



The impact of the Apprenticeship Levy on Apprenticeships and other training outcomes

Pietro Patrignani, Gavan Conlon, Andy Dickerson
and Steve McIntosh

Discussion Paper 034

April 2021

The Centre for Vocational Education Research (CVER) is an independent research centre funded by the UK Department for Education (DfE). CVER brings together four partners: the LSE Centre for Economic Performance; University of Sheffield; National Institute of Economic and Social Research and London Economics.

Any views expressed are those of the authors, and do not represent the views of DfE. For more details on the Centre, go to cver.lse.ac.uk

Published by:
Centre for Vocational Educational Research
London School of Economics & Political Science
Houghton Street
London WC2A 2AE

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means without the prior permission in writing of the publisher nor be issued to the public or circulated in any form other than that in which it is published.

Requests for permission to reproduce any article or part of the Working Paper should be sent to the editor at the above address.

© P. Patrigan, G. Conlon, A. Dickerson, S. McIntosh, April 2021.

The impact of the Apprenticeship Levy on Apprenticeships and other training outcomes

London Economics: Pietro Patrignani, Gavan Conlon

Sheffield University: Andy Dickerson and Steve McIntosh

Abstract

Since April 2017, UK employers with an annual pay bill above £3 million have contributed to the Apprenticeship Levy. In this paper we use a matched firm-learner dataset to explore changes in apprenticeship and other training outcomes between 2015/16 and 2018/19, a period which spans the introduction of the Apprenticeship Levy. The findings reveal that over the period, there was a substantial shift away from lower-level apprenticeship starts to higher-level starts. Moreover, this shift was greater for employers who were required to pay the Levy, with smaller reductions in lower-level apprenticeships, and greater increases in higher-level apprenticeships when compared to similar non-Levy paying employers. No substantial differences were observed for other (non-apprenticeship) training undertaken over the same period.

Executive Summary

The English apprenticeship system has experienced a series of major reforms in recent years, affecting apprenticeship length, quality, level and funding. In particular, the UK government has introduced an Apprenticeship Levy to help fund apprenticeship starts for large employers. Since April 2017, all employers with an annual pay bill of more than £3 million contribute 0.5% of their pay bill in excess of the £3 million threshold to the Apprenticeship Levy. The funds accumulate in a digital account, to which the government adds a 10% top-up, and can be used to fund new apprenticeships at different levels (from Intermediate apprenticeships to apprenticeships at Higher level) within 24 months of deposit. This paper investigates the impact of the new Apprenticeship Levy on apprenticeship starts and other forms of (non-apprenticeship) training activity.

We combine information from three different data sources, namely: the **Individualised Learner Record** (ILR, containing information on apprenticeship and other training undertaken); the ONS' **Inter Departmental Business Register** (IDBR, containing information on business demographics and characteristics); and the **Digital Apprenticeship Service** (DAS, containing information from employers' accounts on Levy contributions and funds spent).

To assess the impact of the Levy, we compare training undertaken in 2015/16 (before the Levy was introduced) with training in 2018/19 (latest available year with data on the Levy) and focus on the evolution of **training intensity over time**, defined as the ratio apprenticeship starts divided by total enterprise employment. The analysis is undertaken separately for different apprenticeship levels and disaggregated by employer Levy status, employer size and industry sector.

Over the period considered, there was a **marked decline in apprenticeship starts** at the Intermediate level and (to a lesser extent) at Advanced level, coupled with a rapid increase in Higher level apprenticeship starts (Level 4 and above). However, enterprises paying the Levy generally experienced a positive trend in starts relative to non-Levy enterprises of similar size and sector. In particular, Levy enterprises previously undertaking no apprenticeship training saw a greater increase compared with non-Levy enterprises previously undertaking no training, while those starting with 'low'/'medium'/'high' levels of apprenticeship training (based on 2015/16 intensity) experienced a less significant decline in training intensity at lower apprenticeship levels and a greater increase at higher apprenticeship levels when compared with enterprises in the non-Levy group starting from a similar level of training intensity.

Evaluation of the impact is hampered by the design of the Apprenticeship Levy which does not provide a sharp discontinuity between Levy-employers and non-Levy employers (as employers contribute an extra £5,000 in Levy for every additional £1 million pay bill above the threshold of £3 million). Nevertheless, we also focus on just those Levy enterprises closest to the threshold, with annual pay bill up to £8 million (contributing up to £25,000 in 2018/19) and compare them with employers of similar characteristics (based on IDBR information), but not paying the Levy. The results indicate a **positive change over time** for the Levy group when compared to the non-Levy group, with the magnitude of the training intensity effect ranging

between 0.1 and 0.5 percentage points depending on level of apprenticeship and previous training intensity level (starting from average intensity levels in 2016 of around 1 in 100 employees for Intermediate and Advanced Apprenticeships and 0.1 in 100 employees for Higher Apprenticeships across all Levy enterprises in this group). Thus, there is a relative increase in training intensity for employers paying the Levy as compared to the non-Levy counterfactual group. However, there is no evidence that this increase is at the expense of other forms of (non-apprenticeship) training.

Evidence suggests that only a minority of these Levy funds were used¹ in the period 2017-2019 by employers who pay the Apprenticeship Levy ('Levy-employers') to fund apprenticeship training. At the same time, there is evidence suggesting that employers not paying the Levy ('non-Levy employers'), for which the government pays 95% of training costs, may have encountered difficulties in providing the desired level of apprenticeship starts due a shortage of funds². This would appear to indicate a misalignment in the Levy-based funding mechanism during this period.

In terms of evaluating the impact of the Apprenticeship Levy, there are a number of limitations in the data and analysis undertaken, including the lack of a sharp discontinuity in the policy design, and conflation of the effects of the Levy with various other reforms affecting apprenticeships at the same time as the Levy was introduced. Nevertheless, the evidence in this paper is strongly suggestive of a net positive effect of the Apprenticeship Levy on the number of apprenticeship starts over the period 2015/16 to 2018/19, especially at higher levels Level 4+), with no associated decrease in the provision of other forms of training as a consequence of the implementation of the Levy.

¹ See Section 3 and <http://www.open.ac.uk/business/apprenticeships/blog/levy-funding-unused>

² See Evans and Dromey (2019).

1. Introduction

Since April 2017, UK employers with an annual pay bill in excess of £3 million are required to pay the Apprenticeship Levy. The Levy is paid at a rate of 0.5% of the pay bill exceeding the £3 million threshold (such that the Levy contribution increases by £5,000 for every additional £1 million in pay bill). Employers also receive an annual £15,000 allowance³. Levy contributions can be spent on Apprenticeship starts ranging from intermediate apprenticeships to higher level apprenticeships. In CVER Briefing Note BN011⁴ we presented emerging evidence on trends in apprenticeship starts over time by enterprise characteristics. In this paper, we evaluate the impact of the introduction of the Apprenticeship Levy on apprenticeship starts. More specifically, we combine information from different data sources to assess whether enterprises contributing to the Apprenticeship Levy have seen different trends and patterns in their apprenticeship starts compared to enterprises not subject to the Levy.

As discussed in more detail in CVER BN011, apart from the introduction of the Apprenticeship Levy, a series of other reforms have occurred in the apprenticeship system in recent years including:

- Reforms seeking to raise the **quality of Apprenticeship training**: in particular the introduction of Apprenticeship Standards (occupation focused and with an external end-point assessment) and the phased withdrawals of Apprenticeship Frameworks; the introduction of a 12-month minimum duration for all Apprenticeships; and a 20% minimum threshold for off-the-job training;
- Changes to the funding mechanisms governing Apprenticeships:
 - Under the new **funding system for employers subject to the Levy**, the contributions accumulate in employers' Digital Accounts and can be spent on apprenticeship training (up to the funding band maximum), with a 10% top-up from the government⁵. Education is a devolved area, so the amount of funding available to be spent on English Apprenticeships is calculated based on the English workforce. More specifically the amount of funding entering the employer's Digital Account each month is calculated as the levy declared to HMRC, multiplied by the proportion of the pay bill paid to the workforce living in England, plus the 10% government top-up;
 - For **employers** with smaller pay bills **not paying the Levy**, the government pays 95% of training costs up to the funding band maximum, while the other 5% is paid for by the employer⁶. Moreover, Levy-paying employers can transfer up to 25% of their Levy funds⁷ to other employers (for example smaller firms in their supply chain).

³ See <https://www.gov.uk/guidance/pay-apprenticeship-levy>

⁴ CVER BN011 available at <http://cver.lse.ac.uk/textonly/cver/pubs/cverbrf011.pdf>

⁵ For Levy-paying employers, the government also co-funds 95% of the costs of additional Apprenticeship training (if Levy funds are not sufficient).

⁶ Co-investment rates were 90% in the period April 2017 to April 2019, see <https://www.gov.uk/guidance/manage-apprenticeship-funds>

⁷ From April 2019. Between April 2018 and April 2019, the maximum proportion transferrable was 10%.

Recent trends in apprenticeship starts have seen a decline in the overall number of starts between the pre-Levy years (around 500,000 starts per academic year) and following the introduction of the Levy (with around 390,000 starts in 2018/19). At the same time there has been a considerable shift away from Apprenticeship starts at Intermediate and, to a lesser extent, Advanced levels (Level 2 and 3 respectively) to apprenticeship starts at Higher level (Level 4 and above): the former group accounted for up to 60% of starts in the years before the introduction of the Levy, but only 37% of starts in 2018/19, while the share of starts in the latter group increased from 4% to 19% over the same period.

Apprenticeship training data presented in this paper cover the period up to the end of the 2018/19 academic year and do not include the period affected by the Covid-19 pandemic.

2. Data and linking

This paper uses information from a range of data sources⁸, namely:

- The **Individualised Learner Record (ILR)** which contains data from Further Education providers on Apprenticeships and other publicly funded training, learners' and training characteristics (e.g. level of Apprenticeship, subject area etc.). The ILR also provides details on **funding** for different learning aims, including whether any Levy funding was received during the year (this information is available from April 2017). For learning aims undertaken through the employer (such as Apprenticeships), the ILR also includes an employer identifier. ILR information between 2015/16 and 2018/19 was used in the current analysis;
- The **Employer Data Service (EDS)** (or 'Blue Sheep' data) is maintained by a third-party provider and contains data on employers undertaking publicly funded training (linked to the ILR). The information in the EDS dataset is collated from various data sources but does not directly match to any meaningful definition of business unit;
- The **ONS' Inter Departmental Business Register (IDBR)** information between 2016 and 2019 (September of each year) has been used at the local unit, PAYE, enterprise and enterprise group levels⁹. The IDBR reports information on employment, turnover, region of location and other variables for all registered UK businesses at different unit levels and the links between the units. Enterprise and local unit identifiers have been linked to the ILR data, with match rates for Apprenticeship training around 95% in recent years; and
- **Apprenticeship Service data:** since April 2017, employers paying the Levy accumulate and can spend funds on Apprenticeship training using the Digital Apprenticeship Service (DAS). From January 2020, the Education and Skills Funding Agency (ESFA), has also invited smaller employers (with a pay bill of less than £3 million)¹⁰ to use the Apprenticeship Service with the intention that, towards the end of 2020, all apprenticeships will be arranged through the Apprenticeship Service. The

⁸ For more information see http://cver.lse.ac.uk/textonly/cver/pubs/cverbrf003_technical_paper.pdf

⁹ In Figure A1 in the Annex we show a summary structure of the IDBR and the links between the different units

¹⁰ Use of the service by smaller employers during the early transition is optional.

