

Skills  
Development  
Scotland

# Profile of Modern Apprenticeship Employers

An analysis using linked data from the Office for National Statistics

August 2024

Skills Development Scotland (SDS) has conducted in-depth research to better understand Scotland's Modern Apprentice (MA) employers. This insight supports and informs SDS and its partners, by providing a better picture of apprentice employer profile and how apprenticeships contribute to the economy.

The findings are a result of linking SDS owned employer data with Office for National Statistics (ONS) data – specifically to the Inter-Departmental Business Register (IDBR) and related databases. Through this work, SDS was able to access information on the size and sector of Scotland's MA employers and a range of economic data on employers, including productivity (GVA per worker).

Therefore, this work provides a robust understanding on a range of aspects, such as employer profile across sectors and sizes; MA recruitment across industry sectors and different sizes of employers; and economic benefits through apprentice employment, including productivity based on intensity of apprentices in the workforce.

# Introduction

- This report outlines the findings of data linkage between Skills Development Scotland and the Office for National Statistics (ONS) which aimed to provide new insight into Modern Apprenticeship (MA) employers. The analysis includes:
  - **A profile of MA employers in Scotland** by industry (SIC/section), size (based on total employment) and apprenticeship employment (number of MAs in-training).
  - An overview of **MA Employment and Intensity** by industry and enterprise size.
  - Research quantifying the **relationship between MA employment intensity and productivity** for MA employers.
- Skills Development Scotland MA employer records have been matched to the Inter-Departmental Business Register (IDBR) and assigned an Enterprise Reference Number using company name and address. The analysis was conducted in the Secure Research Service, part of the Office for National Statistics (ONS)\*.
- The analysis is based on a sample of **19,180 enterprises** that had MA starts within the period **2010-2019\*\***. Annexes 1-3 provide more information on the methodology used in this analysis.

\*This work contains statistical data from ONS which is Crown Copyright. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

\*\* The analysis will be updated with the most recent data in the coming months.

# Summary of Findings

## Profile of MA Employers

- Over half of all MA employers were in three of Scotland's largest employing industries:
  - Construction,
  - Wholesale and retail trade; repair of motor vehicles and motorcycles\*, or
  - Manufacturing.
- Around 9 in 10 MA employers were Small and Medium Enterprises (SMEs) (91.9%). SMEs also make up a sizeable part of Scotland's business base - 99.3% of businesses in Scotland were SMEs.\*\*

## MA Employment

- The Construction industry employed the largest number of MAs overall and also had a high concentration of MAs as a proportion of the total workforce (13.6% or 1 in 7).
- Large employers (250+) on average employed the highest number of Scottish MAs in-training. However, micro-enterprises (0-9) had, on average, the highest number of MAs in-training as a proportion of their workforce (apprenticeship employment intensity).

## Productivity

- MAs play an important role in enterprise productivity.
- This research shows there is a positive relationship between MA employment and enterprise productivity.
- This means that on average, enterprises that employ more MAs are also more productive.

\* Around half of the MA employers in this sector were in 'Repair of motor vehicles and motorcycles'.

\*\*Source: <https://www.gov.scot/publications/businesses-in-scotland-2023/pages/business-size/>

