

Skills Development **Scotland**

Productivity Growth of Modern Apprentices in Scotland

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RA

- The Modern Apprenticeship programme
- Apprenticeship market share
- The productivity puzzle
- Driving the COVID recovery
- Part of wider research on impacts of education



Objectives/Research Questions

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How does an apprentice's productivity change over the course of their apprenticeship?

Which employers benefit most?

What's the role of apprentice retention on productivity growth?

What are the implications of these results?

Literature Review

Factors associated with productivity/apprentice productivity:

- HR policies of organisation flexibilities, work-life balance, working conditions and pay (<u>Goel et al., 2017</u>)
- Diversity: Policies encouraging women to enter the workforce (<u>Loko & Diouf, 2009</u>)
- Workforce characteristics: Larger share of high-skilled workers (<u>Micaleff, 2016</u>)
- Factors that are not easily quantifiable motivation, enthusiasm, attitude, values and beliefs (<u>Bellet et al.</u>, <u>2019</u>; <u>Goel et al.</u>, <u>2017</u>)

Relationship between productivity and retention:

- Organisational productivity can be improved by offering job security (<u>lqbal et al., 2018</u>)
- Employee wellbeing is found to be predictive of several future employer outcomes, including productivity and retention (Sears et al., 2013)

Knowledge Gaps:

- Limited research looking at growth in apprentice productivity during their period of training
- Limited research looking at relationship between productivity and postcompletion retention for apprentices
- First research of this kind carried out in Scotland

Methodology

ılı.	Data	Apprenticeship Employer Survey 2020 , designed by SDS to collect employer views on apprenticeships.
	Main variable of interest	Average productivity growth of Modern Apprentices (MAs) during training, reported at the employer level.
Q	Regression Analysis	 Factors associated with apprentice productivity growth ✓ Characteristics of the employer ✓ Characteristics of the apprentices working for the employer
\longleftrightarrow	Retention and Productivity	Correlation or Causation? ✓ Instrumental Variables regression.

Data: Apprenticeship Employer Survey (AES)

The **AES** was designed to examine the benefits and outcomes for employers from participating in Modern and Foundation Apprenticeships.



A total of **2,410 telephone interviews** were carried out with **MA employers**

Sampling approach

- Where sites offered more than one framework and level they were assigned the framework and level on which they had the most leavers (although those with level 4 – SCQF level 8/9 - frameworks were prioritised regardless of this)
- Responses reweighted to ensure they are representative of MA employers as a whole

AES – Profile of Respondents

- The sector with the largest number of responding employers was Construction (13%) followed by Other (12%), Education (12%)
- Most employers who responded to the survey were small businesses with fewer than 100 employees.





Measuring Apprentice Productivity Growth

The AES asks employers* about the **number of hours in an average day** that Modern Apprentices spend on tasks **at the level of a fully qualified or experienced worker**, at different points in time:

- ✓ At the start of the apprenticeship
- ✓ Around the middle
- ✓ On **completion** of the apprenticeship



This allows us to measure *average apprentice productivity growth* achieved *during* the MA (intraining) for individuals who achieved the qualification.

*This question was asked in reference to apprentices who **completed their MA**. Non-completers have been excluded from the analysis.

Descriptive Analysis: Modern Apprentice Productivity Growth (I)





Employers with a majority of apprentices in the youngest age group report the highest levels of productivity growth 3.55 hrs for the 16-19 age group 103.5%

Descriptive Analysis: Modern Apprentice Productivity Growth (II)

Employers with a majority of apprentices in **Engineering** report the **highest apprentice productivity growth**. Similarly, employers with most apprentices in **level 3** report a higher productivity growth with respect to those with a majority od apprentices in level 2 and 4 – this could be partially due to the high incidence of management-level positions in level 4.



Regression Analysis: Factors associated with MA Productivity Growth

Dependent variable: Average apprentice productivity growth – reported by employers.

