilities. This is a large facility with the kitchens alone employing 40 chefs and chef apprentices. Presently there are four apprentices employed in the kitchens at the Austrian hotel. Interviews with hotel staff highlighted some challenges that limited the use of apprenticeships, including a shortage of motivated, high-potential applicants and legal restrictions regulating the employment of minors (for example, limitations of night and shift work which are essential in the hospitality sector).

Within the Austrian hotel, in addition to the apprenticeship programme, there are alternative pathways to becoming a chef. Many adults start as kitchen assistants and benefit from the opportunity to learn on the job while receiving a full wage, which is significantly higher than the apprenticeship wage. Later these individuals may obtain a formal qualification by sitting the extraordinary apprenticeship exam, supported by a part-time preparatory course.

ENGLAND

The English hotel is a large hotel based in the Midlands. It is an 'event hotel', with meeting and banqueting facilities forming a substantial portion of their business model and workload. There are three primary food and beverage outlets in the hotel: two restaurants and a café. As an events hotel, the largest kitchen serves these banquet and conference facilities. Within the kitchens, staff turnover is low, with no departures in the past year. Most of the kitchen staff have qualifications, but this is heavily dependent on their level and age. The English hotel also has an international staff with many possessing qualifications earned abroad.

The English hotel had recently begun working with a local college to provide classroom-based training for their EQF level 4 chef apprentices (chef de partie). Previously they had worked with a national training provider. They had moved to a new provider (local college) because it provided training across a wider range of areas. This allowed the company to offer the chef de partie apprenticeship, a programme not offered by the previous training provider and which the hotel felt was better suited to their skill needs. Apprentices attend courses one day a week at the local college where they have the opportunity to develop a wide range of skills and competencies. For example, while the English hotel no longer carries out butchering on site, there is the potential for the apprentice to learn butchery skills at the college.

The apprenticeship programme at the English hotel had clear strategic and financial motivations. The apprenticeship supported recruitment activities and staff development for chefs already employed by the hotel. The Apprenticeship Levy featured heavily in the English hotel's rationale for offering apprenticeships. The levy means that there is a strong business case, as one manager in the hotel explained: 'the bottom line is we have a levy to use' (English hotel, Talent Manager). In this way, the incentive to use their levy in a way that supports their own retention and retraining of the team was seen as a key motivating factor for offering apprenticeships. Levy utilisation is a likely driver for using apprenticeships not only to recruit new members of staff but to offer continuing VET for existing members of staff.

5. HVAC APPRENTICESHIP TRAINING

PROGRAMME AND CURRICULA OVERVIEW

An overview of the programme structure and curricular content of HVAC apprenticeships in the three country case studies is provided in Table 3.

Table 3: Overview of HVAC Apprenticeship Programme Structure

	Germany	Austria	England
Programme	Plant mechanic for sanitary, heating and air conditioning technology	Building services engineering – modules plumbing and heating	Domestic heating and plumbing
Level	EQF 4	EQF 4	EQF 4
Training	1.5:3.5 (1.5 days per week at college, 3.5 days at work plus occasional inter-company training centre days)	Block release (3 x 4-week in-school training blocks)	1:4 (1 day at college, 4 days at work per week)
Duration	3.5 years	3 years if completing 2 modules; 4 years if completing 3 modules (not a common route)	4 years + assessment period
Assessment	Interim exam (30%) Final exam (70%) Exams include: • Written assignments • Work task • Situational technical discussion • Documenting with practice-related documents	Passing grades in VET schools Final oral and practical board examination	End-point assessment: • Knowledge test • Design project • Practical tests (x2) • Professional discussion

In **Germany**, the apprenticeship most closely aligned to the HVAC engineer occupation is the 'Plant mechanic for sanitary, heating and air conditioning technology' (Anlagenmechaniker Sanitär-, Heizungs- und Klimatechnik), subsequently referred to simply as HVAC apprenticeship. This is an EQF level 4 apprenticeship which includes 3.5 years of training in the dual system. Apprentices in the programme spend 1.5 days per week at the VET college and 3.5 days per week at the worksite. Occasionally there are days spent at an inter-company training centre; this is included in the worksite time allocation.[6]

The curriculum for the HVAC apprenticeship in **Germany** is organised around 12 learning fields that combine occupational and general competencies (see Table 4 for a summary). The learning fields include topics such as the manufacture of components, installation of pipework and ducts, installation of heating systems and system maintenance. The inclusion of building automation systems as a learning field is indicative of the impact of digitalisation and new technologies on the field of work and thus also in the training requirement. In addition to the occupational

6 This does not contribute to the productive times in the CBS model (see Table 4).

specific skills and knowledge that are addressed in the 12 learning fields, non-technical competencies are embedded through the curricula in the German apprenticeship system. Instruction is not organised in a subject-specific manner, instead college-based learning is geared towards the processes of professional tasks and activities and towards situations in various areas of society. Therefore, competencies such as critical thinking and communication are not treated as separate subjects but instead are considered integral to 'vocational action competence' or Handlungskompetenz. Subject matter addressed in the cross-disciplinary learning field includes German/communication, politics/social studies, religion/ethics and sports/health promotion. Foreign languages, typically English, are not part of the cross-disciplinary learning area but are instead assigned to the vocational content.

The HVAC apprenticeship in building services engineering in **Austria** is a three-year, EQF level 4 programme. Apprentices typically undertake two training modules in gas and sanitary technology and heating technology. Some may opt to undertake an additional module which extends the programme duration to four years. The training for this apprenticeship follows the Austrian dual system, which combines workplace-based learning with block release at vocational education and training colleges. Apprentices are primarily based in the workplace but undergo three 4-week in-school training sessions.

The Austrian HVAC apprenticeship incorporates both occupational specific technical skills and transversal competencies. The technical skills (see Table 4 for a summary) include reading and interpreting technical drawings and documents, installing and maintaining heating and ventilation systems, and electrical engineering and control technology. Each of the modules provides substantial in-depth knowledge and includes the acquisition of new skills relating to installing heat pumps and solar technology in the heating technology module. In addition to these technical skills, the curriculum covers areas such as occupational and environmental safety and customer communication.

In addition to the occupational-specific elements of the curriculum, apprentices undergo non-occupational learning which accounts for approximately one-third of the training at the VET school. Of this, 20 per cent of the time is spent on German, civic education and foreign languages, while 14 per cent is spent on commercial/management training.

The HVAC plumbing and domestic heating apprenticeship in **England** is a four-year EQF level 4 programme. The programme follows a dual model with apprentices spending one day a week at a vocational college and four days a week at the worksite. Unlike the other cases in this study, there is no involvement of chambers or third-party institutions. The delivery of training for the English HVAC apprenticeship is split between employers and the local VET college.

National standards for the English HVAC apprenticeship define the skills, knowledge and behaviours appropriate to the occupation (see Table 4 for a summary) and create an assessment process to evaluate the acquisition of these occupational standards. Eight core knowledge areas are listed in the curricula, including: core plumbing systems, electrical components and control systems, and environmental technology. Embedded within the English HVAC apprenticeship is a requirement to complete a diploma in plumbing and domestic heating.

Unlike the other country cases, non-occupational learning is limited to only English and maths. A level 2 qualification in both is required of apprentices. A recent change to policy, that was not yet in effect at the time of fieldwork, allows adult apprentices (age 19 and above) to waive these requirements with approval from their employer.

Table 4: HVAC Apprenticeship Curricula Content (Summary)

Germany	Austria	England
Install pipework and ducts	Working with pipes, metal sheets and plastics Assembling, testing and maintaining piping systems Installing water and gas pipelines	The layout features, working principles and legislative requirements of plumbing pipework (above 28mm) and non-domestic plumbing systems and appliances
Install electronic components	Basics of electrical engineering and control technology	Electrical components and control systems The testing and commissioning requirements applicable to electrical control systems and components
Install potable water systems	Preparing and distributing hot water Installing and testing heating, ventilation and water systems	The common processes and techniques used in the installation and test of plumbing and domestic heating systems (cold water systems, hot water systems, domestic wet central heating systems, sanitation systems).
Install heating systems	Installing heating systems (e.g. district heating, biomass, oil, gas) Heat pumps, solar technology and alternative heating systems Hydraulic balancing and energy-saving measures	
Set up building automation systems Analyse and service basic supply systems Implement energy-efficient systems	Reading and applying technical documents, plans and drawings	Principles of environmental technology systems
Maintain systems	Sealing, testing and maintaining systems	The routine service and maintenance procedures applicable to plumbing and domestic heating systems
Execute customer orders	Communication with customers and within the team	Customer service Communication
Vocational training labour and collective bargaining law		Supervisory skills
Occupational health and safety	Occupational safety, environmental protection and sustainability	Health and safety

ASSESSMENT PROCESS

Assessment of the HVAC apprenticeship in **Germany** occurs twice and follows the staggered journeyman examination model (Gestreckte Gesellenprüfung). The first assessment is an interim assessment that is held near the end of the second year of the programme. This exam covers the first half of the training content, mostly focused on the supply of ventilation and water to buildings (Versorgungstechnik). Results of this exam account for 40 per cent of the final exam. The second assessment occurs at the end of the apprenticeship and covers all remaining training content. The final exam includes a practical work assignment, a situational technical discussion and written tests in areas such as work order analysis, manufacturing technology and economics/social studies. To pass, apprentices must achieve at least sufficient results in the overall evaluation and in key examination areas.