DAS data received for analysis incorporates the following information (from April 2017 to March 2020¹¹, corresponding to tax years 2017/18 to 2019/20)¹²:

- **Funding information**, containing the *Digital Apprenticeship Service (DAS) identifier* (received in anonymised form), *PAYE reference number* and name for the schemes associated with the DAS, Levy contributions paid and Levy available (including top-up amount), English fraction, end of the year amount, with variables organised by payroll month and year;
- **Amount invested in Apprenticeship training** and funding source (Levy, Co-funded or Transfer), organised by *DAS identifier* and collection period (i.e. academic year). Expenditure on training is only organised at the DAS level, not the PAYE level, as funds accumulate and are spent at the DAS level;
- **Transfer**: containing the (anonymised) sender/receiver identifiers, amount and collection period.

Information on Levy training in the ILR

Information from the **ILR** on Apprenticeship and other training undertaken was linked to the **IDBR** and aggregated at the enterprise and enterprise group level (when enterprises are part of a larger group) through the data matching exercise linking the ILR (with employer information from the EDS) to the IDBR, with match rates in excess of 95% for Apprenticeship training¹³.

For each enterprise (or enterprise group when available), we created summary variables reporting Apprenticeship starts at different levels between the academic years 2016/17 and 2018/19 as well as other (non-Apprenticeship) training undertaken. These enterprise level variables also capture **whether starts were Levy funded** (after April 2017). For each enterprise (group) we also retained information on their characteristics. Given that the training data refer to training undertaken in England only, the relevant information from the **IDBR** (e.g. employment and turnover) was also aggregated at the English level (using local unit information).

Employer information from the Digital Apprenticeship Service (DAS) data

Information contained in the **Apprenticeship Service** data is organised at the DAS level (the level at which the Levy is administered and paid) and it is not directly linkable to the IDBR or ILR training information received¹⁴. The DAS funding files also contain the **PAYE reference** for each of the PAYE schemes associated with the DAS account, and through the PAYE reference it was possible to link information from the Apprenticeship Service data with the IDBR (matching PAYE references with enterprise references for the relevant PAYE schemes).

¹¹ ILR training data on Apprenticeship starts cover the period to the end of the academic year 2018/19, while DAS data includes the 2019/20 tax year (up to March 2020), thus partially covering the 2019/20 academic year.

¹² See also Figure A2 in the Annex.

¹³ See CVER BN011 at <http://cver.lse.ac.uk/textonly/cver/pubs/cverbrf011.pdf> and CVER BN003 at <http://cver.lse.ac.uk/textonly/cver/pubs/cverbrf003.pdf>

¹⁴ Information on DAS account number was received in anonymised form.

However, information at the DAS level cannot be matched retrospectively (before April 2017) nor currently reconstructed for employers not subject to the Levy (as they did not have an account set up with the Digital Service in the period considered).

Matching the ILR/IDBR and Apprenticeship Service data

The definition of business unit used in the IDBR (enterprise and enterprise group) and the definition of DAS employer are different, as the former are based on the ONS' definition of business units, while the Apprenticeship Service data is organised at the employer (DAS) level, following the HMRC definition of connected companies¹⁵. The only identifier available in both data sources is the **PAYE reference**, linked to the enterprise level in the IDBR and linked to the DAS employer level in the Apprenticeship Service data.

In particular, the definition of DAS employer may be wider than the definitions of enterprise and enterprise groups used in the IDBR, meaning that PAYE connected to the same DAS identifier may be linked to different enterprise groups in the IDBR. For example, school trusts act as the DAS employer for all the schools connected to the trust, but these are typically recorded as separate enterprises (with no connection) in the IDBR.

Defining Levy and non-Levy enterprises

For the purposes of the analysis, we combined information from the ILR/IDBR data and Apprenticeship Service to derive a definition of Levy enterprises. To ensure consistency over time (before and after the introduction of the Levy) and using the same definition for all types of employers (whether paying the Levy or not), we decided to use enterprises and enterprise groups as the relevant units for the analysis. In fact, the data on DAS employers currently does not cover non-Levy employers (so is inconsistent across different types of employers) and only started in April 2017, thus not allowing a comparison over time (before and after the introduction of the Levy).

An **IDBR enterprise (group) was defined as being a Levy enterprise** for the purposes of the analysis if:

- They had **at least one Apprenticeship start receiving Levy funding** during the academic years 2016/17 to 2018/19 (using information from the ILR);
- It was **associated with at least one PAYE scheme paying the Levy** between April 2017 and April 2019 (information drawn from the **DAS** data and linked to the IDBR).

Apart from the information presented in Section 3.1, which relates to Levy funds and is organised at the DAS level for Levy employers, all other analysis presented in the remainder of this paper is conducted at the enterprise (group) level and using the definition of Levy and non-Levy employers outlined above.

¹⁵ See government guidance at <https://www.gov.uk/guidance/pay-apprenticeship-levy> and <https://www.gov.uk/government/publications/employment-allowance-more-detailed-guidance/connected-companies-and-employment-allowance-further-guidance-for-employers-and-their-agents>).

Discrepancies between data sources

The data sources used in the analysis are collected for different purposes and operate at different levels of aggregation: the ILR collates information on course aims and learners from training providers, the IDBR is a comprehensive list of UK businesses used by government for statistical purposes, while the Apprenticeship Service data contain records on employers contributing to the Levy. Information and definitions across the different data sources are not necessarily consistent, for example the definition of employers in the DAS data may differ from the definition of enterprise in the IDBR data, and information on training from the ILR may not be consistent with IDBR information on employment¹⁶. Moreover, the quarterly extracts of IDBR used in the analysis contains employment and turnover information which is typically one or two years out of date¹⁷.

3. Descriptive statistics

3.1 Distribution and size of Apprenticeship levy funds using Digital Apprenticeship Service data

Information presented in this section is drawn from the DAS data and reflects Levy funds paid into the digital accounts and the amount spent on Apprenticeship training activities organised by academic year. Information from Levy accounts for the 2016/17 academic year starts from April 2017 while for the 2019/20 academic year is partial and only covers up to March 2020 (end of the tax year).

Characteristics of DAS employers

As shown in Figure 1, in total, there were slightly fewer than 17,000 DAS employers in each of the recent years and the distribution by size (pay bill band) and industry¹⁸ was generally stable over time (between 2017/18 and 2019/20) as shown in Figure 2, with the proportion of employers in pay bill band '£10m-£50m' increasing from 27% to 30% and the share of employers in the smallest pay bill band (£3m to £5m) decreasing from 32% to 28%. The proportions of employers in the other pay bill bands were stable, with the proportion in the pay bill band '£5m-£10m' accounting for around 31% of total DAS accounts and large employers (with pay bill in excess of £50m) accounting for slightly more than 10% of all DAS accounts. Finally, using the prevalent SIC code for the associated PAYE schemes from the IDBR, Figure 3 shows that more than half of all DAS accounts belonged to employers in 'Services Industries', slightly more than a quarter to employers in the 'Health, Education and Public Administration' sectors, one fifth to the 'Manufacturing and Construction' sector and less than 2% in the 'Agriculture and Energy' sectors¹⁹.

¹⁶ Instances of major mismatches between the number of starts from the ILR and employment figures from the IDBR (with number of starts larger than total employment) were removed from the analysis.

¹⁷ Information obtained from the Department for Business, Energy and Industrial Strategy as part of their investigation on data lags, sources and quality for IDBR data.

¹⁸ Information on SIC code is not available in the DAS data so we assigned employers to a given industry using the prevalent SIC code found in the IDBR for associated PAYE schemes.

¹⁹ 'Agriculture and Energy' includes SIC sections A, B, D & E; 'Manufacturing and Construction' includes SIC sections C & F; 'Services Industries' includes SIC sections G, H, I, J, K, L, M, N, R, S, T & U; 'Health, Education and Public Administration' includes SIC section O, P & Q.

Levy contributions and expenditure on Apprenticeship training

Overall, total Levy contributions reached almost £2.4 billion in the 2018/19 academic year (data for the 2019/20 academic year is partial), while expenditure on Apprenticeship training using Levy funds reached £716 million in the same academic year as shown in Figure 4. It should be remembered that employers have up to 24 months to spend the funds on apprenticeship training and 'older' funds get spent first, so it is not possible to directly derive a proportion of eligible funds finally spent.

The average Levy contribution for each DAS employer (funds entering the account) stood at around £137,000 in 2018/19, while average expenditure on Apprenticeship training (funds invested on training and leaving the account) reached approximately £42,000 during the same academic year as shown in Figure 5.

3.2 Apprenticeship training using matched ILR/IDBR data

In this sub-section we present information on apprenticeship training for the academic year before the introduction of the Levy (2015/16) and the latest available academic year with information on training (2018/19). Information on training is derived from the ILR matched to enterprise level information from the IDBR, while the definition of Levy enterprise used in the analysis is the one described in Section 2.

First we examine the **proportion of enterprises engaging in apprenticeship training** (i.e. *having at least one apprenticeship start in the academic year*) and how that has changed over time. As shown in Figure 6, there was a higher proportion of Levy enterprises engaging with apprenticeship training compared to non-Levy enterprises in all years (and the proportions increased from 2015/16 to 2018/19 for Levy enterprises while they decreased for non-Levy enterprises). For example, 48% of medium size Levy enterprises (i.e. with between 50-249 employees) had at least one Apprenticeship start in 2015/16, compared with 36% of non-Levy medium size enterprises, with the proportion increasing to 55% by 2018/19 for the Levy group and decreasing to 25% for the non-Levy group. Similar trends were observed for all other size categories, with an increasing proportion of enterprises engaging with apprenticeship training in the Levy group and a declining proportion in the non-Levy group. An identical pattern can be observed for each broad industrial sector, with a higher and increasing proportion of Levy enterprises engaging in apprenticeship training, and a lower and decreasing proportion of non-Levy enterprises engaging in apprenticeship training in every sector.

Figure 7 presents transition matrices between training (T) and non-training (NT) status for the same enterprise size and sector categories. The results show that the overwhelming majority of non-Levy enterprises were not involved in apprenticeship training either before or after the introduction of the Levy. Amongst Levy-enterprises the likelihood of being a trainer both before and after the introduction of the Levy increases with size of enterprise. For those that do change training status, there are significant proportions of Levy-paying enterprises moving in both directions, i.e. both into and away from training.

In Figure 8 and Figure 9 we examine the **average number of starts per enterprise**, disaggregated by apprenticeship level and Levy status, combined with size and sector: the number of starts was always higher for Levy enterprises in the period considered and declined at a slower rate (for starts at Level 2) and increased at a faster rate (for starts at Level 4 and above) amongst the group of Levy enterprises compared to the group of non-Levy enterprises.