(Average percentage change in the number of hours spent at the level of a fully qualified worker, from start to end of the apprenticeship).

$$productivity growth(y) = \frac{hrs_{end} - hrs_{start}}{hrs_{start}}$$

Baseline Model (Model A):

 $y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$

 X_1 : General characteristics of the employer and average productivity at start

- X_2 : Predominant Age Group of Apprentices
- X₃: Predominant Framework of Apprentices
- X₄: Sector of the employer

- + Retention of Apprentices (Model B)
- + Motivations to employ MAs (Model C)
- + Diversity (Model D)
- + Fair work (Model E)

Regression Analysis Results (I)

Model A (Baseline)

Variable	Coefficient
Productivity level at Start	-0.465***
Proportion of MAs (with respect to total size)	-0.216
Proportion of Female MAs	-0.024
Size Employer (Total number of employees)	-0.000*
Predominant Age Group (with respect to 16-19)	
Predominant Age Group: 20-24	-0.184**
Predominant Age Group: 25+	-0.318***
Predominant Framework Grouping (with respect to 'Oth	er Services')
Automotive	0.532*
Business & Administration	0.089
Construction: Building	0.522**
Construction: Technical Apprenticeship	1.016***
Dental Nursing	0.484**
Digital Applications	-0.090
Electrical Installation	1.020**
Engineering	0.833***
Food and Drink Operations	0.324*
Freight Logistics	0.611***
Hairdressing & Barbering	0.367
Hospitality	0.447***
IT and Telecommunications	0.156
Management	0.297
Other construction / manufacturing / engineering	0.379***
Retail	-0.298
Social Services (Children and Young People)	0.424***
Social Services and Healthcare	0.917***

Multiple regression analysis (OLS) with robust standard errors. Stars indicate significance level *** 1%, ** 5%, * 10%.

On average, employers with apprentices who had a lower productivity level at the start of their MA tend to report higher productivity growth rates, relative to other employers.

Employers with **younger apprentices (16-19 years old)** experience higher productivity growth with respect to those recruiting older apprentices (20+).

Employers with a majority of apprentices in Electrical Installation, Construction (TA) and Social Services (Children & YP) report higher productivity growth with respect to Other services - These frameworks usually require a qualification to practise.

Employer's Sector (with respect to 'Other Services')

Mining and quarrying	-0.860
Manufacturing	0.007
Electricity, gas, steam and air conditioning	0.117
Water supply	-0.491
Construction	0.035
Wholesale and retail trade	0.027
Transportation and storage	-0.017
Accommodation and food service activities	-0.269
Information and communication	0.446
Financial and insurance activities	0.114
Real estate activities	-0.291
Professional, scientific and technical	0.107
Administrative and support service activities	-0.176
Public administration and defence	-0.536**
Education	-0.092
Arts, entertainment and recreation	-0.025
Human health and social work activities	0.063
Other	0.150
Don't know	0.000

Regression Analysis Results (II):



On average, apprentices working with employers with high apprentice retention rates (+75%) experience a productivity growth that is 21.2 pp higher than those working for employers with low or medium retention rates (<75%).

Upskilling staff as a motivation might be signalling employers with already experienced/skilled apprentices who take the MA in order to get the qualification.

To make use of the UK apprenticeship levy fund as a motivation could be signalling employers for which apprentice productivity growth is not a priority.

Employers with **no provisions** to promote diversity report productivity growth rates that are 16.8 pp lower with respect to other employers.

Model E (A + Fair Work)

Variable	Coefficient
Follow any Fair Work practices	0.129

Model B: The Relationship between Apprentice Retention and Average Productivity Growth

Evidence suggests a positive and significant relationship (coefficient: 0.212***), but the direction of the causality is not clear.



Model B: Instrumental Variables Regression

In order to isolate relationship (1) we need an instrumental variable (Z) that is relevant and exogenous.