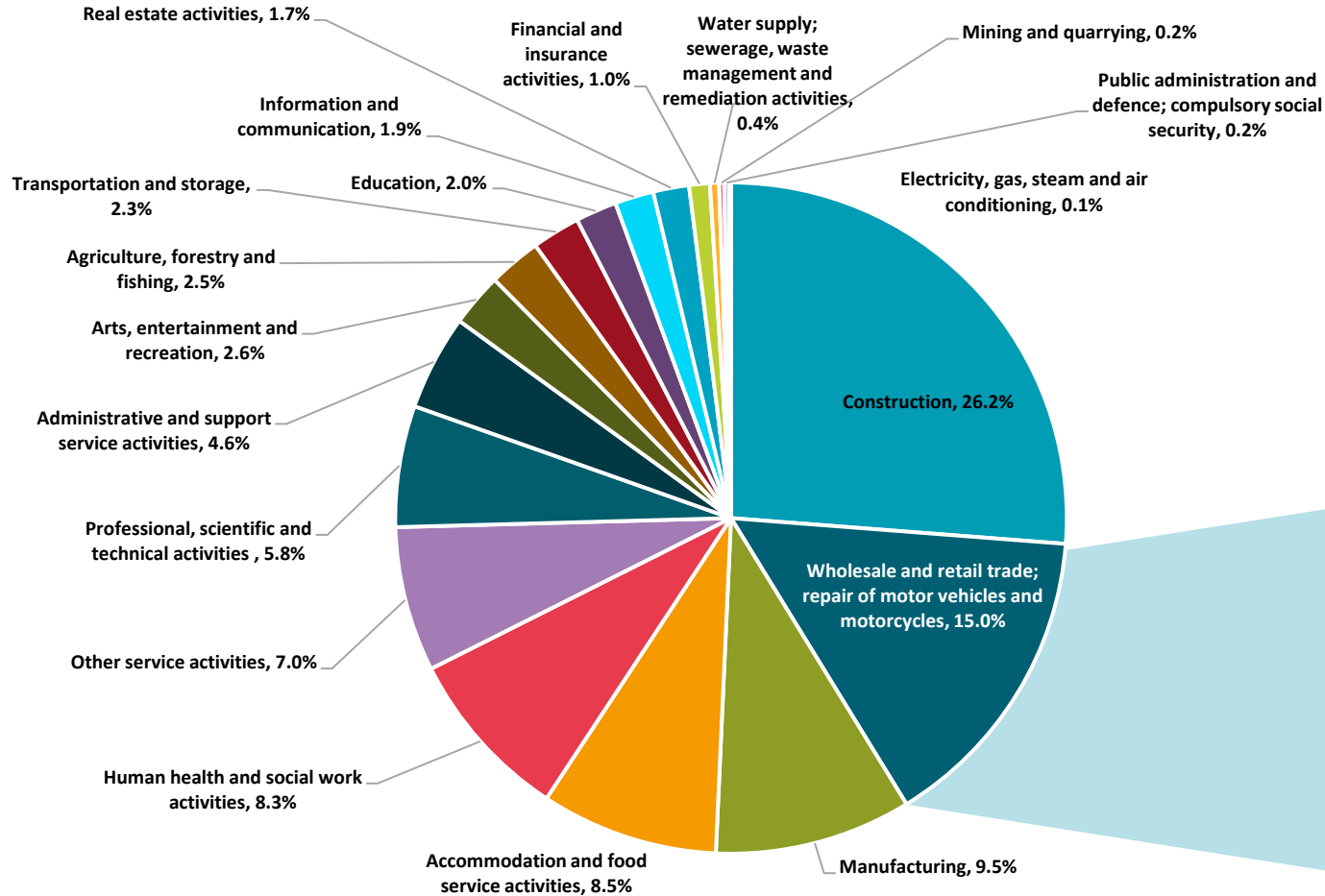
# Profile of MA Employers

**Distribution of MA employers** by industry and size

# Distribution of Enterprises by Industry

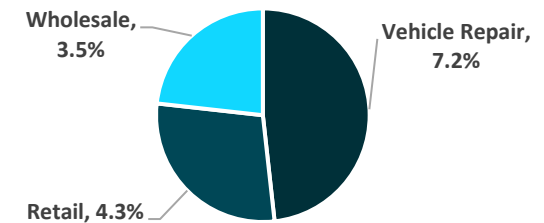
## Standard Industry Classification (SIC-Section) of MA Employers in 2019\*

\*Based on a sample of employers with MA starts in 2010-2019, n=19,180 (17251 with SIC available)



- More than one quarter of employers with an MA were in the Construction industry.
- Half of all employers with an MA were in one of three industries: Construction, Wholesale and retail trade; repair of motor vehicles and motorcycles or Manufacturing.
- Electricity, Public Administration and Mining and Quarrying constituted a very small proportion of MA employers.

