Return to apprenticeships: A comparison between existing apprentices and newly recruited apprentices.

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Abstract:

In England, half of all apprentices are now of adult age. Most of them – and many of younger age, too – worked with their training firm for some time before starting their apprenticeship. In this paper, we estimate the benefit of apprenticeship completion making the distinction between groups of newly recruited and existing staff. To deal with sources of endogeneity resulting from apprenticeship completion, we exploit an exogenous change in minimum duration of training affecting apprenticeship completion.

Our findings show much higher benefits for new compared to existing staff. Also, increasing apprenticeship training only creates positive effects for new entrants, but not for existing workers. Therefore, policy should aim to refocus apprenticeships to be a mechanism of labour market entry combined with education to provide access to and acquire competences required for actual occupational roles, but not as a generic mechanism to train existing staff.

JEL code: J24, M53

1. Introduction

The number of apprenticeships has been increasing in recent years in England until the apprenticeship levy was introduced. Traditionally regarded as a training route to help young people make the school-to-work transition, they offer an alternative way to gain occupational skills outside of further education colleges. However, there is a considerable increase in the number of apprentices of adult age (aged 25 and over) and people, who have been employed at their training firm for some time. Based on our new data, we can show that 75% of apprentices have at least one year of firm tenure before starting their apprenticeship.

To an extent, the growth of adult apprentices resulted from a change in education policy encouraging employers to increase the total number of apprenticeships while reducing support for other forms of workplace-based training. Conversion of existing workers into apprentices has been observed for some time[1], but with the introduction of the Apprenticeship Levy in 2017 – which allows firms to reclaim contributions to a mandatory training fund only for recognized apprenticeships – incentives to enrol existing staff likely increased further. Following the literature (Fuller and Unwin, 2009), we refer to them as 'conversions' or 'existing apprentices'.[2] At the onset, existing apprentices may have similar formal levels of education as newly recruited apprentices, but the work experience with their employer makes them very different. In addition, a wider range of reasons likely exists why they start the apprenticeship, from aiming for career changes, obtaining more skills or certifying existing skills.

In this paper, we estimate the return of completing apprenticeship for newly recruited apprentices and existing apprentices. Previous research, using multivariate regression and conventional Difference-in-Differences, is likely to compound with selection bias as completion is self-selected. To address the likely problem of the selectivity of completing apprenticeships, we take advantage of an exogenous variation affecting the probability of completing apprenticeship caused by the introduction of the Specification of Apprenticeships Standards for England (SASE). This regulation came into effect in August 2012 and introduced a minimum duration of 12 months for all recognized English apprenticeships, thereby creating exogenous change in the cost and probability of completing the training.[3]

As the nature of apprenticeships and the starting wages of apprentices differ widely by people's characteristics, apprentices likely work in different roles during their training, especially when comparing newly recruited apprentices and existing staff beginning apprenticeships. By exploiting that the policy reform affects completion of apprenticeships exogenously for both groups, we estimate wage returns, which are less affected by such individual heterogeneity than previous studies. As discussed in the previous paper on the relationship between increasing length of training and the rate of completion (Nafilyan and Speckesser 2019), our estimates correspond to a Local Average Treatment Effect (LATE) exploiting the changes in earnings from the switchers, who decide not to complete the apprenticeship due to the reform.

The regression results suggest that the wage increase for completing an apprenticeship is around 19%. New entrants can benefit more than existing workers, 35% and 13% respectively.

[1] See e.g. Fuller and Unwin's (2010) evidence on adult apprenticeships submitted to Parliament, suggesting many more mature learners with previous work experience working for their apprenticeship employer before.
[2] Existing apprentice in this paper is defined as apprentice who starts apprenticeship with at least one year working experience in the firm which train them.
[3] Note that the minimum duration does not mean that apprentices have 12 months of training – the actual learning time was in many cases unchanged, see Nafilyan and Speckesser (2019).

These estimated wage returns are higher than found in a benchmark specification using Difference-in-Differences without the instrument (16% and 5%). We argue that the wage increase is largely reflected by the increase in productivity after the completion of apprenticeship with little impact of signalling effect and credential effect.

Since existing apprentices might have gained the required skills to a large extent from previous work experience compared to the new apprentices, further improvement of the apprenticeship in England could consider reviewing the funding of apprentices relative to age bands. Especially, the reason behind those employed workers becoming apprentices might be driven by employers. Since benefits for young people doing apprenticeship are much higher, the funding then should be adjusted to encourage employers to open more apprenticeship positions to younger unemployed workers who need to be trained. The recent introduction of the Apprenticeship Levy neglected this issue and doesn't reflect the differential gains for different groups of apprentices, likely leading to inefficient skills provision to the workforce.

The rest of this paper is organized as follows: Section 2 presents the institutional background to apprenticeships in England and a review of existing research. Section 3 introduces the methodology and discusses the potential caveats when applying it for this research. Section 4 summarizes the data. Section 5 presents the results. Section 6 concludes.

2. Institutional background and existing evidence

2.1. Background

In England, as in most European countries, apprenticeships were historically the traditional route to qualify for a range of occupations in activities such as building, heavy industries, mining and printing. While apprenticeships remained the dominant way of vocational education across the economy in the German-speaking countries and the Netherlands when service industries expanded from the 1960's onward, apprenticeships in England underwent profound changes. With apprenticeship levels similar to these countries sixty years ago, when around 30% of school leavers started apprenticeships (Gospel 1995), industrial change, lack of corporatist industrial relations and a direction of the funding towards the general education system moved the costs of apprenticeships in England towards employers (Fuller and Unwin 2009). As a consequence, they remained only relevant where a lot of practical work experience was needed, i.e. manual occupations, trades and industry. Seen by most employers and the government as too job-specific and lacking transferable skills, the use of apprenticeships across the wider economy declined, although they regained importance when youth unemployment was high in the 1980's. Since then, various youth training programmes adopted key components of apprenticeships, for example the Youth Training Scheme (YTS), which very much focused on work experience rather than college education (ibid.). However, in the overall expansion of general education since the 1980's, apprenticeship training was started only by a minority of young people: In 1990, only 53,000 apprenticeships were started, in particular by young people orientating towards engineering and construction (Lee 2012).

When Modern Apprenticeships were introduced by the government in 1994, their main objective was to provide a consistent framework of employer-based vocational education across all sectors of the economy, including the expanding service sector, to help young people achieve better school-to-work transitions. After various changes in the legislation, the

Apprenticeships, Skills, Children and Learning Bill in 2009 demanded all apprenticeships to include a Competencies Qualification at Level 2 or 3 of the Regulated Qualification Framework, a Technical Qualification demonstrating knowledge and understanding of theoretical concepts and English and mathematics at level of good secondary school leavers. Apprenticeships aiming for Level 2 or Level 3 qualifications differ substantially, both in the qualifications obtained and the complexity of procedural and theoretical knowledge and skills in the occupational field. Level 2 (or 'Intermediate') Apprenticeships aim to qualify people to be able to deliver clearly defined professional tasks, whereas Level 3 (or 'Advanced') Apprenticeships aim for knowledge and skills required to address non-standard and more complex tasks and wider professional knowledge.

Initially aimed as a programme for young people, apprenticeships increasingly involve mature learners with previous work experience, many of them having worked for their apprenticeship employer before (see e.g. Hogarth, et al. 2012). Such apprentices are very different compared to young people, who engage in a programme of skill formation in order to mature and become a recognized member of an occupational community, as described by Fuller and Unwin (2010). Instead, they have had in many cases substantial previous work experience and – when they had been existing employees – employers have better knowledge about their work productivity, attitudes, etc. They also earn significantly more and likely work in different roles than young people. Funding conditions have been very similar for people above the age of 19 since 2010, resulting in significant increase in adult apprentices. More recently, the introduction of the employer-led Apprenticeship Levy in 2017, which can only be used for apprenticeships, likely increased the incentives to use the resources for existing staff rather than to employ young people, who likely make a lower contribution to the firm during their apprenticeship and have higher risk of drop-out.

While this points towards the motivation of employers to engage existing staff and more mature learners altogether, there is a risk that adults and staff converting to apprenticeships 'experience little more than the accreditation of their existing knowledge and skills, with an absence of significant new learning, whilst others achieve new levels of occupational expertise and build a platform for further progression' (see Fuller, et al. 2015). Some of the programmes for existing staff may have this problem, thereby not delivering the knowledge and skills training consistent with a genuine apprenticeship format and offering less time for learning and career development, see also McIntosh and Morris (2018).

2.2 Participation

Figure 1 shows the development of apprenticeship starts since the 2002/03 academic year. From a programme for young people, with about 100,000 people 16 to 18 years old and 70,000 between 19 and 25, the programme expanded in the 2010's. In 2018/19, there were 393,000 starters, about 180,000 of them older than 25 years. The age group 19-25 years old saw moderate expansion to 116,000, while the number of 16-18-year olds was unchanged at 97,000.