4. Econometric analysis

In this section we set out the approach used to estimate the impact of the Apprenticeship Levy on training provision. Unfortunately, there is no clear ‘preferred’ econometric approach to estimating the impact of the Apprenticeship Levy for a variety of reasons:

- The Levy policy design does not create a sharp discontinuity around the threshold as employers pay an extra £5,000 in Levy contributions for each additional £1 million in pay bill in excess of £3 million, and thus the Levy increases gradually as a function of pay bill;
- The apprenticeship training system went through several major reforms in the period, affecting the behaviour of both Levy and non-Levy employers. As a result, some of the changes in apprenticeship starts that occurred (e.g. the shift to higher level apprenticeships) may well have occurred anyway even in the absence of the Levy;
- At the same time as the Apprenticeship Levy was being introduced, funding mechanisms also changed, and from April 2019 for smaller employers not subject to the Levy, the government now pays 95% of training costs (the co-investment rate was 90% prior to April 2019). However, there is evidence²⁰ of a funding shortage for non-Levy employers, meaning that training outcomes for those employers may be linked to funding availability.

As a result, it is difficult to disentangle the effect of the introduction of the Levy from the effects of other changes occurring in the apprenticeship system at the same time. Also, as mentioned in Section 2, there are some inherent data limitations associated with the data matching process.

Methodological approach

Notwithstanding the limitations highlighted above, in order to understand the impact of the Levy on training we explored **two different approaches**, based on looking at training outcomes over time by Levy status, employment size band (up to 49 employees, 50-249 employees and 250+ employees), industry and apprenticeship training intensity (as measured before the introduction of the Levy). In particular, **training intensity bands** were defined on the basis of 2015/16 apprenticeship training and consisted of four categories for each: ‘No training’, ‘Low Intensity’ (bottom third of the distribution with positive training), ‘Medium Intensity’ (middle third of the distribution with positive training), ‘High Intensity’ (top third of the distribution with positive training).

²⁰ See for example, Evans and Dromey (2019).

It should be remembered that the IDBR definition of enterprise does not align with the DAS definition of employer and some Levy employers connected to large companies in the DAS may be identified as small enterprises in the IDBR (as they have no formal links to any other enterprise in the IDBR data).

Approach 1

The first approach examines **changes in training outcomes for Levy enterprises, compared to non-Levy enterprises with similar training intensity in 2015/16** and in the same employment size band or industry. In this approach, **changes in apprenticeship training taking place between 2015/16 and 2018/19 in non-Levy enterprises act as the baseline for Levy enterprises**. However, it should be noted that in some cells (depending on size), there is a strong prevalence of Levy (or non-Levy) enterprises.

Approach 2

The second approach investigates changes in training outcomes separately by Levy status, using as the baseline the change in training observed for **high intensity enterprises** (those in the top third in terms of training intensity in 2015/16).

The idea here is that training volumes for high intensity Levy enterprises *should be* less affected by the introduction of the Levy as these firms were already undertaking relatively high volumes of training (and so would simply substitute other funding streams with Levy funding), while those with lower level of intensity may see a boost in apprenticeship starts (as a result of the Levy). The relative change for those 'not affected' by the Levy acts as the baseline (assuming that the other changes in the apprenticeship system impacted all enterprises similarly).

We use a **difference-in-differences estimator**, with **training intensity** defined as the ratio of apprenticeship starts and IDBR employment as the dependent variable, controlling for region of location, enterprise group type, (log) employment and sector of activity (in the regressions by employment size band only)²¹.

To interpret the findings, it should be noted that coefficients show the difference **relative** to the comparison group, so, for example (given the underlying trends presented), a positive coefficient for Level 2 starts indicates that starts at Level 2 have declined less for the treatment (Levy) group as compared to the counterfactual (non-Levy) group, while a positive coefficient for Level 4 starts indicates that they have increased more for the treatment group compared to the counterfactual.

Findings

In this section we present the findings of the analysis: in the first instance we show training intensity (defined as starts divided by employment) in 2015/16 and 2018/19 by Levy status and enterprise size. We looked at the following metrics: apprenticeship starts at Level 2, Level 3 and higher levels (Level 4 and above) and other (non-apprenticeship) training. In the second

²¹ When implementing the difference in differences analysis (including the PSM diff-in-diff) we have used the 'diff' command in Stata developed by Villa (2016).

part we show the results of the difference-in-differences analysis using the two different approaches outlined above.

Training intensity over time

The unadjusted trends over time for training intensity (starts divided by employment) are presented in Table 1 to Table 3 for small (employment 0-49), medium (employment 50-249) and large (employment 250+) enterprises respectively. The main findings show that:

- Apprenticeship starts at Level 2 declined substantially across almost all categories, but to a greater extent for non-Levy enterprises relative to comparable Levy enterprises (by size band and training intensity in 2015/16);
- Level 3 starts also generally declined (albeit not as much as starts at Level 2), but for some Levy enterprises (generally those starting from lower levels of training intensity) there was actually an increase in apprenticeship starts between 2015/16 and 2018/19;
- Apprenticeship starts at higher levels increased for almost all categories of Levy enterprises considered (especially those starting from lower levels of intensity), while they were generally stable or slightly increasing for non-Levy enterprises (but decreasing for enterprises starting from a high level of training intensity);
- Other training was largely unaffected with no visible trend across Levy and non-Levy enterprises over the period.

Difference in differences: Approach 1

The first approach compares the difference over time in training intensity for enterprises in the Levy group relative to comparable enterprises in the non-Levy group. The coefficients for the difference over time in apprenticeship training are positive across all employment size bands, training intensity bands and types of apprenticeship training, implying a relative **positive change** in apprenticeship starts as a proportion of employment for the Levy group. More specifically, as shown in Table 4 (by enterprise size) and Table 5 (by enterprise industry sector)²²:

- Apprenticeship starts at Level 2 declined at a slower rate for Levy enterprises, for example the decline in training intensity for small enterprises starting from a medium level of intensity was **2.5 percentage points smaller** for Levy enterprises compared to non-Levy enterprises;
- The relative change over time for starts at Level 3 was quite large for small enterprises, for example the change in training intensity for Level 3 starts was **4 percentage points higher** for small Levy enterprises previously undertaking no training compared to non-Levy enterprises not undertaking any training in 2015/16;

²² To check the robustness of the approach used we also employed a Propensity Score Matching difference in differences (i.e., matching Levy and non-Levy observations based on their pre-treatment characteristics) and results (shown for Approach 1 by intensity and enterprise size in Table A1 in the Annex) were very similar to the standard diff-in-diff estimates reported in Table 4.

- Change in Level 4+ starts was also relatively higher for Levy enterprises, for example, Level 4+ training intensity grew at a faster rate (by **0.5 percentage points**) for large Levy enterprises starting from a high level of intensity;
- For enterprises previously undertaking no Apprenticeship training, there was a positive effect of the Levy (compared to non-Levy enterprises undertaking no training in 2016), with training intensity rising between **1.9-4.1 percentage points** more for small enterprises and between **0.1 to 0.4 percentage points** for medium and large enterprises;
- Coefficients for other training undertaken were small and mostly not statistically significant in the disaggregation by enterprise size bands, suggesting that there was **no crowding-out effect** in response to the introduction of the Levy;
- Looking at the analysis by enterprise sector as presented in Table 6, the relative change in Level 2 and Level 3 training intensity was **positive** for Levy enterprises in the different industries, albeit slightly smaller for the 'Health, Education and Public Administration' sector compared to the other sectors;
- The effect on training intensity for Level 4+ apprenticeships was relatively weak for the 'Agriculture and Energy' sector as compared to the other three sectors;
- In the disaggregation by sector, the coefficients show a positive effect on other training for Levy enterprises in the 'Manufacturing and Construction' and 'Services' industries, suggesting that, for these sectors, there was also a **positive effect** (relative to the counterfactual) for non-apprenticeship training;

Difference in differences: Approach 2

In the second approach, differences over time in training intensity are estimated, separately by Levy status, compared to the group starting from high training intensity before the introduction of the Levy. Enterprises in the latter group should have a higher propensity to train and may simply tend to substitute Levy funding for other forms of funding previously used, while those starting from lower levels may boost the number of starts as funding available for apprenticeship training increases.

The findings presented in Table 6 and Table 7 suggest that the effect on apprenticeship training for non-Levy enterprises starting from lower levels of intensity (relative to those starting from high levels) is typically larger compared to similar Levy firms, at least for small enterprises. For medium-sized and large enterprises the effect is quite similar for the Levy and non-Levy groups (albeit generally slightly larger for the latter group).

Overall, training intensity for enterprises starting from a high level declined substantially over time and these findings suggest that the negative effect was partially mitigated by access to Levy funds for Levy enterprises starting from a high level of intensity: for example, compared to low intensity enterprises, non-Levy small enterprises starting from a high level intensity experienced a **15.9 percentage point** decline in Level 3 starts, compared to **7.4 percentage point** for small Levy enterprises (difference of approx. **8.5 percentage points**).

The differential effect for Levy enterprises is even stronger when disaggregating by industry (as these enterprises are larger than enterprises in the counterfactual group), in particular

high intensity Levy enterprises experienced a much smaller fall relative to other Levy enterprises compared to non-Levy enterprises with high intensity in 2015/16.

Looking at Levy employers close to the £3 million threshold

As an extension of Approach 1 (Levy versus non-Levy), we have also undertaken a Propensity Score Matching difference in differences but restricting the attention only to Levy employers with annual pay bill in 2018/19 between £3 million and £8 million at the DAS account level (paying up to £25,000 in Levy contributions) and not belonging to larger groups in the IDBR. Although there is no sharp discontinuity around the £3 million threshold, this approach should ensure that we can compare relatively more similar enterprises in the Levy and non-Levy groups²³. It should be remembered that for every additional million in excess of the £3 million threshold, the Levy contribution is £5,000, which typically covers only a fraction of the cost for a new apprenticeship, so the incentive to take up a new apprentice may be limited for employers close to the threshold.

Results of the PSM diff-in-diff on this restricted group of enterprises are presented in Table 8, both across all enterprises in Panel A (matching on apprenticeship training intensity level in 2016) and separately by 2016 training intensity bands ('no training', 'low'/'medium'/'high' intensity) in Panel B. Values of training intensity were generally similar in 2016 (slightly higher for the Levy group), and the relative change in training intensity between 2016 and 2019 was always positive and statistically significant for the Levy group, around **0.2 percentage points** for Intermediate and Advanced apprenticeships (declining across both groups but at a faster rate for the non-Levy group) and **0.1 percentage points** for Higher apprenticeships (increasing for the Levy group, while stable for the non-Levy). The change for other training was also positive for the Levy group (compared to the counterfactual) and around **0.1 percentage points**.

In Panel B of Table 8 we show the diff-in-diff results disaggregated by 2016 training intensity and the relative change for the Levy group is generally positive for apprenticeship intensity. In particular, for enterprises previously undertaking no apprenticeship training the relative change was around **0.2-0.3 percentage points** compared to similar enterprises in the non-Levy group. The relative change was also positive for Levy enterprises starting from low level of intensity (across all three apprenticeship types), medium level (excluding higher apprenticeships) and high level of intensity (but only for higher apprenticeships). Finally, looking at non-apprenticeship training, the relative change was only positive for the Levy group starting from no apprenticeship training in 2016 and negligible for the other groups.