### Wholesale and retail, repair of motor vehicles and motorcycles breakdown

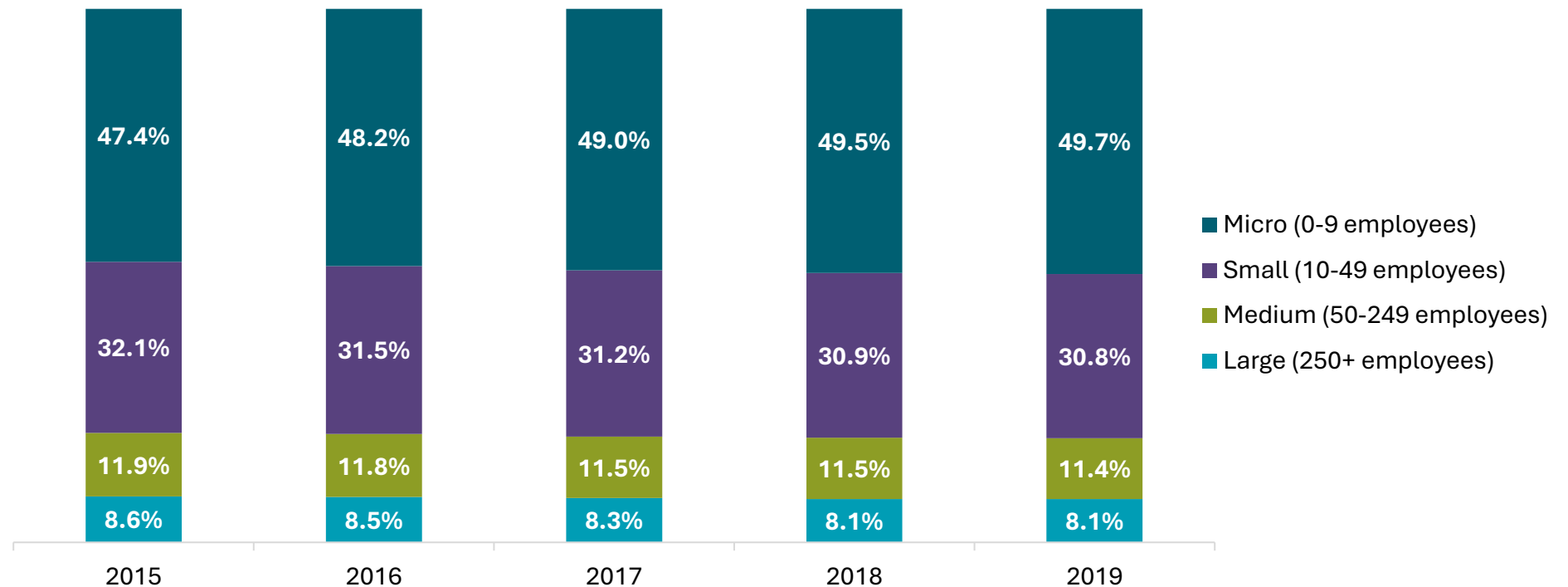


# Distribution of Enterprises by Size

**Most MA employers were in the Micro classification** (up to 9 employees). This distribution has been relatively stable over time, with the proportion of Micro enterprises slightly increasing between 2015 and 2019.

## Size of MA employers

\*Based on a sample of employers with MA starts in 2010-2019,  
n=19,180 (min 14,938, max 17,237 with employment data available in the IDBR)



# MA Employment and Intensity

**Employment:** Number of MAs in training

**Intensity:** MAs in training as a **proportion** of total employment

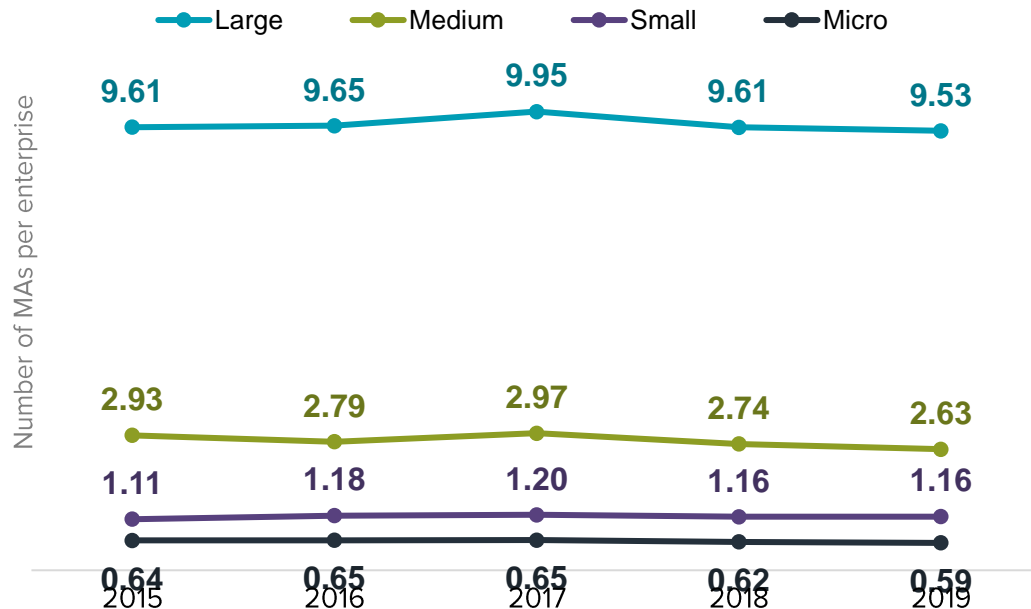


# MA Employment and Intensity by Enterprise Size

Large employers (250+ employees) employed the highest **number** of Scottish MAs on average. However, micro enterprises had the highest apprenticeship employment **intensity**, with MAs representing around **13%** of their workforce.\*

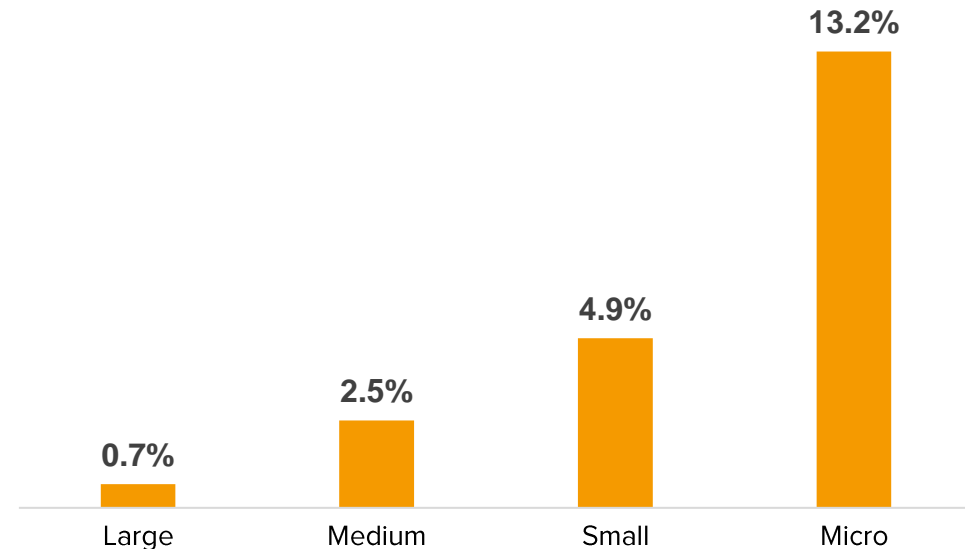
**Average number of MAs employed by enterprise size**