<Figure 1 Here>

Within the apprenticeships, we also observed changes in the level of apprenticeships, see Table 1. In 2002/03, two thirds of the apprentices were young people in Level 2 apprenticeships. In 2018/19, 44% of all apprenticeships were at Level 3, about half of this group aged 25 and over. In the recent years, a new segment of 20% of apprenticeships with tertiary education emerged, a development too recent to be investigated in this study.

<Table 1 Here>

The description of average participant stocks in the programme by sectors in Figure 2 reveals further significant change, with an expansion of apprenticeships driven primarily in business and administration occupations as well as the health and social care sector. Moderate expansion was also observed for the retail and manufacturing sectors.

<Figure 2 Here>

While official statistics confirm the changes in the programme towards involving more mature apprentices, there are no official statistics on the percentages of apprenticeships resulting from conversions of existing staff. However, data from surveys of apprenticeship employers indicate that this practice is widespread, in particular in the service sector, which represents most apprenticeships looked at in this study as mainly apprenticeships in these sectors have been affected by the SASE reform. Based on secondary research, we know that employers in engineering and construction almost exclusively recruit new apprentices, while in retail and leisure/tourism high proportions have provided at least some apprenticeships to their existing staff (40% and 51% respectively, see IFF Research and Institute of Employment Research 2012). Also, young apprentices are more likely to have been newly recruited, while the majority (59%) of businesses with apprentices above the age of 19 said these were taken by existing staff (ibid.).

2.3. Evidence on the impact of apprenticeships

Our paper is the first to study both the occurrence of converting existing staff to apprentices based on the full cohort of apprentices as well as an estimate for the differences in the wage returns between groups. This important extension to the existing evidence is possible because we use new data sets, offering information on an individual's employment history with their apprenticeship firm, on achievement of related learning aims and post-apprenticeship wages for both groups. This complements the international research evidence on the effects of apprenticeships for individuals, which has been growing in two major strands.

The first strand of research focuses on career progression and mobility of apprentices. Due to the special position of apprenticeships, it is commonly believed that they entail relatively more specific skills than general skills affecting job mobility and wage. Empirical evidence is mixed on this strand: Mueller and Schweri (2015), using Swiss data, find high inter-firm and low occupational mobility after apprenticeship and no wage effects when apprentices change firms. Corseuil, et al. (2019), using Brazilian data, find that apprenticeships increase the probability of finding a permanent job and decrease labour turnover.

The second strand focuses on wage returns from apprenticeships. Empirical estimates of such measures are positive throughout compared to other forms of school-based education across countries (Fersterer, et al, 2008; Gunderson and Krashinsky, 2015). Findings for England suggest that apprentices who complete a Level 3 apprenticeship earn 21% more in the first year

and 17% in the fourth year than apprentices who don't complete the apprenticeship (Buscha and Urwin 2013). At Level 2, the wage premium is 20% and 13% in the first and fourth year respectively.[4] McIntosh and Morris (2018) estimate the wage premium of apprenticeship by exploring the wage differences and argue that individuals who began their apprenticeship when aged 19-24 receive larger increase in their daily earnings post-completion, relative to non-achievers than individuals who began their apprenticeship when aged 25+. However, by the nature of the research design, the results only show the return of younger apprentices compared to adults.[5] Cavaglia, et al. (2018) examine the return to apprenticeships compared to academic and vocational education at similar levels in England and argue that there are positive earning effects compared to other types of education. Some previous results suggest that the completion of apprenticeships increases earnings by 15% (McIntosh and Morris, 2018), although there has not been consideration about unobserved factors affecting these results.

3. Methodology

3.1. Identification

Existing research on the wage premium of completing apprenticeships makes use of regression models like Ordinary Least Squares (OLS) and Difference-in-Differences estimators (DID). However, such results disregard likely selection as completion of apprenticeship is driven by characteristics unobserved in the data. Stronger students may quit apprenticeships due to higher opportunity costs, without benefiting the productive skills from apprenticeships, but may show higher wages in the longer terms due to better attitudes or higher productivity throughout. Weaker students could also be less likely to complete the programme because of lower ability, providing a higher than likely estimate of the post-apprenticeship wage outcomes driven by unobserved characteristics. This problem is especially relevant to the comparison of newly recruited and existing staff engaged in apprenticeships as being selected, or volunteering to become an apprentice, has a signalling function and existing staff may well have progressed in their organisation as well as their salary on account of their attitude, capability, skills, etc. even if they hadn't undertaken an apprenticeship. The theoretically ambiguous relationship between completion and innate ability may up- or downward bias estimates of the wage returns. To this end, our paper employs an instrumented difference-in-differences (DDIV) strategy to estimate the wage premium of completing apprenticeship. This approach was pioneered by Duflo (2001), who examined the impact of schooling in Indonesia on attainment and labour market outcomes. The identification strategy relies on the difference in the endogenous variable of interest, which is affected by instruments in the first stage.

In this paper, we take advantage of the SASE reform as an exogeneous variation to estimate the probability of completing apprenticeships unaffected by selection bias. The policy change introduced a minimum duration of 12 months for all government supported apprenticeships and thereby the training period has increased substantially. Apprentices may decide to complete or not to complete depending on circumstances like opportunity costs, long-term perspective, better outside options, individual specific circumstance of not being able to stay longer, etc., which are particular to individuals. Previous research has suggested that extending the length

[4] They estimate wage premiums of completing the apprenticeship between those who complete and fail to complete based on Individualised Learner Record (ILR) matched to earnings data from HMRC tax records.

[5] They employ a triple differences framework to estimate the relative returns of younger apprentices who are between 19-24 years old compared to the apprentices above 25 years old. With rich information on earning trajectory, they control the innate ability of apprentices using pre-apprenticeship earnings.

of the apprenticeship will drive apprentices out of the programmes since participants may gain the most valuable work experience from the first part of the programme and hence there is little value for them to stay longer. Following the literature, we argue that actual learning time remained widely unchanged in contrast to programme length such that training was more likely to be spread out over 12 months (Nafilyan and Speckesser, 2019). The non-completers who withdrew earlier in their programme therefore received less training compared than those who completed at least the 12 month minimum duration introduced by the apprenticeship reform, reflecting a difference in productivity between completers and non-completers found in our results.

In our paper, the first stage relies on the DID model to estimate changes in the probability of completing apprenticeship resulting from an exogenous policy change. We choose this methodology for three reasons. First, we think a conventional Two-Stage Least Squares regression may not capture the compositional change and time trend as employers may operate different apprenticeships over time. For instance, small firms may not operate same apprenticeships for a second successive year. The characteristics of apprentices may change as a result of the policy change. Certain types of apprenticeship may disappear as costs in operating them increase because of the reform. Our descriptive results suggest that the policy tends to drive more expensive apprenticeships out. Therefore, we employ DDIV strategy to alleviate the compositional changes to a large extent. Second, some programmes may respond earlier than the introduction of the reform and DID likely captures the 'changes' in the programmes by comparing the same programme before and after the policy change. Third, as a result of heterogeneity among firms, apprenticeships for specific occupations (by the time called 'frameworks' in England) could involve quite different training hours across firms and vary in length and quality. Considering such heterogeneity among apprenticeships, the programme is identified based on firm, framework and level of apprenticeships. Hence, apprenticeships are the same if they are in the same firm, under the same framework and at either intermediate or advanced level. Under the framework-firm level, we can identify the affected programmes by the policy and avoid the measurement error to a large extent after considering firm's heterogeneity. Programmes with training period of more than twelve months before the reform were unaffected and form a control group to capture the year fixed effect (assuming common trends).

3.2. Estimation

The dependent variable in the first stage is a dummy to show whether an apprentice has completed the apprenticeship. Programmes that were affected by the increased duration of apprenticeships caused a reduction of completion rates. Taking advantage of this relationship, some apprentices in the same programme have a higher probability of non-completion after the introduction of the policy. Hence, the first stage captures the changes in the probability of completion.

The first stage is therefore:

$$C_{ijt} = \alpha_1 Treat_{ij} + \beta_1 After_{it} + \delta Z_{ijt} + \theta_i X_{it} + u_{it}$$

where $Treat_{ij}$ presents an apprentice i in a firm-framework j. As the apprentice enrols in an apprenticeship in a firm under a certain framework, j denotes a firm-framework level combination and $Treat_{ij}$ equals to one if an apprentice enrolled in a programme's planned duration of training is less than 12 months before September 2012. $After_{it}$ equals to one if an

apprentice starts after September 2012. C_{ijt} is a dummy to indicate whether an apprentice has completed the apprenticeship. Z_{ijt} is the interacted term between $Treat_{ij}$ and $After_{it}$ and captures the change in the probability of completing the apprenticeship. The treated and untreated apprenticeships are expected to follow a parallel trend on the basis of the firm-framework specification.

