

Article

# Using administrative data to improve public sector finance statistics, UK: 29 June 2023

Experimental statistics using Pay As You Earn Real Time Information and Value Added Tax to improve subnational estimates of UK public sector finance statistics.

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# 1 . Main points

- We have developed experimental public sector finance statistics from two administrative data sources: Pay As You Earn Real Time Information (PAYE RTI) and Value Added Tax returns (VAT).
- PAYE RTI can provide labour costs with enhanced geographical breakdowns while being broadly consistent with pre-existing information.
- PAYE RTI could potentially provide insight into income tax receipts but requires further investigation.
- Current public corporation turnover estimates derived from VAT returns differ from that gathered from surveys, sometimes greatly.
- These statistics preliminarily demonstrate improvements by providing more detailed subnational estimates.
- Further refinement is needed before we can use these statistics to supplement public sector reporting, which could be explored through further research.

These are not official statistics and should not be used for policy- or decision-making. They are published as research into improving public sector finance statistics. Caution is advised when using the data.

## 2 . Supplementing public sector finance statistics

This feasibility paper is part of a suite of research seeking to improve the timeliness and quality of public sector finance statistics, especially by improving subnational estimates.

The data we currently use for both public corporations and local government:

- tend to be low frequency
- arrive with a time-lag
- contain limited subnational information

Central government information is timelier but generally has minimal subnational information.

Administrative data have the potential to improve the timeliness and granularity of existing reporting. For example, by enhancing subnational breakdowns, or by providing early estimates of expenditure information for general government and public corporations quicker, at a far higher frequency and with potentially fewer revisions. This article assesses the feasibility of using two sources of administrative data in this way: Pay As You Earn Real Time Information (PAYE RTI) and Value Added Tax records (VAT).

## 3 . Experimental results

# Pay As You Earn Real Time Information

## The major components of labour costs

Pay As You Earn Real Time Information (PAYE RTI) helps us to understand the components of labour costs. Linking to the Inter-Departmental Business Register (IDBR) permits comparisons of these components across sectors.

To demonstrate feasibility, we analysed the tax year ending 2021. We are aware that this period covers several national coronavirus (COVID-19) lockdowns, local lockdowns, and restrictions. We do not believe that this has a material impact on the relative proportions of components of labour costs, but this analysis can easily be replicated for other periods.

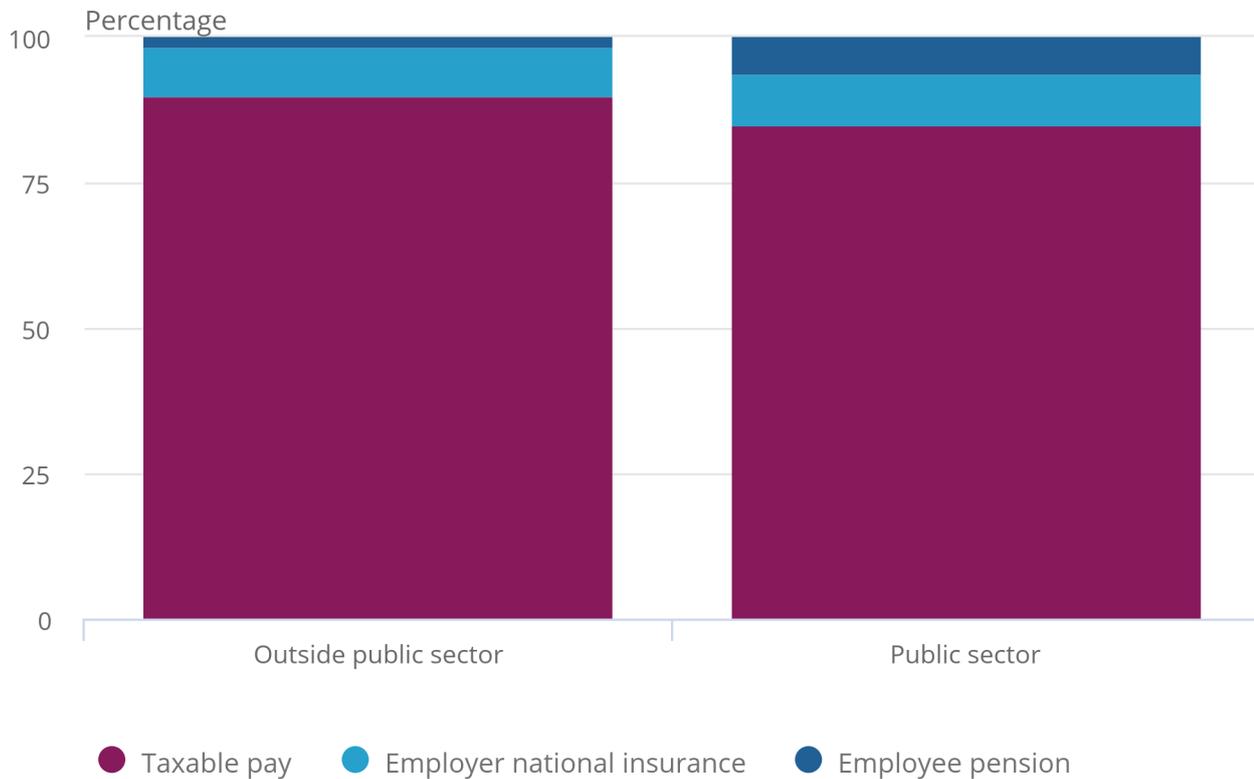
Taxable pay accounts for the majority of labour costs. On average, employees in the public sector make relatively higher pension contributions when compared with other sectors.