The assessment process and content are centralised and standardised nationally. The Chambers of Industry and Commerce legally oversee and certify the examinations, ensuring procedures and standards comply with legal requirements of the Vocational Training Act (BBiG) and the exam regulations. The chambers are also responsible for all elements of the examination process, which includes setting questions, exam dates and admission of eligible candidates and appointing examination boards. These boards include representatives from employers, employees and vocational college instructors. Assessments take place in chamber-run facilities rather than at the workplace or college. This helps to ensure neutrality and consistency across regions. It is believed that this model strengthens legitimacy and comparability of apprentice outcomes.

In **Austria**, while there is a nationally standardised final exam, organised by the Apprenticeship Office of the Austrian Economic Chamber on behalf of the Ministry of Commerce, which all HVAC apprentices must undergo, there are also ongoing assessments which take place during the training period. During the training period, VET school instructors assess the apprentice on subjects covered in the curriculum. These grades are based on active participation and school-based test results. After completing the training period and the VET school-based courses, the apprentice is subject to a final examination. This is nationally regulated and focuses on practical competencies and theoretical knowledge. If, however, the VET school minimum requirements have been met, the theoretical element of the final exam is waived. The practical examination is undertaken in a workshop environment (neither at the VET school nor the worksite) and is overseen by an examination board comprised of representatives from the Chamber of Commerce and the Chamber of Labour. Notably, neither the employer nor the VET school has an evaluative role, as they are not engaged in the administration, evaluation or creation of the examinations of apprentices they have trained, which reinforces the impartiality of the assessment process.

The practical exam includes real-world problem solving which must be addressed and has an oral exam element in which representatives from the examination board ask the apprentices to explain why a particular set of actions is/has to be chosen in a particular situation. Complex tasks, such as finding a malfunction, repairing a malfunction and running tests after the repair, are typically included in the exam. These activities take place in a workshop environment with the tools and materials provided.

In **England**, assessment for HVAC apprentices is structured around the nationally governed end-point assessment (EPA) process. As with the apprenticeship standards, the EPA is set by the Trailblazer group. Independent regulated End-Point Assessment Organisations (EPAOs) set and oversee the assessment as defined by the Trailblazer group. At the conclusion of the four-year training period, apprentices must demonstrate that they have met all 'gateway' requirements to advance to the EPA process. For the English HVAC programme, these gateway requirements include achievement of level 2 English and maths qualifications, achievement of a diploma in plumbing and domestic heating, and a portfolio of evidence of learning that has taken place at the worksite.

The EPA for HVAC apprentices has four assessment methods: (i) a knowledge test (ii) a practical planning test (iii) a practical competence test and (iv) an interview underpinned by the apprentice's portfolio of evidence. Most assessments take place in the apprentice's place of work, with the exception of the knowledge test, which may be taken at a testing centre. The assessment process is overseen by an independent assessor.

COST-BENEFIT ANALYSIS

The costs and benefits of delivering HVAC apprenticeship training vary significantly across the three case study countries. The following sections present summary data on the net cost borne by employers to deliver the HVAC apprenticeship. Table 5 demonstrates the total cost-benefit of delivering an HVAC apprenticeship in the three firms in each of the three country contexts. Costs are presented in British pounds to allow for comparability.[7] These costs and benefits are for the delivery of one apprenticeship for the entire duration of the programme.

Table 5: Cost-Benefit Analysis for Delivery of HVAC Apprenticeships in HVAC Firms

	Value	**Germany**	**Austria**	**England**
CONTEXT				
Programme Duration	Years	3.5	3	4
Annual salary of fully qualified HVAC (including social contributions and/or employer taxes)	GBP	47,088	51,332	38,400
Annual salary of unskilled helper (including social contributions and/or employer taxes)	GBP	28,681	44,687	28,616
Percentage of FTE spent in off-site training/off-work training	%	25%	27%	20%
COSTS				
Apprentice Employment/Wage Costs				
Apprentice wage	GBP	28,361	41,875	90,000
Social contributions/employer taxes	GBP	6,240	12,202	12,600
Other costs	GBP	1,036	0	5,400
Apprentice's total labour costs	*GBP*	*35,637*	*54,077*	*108,000*

7 To calculate in GBP, the average exchange rates for the Euro in 2024 was used (source: https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-gbp.de.html).

Supervision Costs/Material Costs				
Administrative costs	GBP	204	0	2,000
Training supervision at workplace	GBP	18,284	4,824	10,600
Cost of training materials	GBP	1,785	400	352
Other costs (e.g. working clothes)	GBP	3,570	384	400
Total supervision costs	*GBP*	*23,843*	*5,608*	*13,352*
Training or School Costs				
Training costs (external or internal)	GBP	4,463	594	200
Exam or assessment costs	GBP	1,275	0	0
Total training school costs	*GBP*	*5,738*	*594*	*200*
Total Costs		**65,218**	**60,279**	**121,552**
BENEFITS				
Time spent in unskilled work (average)	%	26%	33%	23%
Time spent in skilled work (average)	%	74%	67%	78%
Average productivity level of skilled work	%	55%	100%	78%
Productive working times in company (average)	%	56%	42%	72%
Apprentice's productive contribution	%	50,986	62,631	80,973
Other income or subsidy	%	0	5,624	0
Total Benefits	**GBP**	**50,986**	**68,255**	**80,973**
Costs-Benefits	**GBP**	**14,232**	**-7,976**	**40,579**

Notes: Productive working time in company refers specifically to the time an apprentice is physically present at the worksite and actively engaged in productive tasks. It excludes both on-site learning activities and any in-school learning. For example, in the Austrian case, productive time does not include the approximately 50% of an apprentice's time (in year 1) which is spent observing skilled colleagues rather than actively working. In the BIBB-CBS framework, this time is typically classified as learning time. However, the data presented in this table reflects the reporting practices and data availability of the Austrian HVAC case. Figures are rounded to the nearest whole number.

The data in Table 5 are based on actual financial information reported during interviews and follow-up discussions with representatives from the three HVAC firms. To calculate the costs of delivering apprenticeships, each HVAC firm reported wages paid to apprentices along with on-costs such as pensions, insurance and tax. Other reported costs are the administrative and supervisory related labour costs borne by the firms and equipment such as tools and work clothes. In some cases, there were additional costs in the form of payment to training providers or local colleges to provide services to the apprentices.

Benefits accrued to the HVAC firms are primarily based on the productive capacity of the apprentice while they are at work. While there are a number of potential indicators of productive contribution, many of which are listed in the table, the analysis here is based on the BIBB-CBS approach. This assesses the productive capacity of an apprentice while engaged in skilled and auxiliary tasks and compares this to a fully qualified member of staff. It also considers unproductive times at work such as internal instruction or pure learning time in preparation of examinations (see the Annex for more detail).

The costs less the benefits, across the entire duration of the programme, are presented in the final line of Table 5. The difference between the cases is significant. In the Austrian HVAC firm, the apprenticeship delivery results in a net benefit to the employer. While in the German and English cases, the delivery results in net costs borne by the employer. As will be seen in the comparative analysis of the chefs apprenticeship (see below), England's HVAC apprenticeship is the most expensive of the three countries.

The analysis in Table 5 does not account for the difference in the programme duration across the three countries. To provide more comparable basis for cost evaluation, Table 6 presents estimated costs and benefits assuming a standardised 3.5 years in each programme. While this does not alter the general trend of Austria's demonstrating the most value and England the least, it does more clearly illustrate the relative costs across the three cases.