Like a standard DID, the interacted term captures the changes in the probability of completion as a result of the exogenous change. X_{it} includes rich individual characteristics, including prior educational attainment, level of apprenticeship, age, gender, dummies for each framework, months of apprenticeship and employment. To further alleviate the impact of unobserved factors, we include starting wage as a proxy for their existing skills before apprenticeships and to capture further heterogeneity across programmes. In addition to individual characteristics, we include firm variables like production per person and industry dummies because the earnings available from administrative data don't include occupations and industry.

The second stage is:

$$Y_{ijt} = \alpha_2 Treat_{ij} + \beta_2 After_{it} + \gamma \widehat{C_{ijt}} + \theta_i X_{ijt} + \varepsilon_{it}$$

where Y_{it} denotes the outcome variable (log of annual earnings). Based on changes in the probabilities of completing apprenticeships, the second stage calculates the change in earnings due to changes in the rate of completion. $\widehat{C_{ijt}}$ denotes the predicted probability of completing the apprenticeship estimated from the first stage. Therefore, this paper estimates the local average treatment effect (LATE). It is worth noting that previous literature doesn't account for differences between completers and non-completers, and – although the earnings before apprenticeships are quite similar between two types of apprentices – we believe that unobserved factors may drive the choice of completing apprenticeship and the differences in earnings afterward.

$$\gamma = \frac{E\left[Y_{ij1} - Y_{ij0} \middle| Z_{ijt} = 1\right] - E[Y_{ij1} - Y_{ij0} | Z_{ijt} = 0]}{E\left[C_{ij1} - C_{ij0} \middle| Z_{ijt} = 1\right] - E[C_{ij1} - C_{ij0} | Z_{ijt} = 0]}$$

Firms may respond to the increase in training cost by changing not only the length of apprenticeships but also other characteristics of apprenticeships. Some of the changes may be captured by the observables. But one cannot rule out the possibility that firms may change the unobserved components to offset the impacts of increasing training period. And, the instrument may not meet the exclusion restriction since the impact of the instrument may affect the earnings through other factors rather than completion. However, some of our previous work suggests that there is no effect of the SASE directly on earnings (Nafilyan and Speckesser, 2019).

We interpret our estimate as the wage premium of successfully completing apprenticeship compared to the counterparts who don't complete. This wage premium represents differences in productivity between completers and non-completers as non-completers withdraw earlier from programmes and hence have lower productivity. Guaranteeing causal effect of return to completing apprenticeship is a difficult task since people might be cautious about other channels affecting the decision of completing apprenticeship and earnings after apprenticeships. We relate the estimated earnings differential between newly recruited apprentices and existing apprentices to policy, and in particular the shift in funding apprenticeships likely benefiting existing staff.

4. Data

Our empirical analysis benefits from administrative data available for all English apprentices combining three different Government registers. First, we make use of the Individual Learner Records (ILR) on participation and achievement in apprenticeships, which are collected for every apprentice for education funding purposes and the production of apprenticeship statistics. As a basic selection, we focus on all apprenticeships started between 01 August 2011 and 01 August 2013. From this data, we know exact beginning and ending dates of the apprenticeships and whether learning aims associated with apprenticeships have been completed and/or achieved.

Second, we link the ILR to employment and earnings records at individual level, which are collected by Her Majesty's Revenue and Customs (HMRC), i.e. the income tax register. These data include employment records while people are in their apprenticeship firms as well as other employment.

Lastly, we merge firm-level information available from the Business Structure Database (BSD) of the UK Office for National Statistics (ONS). The BSD contains only few characteristics, but these are available for virtually all businesses. Using a firm identifier available in both ILR and the BSD, merging both sources creates a linked employer-employee panel data set for all apprentices who began their apprenticeships in the academic years 2011/12 and 2012/13.

We restrict data to observed apprenticeships and outcomes for 16 and 65-year-old people and exclude years without observed earnings. We include payment information between the year when starting apprenticeship and the year when leaving the firm. We exclude some few observations who haven't completed the apprenticeships within 5 years.

A drawback of using employment data from HMRC records is that there are no working times included and that they contain measurement errors affecting reported employment durations. Outcome variables like daily or hourly earnings, which can be compared well across jobs and people, cannot be created, which may introduce sources of bias, especially when apprentices leave their training firm.[6] Therefore, our analysis focuses on *annual* earnings in the years after completing apprenticeships.

5. Results.

5.1. Statistical results.

Before estimating the wage premium of completing an apprenticeship, we explore the differences between completers and non-completers and show some simple outcome measures after completion. The descriptive results suggest that the policy change reduced relatively more costly apprenticeships, led to apprenticeships taking in people with lower qualifications and drove out more productive firms. The apprentices with higher earnings withdrew from apprenticeships and became non-completers due to the policy change. We also find significant increases in earnings after completion of an apprenticeship, specifically for new entrants.

Table 2 describes some individual characteristics by recruitment status and whether the apprenticeship is completed. We find that only 25% of apprentices start apprenticeships within a year after they join the firm and that such 'new entrants' more often start intermediate

[6] We may include payment years regardless of when leaving the firms. But since we lack information on the firms after leaving, we can't merge apprentices with the firm's information.

apprenticeships. Completers have higher levels of education compared to non-completes, but the starting wages are similar. The starting wage of new entrants is much lower than the wages of existing apprentices, but observed wage growth is very high for this group. In contrast, wage growth of existing staff converting to apprentices is lower, especially for non-completers. Regarding the length of training and employment, completers receive more than twice the length of training and the length of employment is also longer. Existing staff converting to apprentices have longer employment duration after the training than new entrants.

<Table 2 Here>

Table 3 describes characteristics of apprenticeships before and after the policy change to explore how they were affected. The policy change reduced relatively more costly apprenticeships, and led to apprenticeship intake of people with lower qualifications and drove out the more productive firms.

We distinguish four types of apprenticeships: Apprentices in groups 1 and 3 include programmes that appear both before and after the reform, but were differentially affected by it; groups 2 and 4 include programmes between treated and non-treated, but only appear before the reform. The difficulty of understanding how programmes are differentially affected by the reform arises from additional time effects, which compound. Firms may operate apprenticeships differently over time, especially small firms with only few apprenticeships at same time. Among others, apprenticeships may be affected by factors resulting from changes in business environment and other firm-specific factors and may only operate for a limited time period in an apprenticeship firm. Therefore, it is important to describe the changes affecting programmes unaffected by the reform (groups 3 and 4), identifying the time trend of programmes.

Group 3 and 4 show that individual starting wages are lower and production per person of firms is also lower, suggesting that firms with poor performance are more likely to operate programmes in one year rather than consecutive years and cheaper programmes are more likely to disappear without the impact of the reform due to the time trend. Bearing in mind the differences between groups 3 and 4, we now look at groups 1 and 2. The starting wage between group 1 and 2 is similar. And also, group 1 tends to have on average lower qualifications.

Comparing groups 1 and 2 with groups 3 and 4, programmes lost after the reform in the second period showed higher pay and higher prior qualifications for participants, suggesting that more costly or advanced programmes ceased after the reform.[7] We also find that firms with higher production per person dropped out more and that more apprentices have low level existing qualifications before apprenticeships ('Below Level 2').[8]

<Table 3 Here>

To present how the first stage works, like the previous work (Nafilyan and Speckesser, 2019), Figure 3 describes the length of planned duration and proportion of programmes less than 12 months based on the month, when the apprenticeship started. We split this description by age and show rates separately for young (16-24 years old) and adult apprentices (above 24 years old). We see that the reform increased the planned length of apprenticeships by around 2

[7] In this paper, pay is a proxy for the cost of apprenticeship.
[8] Table A1 in the appendix describes the changes in characteristics between completers and non-completers of apprenticeships affected or unaffected by the policy change.

months for adult apprentices and one month for young apprentices after September 2012, while the proportion of programmes taking less than a year decreased from 40% to 5%. As argued before, this discontinuity provides an exogenous change affecting both incentives of running apprenticeships and as well as individual completion.

<Figure 3 Here>

Figure 4 exhibits how apprentices' annual earnings develop depending on age at start of the apprenticeship, recruitment status and completion. It is worth noting that completers and non-completers don't differ in their wage trajectories before starting the apprenticeship. The figure shows significant increases in earnings after completion of an apprenticeship for young apprentices. Earnings also continue to increase for new entrants regardless of their completion status and new apprentices have a higher wage increasing rate. Existing staff converting to apprentices show no earnings increases in the adult age group. The figure also shows that wages between completers and non-completers remain almost the same over time.

<Figure 4 Here>

Figure 5 describes the distributions of starting wages of apprenticeships affected or unaffected by the reform. The aim of the figure is to further explore compositional changes in apprenticeships resulting from the reform. In this description, the earnings distributions of untreated apprenticeships reveal an overall time trend. The bottom figure describes the untreated programmes, which either only appear in the first period or in both periods, i.e. programmes unaffected by the reform. It suggests that – over time – the more costly apprenticeships are more likely to survive. In contrast, the upper panel of the figure describes the programmes affected by the reform. Compared to apprenticeships unaffected by the reform, among the programmes affected, the more expensive apprenticeships are less often retained. That might be due to the increase in the cost of training due to the reform.