5. Conclusions

In this paper we have examined the emerging evidence on apprenticeship training undertaken by employers contributing to the Apprenticeship Levy since April 2017. In order to undertake the analysis, we combined different datasets containing information on training undertaken (Individualised Learner Record), Levy employers (Digital Apprenticeship Service) and enterprise characteristics (from the ONS' Inter Departmental Business Register). We looked at training outcomes (training intensity defined as number of apprenticeship starts as

²³ To ensure further comparability we also restricted the attention to enterprises with IDBR turnover ranging between £2 million and £50 million in both the Levy and non-Levy groups (in both 2016 and 2019). The resulting Levy and non-Levy groups consisted of around 3,360 and 55,200 enterprises respectively.

a proportion of enterprise employment) in 2015/16 (the last full academic year before the introduction of the Levy) and 2018/19 (the latest available year) using a difference-in-differences approach.

The main findings show that **Levy enterprises experienced a more limited decline in apprenticeship starts at the Intermediate and Advanced levels and a faster rise in starts at Higher levels compared to non-Levy enterprises of similar size or sector and starting from a similar level of apprenticeship training in 2015/16.** These results were observed for both Levy enterprises previously not engaging in training (apprenticeship starts rose at a faster level compared to the non-Levy group) and for Levy enterprises previously already undertaking apprenticeship training with different levels of intensity.

Then, we focused on a smaller group of employers paying up to £25,000 Levy contribution in 2018/19 (corresponding to an English pay bill of up to £8 million) and compared them with employers of similar characteristics (based on IDBR information), but not paying the Levy. Overall intensity levels in 2016 (apprenticeship starts divided by total employment) were generally similar across Levy and non-Levy enterprises in this restricted group, with Levy enterprises providing Apprenticeship training at the Intermediate and Advanced levels to 1.2% and 0.9% of their workforce compared with 1.1% and 0.7% for non-Levy enterprises. Average intensity levels for Higher Apprenticeships in 2016 were around 0.1% across both the Levy and non-Levy groups. The findings for the regressions focusing on this restricted group are generally similar to the main findings, with positive change over time for the Levy group compared to the non-Levy group and magnitude ranging between **0.1-0.5 percentage points** (depending on level of apprenticeship and previous training intensity level).

Finally, we looked at training outcomes for Levy enterprises starting from a lower level of intensity in 2015/16 relative to Levy enterprises starting from a high level of intensity and compared the findings with those observed for the non-Levy group: **Levy enterprises starting from high levels of apprenticeship intensity in 2016 saw a substantial decline in the number of starts** (especially at Intermediate and Advanced level), **but the decline was even larger for non-Levy enterprises**, suggesting that availability of Levy funds attenuated the decline compared to similar enterprises in terms of pre-Levy intensity not contributing to the Levy.

It should be acknowledged that the scope of the analysis is hindered by a series of factors, including the nature of the data used (a combination of sources built for different purposes and using different definitions), the lack of a sharp threshold separating the treatment (Levy) and counterfactual (non-Levy) groups, the various reforms affecting the apprenticeship sector at the same time the Levy was implemented and the fact that employers not paying the Levy may have been unable to achieved the desired levels of training due to shortage of available funding.

References

Battiston A., Patrignani, P., Conlon, G., Dickerson, A. and McIntosh, S. (2020) 'Exploring trends in apprenticeship training around the introduction of the Apprenticeship Levy: emerging evidence using a matched apprentice-employer dataset'. *CVER Briefing Note 011*.

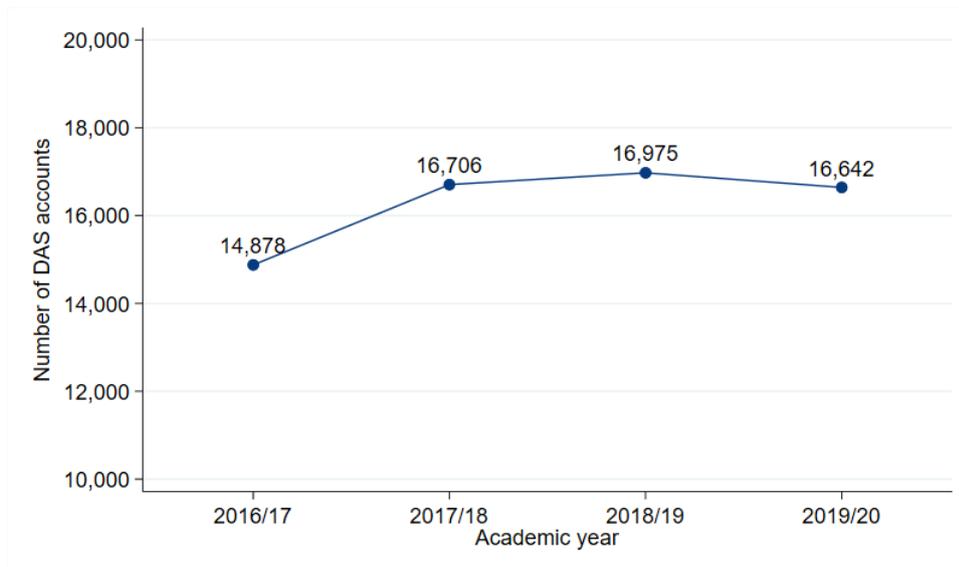
Conlon, G., Patrignani P., Herr, D. and Hedges, S. (2017) 'Matching firms engaged in publicly funded training in the Inter Departmental Business Register'. *Technical Report for CVER Briefing Note 003*.

Evans, S. and Dromey, J. (2019) 'Bridging the Gap: Next Steps for the Apprenticeship Levy'. *Learning and Work Institute*. [online at <https://learningandwork.org.uk/what-we-do/apprenticeships-technical-education/> last accessed 11-02-2021]

Villa, J.M. (2016) 'diff: Simplifying the estimation of difference-in-differences treatment effects'. *Stata Journal* 16, pp. 52-71.

Figures and Tables

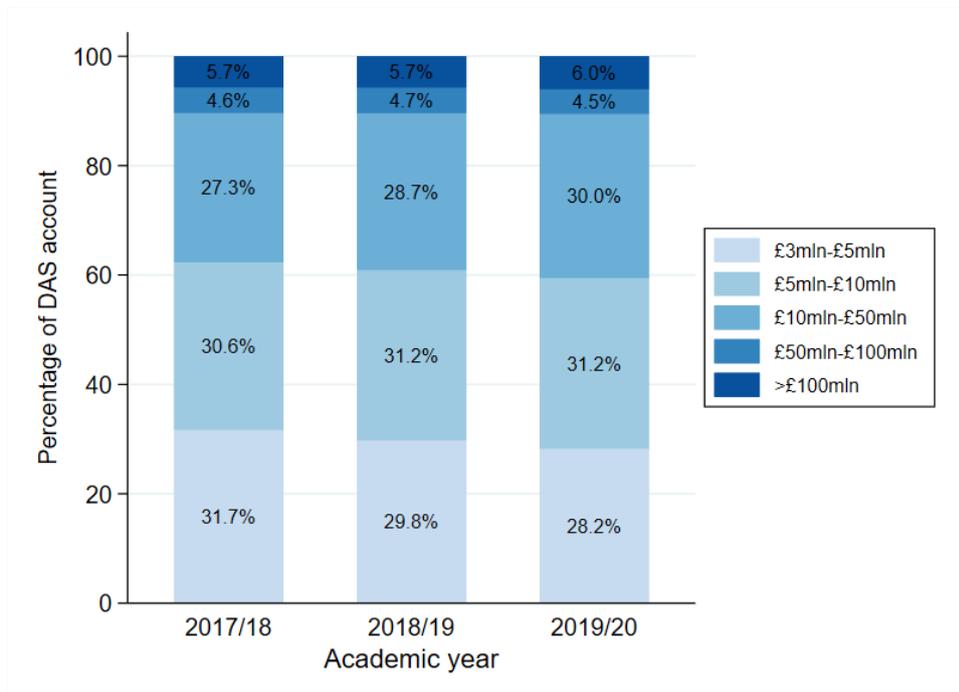
Figure 1: Number of DAS accounts over time



Note: DAS – Digital Apprenticeship Service;

Source: Authors' calculations based on information on the DAS data

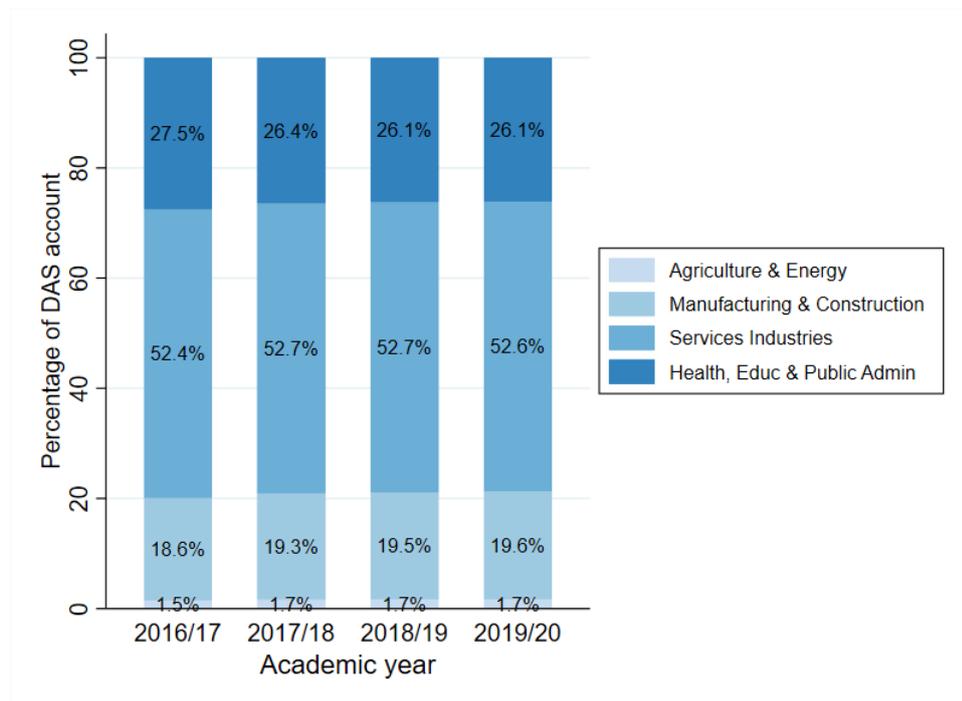
Figure 2: Distribution of DAS accounts by employer pay bill band and academic year



Note: DAS – Digital Apprenticeship Service; Information was matched to payroll year, so the 2016/17 academic year is not available. Information on the 2019/20 academic year is partial and only covers up to the end of March 2020 (end of the 2019/20 payroll year). Employer payroll reconstructed based on DAS data

Source: Authors' calculations based on information on the DAS data

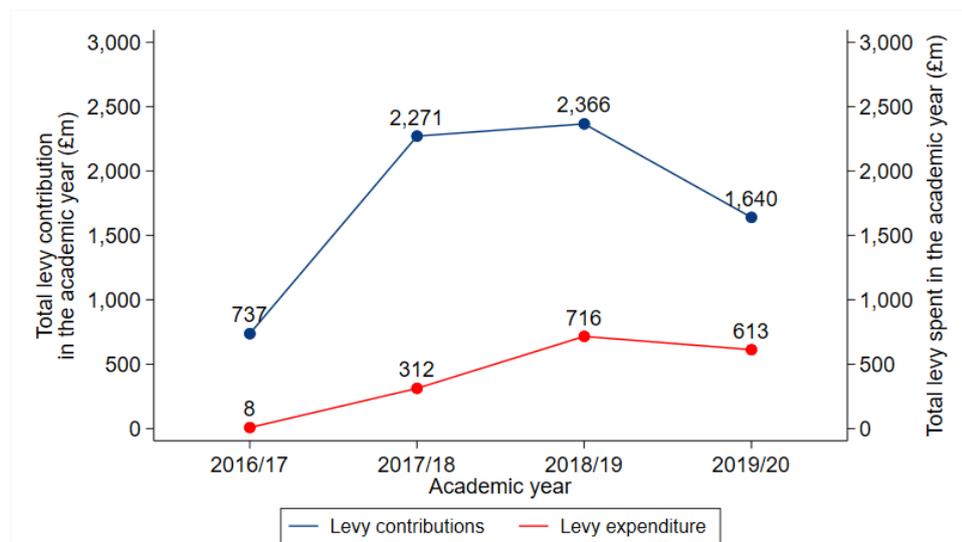
Figure 3: Distribution of DAS accounts by sector and academic year



Note: DAS – Digital Apprenticeship Service; Information on SIC code was drawn from the IDBR using the prevalent SIC code for PAYE schemes connected to the DAS employer identifier. Information on the 2019/20 academic year is partial and only covers up to the end of March 2020 (end of the 2019/20 payroll year). ‘Agriculture and Energy’ includes SIC sections A, B, D & E; ‘Manufacturing and Construction’ includes SIC sections C & F; ‘Services Industries’ includes SIC sections G, H, I, J, K, L, M, N, R, S, T & U; ‘Health, Education and Public Administration’ includes SIC section O, P & Q.