Table 6: Costs and Benefits, Standardised to a 3.5-year Programme

	Germany	Austria	England
Actual Duration (years)	3.5	3	4
Adjusted total costs	£65,218	£70,326	£106,358
Adjusted total benefits	£50,986	£79,631	£70,851
Adjusted total cost-benefit	£14,232	- £9,305	£35,507

The following briefly summarise the costs and benefits from each country's HVAC case. The description is based on the summary data provided in Table 5. For more detailed year-by-year analysis for each firm, please see the Annex.

In **Germany**, overall, the net financial burden for the HVAC workplace to deliver this apprenticeship is £14,232. The primary drivers of the costs for delivering the level 4 HVAC apprenticeship are the apprentice wages and the cost of supervision. Although the wages and labour costs (including on-costs) are the lowest in Germany compared to the other cases, they are still the single largest source of cost expenditure for the HVAC firm: £35,637.

The cost of training supervision at the HVAC workplace is also significant: £18,284. Other costs include payments for training schools or courses, administrative and assessment costs. In all, the total costs for delivering the 3.5-year apprenticeship is £65,218. The benefits the HVAC firm gains through the apprenticeship derive from the productive contribution of the apprentice. In this case, it is £50,986 over the course of the programme.

In **Austria**, delivery of the HVAC apprenticeship offered the best value across the cases compared. There is a net benefit to the Austrian HVAC firm for the delivery of the apprenticeship, totalling £7,976.

The apprentice wage is the primary cost in the HVAC case for Austria. Costs related to supervision of the training are significantly lower in the Austrian HVAC case compared to the other country cases, at £4,824, though it also has shortest programme duration at just three years (as the option of an extension of the apprenticeship for a further year is rarely used at the Austrian firm). In the Austrian case, although the employer may make some small payments relating to the assessment process, these are ultimately reimbursed from public sources; therefore, we do not include these in our calculations.

In addition to a public subsidy received by the Austrian HVAC firm, benefits are derived from the productive capacity of the apprentice.[8] The estimated productive contribution the Austrian HVAC firm receives from their apprentice over the three-year programme is £62,631.

In **England**, as demonstrated in Table 5 above, the HVAC firm has the greatest cost in delivering the apprenticeship, at £40,579. This result remains even after standardising for programme duration (Table 6). Much of this difference is accounted for in the wage costs (including on-costs) for the apprentices over their four-year programme. In the case from England, this totalled £108,000 – roughly double the Austrian case. The costs of supervision of the worksite training and administrative costs associated with running the apprenticeship programmes accounted for an additional £10,600 in costs to the firm in England. The benefits are accounted for by the productive capacity of the apprentice while they are at work. The HVAC firm in England estimates that during year one an apprentice is about 50 per cent as productive in undertaking skilled tasks (as compared to a fully qualified member of staff), and by the fourth year of the programme they are 100 per cent as productive. This analysis estimates the English HVAC firm to receive £80,973 in value from their apprentices over the four-year programme.

There are longer-term benefits which the HVAC firm in England accrues through the delivery of apprenticeships which are mostly tied in to the supply of labour and recruitment costs. Nearly all apprentices remain with the firm beyond the training period.

INSTITUTIONAL FACTORS

Germany's dual VET system integrates employers, vocational schools and chambers in a collaborative framework. Chambers play a particularly important role across nearly every aspect of the apprenticeship programme, from curriculum development and exam administration to quality monitoring and mediation services. For employers, this legally mandated structure minimises transaction costs by offloading administrative burdens and standardising assessment. At the HVAC firm in Germany, although they had only limited interaction with the vocational school, trust in the quality of instruction and the chamber's oversight diminished

8 The subsidies for employers with apprentices in Austria are legally regulated in the Vocational Training Act (Berufsausbildungsgesetz – BAG), in particular in Sections 19 to 19c, as well as in funding guidelines issued by the Federal Ministry of Economy. For the HVAC and other selected apprenticeships, Vienna instituted additional subsidies provided to employers to encourage the hiring of apprentices. However, as this was a short-term policy intervention that was being phased out during the field work, these benefits are not included in the analysis.

any concerns about training quality. The HVAC firm perceived the system as efficient, even while noting the broader support for the trades was lacking. With the chambers providing third-party quality assurance, institutional trust is reinforced.

The HVAC apprenticeship in **Austria** reflects the standardisation, formalisation and reliance on social partner institutions which is characteristic of the Austrian apprenticeship system. Chambers of Commerce and Labour play critical roles in the delivery of the HVAC apprenticeship through their support for curriculum design, exam administration and quality monitoring. This cooperation is seen as supporting the legitimacy and quality of the apprenticeship system.

This institutional cooperation also fosters trust in the system. For employers this may reduce transaction costs relating to apprenticeship delivery due to the predictable, reliable skill outputs. However, this degree of institutional structure may also imply rigidity in the system. While the apprenticeship system is particularly strong in the traditional trade sectors, such as HVAC, it may not be seen in other fields, such as hospitality, where apprenticeship delivery has a reduced influence.

The apprenticeship system in **England** is characterised by a bilateral relationship between the employer and the local college. In the case of the HVAC firm in England, this relationship was a challenging one, as finding a local college offering the training course was difficult and turnover among college staff limited opportunities to build relationships between the institutions. The HVAC firm received little feedback from the college on their apprentices' progress, and the process was seen as something of a hassle.

The lack of a systemic framework or third-party institution (for example, the chambers in the other case study countries) decreased efficiency and trust in the system. Information sharing, recruitment and quality monitoring were left in a grey area between the school and the employer, with the employer relying on the apprentice to report any issues or challenges that may have arisen in the school-based training.

DRIVERS OF COST VARIATION

Variations in the costs and benefits described above have multiple drivers. Principal drivers for benefits are the degree of apprentice productivity and the time spent in productive work processes. The more productive apprentices are, and the more they spend on productive work, the greater offset there is on the cost of apprenticeship investment. The principal driver for the costs is the remuneration of apprentices.

As noted above, the high costs in England are attributable in part to the substantially higher wage costs. While only lasting six months longer than the German case, the wage costs are roughly three times as high at the English firm. This may reflect the different standing of apprenticeships in each system, with the English approach utilising apprentices as labour rather than an extension of the education system. Although English HVAC apprentice wages are the highest of the three cases, the earnings gap between apprentice and fully qualified HVAC engineer is the lowest in England. The high wage paid by the employer reflects the cost of acquiring apprentices who are capable of completing the apprenticeship to the standard required by the company.

In the case of Austria, the public subsidy (a portion of monthly wages paid back to the employer), helps account for the net benefit which the Austrian case experienced. In the Austrian HVAC case, wage disparities between fully skilled workers and apprentices may contribute to cost variation. The HVAC firm paid on average 15 per cent above the collectively agreed wage for skilled workers, but this did not apply to apprentices (as it is a common unwritten norm not to compete for apprentices based on wages in Austria). As a result, the relative cost advantage of employing an apprentice may be amplified.

Standardisation and institutionalisation likely also help minimise costs. As discussed above, in the German and Austrian systems, the role of chambers is critical in this area. The standardised nature of curriculum and assessment contributes to efficiency and trust into the qualifications that supports predictability of productivity for employers.

6. CHEF APPRENTICESHIP TRAINING

PROGRAMME AND CURRICULA OVERVIEW

Before providing cost-benefit estimates for each of the cases, consideration is first given to the content and structure of the chef apprenticeships in each country. This information is summarised in Table 7.

Table 7: Overview of Chef Apprenticeship Programme Structure

	Germany	Austria	England
Programme	Cook (Koch/Köchin)	Cook (Koch/Köchin)	Chef de Partie
Level	EQF 4	EQF 4	EQF 4
Training	1:2 (1 week in school, 2 weeks in work)	Block release (2 x 5-week in-school training blocks)	1:4 (1 day at college, 4 days at work per week)
Duration	3 years	3 years	1.5 years + assessment
Assessment	Interim exam (25%) Final exam (75%) Exams include: • Written parts • Practical work tasks • Professional discussion	Passing grades in VET school Final Exam • Oral exam • Practical board exam	End-point assessment: • Observation of normal duties • Professional discussion • Knowledge test

The chef apprenticeship in **Germany** is an EQF level 4 programme delivered over three years. It is a dual training model which is structured around a rotation of two weeks in company and one week of school-based instruction. In this system, employers play a central role in the delivery of training, which is complemented by the vocational school and coordinated with oversight undertaken by the chamber.