<Figure 5 Here>

5.2. Regression results.

Headline result

In this section, we present the empirical estimates of the wage premium from completing apprenticeships. First, we estimate linear regression (OLS) and Difference-in-Differences models (DID) as a benchmark. The first panel of Table 4 presents regression estimates conditional on a set of control variables, especially firm's characteristics. There is an 8% wage increase of completing an apprenticeship and the new apprentices have a much larger wage effect than existing apprentices. DID results are consistent with the OLS results and similar to estimates from the previous literature, ranging between 5% and 16% depending on specifications. Using instruments of the SASE, IV estimates suggest that the wage increase is ranging between 6% and 20%, larger than DID and OLS results.

<Table 4 Here>

Building on the benchmark results, Table 5 shows both the first stage and the second stage of DID-IV. The first stages are presented by the 'Interaction', which is the interacted term between the dummy for post-reform and the dummy for the affected programmes. The coefficients are highly significant across all specifications. The first two columns include all apprentices and the second stage estimate of the wage increase of completing an apprenticeship

is 19%, suggesting the wage premium of OLS and DID is downward biased. Apprentices with higher starting wages are more likely to withdraw from apprenticeship. Subgroup results also suggest that there is a 35% and 13% wage increase for new and existing apprentices separately after completing apprenticeship and the results are also larger than corresponding benchmark results. We include tenure and training period as control to proxy work experience and length of the programmes. The wage premium might be driven by higher productivity. The completers are more capable of the job tasks because of completing the training.

<Table 5 Here>

Although Table 5 controls the types of apprenticeships, some programmes, which only appear in one year, may represent a suitable control group. To provide a robustness check for our main results, Table 6 shows the results based on a restricted sample excluding programmes only appearing in one period. Estimates from this restricted sample are very similar, with wage increase of 34% for new apprentices and 13% for existing apprentices.

<Table 6 Here>

To explore whether the wage premium arises from continuation with the apprenticeship firm or results from job changes, we further estimate models based on restricted samples before apprentices leave their training firm (Table 7). With this restriction, the wage premium of apprenticeship completion becomes insignificant for existing apprentices, while the size of the wage premium also declines largely when continuing employment with their apprenticeship firm. New apprentices have similar earnings before leaving the firm compared to the full sample. Although leaving the firm is an endogenous selection, it is safe to say that existing apprentices can't benefit from completing apprenticeship compared to newly recruited apprentices.

<Table 7 Here>

Table 8 examines the wage premium of additional training and suggests that only new apprentices can significantly benefit from the additional training due to the policy change and the magnitude of the effect for existing apprentices is very small. Perhaps because existing apprentices have already a significant amount of work experience, additional training does not seem to benefit them any further. The results also testify the wage premium that existing apprentices have lower wage premium than new apprentices because they are more familiar with the job tasks.

<Table 8 Here>

Exploring heterogeneity by groups of apprentices

Table 9 and Table 10 show the heterogeneous results based on the characteristics of apprenticeship and apprentices. Table 9 examines the results given levels of apprenticeship. It shows that there is a wage premium on the intermediate apprenticeships for both new and existing apprentices. The wage premium of advanced apprenticeships for new apprentices is larger, but insignificant for existing apprentices. Finally, Table 10 shows the results for the different age groups indicating that adult apprenticeships have a larger wage premium among existing apprentices and a smaller wage premium among new apprentices of adult age.[9]

[9] The results in Table A2 suggest that apprentices in manufacturing sector enjoy much larger wage increase after completing apprenticeships compared with apprentices in service sector.

<Table 9 and Table 10 Here>

5.3. Discussion and implications

Having provided further sensitivity of estimated effects, we now try to uncover the mechanism how the wage increase arises from completion of apprenticeship. Like the standard literature explaining earnings differentials, which highlights the issue of innate ability, it is likely that better apprentices will earn more no matter whether they complete or not. Completers may acquire more skills compared to non-completers and the skills could be either generic or specific, obtained from the training.

We use their starting earnings as a proxy for their skills and productivity prior to apprenticeships. Our descriptive results suggest that apprentices with higher starting salaries are more likely not to complete the apprenticeship after the reform, presumably due to higher opportunity cost or better outside options. This implies that the probability of completing apprenticeship is negatively correlated with their competence in the workplace and hence biases the completion coefficient downwards. Apprentices who drop out as a result of the policy change may receive less training because of shorter training time and may also put less effort in, leading to lower productivity. Therefore, the wage increase reflects the increase in productivity after successfully completing apprenticeships compared to non-completion. Since non-completers as the comparison group receive some training to varying degrees, we think the results represent the lower bar of the completion from this perspective.

The wage increase after completion may be due to the fact that completion expresses higher value to the employer, suggesting a signalling effect. With available data, we can't rule out the possibility of signalling effect as a result of organisational behaviours. The earnings might be determined by qualifications in some firms. However, we expect that the signalling effect doesn't play an important role in explaining the wage increase. One of the benefits of apprenticeship is it provides tools for employers to screen the employees. We assume that by the end of the training, employers have revealed the true productivity of apprentices. Further, the wage differences don't diminish after completion in Figure 4. It is expected that the wage gap would reduce with the time of employment revealing true productivity. Hence, we expect the wage increase reflects the differential productivity between completers and non-completers to a large extent. The large wage increase after completion might also be because of the lower starting wage of newly recruited apprentices due to lower productivity and lack of information. Therefore, it is expected that they have a 'catch up' effect after the completion.

There is also a concern that non-completers may have enough skills to do the job but are unable to because of lack of credential without completing the programme. This is suggested by the job assignment model (Sattinger, 1993) in which a set of production factors is indivisible. Both the skills and certificate are required to carry out specific job tasks. In this case, non-completers will inevitably receive lower earnings. We believe that this might not be pervasive amongst some frameworks since apprentices should acknowledge the job requirements before the apprenticeship and will try their best to gain the credential during the training. However, further research is needed to estimate to what extent the credential effect exists.

Moreover, there is an extensive literature on the distinction between general and specific skills of vocational or work-based education. It is widely accepted that firms are not willing to provide general skills unless they can recoup their investment after training. Due to the nature

of apprenticeships (more specific skills), apprentices may experience low occupational mobility and wage decrease after finishing apprenticeships (Mueller and Schweri, 2015). To examine this issue, we restricted the sample to people before leaving their training firms (see above). We found that the wage increase for new apprentices remains constant and significant, but no wage increase was found for existing apprentices. The results further prove our hypothesis that the apprenticeship brings little value to existing apprentices with years of work experience.

Then again, completing an apprenticeship has also an option value as it is not just increasing skills, but also certifying these skills and improving career mobility. One of the commonly believed merits of apprenticeships is that they improve the school-to-work transition for young people (Ryan, 2001). In turn, not completing an apprenticeship could have negative effects for apprentices, e.g. when leaving the firm. Due to asymmetric information and the firm-specific nature of skills obtained in apprenticeships, other firms would offer a lower wage to apprenticeship achievers when changing jobs than what is their likely true productivity. Therefore, the market value of apprentices might be lower than their true productivity, leading to a fact that the firms which train them may also offer a lower wage for the apprentices, thereby having incentives to provide general skills. It may imply that apprenticeships contain substantial firm specific training, but also certify skills for existing staff, who may then receive higher earnings after changing firms. Hence, a significantly positive effect for existing apprentices would mainly come from the wage increase when leaving the firm. Unfortunately, our data doesn't allow us to evaluate changes in earnings between firms.[10]

Lastly, we realize the complicity of wage structure. With asymmetric information, the wage after leaving the training firm can be affected both upward or downward. First, as we discussed in the above section, apprentices with higher starting wages tend to withdraw from the apprenticeship more often. Therefore, they may also have a higher starting wage when changing firms. Second, non-completers likely provide a negative signal in the matching process to vacancies of other employers, which would then reduce the earnings potential in alternative employment. Third, the differences between completers and non-completers in earnings can be smaller due to more firm-specific skills after changing jobs. By completing the apprenticeship, completers gain more firm-specific skills compared to non-completers, hence higher earnings in the firms which trained them. In a new firm, where general skills may play a more important role, the differences between completers and non-completers would be smaller. A quantitative analysis of all different mechanisms affecting the wages however is beyond the scope of this paper and crucially would require data currently not available, in particular firm characteristics of the post-apprenticeship employer (currently not available in HMRC data).

6. Conclusions.

By taking advantage of the 2012 apprenticeship reform, which created exogenous variation affecting completion of a number of apprenticeship programmes and left other apprenticeships unaffected, we estimate the benefits of apprenticeship completion for new and existing staff using data for recent cohorts of English apprentices.