Based on a sample of employers with MA starts in 2010-2019, n=19,180 (17,237 with employment data available)



**Average apprenticeship employment intensity by enterprise size**

Based on sample of Employers with MA starts in 2010-2019, n=19,180 (17,237 with employment data available)



Source: ONS

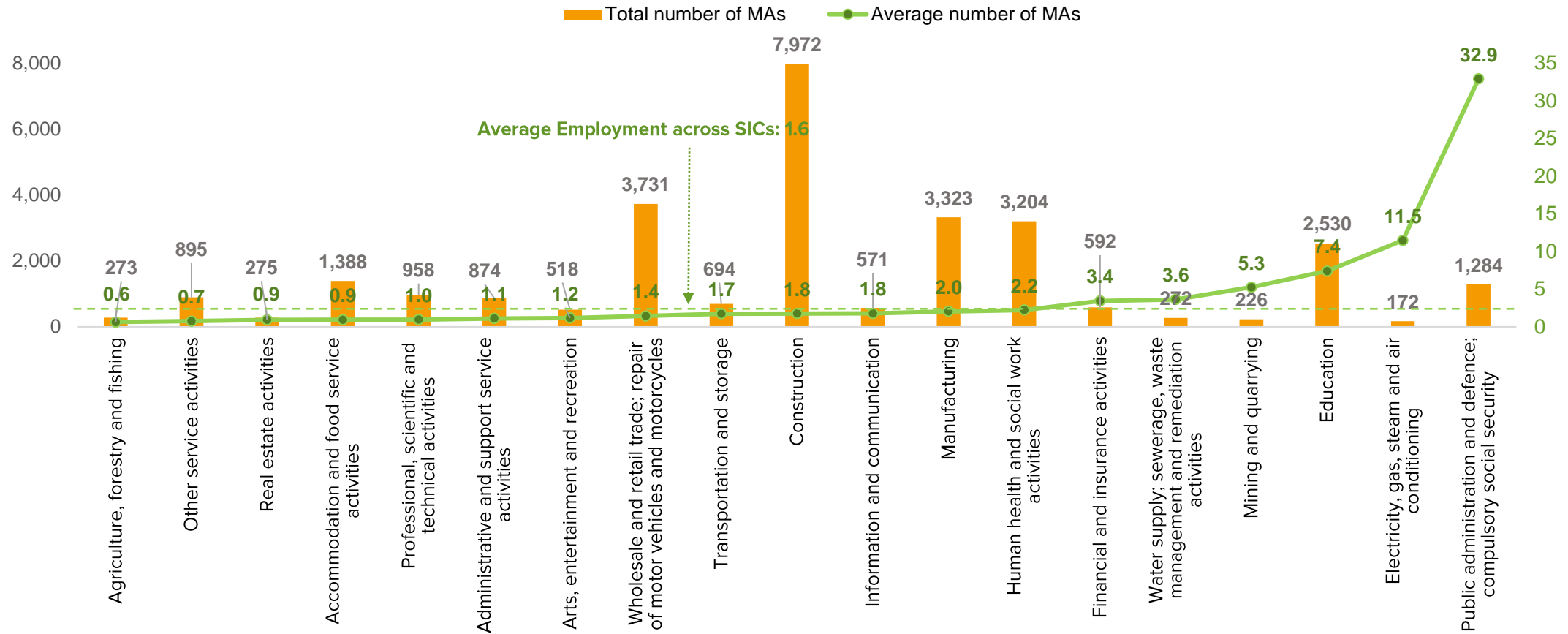
\* The sample of large employers contains some UK headquartered enterprises and the apprentice intensity is shown as a percentage of total (UK) employment. Apprentices as a proportion of Scottish employment would likely be higher.

# MA Employment by Industry

Enterprises in the Construction industry collectively had the largest **number** of **MAs in training**. However, Public Administration and Defence had the highest **average** of MAs in training per employer.

**Total and Average Apprenticeship Employment by SIC**

Based on a sample of employers with MA starts in 2010-2019, n=19,180 (17,251 with SIC available)