Source: Authors’ calculations based on information on the DAS data

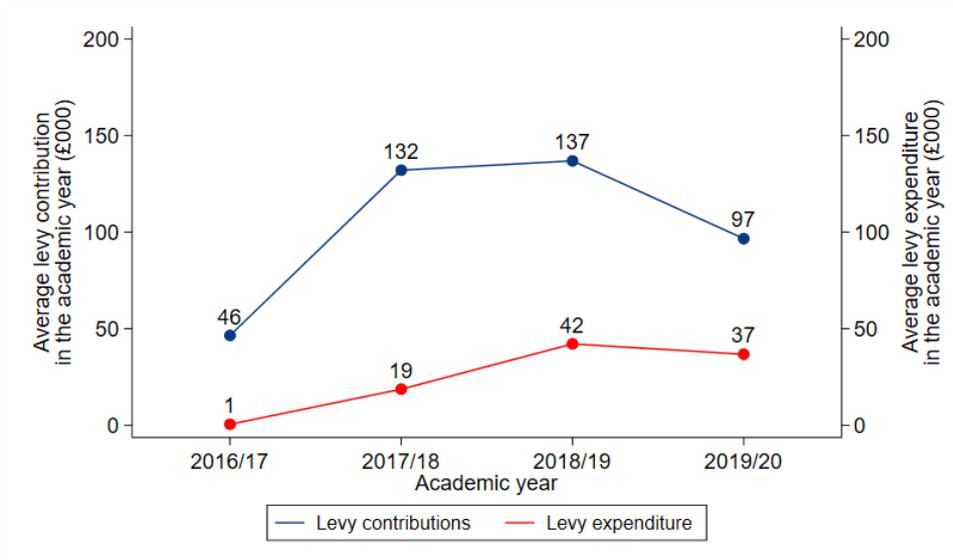
Figure 4: Total Levy contributions and expenditure



Note: DAS – Digital Apprenticeship Service; Information on SIC code was drawn from the IDBR using the prevalent SIC code for PAYE schemes connected to the DAS employer identifier. Information on the 2019/20 academic year is partial and only covers up to the end of March 2020 (end of the 2019/20 payroll year).

Source: Authors’ calculations based on information in the DAS data

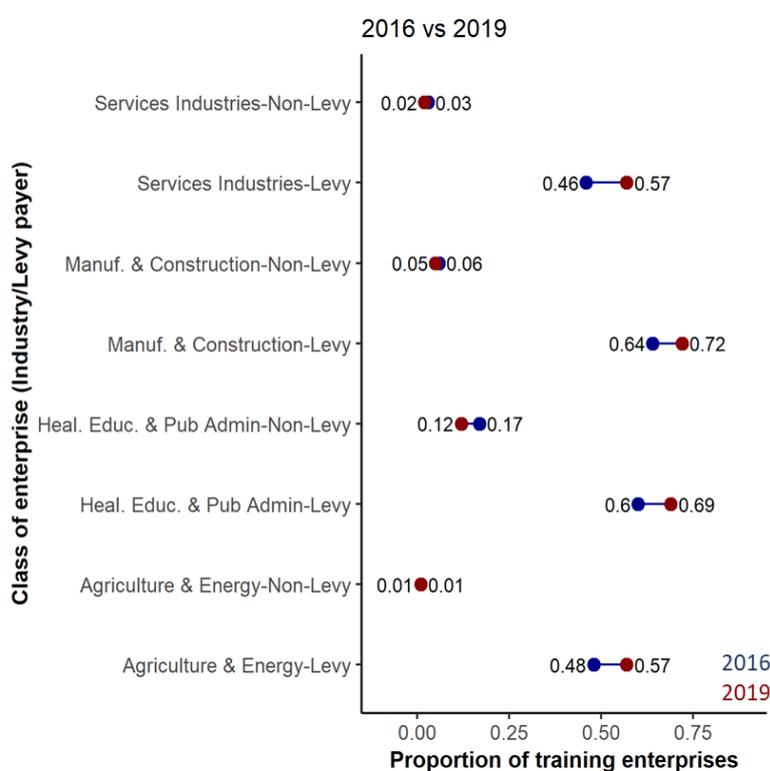
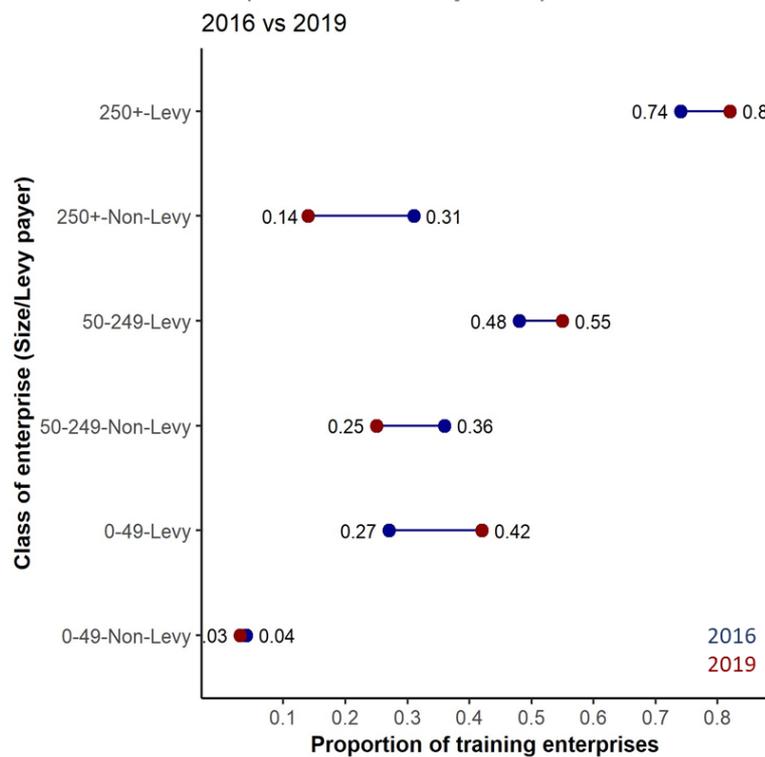
Figure 5: Average Levy funds per DAS account



Note: DAS – Digital Apprenticeship Service; Information on SIC code was drawn from the IDBR using the prevalent SIC code for PAYE schemes connected to the DAS employer identifier. Information on the 2019/20 academic year is partial and only covers up to the end of March 2020 (end of the 2019/20 payroll year).

Source: Authors' calculations based on information in the DAS data

Figure 6: Proportion of enterprises engaging in apprenticeship training by size and sector



Note: Apprenticeship training status in 2015/16 and 2018/19 for Levy and non-Levy enterprises. Enterprise size based on IDBR employment. 'Agriculture and Energy' includes SIC sections A, B, D & E; 'Manufacturing and Construction' includes SIC sections C & F; 'Services Industries' includes SIC sections G, H, I, J, K, L, M, N, R, S, T & U; 'Health, Education and Public Administration' includes SIC section O, P & Q. The definition of Levy enterprise is described in section 2.

Source: Authors' calculations based on ILR/IDBR and DAS data.

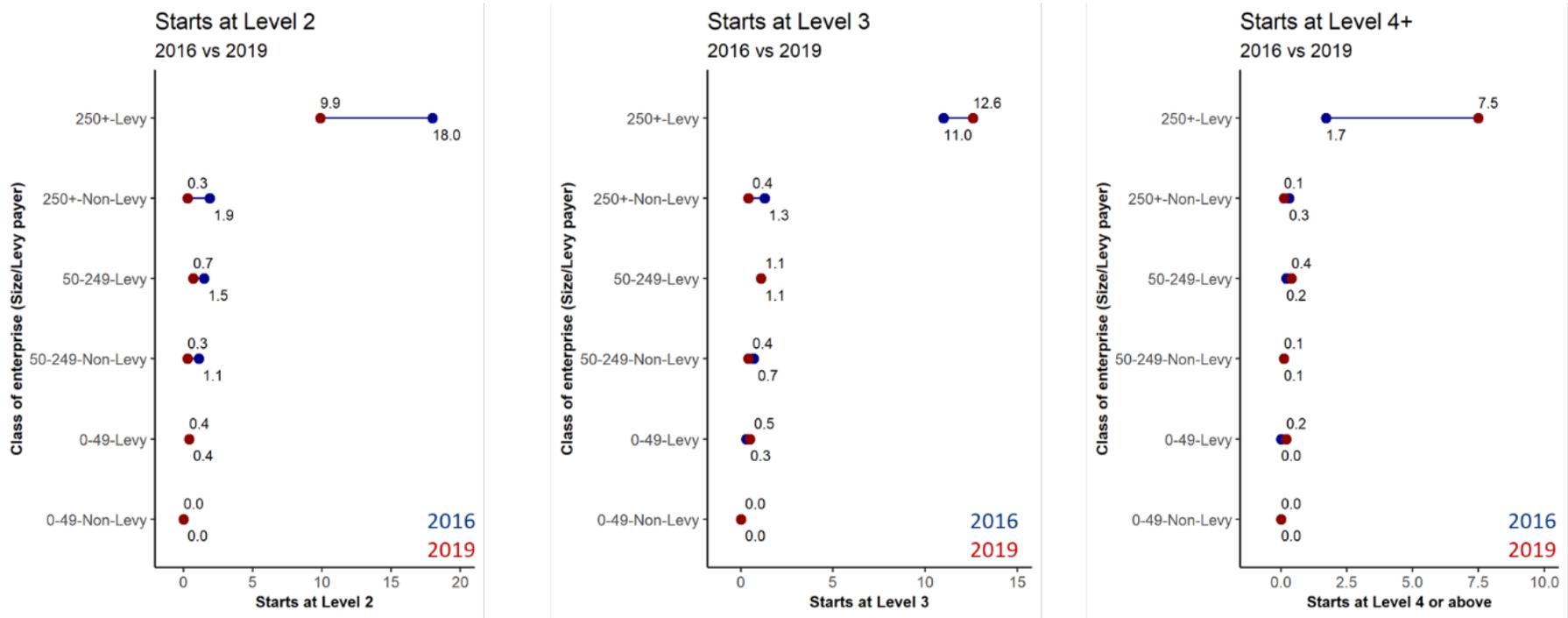
Figure 7: Apprenticeship training transition matrices – by size and industry