We first explore the situation before and after the reform in order to understand how firms and apprentices react to it. The descriptive findings suggest some compositional changes resulting

[10] We only observe firms which trained the apprentices.

from the reform: On the firm's side, programmes lost due to the reform tend to be those involving apprentices with higher pay and better entry qualifications. Hence, the reform tends to drive more expensive apprenticeships out as it increases the cost of training. We also see that firms with relatively higher turnover per person drop out after the reform. On the apprentice's side, apprentices have more often low-level entry qualifications after the reform. Descriptive analysis of earnings shows that compliers, who withdraw from the apprenticeship, tend to have higher starting salaries compared to the apprentices who do not withdraw as a result of the policy change.

In the main part of the paper, we estimate differential benefits of apprenticeship completion for new and existing staff. To address the likely endogeneity of completion of the apprenticeships, we exploit the introduction of a minimum duration of programmes in some sectors leaving other sectors unaffected, which caused an exogenous mechanism affecting apprenticeship drop-out and completion. More specifically, this analysis provides a Local Average Treatment Effect (LATE) by exploiting the changes in earning from the switchers.

The regression results suggest that the wage increase of completion of apprenticeship is around 13%-35%, reflecting the increase in productivity after successfully completing apprenticeships. The new entrants can benefit much more than existing workers. The positive effect of existing staff converted to apprentices becomes insignificant when restricting the sample to cover only people while working in their apprenticeship firms. In addition, the increase in apprenticeship training resulting from the policy change only creates positive effects for new entrants, but does not benefit existing workers. Conventionally, employers use apprenticeships to screen and select the most productive employees and we expect that the signalling effect doesn't play an important role in explaining the wage increase. We assume that by the end of the training, employers have revealed the true productivity of apprentices and therefore believe that the wage increase reflects differences in productivity between completers and non-completers. The non-completers may also receive lower earnings due to lack of credentials. We argue that this might not pervasive amongst some frameworks, but estimating the credential effect is beyond the scope of this paper.

In our heterogeneity analysis, we find wage increases for new apprentices could rise up to 50% after completing advanced apprenticeship. In our view, the relatively lower benefits of apprenticeships for existing staff and the lack of any impact from increased training cast doubt that the recent expansion of apprenticeships for existing staff yields significant benefits for individual earnings and workforce productivity. While we acknowledge the findings that apprenticeships for existing staff may increase post-completion earnings for people changing employers – and thereby may result in longer term earnings gains, which cannot be captured by the limited period of post-apprenticeship earnings observed in our data – the higher return of apprenticeship completion for people starting as new staff found in our analysis is coherently found across a range of empirical specifications. Further work could examine career mobility and earnings gains after changing the firms when data is available. Moreover, future research could explore the occupations people work in, which could provide more insightful findings for earnings differences.

Although the introduction of the Apprenticeship Levy in 2017 changed some of the funding, resulting in more advanced apprenticeships, there are considerable amount of unused levy

funding.[11] In order to improve the labour market (and likely related: productivity) benefits of apprenticeships, the levy funding should be focused to train young people rather than training existing staff, which was also the original expectation from policy. In our view, further apprenticeship reform in England should aim to enable employers to operate levy-funded apprenticeships as a mechanism of labour market entry combined with education rather than a generic mechanism to fund skills training for their existing staff.

[11] A survey conducted by The Open University (2018) suggests that there are around 16% unused levy funding.

i) Supplementary material:

Supplementary material is available on the OUP website. The data uses confidential data from Her Majesty's Revenue and Customs (HMRC), and Department for Education (DfE). The data is provided through the ONS Secure Research Service. All applications must be made on the DfE application form which can be requested from data.sharing@education.gov.uk. Stata do file has been uploaded online as supplementary material. The online appendix is also available here.

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Tables and Figures

Table 1. Composition of starter cohorts by age and level of apprenticeship

Level	Intermediate			Advanced Level			Higher			Total
Age group	16-18	19-24	25+	16-18	19-24	25+	16-18	19-24	25+	
2002/03	44%	27%		14%	15%					167,600
2010/11	21%	20%	25%	8%	12%	15%				457,200
2018/19	14%	10%	13%	10%	14%	20%	1%	5%	13%	393,375

Source: Department for Education (2020)

Table 2. Variable description

	Completers		Non-completers	
	Mean	Sd	Mean	Sd
New apprentices				
Proportion of Intermediate apprenticeships	0.71	0.45	0.70	0.46
Education below Level 2	0.38	0.48	0.48	0.50
Education Level 2	0.46	0.50	0.39	0.49
Education above Level 2	0.16	0.36	0.13	0.33
Wage when starting apprenticeships	5,000	7,000	6,000	7,000
Wage when finishing apprenticeships	11,000	7,000	8,000	7,000
Wage when leaving firms	15,000	10,000	11,000	9,000
Months between start and end of apprenticeship	15.52	7.65	6.55	6.82
Months between end of apprenticeship and leaving the firm	27.65	22.07	19.95	20.07
Observations (%)	110,000 (16.25%)		92,000 (9.64%)	
Existing apprentices				
Proportion of Intermediate apprenticeships	0.57	0.50	0.55	0.48
Below Level 2	0.40	0.49	0.42	0.49
Level 2	0.42	0.49	0.42	0.49
Above Level 2	0.17	0.38	0.16	0.36
Wage when starting apprenticeships	16,000	11,000	16,000	12,000
Wage when finishing apprenticeships	18,000	11,000	16,000	13,000
Wage when leaving firms	19,000	13,000	18,000	13,000
Months between start and end of apprenticeship	14.20	6.000	7.31	6.65
Months between end of apprenticeship and leaving the firm	70.31	73.35	50.14	67.49
Observations	557,000 (46.87%)		479,000 (27.24%)	

Notes: The sample includes apprentices who enrolled between Aug-2011 and Aug-2013 and includes age between 16 and 65 years old. The leaving data of non-leavers is 31/Dec/2016. New apprentices are defined as apprentices who start the apprenticeships within 12 months after joining in the firms. Existing apprentices are defined as apprentices who start apprenticeships after 12 months after joining the firms.
Sources: ILR-BSD-HMRC

Table 3. Features by types of programmes.

	Before the reform			
	Group 1	Group 2	Group 3	Group 4
	Treated programmes in two periods	Treated programmes in first period	Un-treated programmes in two periods	Un-treated programmes in first period
Annual earnings in £ (starting)	12,239	11,891	13,615	12,102
Production in person (firm) in 1000 £s	134.69	142.42	274.87	142.15
Below Level 2	0.49	0.44	0.4	0.38
Level 2	0.37	0.39	0.45	0.45
Level 3	0.13	0.17	0.15	0.17
Length of training	8.53	7.84	12.86	12.9
Length of employment	51.21	52.78	60.85	54.7
Length of plan training	9.37	8.85	15.87	15.97
Observations	60,000	46,000	94,000	71,000
Percentage	14.95	11.35	23.51	17.71

Notes: Pay denotes the starting payment. The four columns describe the programmes before the reform. The omitted group is the programmes only appearing in the second year. Sources: ILR-BSD-HMRC

Table 4. OLS and DID.

VARIABLES	All sample	New apprentices	Existing apprentices
OLS			
Complete	0.0802***	0.134***	0.0519***
	(0.00152)	(0.00342)	(0.00162)
IV			
Complete	0.143***	0.264***	0.109***
	(0.00379)	(0.00767)	(0.00421)
Observations	1,277,894	367,842	910,052
DID			
After	0.233***	0.703***	0.119***
	(0.00311)	(0.00712)	(0.00321)
Completion group	-0.0491***	-0.0444***	-0.0288***
	(0.00314)	(0.00718)	(0.00324)
Interaction	0.112***	0.160***	0.0535***
	(0.00350)	(0.00788)	(0.00364)
Observations	1,668,053	470,169	1,197,884

Notes: The sample includes apprentices who enrolled between August 2011 and August 2013. 'After' equals to one if an apprentice finished the apprenticeship. 'Complete' equals to one if an apprentice completes the apprenticeship. 'Interaction' denotes the interacted between 'Complete' and 'After'. "Complete group" represents the group of completers. The sample for OLS and IV results includes years of payment between the year when finishing apprenticeship and the year when leaving the firm. The sample for DID results includes years of payment between the year when starting apprenticeship and the year when leaving the firm. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
Sources: ILR-BSD-HMRC

Table 5. DID-IV.