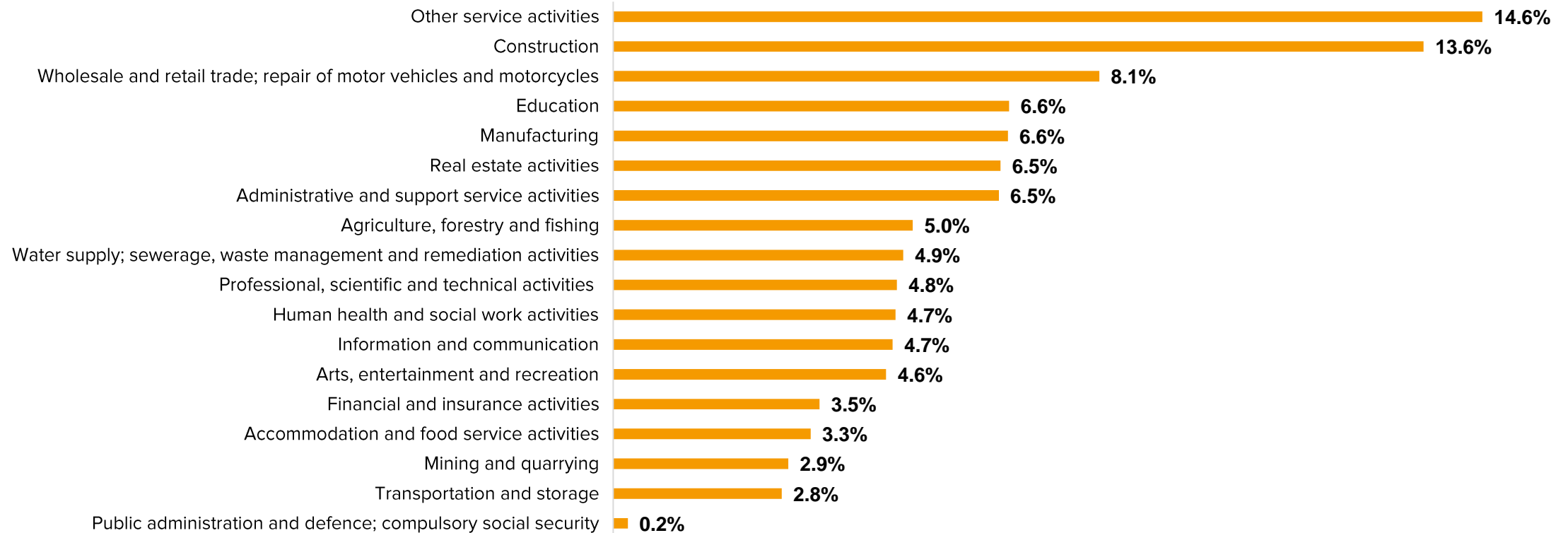
Source: ONS. The high average apprenticeship employment for Public administration might be driven by the low number of enterprises in this sector. This figure should be interpreted with caution

# MA Employment Intensity by Industry

The industries that employed the **highest number of MAs as a percentage of their total workforce** were Other Service Activities, Construction, Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles, and Education.

## Average Apprenticeship Employment Intensity across 2011-2019

(only SICs with n>30)



# **Relationship between MA Employment Intensity and Productivity**

**Productivity:** Gross Value Added (GVA) per worker.

# Productivity Analysis

- In addition to building a profile of MA employers, we used the SDS-IDBR (ONS) linked dataset to **study the relationship between apprenticeship employment intensity and enterprise productivity**.
- There is a **positive and significant relationship** between apprenticeship employment intensity and enterprise productivity.

This means that, on average, **MA employers with a higher level of apprenticeship employment intensity are also more productive**, but it is *not possible to claim a causal relationship* at this point.

# Productivity Analysis: Methodology

- A **panel dataset** of enterprises identified as Modern Apprenticeship (MA) employers was analysed for the period **2010 to 2019**.
- The objective is to investigate the relationship between **productivity** (measured through real\* Gross Value Added – GVA per worker) and **MA employment intensity** (measured as the proportion of MAs in training relative to the total number of employees) for a sample of MA employers.
- We used static and dynamic panel methodologies:
  - ✓ **Random effects (RE) – Simplest approach**, assuming no correlation between error term and apprenticeship employment (although this assumption is unlikely/unrealistic)
  - ✓ **Fixed effects (FE) – Slightly stricter** and does not make the assumption of no correlation. Controls for unobserved fixed characteristics affecting productivity.
  - ✓ **System GMM – Most sophisticated approach**, attempts to investigate if a **causal effect exists** (not just correlations). Deals with biases from joint determination of apprenticeship intensity and productivity (unobserved fixed and non-fixed factors affecting both apprenticeship intensity and productivity).

# Gross Value Added Regressions – RE,FE

Dependent variable: Log real GVA per worker	Random Effects (RE)				Fixed Effects (FE)			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
<b>Apprenticeship intensity (log)</b>	<b>0.095***</b> (0.021)	<b>0.088***</b> (0.019)	<b>0.065***</b> (0.013)	<b>0.047***</b> (0.011)	<b>0.133***</b> (0.020)	<b>0.102***</b> (0.014)	<b>0.084***</b> (0.010)	<b>0.070***</b> (0.017)
Average age of apprentices	-0.019* (0.010)	-0.024*** (0.008)	-0.015 (0.009)	-0.016 (0.019)	-0.025*** (0.007)	-0.014* (0.008)	-0.011 (0.008)	-0.025* (0.013)
Average age of apprentices (squared)	0.000** (0.000)	0.000** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Proportion of female apprentices	-0.222*** (0.078)	0.000 (0.047)	0.049** (0.025)	0.071 (0.046)	0.047 (0.032)	0.087*** (0.025)	0.084*** (0.027)	0.060 (0.041)
Number of cases	10085	4647	4647	2131	10085	4647	4647	2131
Number of groups	3792	1591	1591	1303	3792	1591	1591	1303
Region and year dummies	Y	Y	Y	Y	Y	Y	Y	Y
Enterprise characteristics (except SIC and size)		Y	Y	Y		Y	Y	Y
Industry (2 digit SIC) and size			Y	Y			Y	Y
Industry characteristics				Y				Y