The curriculum for chef apprentices in Germany incorporates occupation-specific skills with cross-cutting or integrative skills. Occupation-specific technical skills include competencies such as food preparation across a variety of categories (for example, soups, meats, sauces). It also includes non-technical skills such as working with guests and team members. Table 8 summarises the content of curricula for German chef apprentices. A strong emphasis on practical proficiency is observed in the German case with apprentices progressing systematically through different kitchen stations within the German hotel (beginning with breakfast and ending with à la carte).

In the German vocational education system, education and training are delivered via an integrated model rather than through separate subject matter instruction. The learning fields (Lernfeld) approach is organised around occupational situations and aims to develop a holistic vocational competence that combines technical knowledge with social, personal and methodological skills. As such, general education content is embedded within the vocational context. It is therefore difficult to estimate the percentage of time a learner would spend on occupation-specific skills versus transversal competencies. The topics covered in cross-occupational learning include German, politics/social studies, religion/ethics, sports/health promotion and foreign languages.

The chef apprenticeship in **Austria** is a three-year dual programme at EQF level 4. It combines workplace-based training with block release for vocational schooling. In this model apprentices attend two 5-week blocks of vocational school-based education per year, and the rest of their time is spent at the worksite.

The school-based element of the dual education system (Duale Ausbildung) is delivered by designated vocational schools. In Vienna, this is the Berufsschule für das Gastgewerbe (Vocational School for the Catering and Hospitality Industry), which provides a standardised curriculum as part of a three-year part-time programme. Employers are responsible for delivering the practical training in accordance with regulatory requirements. The curriculum is organised around seven core competency areas (see Table 8). These include both technical competencies, such as food preparation and hygiene, and non-technical competencies such as meal planning and stock control.

In addition to the occupation-specific elements of the chef curricula, apprentices must receive training in civic education, German and two foreign languages (the second should be linked to cooking). Together these account for 300 hours of training across the three-year period (27.7 per cent of their time in the vocational schools). In addition, chef apprentices receive 180 hours (16.6 per cent) of commercial training (or management). In all, 44.3 per cent of training time is allocated to non-occupation-specific skill development.

The apprenticeship programme in **England** for chef de partie is an EQF level 4 programme delivered over an 18-month period. This is followed by an end-point assessment process. Apprentices in this programme follow a 4:1 model wherein four days a week are spent at the worksite and one day a week is spent at the local college during term time (approximately 40 weeks per year). There is a bilateral arrangement between the hotel employer and the college, unlike other cases in this study there are no third-party intermediaries such as chambers. There is frequent communication between the local college and the English hotel, which helps ensure apprentices maintain appropriate progress and enables alignment between classroom-based learning and on-the-job training. The executive chefs at the English hotel reinforce the formal training with skill demonstrations by senior chefs and monthly training sessions for apprentices.

The content of training for English chef apprenticeships is set by IfATE and updated periodically.[9] It includes 35 knowledge areas, 16 skills and 8 behaviours that are expected of successful apprentices. The technical skill competencies focus heavily on food preparation, but apprentices are also trained in efficient material use and health and safety guidelines. Non-technical skills include areas such as teamworking and business literacy such as profit and loss and risk assessments. Table 8 includes a summary overview of the training content for the English chef apprenticeships.

Non-occupation-specific skill development in England is limited to a universal requirement that apprentices obtain an EQF level 2 qualification in English and maths. Until recently this was a requirement of all EQF level 3 and level 4 apprentices in England. A 2025 change means that it is now an optional requirement for apprentices aged 19 or older, at the discretion of the employer.

9 As noted above, the functions of IfATE were transferred to Skills England in 2025 (after the fieldwork was completed).

Table 8 summarises the key features of each country's approach to training chefs via apprenticeships.

Table 8: Chef Apprenticeship Curricula Content (Summary)

Germany	Austria	England
Handling and storing goods Implementing sustainability measures in food and resource usage	Inventory and stock management	Efficient use of materials Monitor use and waste
Calculating costs and managing resources	Working in the operational and professional environment	Business strategy, P&L, legislation, risk assessment
Preparing and cooking various types of dishes (e.g. soups, sauces, meats, plant-based foods)	Food processing Mise en place (set-up)	Advanced preparation and cooking of meats, poultry, fish, vegetable, soups, desserts, sauces, dough and biscuits
	Food serving and presentation	Finishing methods
	Meal composition and planning	Reviewing and refreshing menus
Working with guests and team members Supervising others and managing kitchen operations		Teamwork, coaching, diversity Working collaboratively
Implementing hygiene practices Applying hygiene regulations Occupational health and safety Environmental protection and sustainability	Safe, hygienic and sustainable working	Following health and safety guidelines
Working in a digitalised environment		Using tech
Structure of the training organisation, labour law and collective agreements		Using standard operating procedure

ASSESSMENT PROCESS

For the chef apprentices in **Germany**, assessment is conducted at interim and final stages. Both the interim (accounting for 25 per cent of total marks) and final (75 per cent) exam comprise a written, practical and oral component. The written exam covers theoretical knowledge including topics of technology, inventory management and economics/social studies. For the final practical exam element, apprentices must plan, prepare and present a three-course menu, typically for six people. The menu must meet specific requirements (for example, a terrine or mousse as a starter). During the practical exam, chef apprentices may be asked to engage in role-play to simulate guest interaction.

With a process similar to that described above for HVAC apprentices, the exams for chef apprentices in Germany are nationally standardised and overseen by examination boards. These boards are established by the Chambers of Industry and

Commerce (IHK). Through the examination boards, the chambers are responsible for ensuring that the standards and processes comply with legal requirements and regulations, as well as for setting and administering examinations. Typically, exam boards will include representatives from employers, employees and vocational schools (for example, an instructor). Their participation in examination boards is honorary, though expenses are reimbursed. Interview participants from the German hotel expressed concerns about the ability of these exams to capture real-world relevance. One concern is that the basket of ingredients which apprentices will have to use in the practical exam is known in advance, allowing for rote preparation rather than a more organic demonstration of cooking skills.

In addition to the formal exams, the German hotel undertakes internal assessments which are more focused on the day-to-day work requirements of a chef. This is reported to enable a more supportive and accurate evaluation of the apprentices' skill development. This worked to overcome the perceived inefficiencies and disconnections between school-based evaluation and firm-based standards.

In **Austria**, the chef apprenticeship programme assessment occurs in three domains: (i) VET school assessments (ii) workplace-based assessments and (iii) an externally administered final examination. VET school assessments are nationally standardised and undertaken as part of the block-release courses. In these assessments, instructors evaluate the apprentice based on subject-specific performance. This can include assessing active participation, test results or assignments which are graded on a scale of 1–5 (5 is a failure). Workplace-based assessments occur in a less formal context, with employers monitoring progress in skill acquisition and the work readiness of apprentices. The final examination, conducted by an external body and managed by the chambers, serves as a summative assessment.

Upon completion of the VET school programme and their apprenticeship contract, an apprentice can apply to sit their final exam. The final examinations are highly formalised and standardised. A regional examination board for the chef apprenticeship, comprised of members from the Chambers of Labour and Commerce, is responsible for administering the examination. The content of the assessment is determined nationwide and universally set, and therefore independent of a particular employer. These final examinations comprise oral and practical components. The practical element of the chef's exam requires an apprentice to prepare a four-course menu for four people. In the case of the Vienna region, these exams take place in the local chamber's training centre.

The practical exam is administered by the Apprenticeship Office (on behalf of the Ministry of Commerce) with exam boards comprised of representatives from the Chamber of Commerce and the Chamber of Labour. For the chef's apprenticeship (as with every programme) there is one exam board responsible for the region. Notably, the exam boards do not include input from a VET school instructor of the apprentice to be examined (though examination board members often have a background as VET instructors).

In **England,** at the end of the 18-month training period, apprentices must meet 'gateway' requirements before proceeding to their EPA. For chef apprentices, this includes: (a) confirmation by the employer that the apprentice is performing at or above the required standard (b) successful completion of level 2 English and maths qualifications[10] and (c) submission of a portfolio of evidence demonstrating the apprentice's knowledge, skills and behaviours. Once these conditions are met, the apprentice becomes eligible to undertake the end-point assessment.