	All sample		New apprentices		Existing apprentices	
Annual payment	First stage	Second stage	First stage	Second stage	First stage	Second stage
Interaction	-0.168***		-0.181***		-0.162***	
	(0.00234)		(0.00402)		(0.00285)	
After	-0.00698***	-0.0561***	-0.00287	-0.121***	-0.00582***	-0.0225***
	(0.00149)	(0.00267)	(0.00263)	(0.00545)	(0.00179)	(0.00289)
Treatment	0.203***	0.0285***	0.184***	0.0335***	0.214***	0.0258***
programmes	(0.00197)	(0.00342)	(0.00349)	(0.00580)	(0.00237)	(0.00417)
Complete		0.191***		0.350***		0.127***
		(0.0240)		(0.0451)		(0.0274)
Constant	-0.0579***	8.092***	-0.00865	7.128***	-0.138***	8.588***
	(0.0117)	(0.0201)	(0.0185)	(0.0375)	(0.0155)	(0.0240)
Observations	1,277,894	1,277,894	367,842	367,842	910,052	910,052
R-squared		0.356		0.299		0.363

Notes: The sample include years of payment between the year when finishing apprenticeship and the year when leaving the firm. The control variables include calendar years, detailed classification of frameworks, level of apprenticeships, age of apprentices, prior educational attainment, months of training, months of employment after apprenticeship, starting wage, types of programmes, industries, and firm's annual production per person. Dependent variable of first stage is a dummy for completion. Dependent variable of second stage is the log of real wage. Treatment denotes the planned length of training of apprenticeship in a firm is less than 12 months before September 2012. 'After' equals to one if an apprenticeship starts after September 2012. 'Interaction' denotes the interacted term between 'Treatment' and 'After'.
Sources: ILR-BSD-HMRC

Table 6. DID-IV with restricted sample.

	All sample		New apprentices		Existing apprentices	
Annual payment	First stage	Second stage	First stage	Second stage	First stage	Second stage
Interaction	-0.164***		-0.182***		-0.157***	
	(0.00242)		(0.00413)		(0.00295)	
After	-0.00740***	-0.0527***	-0.00210	-0.117***	-0.00627***	-0.0198***
	(0.00155)	(0.00265)	(0.00273)	(0.00542)	(0.00187)	(0.00282)
Treatment	0.203***	-0.0112***	0.185***	-0.0187***	0.213***	-0.00870*
programmes	(0.00165)	(0.00419)	(0.00301)	(0.00714)	(0.00197)	(0.00497)
Complete		0.207***		0.344***		0.130***
		(0.0241)		(0.0447)		(0.0272)
Constant	-0.216***	7.970***	-0.134***	6.854***	-0.319***	8.634***
	(0.0244)	(0.0401)	(0.0374)	(0.0734)	(0.0328)	(0.0480)
Observations	494,065	494,065	149,359	149,359	344,706	344,706
R-squared		0.372		0.319		0.386

Notes: The restricted sample exclude programmes which only appear in the first or second period.
Sources: ILR-BSD-HMRC

Table 7. DID-IV before apprentices leave.

	All sample		New apprentices		Existing apprentices	
Annual payment	First stage	Second stage	First stage	Second stage	First stage	Second stage
Interaction	-0.161***		-0.172***		-0.155***	
	(0.00288)		(0.00530)		(0.00340)	
After	-0.0118***	-0.104***	-0.00609*	-0.178***	-0.0106***	-0.0642***
	(0.00179)	(0.00282)	(0.00342)	(0.00601)	(0.00210)	(0.00304)
Treatment	0.209***	0.0377***	0.184***	0.0413***	0.219***	0.0339***
programmes	(0.00242)	(0.00387)	(0.00464)	(0.00671)	(0.00282)	(0.00470)
Complete		0.102***		0.330***		0.0471
		(0.0262)		(0.0524)		(0.0298)
Constant	-0.0966***	8.223***	0.00712	7.161***	-0.175***	8.605***
	(0.0153)	(0.0224)	(0.0262)	(0.0446)	(0.0189)	(0.0257)
Observations	847,626	847,626	206,330	206,330	641,296	641,296
R-squared		0.430		0.391		0.435

Notes: The sample exclude the years of payment after apprentices leave the firms.
Sources: ILR-BSD-HMRC

Table 8. Effect of duration of training.

	All sample		New apprentices		Existing apprentices	
All sample	FS	RF	FS	RF	FS	RF
Interaction	3.352***		3.515***		3.208***	
	(0.0237)		(0.0430)		(0.0280)	
After	-0.207***	-0.112***	-0.222***	-0.263***	-0.139***	-0.0538***
	(0.0107)	(0.00122)	(0.0204)	(0.00272)	(0.0124)	(0.00128)
Treatment programme	-3.728***	0.0305***	-3.685***	0.0442***	-3.694***	0.0211***
	(0.0129)	(0.00279)	(0.0251)	(0.00554)	(0.0149)	(0.00305)
Length of training		0.00959***		0.0120***		0.00731***
		(0.000848)		(0.00172)		(0.000929)
Constant	4.667***	7.999***	3.367***	6.956***	5.027***	8.490***
	(0.154)	(0.0187)	(0.245)	(0.0348)	(0.200)	(0.0216)
Observations						
R-squared	1,668,053	1,668,053	470,169	470,169	1,197,884	1,197,884
Restricted sample						
Interaction	2.634***		2.935***		2.490***	
	(0.0307)		(0.0551)		(0.0362)	
After	0.0173	-0.117***	-0.102***	-0.257***	0.0968***	-0.0572***
	(0.0192)	(0.00222)	(0.0350)	(0.00467)	(0.0225)	(0.00235)
Treatment programme	-3.342***	0.00777**	-3.443***	0.0140*	-3.284***	-0.00236
	(0.0215)	(0.00380)	(0.0410)	(0.00754)	(0.0249)	(0.00408)
Length of training		0.00412***		0.00702***		0.00133
		(0.00134)		(0.00259)		(0.00146)
Constant	7.474***	7.871***	6.208***	6.669***	7.245***	8.532***
	(0.325)	(0.0384)	(0.509)	(0.0714)	(0.423)	(0.0435)
Observations						
R-squared	644,172	644,172	192,200	192,200	451,972	451,972

Notes: Variable of interest is the months of training.
Sources: ILR-BSD-HMRC

Table 9. DID-IV by levels of apprenticeship and types of apprentice.

	New apprentices				Existing apprentices			
	Intermediate		Advanced		Intermediate		Advanced	
VARIABLES	First stage	Second stage	First stage	Second stage	First stage	Second stage	First stage	Second stage
Interaction	-0.181***		-0.138***		-0.150***		-0.194***	
	(0.00442)		(0.0112)		(0.00352)		(0.00577)	
After	-0.0149***	-0.126***	0.00154	-0.111***	-0.0249***	-0.0240***	0.0114***	-0.0201***
	(0.00315)	(0.00725)	(0.00462)	(0.00880)	(0.00258)	(0.00513)	(0.00246)	(0.00329)
Treatment	0.184***	0.0389***	0.186***	-0.0442*	0.183***	0.0312***	0.235***	0.0425***
programmes	(0.00398)	(0.00636)	(0.00796)	(0.0229)	(0.00316)	(0.00467)	(0.00401)	(0.00775)
Complete		0.349***		0.503***		0.117***		0.0406
		(0.0519)		(0.156)		(0.0397)		(0.0417)
Constant	0.103***	6.997***	0.0236	8.008***	-0.0652***	8.515***	0.264**	8.948***
	(0.0188)	(0.0411)	(0.158)	(0.304)	(0.0160)	(0.0269)	(0.126)	(0.177)
Observations	268,999	268,999	98,843	98,843	518,846	518,846	391,206	391,206
R-squared		0.308		0.244		0.332		0.418

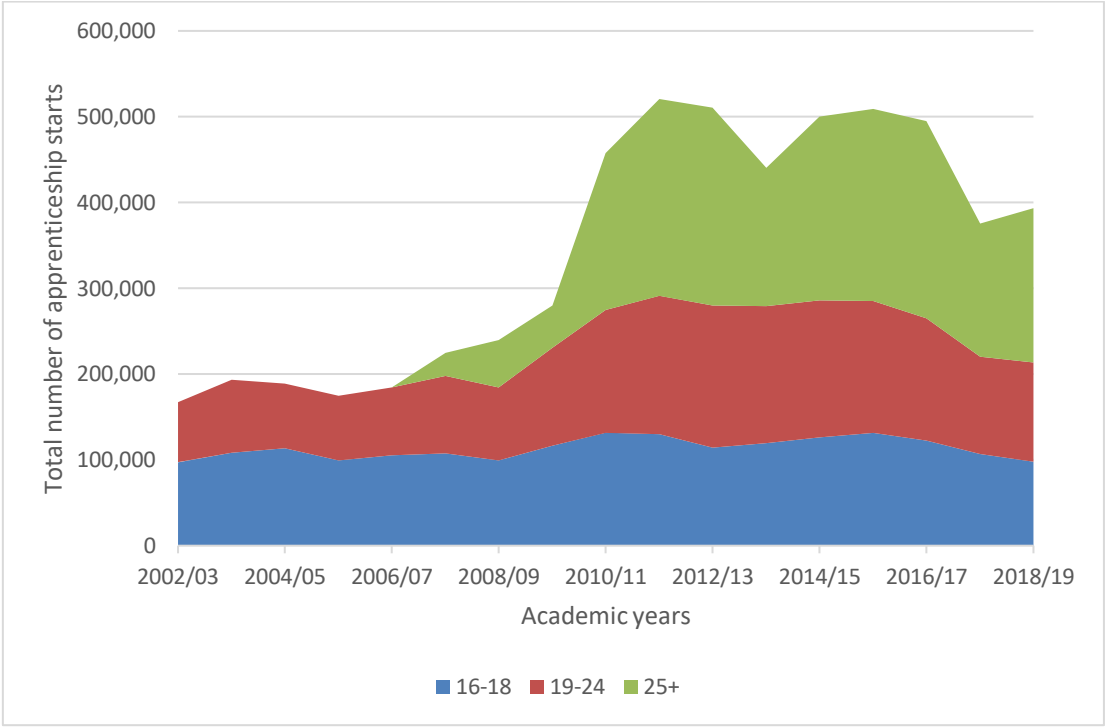
Sources: ILR-BSD-HMRC

Table 10. DID-IV by age and types of apprentice.