Note: NT: Not Training (any employee) T: Training (at least one employee); Apprenticeship training status in 2015/16 and 2018/19 for Levy and non-Levy enterprises. Enterprise size based on IDBR employment. 'Agriculture and Energy' includes SIC sections A, B, D & E; 'Manufacturing and Construction' includes SIC sections C & F; 'Services Industries' includes SIC sections G, H, I, J, K, L, M, N, R, S, T & U; 'Health, Education and Public Administration' includes SIC section O, P & Q

Source: Authors' calculations based on ILR/IDBR and DAS data

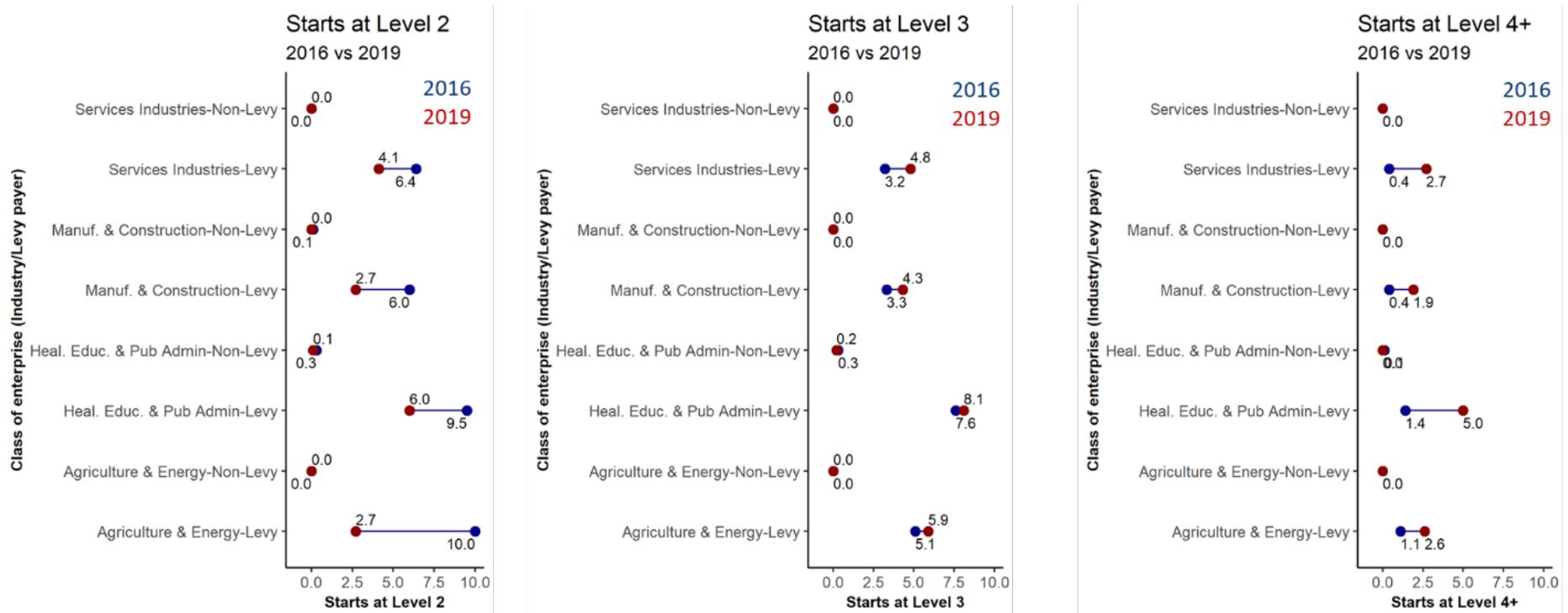
Figure 8: Apprenticeship starts by enterprise size



Note: Number of apprenticeship starts in 2015/16 and 2018/19 for Levy and non-Levy enterprises. Enterprise size based on IDBR employment. The definition of Levy enterprise is described in section 2.

Source: Authors' calculations based on ILR/IDBR and DAS data

Figure 9: Apprenticeship starts by industry



Note: Number of apprenticeship starts in 2015/16 and 2018/19 for Levy and non-Levy enterprises. Enterprise size based on IDBR employment. ‘Agriculture and Energy’ includes SIC sections A, B, D & E; ‘Manufacturing and Construction’ includes SIC sections C & F; ‘Services Industries’ includes SIC sections G, H, I, J, K, L, M, N, R, S, T & U; ‘Health, Education and Public Administration’ includes SIC section O, P & Q. The definition of Levy enterprise is described in section 2.

Source: Authors’ calculations based on ILR/IDBR and DAS data

Table 1: Training intensity (starts as a % of employment) in 2015/16 and 2018/19 for small enterprises (employment 0-49), by Levy status and training intensity bands

Year	Levy status	Training intensity in 2016	Apprenticeship Level 2 (Mean)	Apprenticeship Level 3 (Mean)	Apprenticeship Level 4+ (Mean)	Other training (Mean)	N
2015/16	Non-Levy	No Appr training	0.0%	0.0%	0.0%	0.1%	1,459,470
2018/19			0.2%	0.2%	0.0%	0.1%	1,459,470
2015/16	Non-Levy	Low Intensity	4.2%	3.0%	0.3%	1.0%	22,183
2018/19			1.3%	1.7%	0.3%	0.9%	22,183
2015/16	Non-Levy	Medium Intensity	11.3%	7.7%	0.6%	2.0%	18,129
2018/19			2.6%	2.6%	0.3%	1.1%	18,129
2015/16	Non-Levy	High Intensity	33.0%	21.1%	1.7%	4.3%	20,543
2018/19			4.6%	3.7%	0.4%	1.4%	20,543
2015/16	Levy	No Appr training	0.0%	0.0%	0.0%	0.3%	2,321
2018/19			2.7%	4.2%	1.9%	0.8%	2,321
2015/16	Levy	Low Intensity	3.9%	2.1%	0.3%	0.6%	494
2018/19			2.4%	2.5%	0.6%	1.1%	494
2015/16	Levy	Medium Intensity	11.0%	7.0%	0.8%	2.4%	206
2018/19			4.7%	6.1%	2.0%	2.6%	206
2015/16	Levy	High Intensity	31.7%	23.8%	4.8%	5.8%	174
2018/19			11.3%	15.8%	4.3%	3.5%	174

Note: For each category training intensity is defined as number of starts as a proportion of total IDBR employment. 'Other training' identifies the number of non-apprenticeship training starts. Enterprise size based on IDBR employment. The definition of Levy enterprise is described in section 2. Training intensity bands were defined on the basis of 2015/16 apprenticeship training: 'No training' (no apprenticeship starts), 'Low Intensity' (bottom third of the distribution with positive training), 'Medium Intensity' (middle third of the distribution with positive training), 'High Intensity' (top third of the distribution with positive training)

Source: Authors' calculations based on ILR/IDBR and DAS data

Table 2: Training intensity (starts as a % of employment) in 2015/16 and 2018/19 for medium size enterprises (employment 50-249), by Levy status and training intensity bands

Year	Levy status	Training intensity in 2016	Apprenticeship Level 2 (Mean)	Apprenticeship Level 3 (Mean)	Apprenticeship Level 4+ (Mean)	Other training (Mean)	N
2015/16	Non-Levy	No Appr training	0.0%	0.0%	0.0%	0.2%	12,117
2018/19			0.1%	0.2%	0.0%	0.3%	12,117
2015/16	Non-Levy	Low Intensity	0.7%	0.5%	0.1%	0.5%	1,854
2018/19			0.4%	0.4%	0.1%	0.6%	1,854
2015/16	Non-Levy	Medium Intensity	1.6%	1.3%	0.2%	0.6%	2,293
2018/19			0.6%	0.7%	0.2%	0.8%	2,293
2015/16	Non-Levy	High Intensity	7.8%	5.2%	0.9%	1.8%	2,587
2018/19			1.7%	2.0%	0.5%	2.1%	2,587
2015/16	Levy	No Appr training	0.0%	0.0%	0.0%	0.2%	3,463
2018/19			0.2%	0.5%	0.2%	0.4%	3,463
2015/16	Levy	Low Intensity	0.5%	0.5%	0.1%	0.4%	1,415
2018/19			0.4%	0.8%	0.3%	0.5%	1,415
2015/16	Levy	Medium Intensity	1.5%	1.4%	0.1%	0.7%	1,095
2018/19			0.7%	1.2%	0.3%	0.8%	1,095
2015/16	Levy	High Intensity	7.6%	4.9%	0.8%	1.6%	741
2018/19			1.7%	2.2%	0.6%	1.4%	741

Note: For each category training intensity is defined as number of starts as a proportion of total IDBR employment. 'Other training' identifies the number of non-apprenticeship training starts. Enterprise size based on IDBR employment. The definition of Levy enterprise is described in section 2. Training intensity bands were defined on the basis of 2015/16 apprenticeship training levels: 'No training' (no apprenticeship starts), 'Low Intensity' (bottom third of the distribution with positive training), 'Medium Intensity' (middle third of the distribution with positive training), 'High Intensity' (top third of the distribution with positive training)

Source: Authors' calculations based on ILR/IDBR and DAS data

Table 3: Training intensity (starts as a % of employment) in 2015/16 and 2018/19 for large enterprises (employment 250+), by Levy status and training intensity bands

Year	Levy status	Training intensity in 2016	Apprenticeship Level 2 (Mean)	Apprenticeship Level 3 (Mean)	Apprenticeship Level 4+ (Mean)	Other training (Mean)	N
2015/16	Non-Levy	No Appr training	0.0%	0.0%	0.0%	0.1%	476
2018/19			0.0%	0.0%	0.0%	0.0%	476
2015/16	Non-Levy	Low Intensity	0.1%	0.2%	0.0%	0.0%	85
2018/19			0.0%	0.1%	0.0%	0.2%	85
2015/16	Non-Levy	Medium Intensity	0.7%	0.4%	0.0%	0.1%	51
2018/19			0.0%	0.3%	0.2%	0.1%	51
2015/16	Non-Levy	High Intensity	3.7%	2.4%	0.5%	1.0%	83
2018/19			0.5%	0.7%	0.2%	1.1%	83
2015/16	Levy	No Appr training	0.0%	0.0%	0.0%	0.2%	1,442
2018/19			0.2%	0.4%	0.3%	0.1%	1,442
2015/16	Levy	Low Intensity	0.1%	0.1%	0.0%	0.2%	1,366
2018/19			0.2%	0.5%	0.3%	0.3%	1,366
2015/16	Levy	Medium Intensity	0.5%	0.5%	0.1%	0.4%	1,405
2018/19			0.4%	0.8%	0.4%	0.5%	1,405
2015/16	Levy	High Intensity	3.4%	2.0%	0.4%	0.9%	1,375
2018/19			1.1%	1.3%	0.5%	0.8%	1,375

Note: For each category training intensity is defined as number of starts as a proportion of total IDBR employment. 'Other training' identifies the number of non-apprenticeship training starts. Enterprise size based on IDBR employment. The definition of Levy enterprise is described in section 2. Training intensity bands were defined on the basis of 2015/16 apprenticeship training levels: 'No training' (no apprenticeship starts), 'Low Intensity' (bottom third of the distribution with positive training), 'Medium Intensity' (middle third of the distribution with positive training), 'High Intensity' (top third of the distribution with positive training).