The end-point assessment for chef apprentices in England has three core elements: observation of the apprentice undertaking routine duties in the workplace, a professional discussion underpinned by a portfolio of evidence compiled over the apprentice's training period and a knowledge test. While the content of the EPA is determined by Trailblazer groups, who also set the training standard, an independent regulated End-Point Assessment Organisation will administer the EPA. An important distinction in the case for England is that skill assessment is only conducted through observation at the apprentice's workplace. This can pose a problem if the workplace does not involve tasks that reflect the full scope of the training apprentices are expected to undertake. For example, if the employer does not serve fish dishes, then the apprentice's ability to prepare fish (one of the specified skills) can be neither observed nor assessed. This was cited as a concern at the hotel in England where interview participants indicated a degree of scepticism at the assessment methods' ability to capture actual skill levels.

COST-BENEFIT ANALYSIS

Despite operating under the same corporate structure of a shared hotel brand and offering similar apprenticeship programmes, the costs and benefits associated with delivering apprenticeship training differ significantly across the three case study countries. The following sections present summary data on the cost borne to employers (each hotel) to deliver the chef apprenticeship. Costs are presented in British pound figures to allow for comparability.[11] Table 9 provides an overview of the costs for delivering the chef's apprenticeship in each of the three country case study hotels. These costs and benefits are for the delivery of the entire apprenticeship for a single apprentice (i.e. across the duration of the apprenticeship programme).

Table 9: Cost-Benefit Analysis for Delivery of Chef Apprenticeships

	Value	Germany	Austria	England
CONTEXT				
Programme duration	Years	3	3	2
Annual salary of fully qualified chef (including social contributions and/or employer taxes)	GBP	34,933	35,532	30,000
Annual salary of unskilled helper (including social contributions and/or employer taxes)	GBP	29,700	30,139	21,176
Percentage of FTE spent in off-site training/off-work training	%	24%	29%	20%
COSTS				
Apprentice Employment/Wage Costs				
Apprentice wage	GBP	34,680	40,936	55,800
Social contributions/employer taxes	GBP	6,936	12,076	1,866
Other costs	GBP	2,753	0	2,334

10 At the time of the fieldwork this was a requirement for all English apprenticeships. However, the mandate was removed in 2025 for older apprentices at the discretion of their employer.

11 To calculate in British pounds, the average exchange rates for the Euro in 2024 was used (source: https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-gbp.de.html).

Apprentice's total labour costs	*GBP*	*44,369*	*53,012*	*60,000*
Supervision Costs/Material costs				
Administrative costs	GBP	0	0	546
Training supervision at workplace	GBP	4,425	6,643	5,846
Cost of training materials	GBP	501	0	400
Other costs	GBP	3,894	99	400
Total supervision costs	*GBP*	*8,820*	*6,742*	*7,192*
Training or School Costs				
Training costs (external or internal)	GBP	2,259	8,478	166
Exam or assessment costs	GBP	385	0	0
Total training school costs	*GBP*	*2,644*	*8,478*	*166*
Total Costs		**55,833**	**68,232**	**67,358**
BENEFITS				
Time spent in unskilled work (average)	%	8%	90%	20%
Time spent in skilled work (average)	%	92%	10%	80%
Average productivity level of skilled work (average)	%	92%	100%	100%
Productive working times in company (average)	%	52%	71%	80%
Apprentice's productive contribution	GBP	50,869	65,041	45,176
Other income or subsidy	GBP	0	5,576	0
Total Benefits	**GBP**	**50,869**	**70,617**	**45,176**
Costs-Benefits	**GBP**	**4,964**	**-2,385**	**22,182**

Notes: Productive working time in company refers specifically to the time an apprentice is physically present at the worksite and actively engaged in productive tasks. It excludes both on-site learning activities and any in-school learning. Productive contribution is calculated based on the BIBB-CBS methodology. See the Annex for more detail. The wage for the unskilled worker in England is from the Annual Survey of Hours and Earnings 2024. Figures are rounded to the nearest whole number.

The data in Table 9 is based on the actual financial information reported by the three hotels in the country cases. To calculate the costs of delivering apprenticeships, each hotel reported the wages paid across the training programme period along with on-costs such as national insurance or social contributions, pensions and other employer-borne costs. Other costs related to the apprentice include equipment such as knives and work clothes. The costs of supervision include the administrative costs (time and materials), such as filling out forms, and the costs associated with workplace training (for example, lost productivity of trainer chefs). In some cases, the hotels were responsible for making payments to the vocational colleges or they made payments for other training programmes offered to apprentices (internal or external to the hotel).

The benefits accrued to the hotel while offering the apprenticeship emerge principally from the productive contribution of the apprentice while they are in the workplace. The analysis in Table 9 is based on the BIBB-CBS approach which accounts for the portion of time an apprentice spends working on skilled tasks and their relative productivity in these tasks (as compared to a fully qualified chef) and auxiliary tasks. See the Annex for a detailed description of this approach.

The costs less the benefits, across the entire duration of the programme, on a per-apprentice basis is presented in the final line of Table 9. The distinctions are significant with the Austrian hotel reporting a net benefit of £2,385 and the German hotel reporting a net cost of £4,964. England is the clear outlier, with the delivery of the chef apprenticeship costing the English hotel £22,182.

The analysis in Table 9 does not account for the differences in the duration of chef training programmes in the three countries. In Germany and Austria, these programmes last three years, while in England, it only lasts two years. To provide a more comparable basis for cost evaluation, Table 10 presents estimated costs and benefits assuming a standardised three-year programme in each country. While this does not alter the overall trend (Austria's offering the best value), it more clearly illustrates the extent to which the English programme is more expensive than its counterparts.

Table 10: Costs and Benefits, Standardised to a Three-year Programme

	Germany	Austria	England
Actual Duration (years)	3	3	2
Adjusted Total costs	£55,833	£68,232	£101,037
Adjusted Total benefits	£50,869	£70,617	£67,764
Adjusted Total cost -benefit	£4,963	- £2,385	£33,273

The following briefly summarises the costs and benefits in each case. While this reporting is reflective of the summary presented in Table 9, a year-by-year breakdown of each country case is available in the Annex.

Of the three cases in this study, the hotel in **Austria** offers the best value for delivering the EQF level 4 chef apprenticeship programme. The hotel reported a net financial benefit, while the other two cases reported a net cost of delivering the chef apprenticeship.

In the **German** case, the largest cost element was apprentice wages (and associated costs) at £44,369; however, these wages were the lowest of all three cases. The cost of supervision was the second most significant driver of costs in the German case. The benefits of delivering the apprenticeship in Germany are derived entirely from the productive contribution of the apprentice. In Germany, as in all the three countries, there are fairly high levels of productivity among the apprentices as compared to fully qualified chefs. Apprentices started at 88 per cent as productive in performing skilled tasks, and by year three, they are nearly 100 per cent as productive (in comparison to a fully qualified chef).

In the hotel in **Austria**, the delivery of a three-year chef apprenticeship benefits the hotel by £2,385. The apprentices' wages (and associated costs) are the single largest cost element of the Austrian chef apprenticeship programme (£53,012). The Austrian hotel's training supervision costs and payments for courses are the highest among the three cases (£6,643 and £8,478 respectively), though most of the course costs are internal courses offered through the hotel. In the Austrian case, although the employer may make some small payments relating to the assessment process, these are ultimately reimbursed from public sources; therefore, the assessment cost is not included these in the calculations.

The hotel in Austria benefits from offering the chef apprenticeships through the apprentice's productive contribution[12] and the receipt of public subsidy. Chef apprentice employers in Austria receive a standard subsidy equivalent to three months' wages in the first year, two in the second year and one in the final year of the apprenticeship.

In the case of the hotel in **England**, the employer faced substantial net costs for the delivery of the chef apprenticeship (£22,182). Despite having the shortest duration of the three countries, the English hotel had the highest costs associated with delivering the chef apprenticeship programme.

The wages (and associated costs) paid to chef apprentices are the most substantial cost element. The average wage paid to the chef apprentice in the English case is substantially higher than that paid to apprentices in the German and Austrian cases. While the English case had a total wage bill of £60,000 for a two-year programme, in Germany the three-year wage bill was £44,369.

Other costs associated with the delivery of the chef's apprentice include training supervision that takes place at the workplace (£5,846). Offsetting these costs are the benefits the English hotel receives from the productive capacity of the apprentice while they are at the worksite. The apprentices are highly productive in skilled tasks, even in year one. At the English hotel, this apprenticeship programme was largely used to certify the skills of current staff rather than upskill new staff, therefore their reported productivity compared to skilled workers was 100 per cent. The chef apprentice in England is estimated to contribute £45,176 of value over the two-year period.