Note: Clustered standard errors at industry level presented in brackets, significance level: \*10%, \*\* 5%, \*\*\* 1%. Enterprise characteristics covering: net expenditure per worker, expenditure in services as a proportion of total expenditure, UK parent company dummy, part-time workers ratio, multiple local units dummy, legal status, and enterprise age band. Industry characteristics include: proportion of workers receiving training, proportion of staff not fully proficient, average number of hours worked, proportion of temporary workers and real R&D expenditure per worker. Values reported for AR(1) and AR(2) are p-values for autocorrelation in first difference equations (null hypothesis: no autocorrelation). Hansen test p-values refer to a test for instrument validity (null hypothesis: instrument validity).

# Productivity Analysis: Interpretation

- Where the **coefficients are greater than zero ( $>0$ )**, it means that there is a **positive relationship** (when apprenticeship intensity increases, productivity also increases).
- Coefficients are highlighted with asterisks, depending on **level of significance**:

No asterisk	Not significant (not reliable)
*	Significant at 10%
**	Significant at 5%
***	Significant at 1% (most reliable)

- There's a **positive and significant** relationship between GVA and apprenticeship employment intensity across all specifications and estimators. Under the final fixed effects (FE) specification (model 4, FE) an **increase of 1% in apprenticeship employment intensity** is associated with a small **increase in real GVA per worker**.
- The results from the GMM regression weren't significant at any level in any of the models, so it is **not possible to establish a causal effect** from apprenticeship employment intensity to productivity.



# Productivity Analysis: Considerations

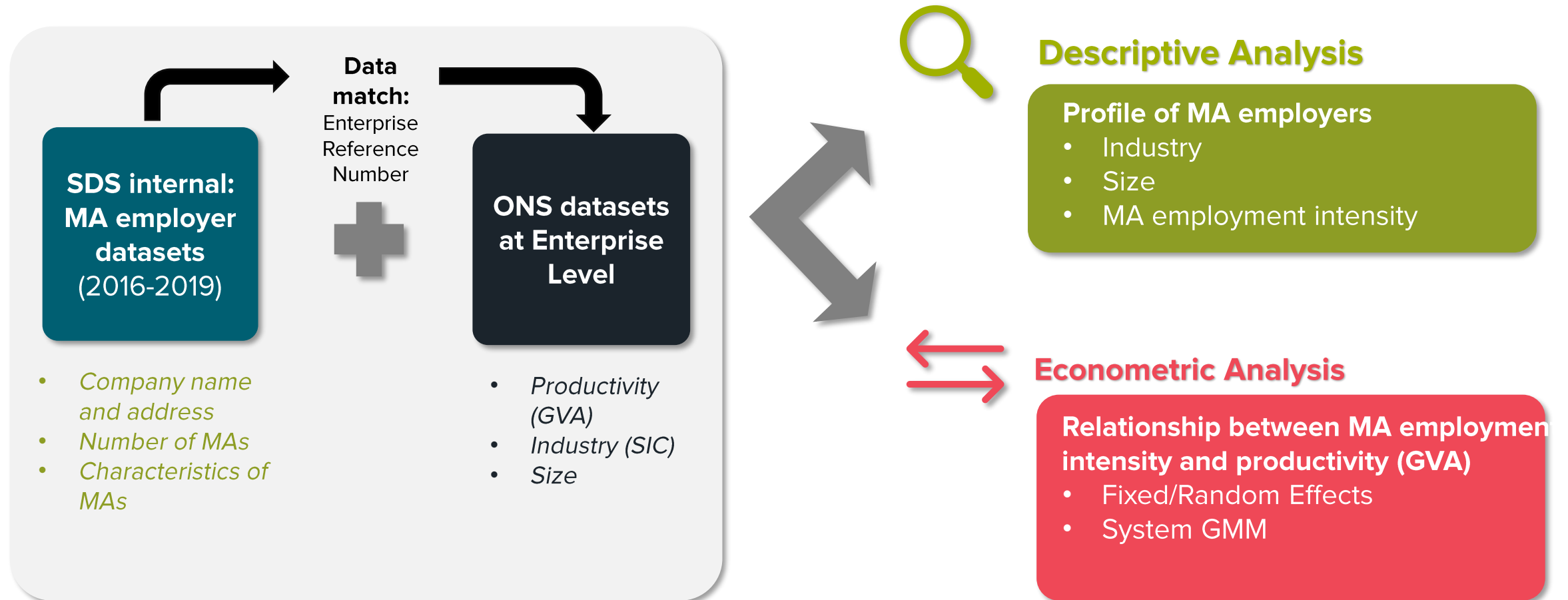
- The results of the current analysis **only apply to employers who already have MAs**. For them, an increase in apprenticeship employment intensity is associated with an increase in productivity.
- This analysis does not allow us to compare MA employers vs non-MA employers. Further research is needed to explore this research question.