Model B: Instrumental Variables Regression

Endogenous: Retention

Instrument: Dummy variable that is equal to 1 if the employer reported 'To improve ability to retain staff' as one of their motivations to employ MAs



Once relationship 1) is isolated using IV, the association is **no longer significant**.

There's **no evidence** suggesting a strictly causal association:

Retention → Productivity

The relationship we found previously might be driven by:

- ✓ Reverse causality
- ✓ Common factors driving both variables: organisational culture, business model, etc.

Conclusions

- Apprentice productivity increases substantially during their apprenticeship
- Reported increase highest in STEM and construction frameworks, and at SCQF level 6-7 (~AQF level 3)
- Productivity growth is *significantly* higher for employers that:
 - Employ **younger** apprentices
 - Employ mainly construction, electrical or social services & health apprentices
 - Promote **diversity** in recruitment
 - Retain a higher proportion of apprentices on completion
- Relationship between post-completion apprentice retention and productivity growth.
- Shows where we could focus but only part of the story





Thank you.

Making skills work for Scotland

Annex

Modern Apprenticeships (MAs)

- A **Modern Apprenticeship** is a job which lets people earn a wage and gain an industry-recognised qualification. For employers, modern apprenticeships help develop their workforce by training new staff, and upskilling existing employees.
- Modern Apprenticeships combine a qualification with on-the-job experience. This lets people work, learn and earn at the same time. We contribute towards the costs of their training, through a training provider who works with the business.
- There are over 80 Modern Apprenticeship frameworks from healthcare and financial services to construction and IT. These have been developed by sector skills councils, in consultation with their industry

Foundation Apprenticeships (FAs)

- Foundation Apprenticeships are a work-based learning opportunity for senior-phase secondary school pupils.
- Lasting **one or two years**, pupils begin their Foundation Apprenticeship in S5 or S6. Young people spend time out of school at college or with a local employer, and complete the Foundation Apprenticeship alongside their other subjects like National 5s and Highers.
- Completion leads to a qualification at the same level of learning as a Higher and can lead to progression on to a job, such as a Modern or Graduate Apprenticeship.
- Foundation Apprenticeships are recognised as entry qualifications by all Scottish colleges and universities

Hours spent in average day working at the level of a fully qualified worker, by stage of MA



Base (un-weighted): All employers who had any MAs completed (1,910)

Instrumental Variables: Validity of the Instrument

Relevance

Source	SS	df	MS	Number of obs	=	1,876
Model Residual Total	2.06949505 357.060569 359.130064	1 1,874 1,875	2.06949505 .190533922 .191536034	F(1, 1874) Prob > F R-squared Adj R-squared Root MSE	= = = =	0.0010 0.0058 0.0052 .4365
retention_~h	Coef.	Std. Err.	t P	> t [95% Co	nf.	Interval]
retain_staff _cons	.0810178 .6783042	.024583 .0217979	3.30 0 31.12 0	.001 .032804 .000 .635553	9 6	.1292307 .7210549

Exogeneity

Source	SS	df	MS	Number of obs	=	1,474
Model Residual	2.74854808 4213.1562	1 1,472	2.74854808 2.8621985	Prob > F R-squared	=	0.3273 0.0007
Total	4215.90475	1,473	2.86212135	Root MSE	=	1.6918
phstart_end	Coef.	Std. Err.	t P	> t [95% Co	onf.	Interval]
retain_staff _cons	.1077909 1.017435	.1099968 .0983341	0.98 0 10.35 0	.327107976 .000 .82454	54 45	.3235581 1.210325

Instrument is relevant

Statistically significant relationship between the instrument (having 'To improve ability to retail staff' as motivation) and the endogenous variable (retention of apprentices).

Having 'To improve ability to retain staff' as a motivation is strongly associated with actual retention of apprentices. (rule of thumb F>10, t>3.2)

Instrument 'appears to be' exogenous:

No direct significant relationship between the instrument (having 'to improve ability to retain staff') and productivity

No formal test available, but from running a regression against productivity growth, there seems to be no significant 'direct' relationship between these variables.