	New apprentices				Existing apprentices			
	>24		16-24		>24		16-24	
VARIABLES	First stage	Second stage	First stage	Second stage	First stage	Second stage	First stage	Second stage
Interaction	-0.196***		-0.174***		-0.157***		-0.170***	
	(0.00731)		(0.00480)		(0.00358)		(0.00473)	
After	-0.0157***	-0.0287***	0.00270	-0.160***	-0.00978***	-0.00214	0.00217	-0.0597***
	(0.00493)	(0.0107)	(0.00310)	(0.00623)	(0.00220)	(0.00335)	(0.00308)	(0.00531)
Treatment	0.199***	0.0328***	0.177***	0.0233***	0.223***	0.0159***	0.200***	0.0348***
programmes	(0.00642)	(0.0102)	(0.00415)	(0.00706)	(0.00293)	(0.00529)	(0.00404)	(0.00672)
Complete		0.336***		0.373***		0.127***		0.0955**
		(0.0745)		(0.0564)		(0.0326)		(0.0486)
Constant	-0.273**	8.447***	-0.0278	7.005***	0.139	8.401***	-0.0757***	8.503***
	(0.111)	(0.222)	(0.0200)	(0.0407)	(0.138)	(0.198)	(0.0187)	(0.0324)
Observations	108,713	108,713	259,129	259,129	584,662	584,662	325,390	325,390
R-squared		0.268		0.315		0.412		0.276

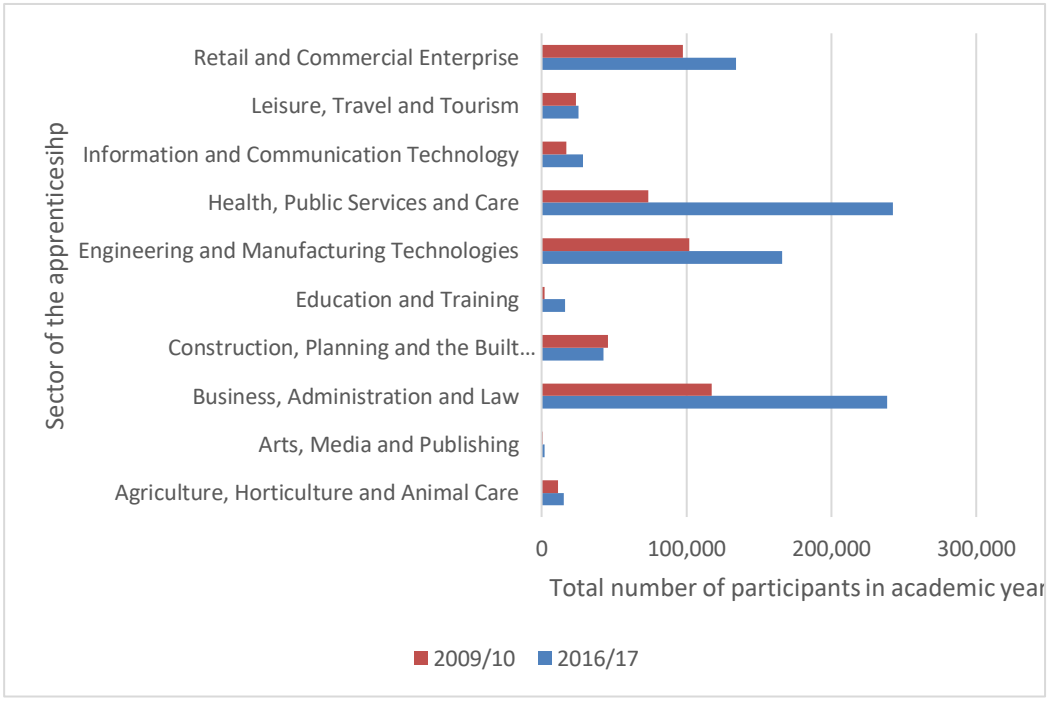
Sources: ILR-BSD-HMRC

Figure 1. Total number of apprenticeships starts by academic year



Source: Department for Education (2020)

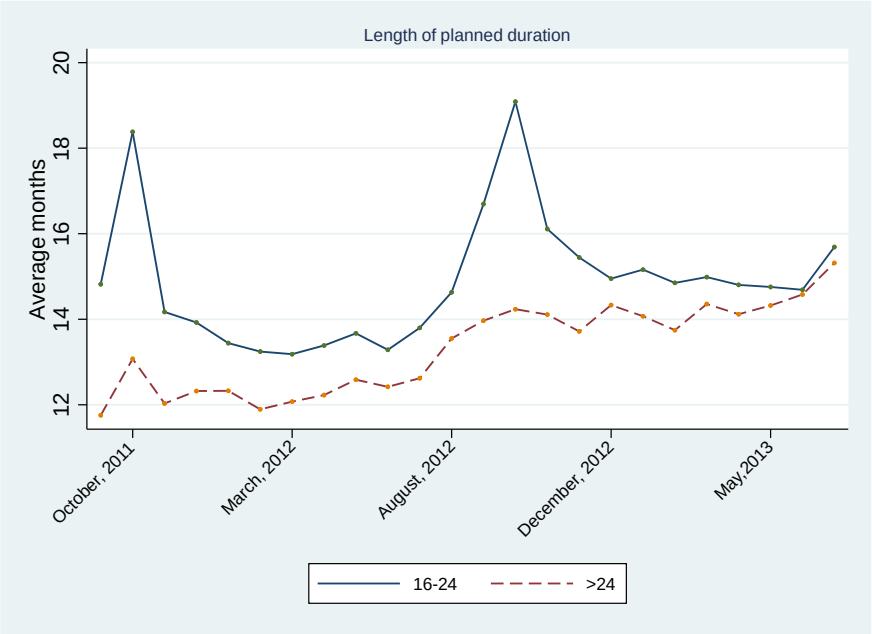
Figure 2. Total number of apprenticeships starts by academic year



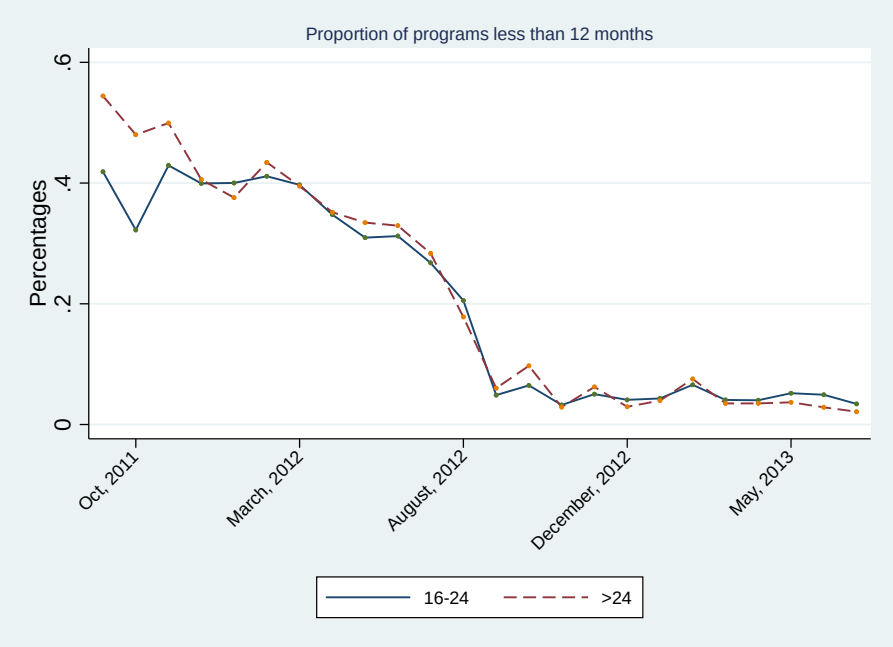
Source: Department for Education (2020)

Figure 3. Earnings differences based on training periods.

Panel A, Length of planned duration.