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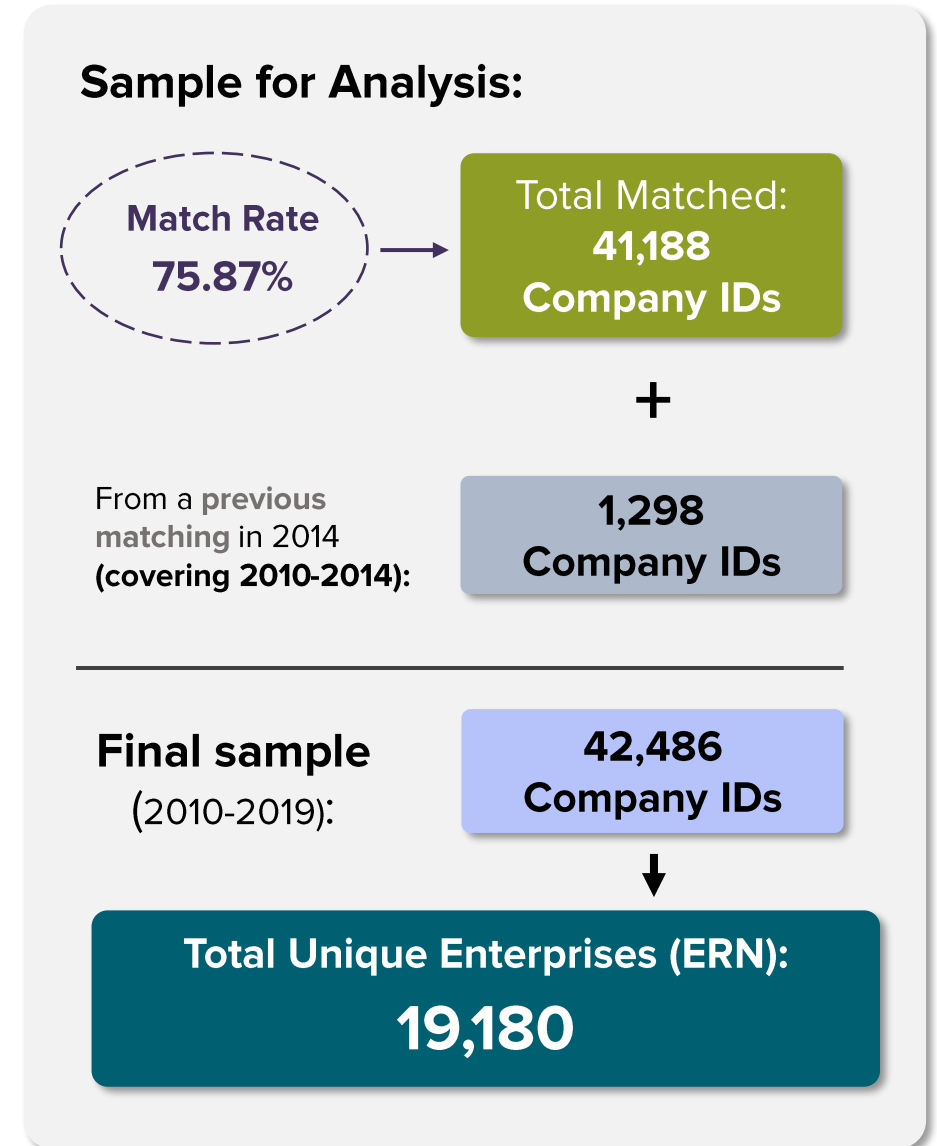
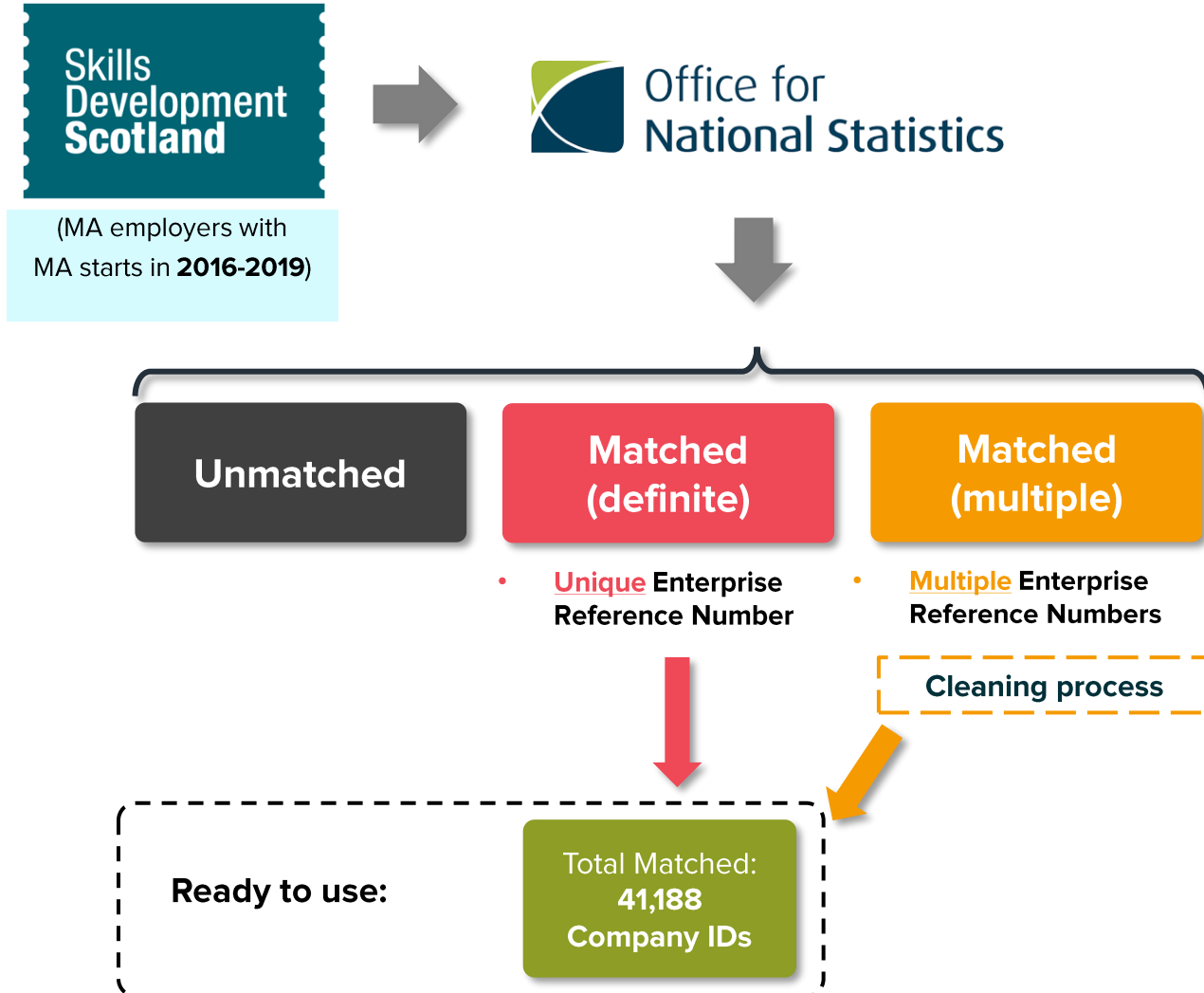
Contact us:  
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# Annex 1: Project Overview