INSTITUTIONAL FACTORS

The institutional structure of the **German dual apprenticeship system** which centres on collaboration between employers, vocational schools and chambers, was viewed positively by the German hotel. In the German system, chambers play a crucial role in the delivery of apprenticeships. The chambers (and their umbrella organisation) are formally involved in the development and updating of training regulations or curricula at the national level. Chambers also work to ensure that company-based training is aligned with national standards and undertakes activities to support quality initiatives. As already noted, German chambers are responsible for organising, administering and certifying apprenticeship examinations. Further, chambers provide advisory services to companies and prospective apprentices regarding available training opportunities and help to match employer with apprentice (however, employers have the primary responsibility for recruitment and placement of apprentices).

Despite critiques of limited responsiveness to firm needs, the chambers' regulatory role provided a stable framework through which the programmes operated. This helps to reduce the German hotel's transaction costs through increased trust and efficiency in the system. Despite this, the case study identified opportunities for improved coordination between school curriculum and on-site company training. From the German hotel's perspective, trust in the system remains high despite limited responsiveness and flexibility.

12 The executive chef at the Austrian hotel explained that the productivity of apprentices is not low, per se, but that the productivity level differs from one individual to the next. The activities are often routine, standardised and can be learnt quickly while skilled activities require significant supervision by a senior member of kitchen staff. Therefore, the questionnaire asks for average assessments.

The **dual apprenticeship system in Austria** is embedded within institutionally governed, formal mechanisms that link chambers, employers and VET schools. In the Austrian system, chambers are involved in nearly every aspect of an apprenticeship – selecting exam boards, determining the content and curricula (the latter enshrined in law) and determining the collective agreements for apprentices.

Apprentices are fully embedded within the Austrian industrial relations systems, with wages and employment conditions, including apprenticeship contracts, regulated by universally binding collective agreements at the sectoral level. This creates both standardisation of programmes and institutional relationships that foster trust in the system, but it can also lead to inflexibilities as was noted in the Austrian hotel.

Staff at the Austrian hotel explained that labour protections guiding the employment of minors (making shift work and late hours illegal) make apprenticeships in a restaurant setting difficult. The prestigious school-based VET alternatives available in Austria create recruitment challenges for the Austrian hotel. Apprenticeship termination is also highly regulated in Austria, which can make employers cautious about taking on young people. As a result, the Austrian hotel preferred to employ older apprentices (18+) in the chef programmes, making it something of an outlier in the Austrian apprenticeship system.

The **apprenticeship system in England** operates through bilateral coordination between employers and colleges or training providers. It is a major institutional difference to the Austrian and the German context that the English apprenticeship programme may be used, as in the case of the English hotel, to certify the skills that have already been acquired instead of upskilling new recruits.

The absence of chambers or sectoral intermediaries likely results in higher transaction costs for English employers who must independently manage the communication, quality control and performance monitoring. The hotel in England had only recently begun working with a local college to provide chef de partie training; previously it relied on the services of a national training provider. Their experiences with both institutional arrangements revealed weaknesses such as inadequate communication, a lack of alignment between content and workplace needs and substantial management and coordination burdens placed on the employer. While some of this has been alleviated through the switch to working with a local college, there is still a significant administrative burden on the employer. Reliance on apprentices to self-report training content and experiences highlights some of the ad hoc nature of integration of work and learning in the English system.

DRIVERS OF COST VARIATION

There are several factors, systemic and organisational, which drive cost variation in the apprenticeship system. The degree of apprenticeship productivity is a central driver in the benefit variation. Where apprentices are more productive, the value of their work offsets a greater portion of the cost of delivering apprenticeships. In most of the cases, the apprentices increased their productive contribution over time so that year one is the most expensive to the employer with the final year being the most affordable. However, all the chef apprentices in these cases had a high level of productivity in completing skilled tasks.

The institutional structure of the apprenticeship systems is also likely to play a role in the overall cost of delivery. In Germany and Austria, the chambers provide third-party quality assurance and oversee much of the management of the system. Likewise, the highly formalised and institutionalised structure of apprenticeship in Germany and Austria may make the systems more rigid but also help ensure quality. While in the England case, no such body exists, and the responsibilities fall to employers to negotiate directly with the training providers or colleges.

The regulatory burden related to the employment of minors was a challenge in some of the cases. Protections against shift and night work disincentivised the hiring of younger apprentices in Austria and Germany.

In the case of England, the incentive to recoup the Apprenticeship Levy was a strategic key driver in the firm's engagement with apprenticeships. This likely influenced the use of apprenticeship among current staff to encourage upward training in a way that makes use of apprenticeship systems, despite the high net costs in the English case.

7. DISCUSSION AND CONCLUSION

The comparative analysis above highlights the high cost to the employer of the apprenticeship system in England compared to the systems in Germany and Austria. Even after standardising for programme duration, firms in the English system reported having net costs more than double that of the costs borne by the other firms. This is largely due to the higher wages paid to apprentices in England. This may reflect a different attitudinal position which sees apprentices as members of the workforce rather than – their status as employees notwithstanding – as part of the formal vocational education system.

The second significant cost driver that demonstrated significant variation across the country cases is the cost of supervising the on-site training of apprentices. Across all cases, supervision costs were higher for the HVAC apprenticeships compared to chefs. Within-country variation, however, is noteworthy. The HVAC firm in Austria reported the lowest HVAC supervision costs, while the hotel in Austria had the highest of the chef supervision costs. Further study would be necessary to identify the drivers of this variation, and it was noted in the interview process that it can be difficult to accurately estimate the time required for (and therefore cost of) supervision over the multiple years of an apprenticeship.

The administrative costs for delivering apprenticeships were highest for the firms in England in both the HVAC and chef apprenticeship programmes. This may reflect the added administrative burden the English system places on employers to manage the relationship with local colleges, coordinate assessment systems and other tasks which are undertaken by the chambers in Germany and Austria.

INSTITUTIONAL RELATIONSHIPS

The comparative nature of this research reveals the critical role that intermediary institutions can play in fostering trust and reducing transaction costs within an apprenticeship system. In Germany and Austria, the chambers are deeply integrated into nearly every aspect of apprenticeship delivery. While in the case of England, no such institution exists and instead only the employers and the colleges manage apprenticeship delivery. The formalisation of the apprenticeship system through the presence of chambers in the German and Austrian cases offered employers predictability and reassurance about the quality of instruction and skill development. For example, the German employers reported confidence in the system's ability to deliver consistent outcomes.

In contrast, in the case of England, the system's reliance on bilaterial coordination increased transaction costs for employers in the apprenticeship system. The employers in England had to manage communications and undertake their own quality assurance processes with regard to the colleges, courses, apprentices' progression and assessment processes. The HVAC firm in England, in particular, cited poor communication, information sharing and responsiveness in their interaction with the local colleges.

The comparative evidence speaks to the potential for robust institutional relationships to increase trust in the system, thereby reducing transaction costs borne by employers.

ASSESSMENT PROCESSES

The assessment of apprentices is a critical element in ensuring quality of training and certifying occupational competence. Through the analysis of the six cases in this project, it is clear that there is substantial variation in the approach to assessment and reliability of the outcomes. All the apprenticeship cases in this study had assessments that combined practical skill with tests of knowledge and theoretical understandings.

In Germany and Austria, the chambers' role in administering and sitting on exam boards works to ensure impartiality in the results. Utilising the chambers' training space as sites for examination (as in the Austrian case) also allowed for meaningful practical examination that could be universally standardised. In England, there is more reliance on workplace-based opportunities to assess skill. This can lead to unequal skill assessment – apprentices cannot be examined on their ability to prepare fish in a kitchen that does not have fish. The result is that the skills an apprentice graduates with can be dependent on where they had undertaken their apprenticeship. As explained in the case of the hotel in England, applicants to work in the kitchen who completed apprenticeships at chain restaurants known to rely heavily on pre-prepared meals would be unlikely to be offered an interview. The head chef would not trust the technical skill and breadth of skill of those applicants.

NON-OCCUPATION-SPECIFIC LEARNING

The scope of non-occupational learning expected of apprentices varied substantially between the German speaking countries and England. While England was loosening requirements related to foundation skills such as English and maths, in Germany and Austria, apprentices spend a significant portion of the time at the vocational colleges undertaking learning related to civics, ethics or religion and foreign language. These skills are likely to foster broader career pathways for apprentices beyond the specific technical capabilities that come with the apprenticeship training.