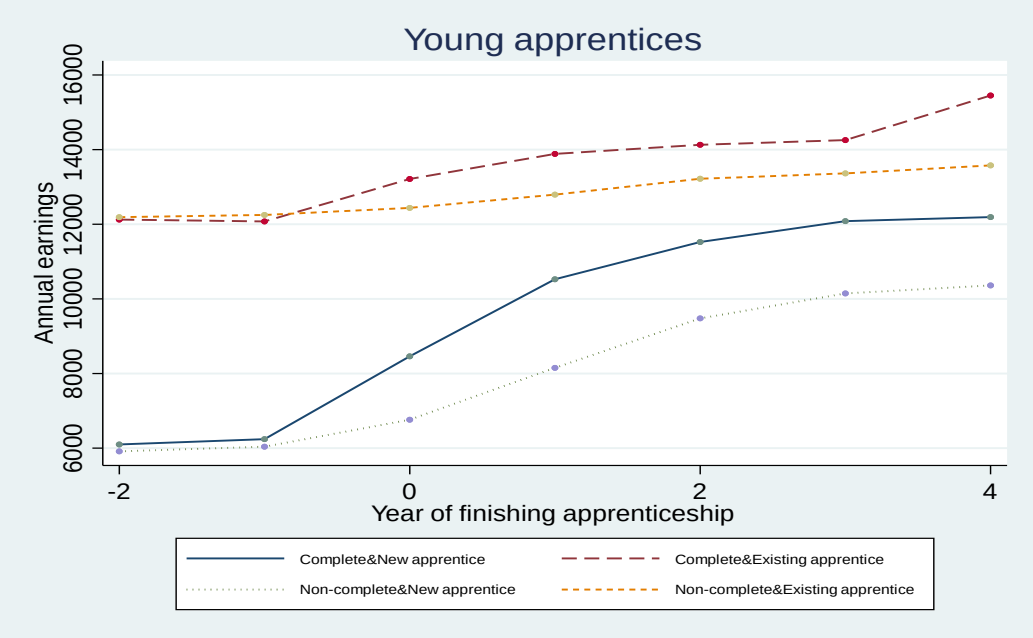
Panel B, Proportion of programmes less than 12 months.



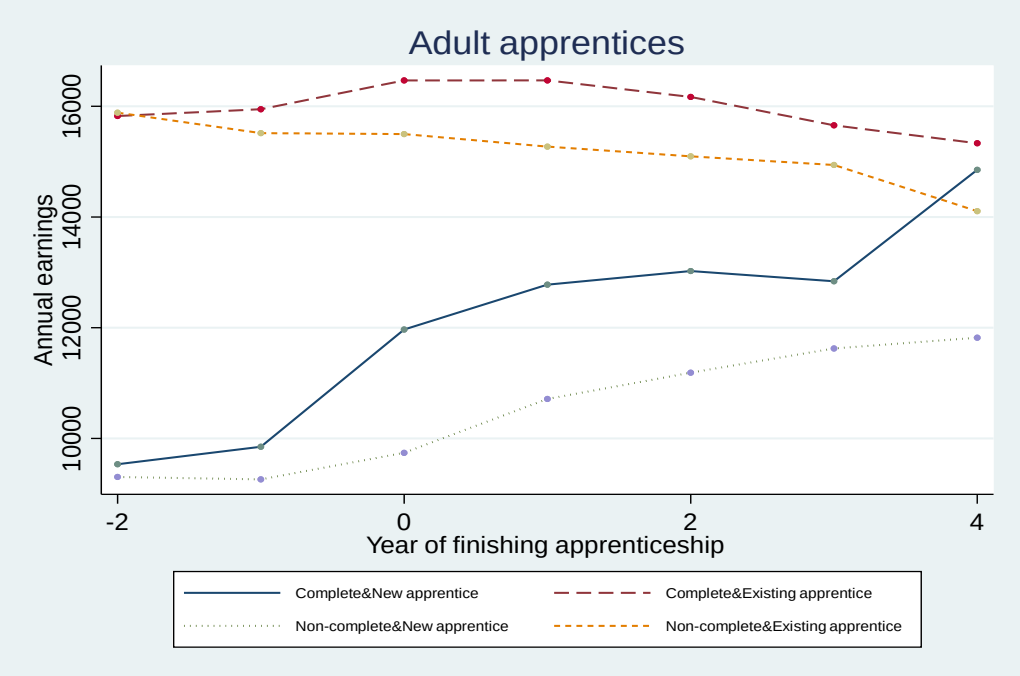
Notes: The sample includes apprentices who start apprenticeship between 1st August 2011 and 1st August 2013.
Source: ILR-BSD-HMRC

Figure 4. Earning trajectories.

Penal A, Young apprentices (16-24).

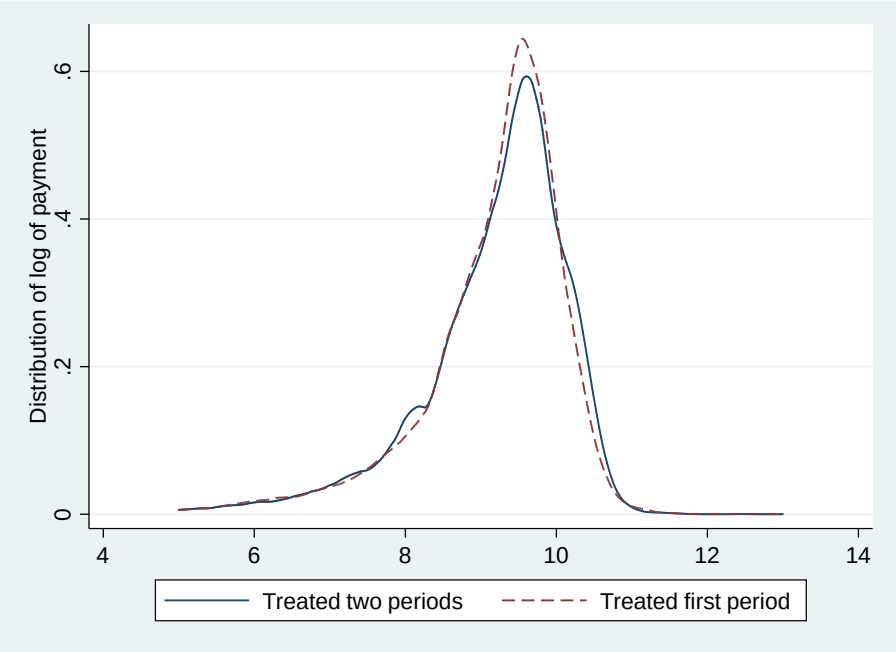


Panel B, Adult apprentices (>25).

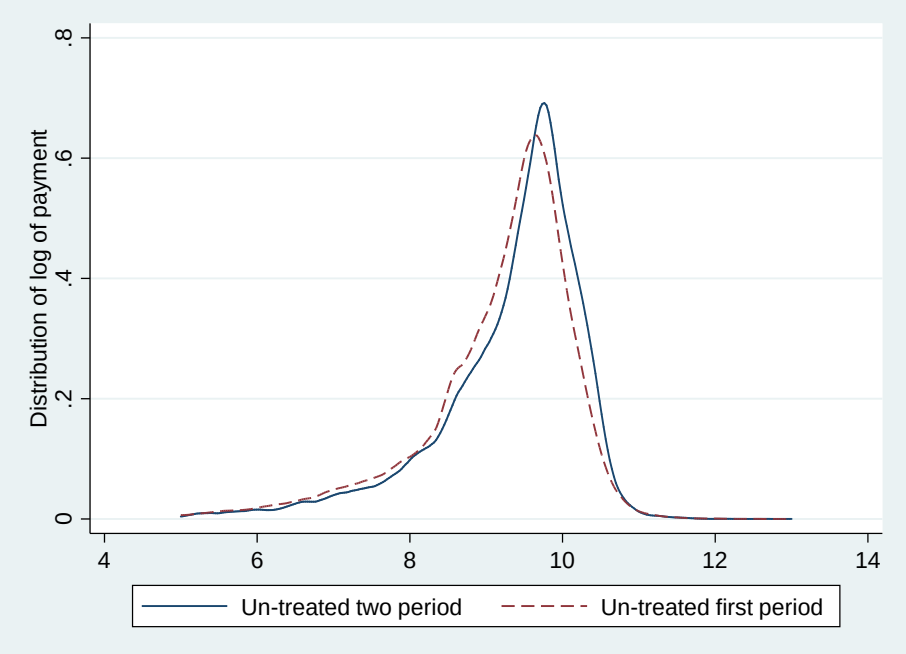


Notes: Young apprentices are below 25 years old. X-axis represents the years before and after finishing apprenticeships.
Source: ILR-BSD-HMRC.

Figure 5. Changes in earning distributions
Panel A, Distribution of earnings among treated programmes.



Panel B, Distribution of earnings among untreated programmes.



Notes: The Figure only includes starting wages of apprentices.
Sources: ILR-BSD-HMRC