The project involved matching SDS data to ONS dataset at enterprise level. The matched dataset was used to build a profile of MA employers and analyse the relationship between MA employment and productivity.



# Annex 2: Sampling Framework



# Annex 3: Structure of Final Matched Dataset

All datasets were merged using **Enterprise Reference Number (ONS ID)** and **Industry (2 digit-SIC)**

Enterprise level				Industry level		
<b>SDS MA data</b>	<b>ONS Annual Business Survey (ABS)</b>	<b>ONS Business Register Employment Survey (BRES)</b>	<b>ONS Business Enterprise Research and Development (BERD)</b>	<b>ONS Business Structure Database (BSD)</b>	<b>ONS Labour Force Survey (LFS)</b>	<b>ONS National Employer Skills Survey (NESS)</b>
<ul style="list-style-type: none"> <li>• <b>Number</b> of in-training MAs</li> <li>• Proportion of in-training <b>female</b> MAs</li> <li>• <b>Average age</b> of in-training MAs</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Gross Value Added (GVA)</b></li> <li>• <b>Employment costs (EC)</b></li> <li>• Employment</li> <li>• Capital expenditure</li> <li>• Expenditure on computer services and advertising</li> <li>• Total purchases</li> <li>• Foreign ownership</li> <li>• Legal status</li> </ul>	<ul style="list-style-type: none"> <li>• Proportion of <b>employees working part-time</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Research and Development</b> investment</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Size</b></li> <li>• <b>SIC</b></li> <li>• Region (postcode)</li> <li>• Birth year of enterprise</li> <li>• Number of live local units per enterprise</li> </ul>	<ul style="list-style-type: none"> <li>• Average number of <b>hours worked by Industry</b></li> <li>• Proportion of temporary workers</li> </ul>	<ul style="list-style-type: none"> <li>• Proportion of <b>staff not fully proficient</b></li> <li>• Proportion of <b>workers receiving training</b>.</li> </ul>
Digital Object Identifier (DOI):	<a href="https://doi.org/10.57906/ks2s-qx24">https://doi.org/10.57906/ks2s-qx24</a>	<a href="https://doi.org/10.57906/m3dm-jp03">https://doi.org/10.57906/m3dm-jp03</a>	<a href="https://doi.org/10.57906/1c04-sv57">https://doi.org/10.57906/1c04-sv57</a>	<a href="https://doi.org/10.57906/7kh0-0910">https://doi.org/10.57906/7kh0-0910</a>	<a href="https://doi.org/10.57906/kpcj-gt08">https://doi.org/10.57906/kpcj-gt08</a>	<a href="https://doi.org/10.57906/zs9p-gw83">https://doi.org/10.57906/zs9p-gw83</a>