Source: Authors' calculations based on ILR/IDBR and DAS data

Table 4: Approach 1 – ‘Diff-in-diff’: change in training intensity (starts divided by employment) by intensity and enterprise size for Levy enterprises vs. non-Levy enterprises

Size	Training intensity in 2016	Appr Level 2	Appr Level 3	Appr Level 4+	Other training	Obs
		<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>	<i>N</i>
0-49	No Appr training	0.025***	0.041***	0.019***	0.004***	2,916,659
	Low intensity	0.016***	0.019***	0.005***	0.006*	44,932
	Medium intensity	0.025***	0.042***	0.014***	0.010	36,976
	High intensity	0.098***	0.104***	0.007	0.016	40,800
50-249	No Appr training	0.001***	0.003***	0.002***	0.000	30,676
	Low intensity	0.003***	0.005***	0.002***	0.001	6,452
	Medium intensity	0.003***	0.004***	0.001***	-0.001	6,685
	High intensity	0.005	0.007**	0.003**	-0.006	6,574
250+	No Appr training	0.001***	0.004***	0.002***	0.000	3,720
	Low intensity	0.002**	0.004***	0.003***	-0.001	2,796
	Medium intensity	0.005**	0.004**	0.002	0.001	2,802
	High intensity	0.010	0.011***	0.005***	-0.001	2,806

Note: For each category training intensity is defined as number of starts as a proportion of total IDBR employment. ‘Other training’ identifies the number of non-apprenticeship training starts. Enterprise size based on IDBR employment. The definition of Levy enterprise is described in section 2. Training intensity bands were defined on the basis of 2015/16 apprenticeship training levels: ‘No training’ (no apprenticeship starts), ‘Low Intensity’ (bottom third of the distribution with positive training), ‘Medium Intensity’ (middle third of the distribution with positive training), ‘High Intensity’ (top third of the distribution with positive training). The coefficients should be interpreted as the percentage difference in training intensity over time for Levy enterprises relatively to the comparison group (non-Levy enterprises).

Source: Authors’ calculations based on ILR/IDBR and DAS data

Table 5: Approach 1 – ‘Diff-in-diff’: change in training intensity (starts divided by employment) by intensity and enterprise industry for Levy enterprises vs. non-Levy enterprises

Industry	Training intensity in 2016	Appr Level 2	Appr Level 3	Appr Level 4+	Other training	Obs
		<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>	<i>N</i>
Agriculture and Energy	No Appr training	0.010***	0.016***	0.020***	0.003	278,338
	Low intensity	0.038***	0.016***	0.001	0.009	760
	Medium intensity	0.103***	0.052***	0.003	0.034*	1,028
	High intensity	0.278***	0.171***	0.017	0.066	1,282
Manufacturing and Construction	No Appr training	0.009***	0.011***	0.006***	0.002	482,030
	Low intensity	0.024***	0.018***	0.002***	0.006**	10,962
	Medium intensity	0.077***	0.052***	0.003***	0.012***	9,176
	High intensity	0.253***	0.157***	0.005***	0.034***	12,918
Services Industries	No Appr training	0.008***	0.016***	0.007***	0.002***	1,989,117
	Low intensity	0.029***	0.019***	0.003***	0.003**	26,994
	Medium intensity	0.075***	0.048***	0.005***	0.009***	24,769
	High intensity	0.218***	0.152***	0.014***	0.020***	24,760
Health, Education and Public Administration	No Appr training	0.008***	0.012***	0.006***	-0.001	154,336
	Low intensity	0.018***	0.012***	0.005***	-0.001	14,560
	Medium intensity	0.050***	0.039***	0.010***	0.000	10,938
	High intensity	0.108***	0.090***	0.019***	0.005	10,172

Note: For each category, training intensity is defined as number of starts as a proportion of total IDBR employment. ‘Other training’ identifies the number of non-apprenticeship training starts. ‘Agriculture and Energy’ includes SIC sections A, B, D & E; ‘Manufacturing and Construction’ includes SIC sections C & F; ‘Services Industries’ includes SIC sections G, H, I, J, K, L, M, N, R, S, T & U; ‘Health, Education and Public Administration’ includes SIC section O, P & Q. The definition of Levy enterprise is described in section 2. Training intensity bands were defined on the basis of 2015/16 apprenticeship training levels: ‘No training’ (no apprenticeship starts), ‘Low Intensity’ (bottom third of the distribution with positive training), ‘Medium Intensity’ (middle third of the distribution with positive training), ‘High Intensity’ (top third of the distribution with positive training). The coefficients should be interpreted as the percentage difference in training intensity over time for Levy enterprises relatively to the comparison group (non-Levy enterprises).

Source: Authors’ calculations based on ILR/IDBR and DAS data

Table 6: Approach 2 – ‘Diff-in-diff’: change in training intensity (starts divided by employment) by Levy status and enterprise size band for lower training intensity bands vs. high intensity (based on 2016 Apprenticeship training intensity)

Size	Training intensity in 2016	Levy status	Appr Level 2	Appr Level 3	Appr Level 4+	Other training	Obs
			<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>	<i>N</i>
0-49	No Appr training	Levy	0.227***	0.122***	0.026***	0.019**	4,926
		Non-levy	0.289***	0.177***	0.013***	0.030***	2,952,533
	Low intensity	Levy	0.180***	0.074***	0.008	0.019	1,318
		Non-levy	0.254***	0.159***	0.012***	0.028***	84,414
	Medium intensity	Levy	0.131***	0.068**	0.016	0.015	750
		Non-levy	0.196***	0.122***	0.009***	0.020***	77,026
50-249	No Appr training	Levy	0.061***	0.032***	0.004***	0.004**	8,306
		Non-levy	0.062***	0.034***	0.005***	-0.002	28,944
	Low intensity	Levy	0.057***	0.030***	0.004***	0.004	4,254
		Non-levy	0.057***	0.030***	0.004***	-0.002	8,772
	Medium intensity	Levy	0.050***	0.025***	0.004***	0.003	3,632
		Non-levy	0.051***	0.026***	0.004***	-0.002	9,627
250+	No Appr training	Levy	0.025***	0.011***	0.001**	0.001	5,448
		Non-levy	0.033***	0.017***	0.004***	-0.001	1,078
	Low intensity	Levy	0.024***	0.010***	0.002***	0.002	5,282
		Non-levy	0.032***	0.017***	0.003***	0.001	320
	Medium intensity	Levy	0.022***	0.009***	0.002***	0.002	5,348
		Non-levy	0.026***	0.016***	0.005***	-0.001	260

Note: For each category, training intensity is defined as number of starts as a proportion of total IDBR employment. ‘Other training’ identifies the number of non-apprenticeship training starts. Enterprise size based on IDBR employment. The definition of Levy enterprise is described in section 2. Training intensity bands were defined on the basis of 2015/16 apprenticeship training levels: ‘No training’ (no apprenticeship starts), ‘Low Intensity’ (bottom third of the distribution with positive training), ‘Medium Intensity’ (middle third of the distribution with positive training), ‘High Intensity’ (top third of the distribution with positive training). The coefficients should be interpreted, separately for each Levy status group, as the percentage difference in training intensity over time for enterprises with lower levels of intensity relatively to the comparison group (enterprises with high intensity in 2016).

Source: Authors’ calculations based on ILR/IDBR and DAS data

Table 7: Approach 2 – ‘Diff-in-diff’: change in training intensity (starts divided by employment) by Levy status and enterprise industry for lower training intensity bands vs. high intensity (based on 2016 Apprenticeship training intensity)

Industry	Training intensity in 2016	Levy status	Appr Level 2	Appr Level 3	Appr Level 4+	Other training	Obs
			<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>	<i>N</i>
Agriculture and Energy	No Appr training	Levy	0.069***	-0.011	0.023	0.018*	262
		Non-levy	0.348***	0.142***	0.018***	0.086***	279,358
	Low intensity	Levy	0.055***	-0.026	0.000	0.018	140
		Non-levy	0.299***	0.125***	0.017***	0.078***	1,902
	Medium intensity	Levy	0.046*	-0.035	0.001	0.010	106
		Non-levy	0.224***	0.087***	0.016***	0.043***	2,204
Manufacturing and Construction	No Appr training	Levy	0.069***	0.026***	0.003	0.009**	2,808
		Non-levy	0.312***	0.170***	0.001***	0.040***	492,140
	Low intensity	Levy	0.052***	0.012***	-0.001	0.010**	2,104
		Non-levy	0.278***	0.150***	0.001**	0.037***	21,776
	Medium intensity	Levy	0.049***	0.010**	-0.002	0.010**	2,140
		Non-levy	0.222***	0.113***	0.000	0.031***	19,954
Services Industries	No Appr training	Levy	0.065***	0.037***	0.007***	0.007***	10,030
		Non-levy	0.275***	0.173***	0.012***	0.024***	2,003,847
	Low intensity	Levy	0.051***	0.022***	0.001	0.004	4,760
		Non-levy	0.238***	0.153***	0.012***	0.021***	46,994
	Medium intensity	Levy	0.042***	0.019***	0.002	0.003	4,036
		Non-levy	0.184***	0.122***	0.010***	0.014***	45,493
Health, Education and Public Administration	No Appr training	Levy	0.050***	0.043***	0.011***	-0.001	5,018
		Non-levy	0.150***	0.120***	0.025***	0.005***	159,490
	Low intensity	Levy	0.038***	0.027***	0.008***	-0.000	3,580
		Non-levy	0.126***	0.103***	0.022***	0.006**	21,152
	Medium intensity	Levy	0.031***	0.023***	0.008***	-0.001	3,190
		Non-levy	0.089***	0.073***	0.017***	0.004	17,920

Note: For each category, training intensity is defined as number of starts as a proportion of total IDBR employment. ‘Other training’ identifies the number of non-apprenticeship training starts. ‘Agriculture and Energy’ includes SIC sections A, B, D & E; ‘Manufacturing and Construction’ includes SIC sections C & F; ‘Services Industries’ includes SIC sections G, H, I, J, K, L, M, N, R, S, T & U; ‘Health, Education and Public Administration’ includes SIC section O, P & Q. The definition of Levy enterprise is described in section 2. Training intensity bands were defined on the basis of 2015/16 apprenticeship training levels: ‘No training’ (no apprenticeship starts), ‘Low Intensity’ (bottom third of the distribution with positive training), ‘Medium Intensity’ (middle third of the distribution with positive training), ‘High Intensity’ (top third of the distribution with positive training). The coefficients should be interpreted, separately for each Levy status group, as the percentage difference in training intensity over time for enterprises with lower levels of intensity relatively to the comparison group (enterprises with high intensity in 2016).