CONCLUSION

This report has presented findings from a comparative study of apprenticeship costs and benefits, borne by the employer, in three distinct institutional contexts. Despite similarity in the content of the HVAC and chefs apprenticeship programmes in Germany, Austria and England, the costs of deriving these programmes varied significantly. Some of this will be driven by institutional differences – the role of chambers, the embeddedness (or not) of apprentices in the industrial relations systems, the availability of public subsidies for employers of apprentices.

While the data presented in this report is useful in indicating the cost of delivering apprenticeships for firms, it is not necessarily representative. Representative large-scale findings would require robust data sets that speak to the diversity of employers and apprenticeship programmes across the three case countries.

Through the research process it was also clear that even some of the firms did not have a clear understanding of the holistic costs of offering apprenticeships. A tool or online resources that would enable firms to undertake these calculations may help to guide investment in skill development in ways that are in line with overall financial health of a firm.

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ANNEX

Table A.1: Full Costs and Benefits of German HVAC Apprenticeship

	Value	Year 1	Year 2	Year 3	Year 3.5	Total
CONTEXT						
Number of apprentices at German HVAC firm	Number	0	0	1	0	1
Duration (in years)	Years					3.5
Annual salary of fully qualified HVAC technician (including social contributions and/or employer taxes)	GBP					47,088
Annual salary of unskilled helper (including social contributions and/or employer taxes)	GBP					28,681
Percentage of FTE spent in off-site training/off-work training	%	25%	25%	25%	25%	25%
COSTS						
Apprentice Employment/Wage Costs						
Apprentice wage	GBP	7,446	7,558	8,803	4,554	28,361
Social contributions/employer taxes	GBP	1,638	1,663	1,937	1,002	6,240
Other costs	GBP	259	259	259	259	1,036
Apprentice's total labour costs	*GBP*	*9,343*	*9,480*	*10,999*	*5,815*	*35,637*
Supervision Costs/Material Costs						
Administrative costs	GBP	204	0	0	0	204
Training supervision at workplace	GBP	5,224	5,224	5,224	2,612	18,284
Cost of training materials	GBP	510	510	510	255	1,785
Other costs (e.g. work clothes)	GBP	1,020	1,020	1,020	510	3,570
Total supervision costs	*GBP*	*6,958*	*6,754*	*6,754*	*3,377*	*23,843*
Training or School Costs						
Training costs (external or internal)	GBP	1,275	1,275	1,275	638	4,463
Exam or assessment costs	GBP	0	0	0	1,275	1,275
Total training school costs	*GBP*	*1,275*	*1,275*	*1,275*	*1,913*	*5,738*
Total Costs		**17,576**	**17,509**	**19,028**	**11,105**	**65,218**
BENEFITS						
Time spent in unskilled work	%	50%	40%	15%	0%	
Time spent in skilled work	%	50%	60%	85%	100%	
Productivity level of skilled work	%	40%	50%	60%	70%	
Productive working times in company	%	56%	56%	56%	56%	
Apprentice's productive contribution	GBP	12,865	13,862	15,334	8,925	50,986
Other income or subsidy	GBP	0	0	0	0	0
Total Benefits	**GBP**	**12,865**	**13,862**	**15,334**	**8,925**	**50,986**
Costs-Benefits	**GBP**	**4,711**	**3,647**	**3,694**	**2,180**	**14,232**

Notes: Productive working time in company refers specifically to the time an apprentice is physically present at the worksite and actively engaged in productive tasks. It excludes both on-site learning activities and any in-school learning. Figures are rounded to the nearest whole number.

Table A.2: Full Costs and Benefits of Austrian HVAC Apprenticeship

	Value	Year 1	Year 2	Year 3	Total
CONTEXT					
Number of apprentices at Austrian HVAC firm	Number	1	3	3	7
Duration (in years)	Years				3
Annual salary of fully qualified HVAC technician (including social contributions and/or employer taxes)	GBP				51,332
Annual salary of unskilled helper (including social contributions and/or employer taxes)	GBP				44,687
Percentage of FTE spent in off-site training /off-work training	%	27%	27%	27%	27%
COSTS					
Apprentice Employment/Wage Costs					
Apprentice wage	GBP	11,507	13,399	16,969	41,875
Social contributions/employer taxes	GBP	3,353	3,904	4,945	12,202
Other costs	GBP	0	0	0	0
Apprentice's total labour costs	*GBP*	*14,860*	*17,303*	*21,914*	*54,077*
Supervision Costs/Material Costs					
Administrative costs	GBP	0	0	0	0
Training supervision at workplace	GBP	1,608	1,608	1,608	4,824
Cost of training materials	GBP	200	100	100	400
Other costs (e.g. work clothes)	GBP	128	128	128	384
Total supervision costs	*GBP*	*1,936*	*1,836*	*1,836*	*5,608*
Training or School Costs					
Training costs (external or internal)	GBP	198	198	198	594
Exam or assessment costs	GBP	0	0	0	0
Total training school costs	*GBP*	*198*	*198*	*198*	*594*
Total Costs	**GBP**	**16,994**	**19,337**	**23,948**	**60,279**
BENEFITS					
Time spent in unskilled work	%	50%	28%	20%	
Time spent in skilled work	%	50%	72%	80%	
Productivity level of skilled work	%	100%	100%	100%	
Productive working times in company	%	31%	48%	48%	
Apprentice's productive contribution	GBP	14,883	23,746	24,002	62,631
Other income or subsidy	GBP	2,466	1,914	1,244	5,624
Total Benefits	**GBP**	**17,349**	**25,660**	**25,246**	**68,255**
Costs-Benefits	**GBP**	**-355**	**-6,323**	**-1,298**	**-7,976**

Notes: Time spent in unskilled/skilled work does not include time an apprentice spends observing at the worksite. Productive working time in company refers specifically to the time an apprentice is physically present at the worksite and actively engaged in productive tasks. It excludes both on-site learning activities and any in-school learning. In the BIBB-CBS framework, this time is typically classified as learning time. For this case, firm-reported differences in the number of sick leave days between regular employees and apprentices are not accounted for. Time off due to annual leave are not accounted for both for regular employees and apprentices. Figures are rounded to the nearest whole number.

Table A.3: Full Costs and Benefits of English HVAC Apprenticeship

	Value	Year 1	Year 2	Year 3	Year 4	Total
CONTEXT						
Number of apprentices	Number	1	0	0	1	2
Duration (in years)	Years					4
Annual salary of fully qualified HVAC technician (including social contributions and/or employer taxes)	GBP					38,400
Annual salary of unskilled helper (including social contributions and/or employer taxes)	GBP					28,616
Percentage of FTE spent in off-site training/ off-work training	%	20%	20%	20%	20%	20%
COSTS						
Apprentice Employment/Wage Costs						
Apprentice wage	GBP	16,000	20,000	25,000	29,000	90,000
Social contributions/employer taxes	GBP	2,240	2,800	3,500	4,060	12,600
Other costs	GBP	960	1,200	1,500	1,740	5,400
Apprentice's total labour costs	*GBP*	*19,200*	*24,000*	*30,000*	*34,800*	*108,000*
Supervision Costs/Material Costs						
Administrative costs	GBP	500	500	500	500	2,000
Training supervision at workplace	GBP	2,650	2,650	2,650	2,650	10,600
Cost of training materials	GBP	88	88	88	88	352
Other costs (e.g. work clothes)	GBP	100	100	100	100	400
Total supervision costs	*GBP*	*3,338*	*3,338*	*3,338*	*3,338*	*13,352*
Training or School Costs						
Training costs (external or internal)	GBP	50	50	50	50	200
Exam or assessment costs	GBP	0	0	0	0	0
Total training school costs	*GBP*	*50*	*50*	*50*	*50*	*200*
Total Costs	**GBP**	**22,588**	**27,388**	**33,388**	**38,188**	**121,552**
BENEFITS						
Time spent in unskilled work	%	50%	30%	10%	0%	
Time spent in skilled work	%	50%	70%	90%	100%	
Productivity level of skilled work	%	50%	70%	90%	100%	
Productive working times in company	%	72%	72%	727%	72%	
Apprentice's productive contribution	GBP	15,696	17,953	22,219	25,105	80,973
Other income or subsidy	GBP	0	0	0	0	0
Total Benefits	**GBP**	**15,696**	**17,953**	**22,219**	**25,105**	**80,973**
Costs-Benefits	**GBP**	**6,892**	**9,435**	**11,169**	**13,083**	**40,579**

Notes: Productive working time in company refers specifically to the time an apprentice is physically present at the worksite and actively engaged in productive tasks. It excludes both on-site learning activities and any in-school learning. Figures are rounded to the nearest whole number.