## Figure 1: Taxable pay makes up the largest component of labour costs

Relative proportions of the cash components of labour costs captured in PAYE RTI, public sector and outside public sector, from the tax year ending 2021

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Relative proportions of the cash components of labour costs captured in PAYE RTI, public sector and outside public sector, from the tax year ending 2021



Source: Pay As You Earn Real Time Information from HM Revenue and Customs, Inter-Departmental Business Register

#### Notes:

1. Totals may not sum as expected because of rounding.
2. Public Sector defined as legal statuses 4,5, and 6. Outside public sector defined as legal statuses 1,2,3, and 7.

## Coherence with other measures of local government expenditure

Around 40% of local government expenditure in the financial year ending (FYE) March 2022 was on labour costs (see the [Local authority revenue expenditure and financing England: 2021 to 2022 individual local authority data – outturn, available on GOV.UK](#)); PAYE RTI has the potential to offer insight into this large area of expenditure. To assess how well PAYE RTI can be used to improve public sector reporting we must first understand how well it matches pre-existing sources.

We compared published local authority labour costs from the Department for Levelling Up, Housing and Communities (DLUHC) with those derived from PAYE RTI. We did this for a small sample of local authorities as well as the national total to assess coherence at different levels.

DLUHC reports local authority expenditure on a financial year basis, whereas PAYE RTI uses tax years. While direct comparisons of these slightly different periods will lead to differences, we concluded that it will not materially alter the interpretation of these results. We could investigate the feasibility of generating financial years from PAYE RTI in the future.

We selected an anonymous random sample of 15 English local authorities and compared six years. PAYE RTI does not capture employer pension contributions, but they are in DLUHC's figures, so we applied the [average public sector employer contribution rate](#) of 18% to the PAYE RTI estimates.

Across the 15 authorities, the median PAYE RTI estimate was 2% higher than the DLUHC figure, with an interquartile range from negative 17% to positive 18%. One local authority had much higher PAYE RTI labour cost estimates; more than double the DLUHC values. We believe that we are miscategorising some expenditure within PAYE RTI for this local authority, and perhaps others. We may conduct further investigations.

Results were similar at a national level. PAYE RTI labour cost estimates were 7% lower than the England total provided by DLUHC for FYE 2021, once adjusted for employer pension contributions.