Source: Authors’ calculations based on ILR/IDBR and DAS data

Table 8: Propensity Score Matching ‘Diff-in-diff’: change in training intensity (starts divided by employment) for small Levy enterprises vs. non-Levy enterprises

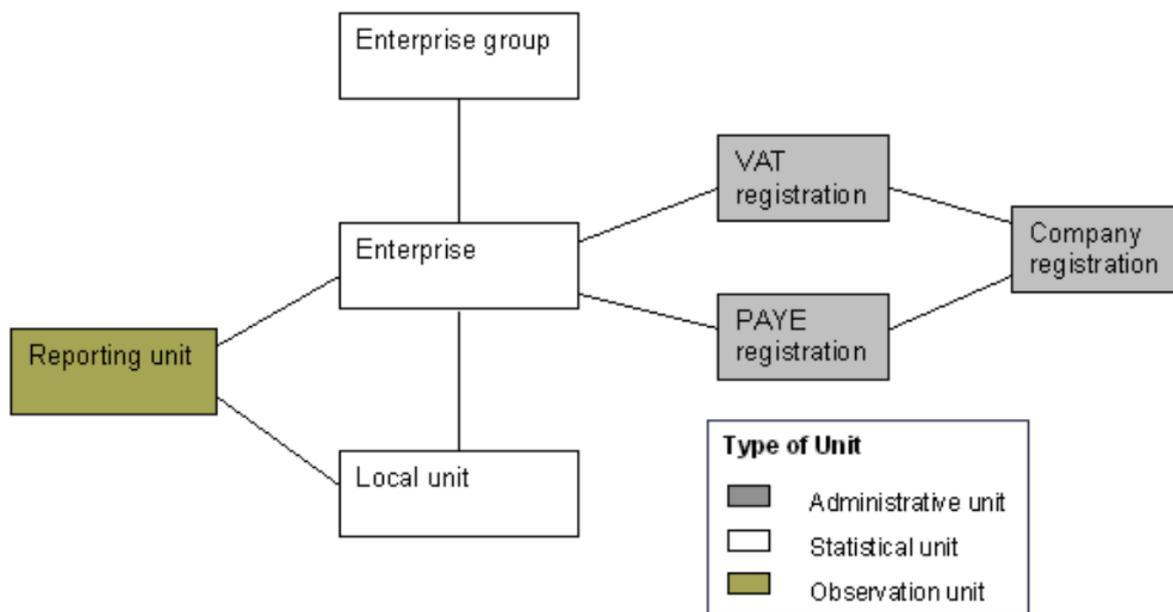
Panel A: All	Appr Level 2	Appr Level 3	Appr Level 4+	Other training	Obs
Diff-in-diff coefficient	0.002***	0.002***	0.001***	0.001*	116,716
Std. Err.	(0.000)	(0.000)	(0.000)	(0.000)	
Mean value for non-Levy enterprises in 2016	0.011	0.007	0.001	0.003	
Mean value for Levy enterprises in 2016	0.012	0.009	0.001	0.005	
Difference <i>Levy-non-Levy</i> in 2016	0.000	0.002	0.000	0.002	
Mean value for non-Levy enterprises in 2019	0.003	0.003	0.001	0.004	
Mean value for Levy enterprises in 2019	0.005	0.008	0.003	0.007	
Difference <i>Levy-non-Levy</i> in 2019	0.002	0.004	0.002	0.003	
Panel B: By 2016 training intensity band	Appr Level 2	Appr Level 3	Appr Level 4+	Other training	Obs
No Appr training	0.002***	0.003***	0.002***	0.002***	90,032
Low intensity	0.001**	0.004***	0.001***	0.000	12,242
Medium intensity	0.004***	0.005***	0.001	0.001	6,418
High intensity	0.005	-0.002	0.002***	0.000	5,562

Note: Relevant Levy enterprises are only those linked to DAS employers with 2018/19 pay bill between £3 million and £8 million and not belonging to a wider group. Both Levy and non-Levy enterprises were filtered on IDBR turnover between £2 million and £50 million (in both 2016 and 2019). For each category, training intensity is defined as number of starts as a proportion of total IDBR employment. ‘Other training’ identifies the number of non-apprenticeship training starts. The definition of Levy enterprise is described in section 2. The coefficients should be interpreted as the percentage difference in training intensity over time for Levy enterprises relatively to the comparison group (non-Levy enterprises). Training intensity bands were defined on the basis of 2015/16 apprenticeship training levels: ‘No training’ (no apprenticeship starts), ‘Low Intensity’ (bottom third of the distribution with positive training), ‘Medium Intensity’ (middle third of the distribution with positive training), ‘High Intensity’ (top third of the distribution with positive training). Kernel Propensity Score Diff-in-Diff with propensity score estimated using the 2016 value of the following covariates: sector, region, group type, log employment, log turnover and (in the ‘all’ regressions) apprenticeship training intensity in 2016.

Source: Authors’ calculations based on ILR/IDBR and DAS data

Annex 1: Additional Figures and Tables

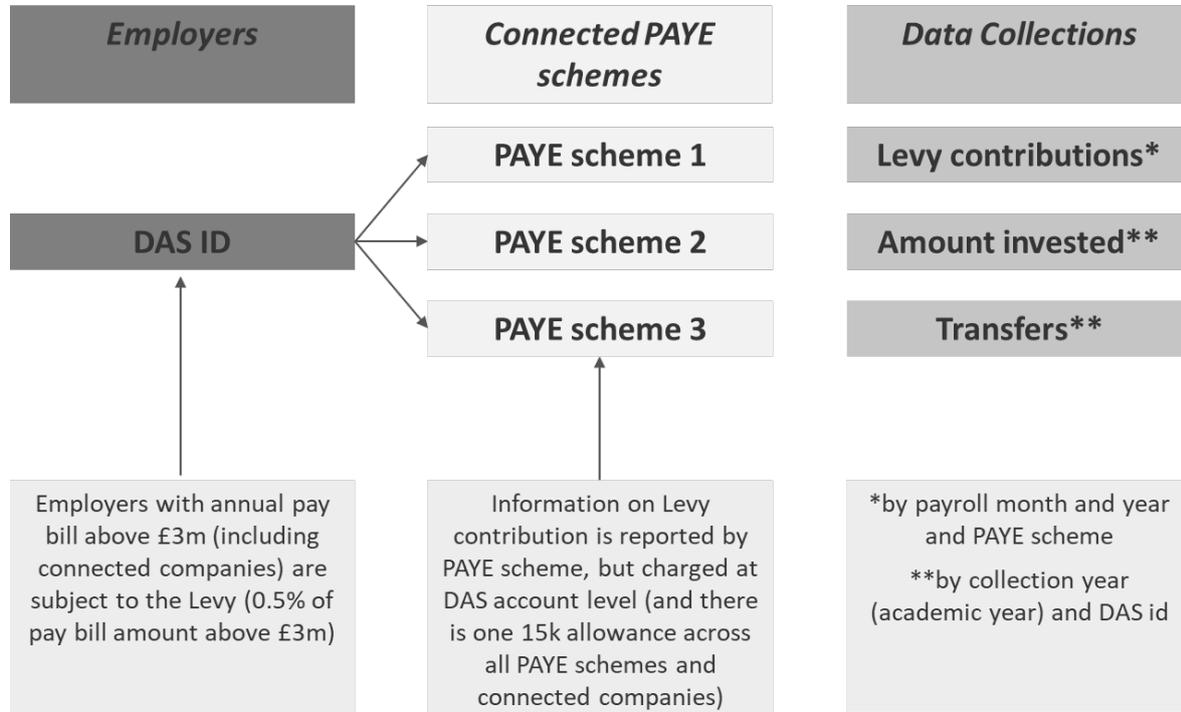
Figure A1: Structure of the IDBR



Note: Different units may be linked through relevant identifiers (e.g. *entref* (enterprise), *luref* (local unit), *payref* (PAYE))

Source: ONS 'Further information about IDBR sources, structure and updating for publications'

Figure A2: Structure of the Digital Apprenticeship Service data



Note: DAS – Digital Apprenticeship Service; PAYE - Pay As You Earn

Source: The authors based on information provided by ESFA (Education and Skills Funding Agency)

Table A1: Approach 1 – Propensity Score Matching ‘Diff-in-diff’: change in training intensity (starts divided by employment) by intensity and enterprise size for Levy enterprises vs. non-Levy enterprises

Size	Training intensity in 2016	Appr Level 2	Appr Level 3	Appr Level 4+	Other training	Obs
		<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>	<i>N</i>
0-49	No Appr training	0.025***	0.041***	0.019***	0.004***	2,864,566
	Low intensity	0.010***	0.016***	0.004***	0.005***	43,134
	Medium intensity	0.020***	0.040***	0.016***	0.008***	35,016
	High intensity	0.083***	0.099***	0.003	0.012***	38,908
50-249	No Appr training	0.002***	0.004***	0.002***	0.001	30,626
	Low intensity	0.002***	0.005***	0.002***	0.000	6,340
	Medium intensity	0.004***	0.004***	0.002***	0.000	6,648
	High intensity	-0.009**	-0.007**	0.000	-0.006**	6,516
250+	No Appr training	0.001***	0.004***	0.002***	0.000	3,628
	Low intensity	0.002***	0.004***	0.003***	-0.000	1,562
	Medium intensity	0.005***	-0.000	-0.001	0.001	1,818
	High intensity	0.004	0.007***	0.004***	0.003	1,744

Note: For each category training intensity is defined as number of starts as a proportion of total IDBR employment. ‘Other training’ identifies the number of non-apprenticeship training starts. Enterprise size based on IDBR employment. The definition of Levy enterprise is described in section 2. Training intensity bands were defined on the basis of 2015/16 apprenticeship training levels: ‘No training’ (no apprenticeship starts), ‘Low Intensity’ (bottom third of the distribution with positive training), ‘Medium Intensity’ (middle third of the distribution with positive training), ‘High Intensity’ (top third of the distribution with positive training). The coefficients should be interpreted as the percentage difference in training intensity over time for Levy enterprises relatively to the comparison group (non-Levy enterprises). Kernel Propensity Score Diff-in-Diff with propensity score estimated using the 2016 value of the following covariates: sector, region, group type and log employment

Source: Authors’ calculations based on ILR/IDBR and DAS data

Annex 2: The difference-in-differences estimator

$$Y_i = \alpha + \beta_1 \times time_i + \beta_2 \times T_i + \beta_3 \times time_i \times T_i + \varepsilon_i \quad (1)$$

where:

Y_i is training intensity, entered separately for apprenticeship starts at intermediate, advanced and higher level and for non-apprenticeship training starts;

$time_i$ is a binary variable identifying the pre-Levy (2016=0) and Levy period (2019=1);

T_i is a binary variable identifying treatment status (e.g. Levy vs. non-Levy) for each enterprise;

α is the mean value of training intensity in the control group (e.g. non-Levy) in 2016;

$\alpha + \beta_1$ is the mean value of training intensity in the control group (e.g. non-Levy) in 2019;

$\alpha + \beta_2$ is the mean value of training intensity in the treatment group (e.g. Levy) in 2016;

β_2 is the difference between treatment and control groups (e.g. Levy vs. non-Levy) in 2016;

$\alpha + \beta_1 + \beta_2 + \beta_3$ is the mean value of training intensity in the treatment group (e.g. Levy) in 2019;

$\beta_2 + \beta_3$ is the difference between treatment and control groups (e.g. Levy vs. non-Levy) in 2019;

β_3 is the difference-in-differences estimand;