Table A.4: Full Costs and Benefits of German Hotel's Chef Apprenticeship

	Value	Year 1	Year 2	Year 3	Total
CONTEXT					
Number of chef apprentices at German hotel	Number	5	4	2	11
Duration (in years)	Years				3
Annual salary of fully qualified chef (including social contributions and/or employer taxes)	GBP				34,933
Annual salary of unskilled helper (including social contributions and/or employer taxes)	GBP				29,700
Percentage of FTE spent in off-site training/off-work training	%	24%	24%	24%	
COSTS					
Apprentice Employment/Wage Costs					
Apprentice wage	GBP	10,200	11,730	12,750	34,680
Social contributions/employer taxes	GBP	2,040	2,346	2,550	6,936
Other costs	GBP	428	1,132	1,193	2,753
Apprentice's total labour costs	*GBP*	*12,668*	*15,208*	*16,493*	*44,369*
Supervision Costs/Material Costs					
Administrative costs	GBP	0	0	0	0
Training supervision at workplace	GBP	1,475	1,475	1,475	4,425
Cost of training materials	GBP	167	167	167	501
Other costs (e.g. work clothes)	GBP	1,298	1,298	1,298	3,894
Total supervision costs	*GBP*	*2,940*	*2,940*	*2,940*	*8,820*
Training or School Costs					
Training costs (external or internal)	GBP	753	753	753	2,259
Exam or assessment costs	GBP	0	0	385	385
Total training school costs	*GBP*	*753*	*753*	*1,138*	*2,644*
Total Costs		**16,361**	**18,901**	**20,571**	**55,833**
BENEFITS					
Time spent in unskilled work	%	12%	8%	4%	
Time spent in skilled work	%	88%	92%	96%	
Productivity level of skilled work	%	88%	92%	96%	
Productive working times in company	%	52%	52%	52%	
Apprentice's productive contribution	GBP	16,238	16,937	17,694	50,869
Other income or subsidy	GBP	0	0	0	0
Total Benefits	**GBP**	**16,238**	**16,937**	**17,694**	**50,869**
Costs-Benefits	**GBP**	**123**	**1,964**	**2,877**	**4,964**

Notes: Other wage costs in this case include Christmas holiday and bonus pay. Productive working time in company refers specifically to the time an apprentice is physically present at the worksite and actively engaged in productive tasks. It excludes both on-site learning activities and any in-school learning. Figures are rounded to the nearest whole number.

Table A.5: Full Costs and Benefits of Austrian Hotel's Chef Apprenticeship

	Value	Year 1	Year 2	Year 3	Total
CONTEXT					
Number of apprentices at Austrian hotel	Number	1	0	3	4
Duration (in years)	Years				3
Annual salary of fully qualified chef (including social contributions and/or employer taxes)	GBP				35,532
Annual salary of unskilled helper (including social contributions and/or employer taxes)	GBP				30,139
Percentage of FTE spent in off-site training/off-work training	%	29%	29%	29%	29%
COSTS					
Apprentice Employment/Wage Costs					
Apprentice wage	GBP	11,900	13,328	15,708	40,936
Social contributions/employer taxes	GBP	3,510	3,932	4,634	12,076
Other costs	GBP	0	0	0	0
Apprentice's total labour costs	*GBP*	*15,410*	*17,260*	*20,342*	*53,012*
Supervision Costs/Material Costs					
Administrative costs	GBP	0	0	0	0
Training supervision at workplace	GBP	2,583	2,583	1,477	6,643
Cost of training materials	GBP	0	0	0	0
Other costs (e.g. work clothes)	GBP	33	33	33	99
Total supervision costs	*GBP*	*2,616*	*2,616*	*1,510*	*6,742*
Training or School Costs					
Training costs (external or internal)	GBP	2,826	2,826	2,826	8,478
Exam or assessment costs	GBP	0	0	0	0
Total training school costs	*GBP*	*2,826*	*2,826*	*2,826*	*8,478*
Total Costs		**20,852**	**22,702**	**24,678**	**68,232**
BENEFITS					
Time spent in auxiliary work	%	100%	90%	80%	
Time spent in skilled work	%	0%	10%	20%	
Productivity level of skilled work	%	100%	100%	100%	
Productive working times in company	%	71%	71%	71%	
Apprentice's productive contribution	GBP	21,299	21,680	22,062	65,041
Other income or subsidy	GBP	2,550	1,904	1,122	5,576
Total Benefits	**GBP**	**23,849**	**23,584**	**23,184**	**70,617**
Costs-Benefits	**GBP**	**-2,997**	**-882**	**1,494**	**-2,385**

Notes: Productive working time in company refers specifically to the time an apprentice is physically present at the worksite and actively engaged in productive tasks. It excludes both on-site learning activities and any in-school learning. Reported differences in the number of sick leave days between regular employees and apprentices are not accounted for. Time off due to annual leave are not accounted for, either for regular employees or apprentices

Percentage of FTE spent in off-site training includes time spent at VET school (22.2%) plus time spent at hotel-sponsored training activities which take place off the job site (7.1%). Figures are rounded to the nearest whole number.

Table A.6: Full Costs and Benefits of English Hotel's Chef Apprenticeship

	Value	Year 1	Year 2	Total
CONTEXT				
Number of apprentices	Number	3	0	3
Duration (in years)	Years			2
Annual salary of fully qualified chef (including social contributions and/or employer taxes)	GBP			30,000
Annual salary of unskilled helper (including social contributions and/or employer taxes)	GBP			21,176
Percentage of FTE spent in off-site training /off-work training	%	20%	20%	20%
COSTS				
Apprentice Employment/Wage Costs				
Apprentice wage	GBP	27,900	27,900	55,800
Social contributions/employer taxes	GBP	933	933	1,866
Other costs	GBP	1,167	1,167	2,334
Apprentice's total labour costs		*30,000*	*30,000*	*60,000*
Supervision Costs/Material Costs				
Administrative costs	GBP	273	273	546
Training supervision at workplace	GBP	2,923	2,923	5,846
Cost of training materials	GBP	200	200	400
Other costs (e.g. work clothes)	GBP	200	200	400
Total supervision costs	*GBP*	*3,596*	*3,596*	*7,192*
Training or School Costs				
Training costs (external or internal)	GBP	83	83	166
Exam or assessment costs	GBP	0	0	0
Total training school costs	*GBP*	*83*	*83*	*166*
Total Costs	**GBP**	**33,679**	**33,679**	**67,358**
BENEFITS				
Time spent in unskilled work	%	20%	20%	
Time spent in skilled work	%	80%	80%	
Productivity level of skilled work	%	100%	100%	
Productive working times in company	%	80%	80%	
Apprentice's productive contribution	GBP	22,588	22,588	45,176
Other income or subsidy	GBP	0	0	0
Total Benefits	**GBP**	**22,588**	**22,588**	**45,176**
Costs-Benefits	**GBP**	**11,091**	**11,091**	**22,182**

Notes: Productive working time in company refers specifically to the time an apprentice is physically present at the worksite and actively engaged in productive tasks. It excludes both on-site learning activities and any in-school learning. Figures are rounded to the nearest whole number.

BIBB Measurement of an Apprentice's Productive Contribution

The productive contribution of an apprentice to their employer is estimated using a methodology developed by the BIBB. This approach quantifies the value of work performed by an apprentice, split between auxiliary and skilled tasks. The calculation includes the number of hours worked on each task, the wage for corresponding staff categories (skilled and unskilled) and associated non-wage labour costs. The apprentice's performance level, as compared to a skilled member of staff and adjusted for their year in the training programme, is also factored in.

The formula is expressed as follows:

> *Productive Contribution = (hours on auxiliary tasks * [hourly wage for auxiliary staff + non-wage labour costs]) + (hours on skilled tasks *[hourly wage for skilled staff + non-wage labour costs] * performance level in training year)*

Differences in the way data was collected from the various case firms means that in some instances the above formula was expressed using annual figures (i.e. annual wage for auxiliary staff rather than hourly wage). The same underlying approach as that expressed above was used to calculated productive contribution based on annual data in those instances.

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