### **Figure 2: PAYE RTI captures local government labour costs with consistency across years with variability between authorities**

A sample of English local authority data, each point represents the difference between labour costs captured by PAYE RTI and those published by DLUHC for one local authority for a single year

#### Notes:

1. Period covered: year ending 2016 to year ending 2021. PAYE RTI figures are calculated using the tax year, whereas DLUHC figures use the financial year.
2. Not all local authorities have an estimate for each of the six years.

#### Download the data

[.xlsx](#)

## Subnational labour costs

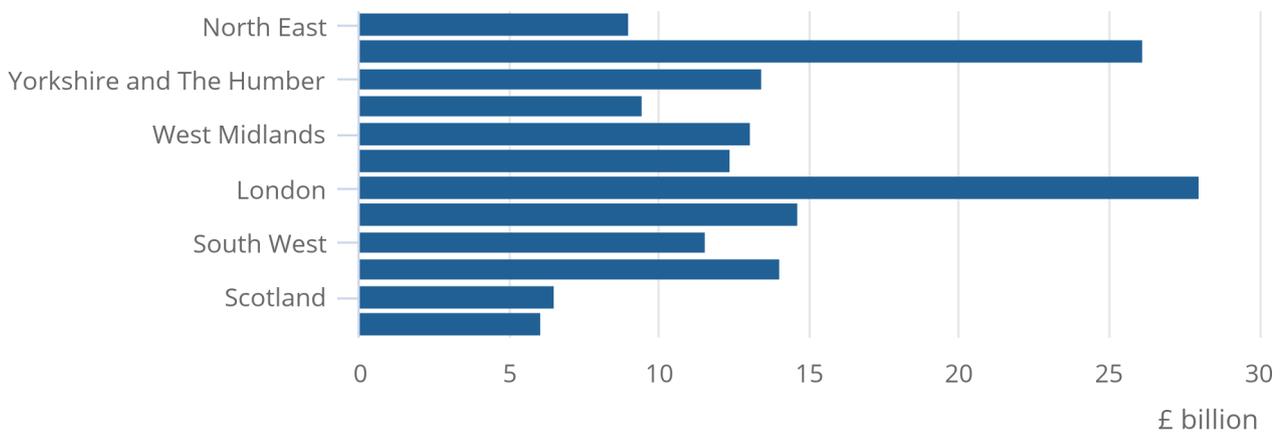
At present, national public sector expenditure statistics are often apportioned to regions and sub-regions, for more information see our [Country and regional public sector finances: methodology guide](#). PAYE RTI provides a method of measuring expenditure on labour costs at a detailed geographical level. This could improve existing reporting or apportionment methods. Using the default address from the enterprise tax management platform information within PAYE RTI, it is possible to calculate the total labour costs for the public sector at each of the three [UK International Territorial Levels \(ITL\)](#).

### Figure 3: London accounts for the highest public sector labour costs

Labour cost by country and region of the UK, data analysed are from the tax year ending 2021

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Labour cost by country and region of the UK, data analysed are from the tax year ending 2021



Source: Pay As You Earn Real Time Information from HM Revenue and Customs, Inter-Departmental Business Register

#### Notes:

1. The totals shown have not been adjusted for differences in the number of employees.
2. Public sector defined as legal statuses 4,5, and 6. Outside public sector defined as legal statuses 1,2,3, and 7.

To test the feasibility of creating subnational labour costs, we generated estimates at an ITL2 level in our [Labour cost by International Territorial Level 2 breakdown of the UK dataset](#). We are required to suppress information for a small number of ITL2 areas to prevent disclosure. Suppression at the ITL3 level is more widespread. We could pursue options to maximise the value of ITL3 level information while adhering to disclosure controls in the future.

## Reporting labour costs across functions of government

The Classification of the Functions of Government (COFOG) is the international standard for classifying the purpose of government activities. Labour costs are likely to be observed in the majority of COFOG groups.

It is not possible to accurately apportion PAYE RTI based labour costs to COFOGs because there is no reliable way to identify the function in which an employee is engaged. In some cases, it is possible to confidently place all employees of a single organisation into one function, for example police and fire rescue services fall into public order and safety. However, many general government organisations are involved in more than one function. While PAYE RTI does provide some indication of the industrial sector and trade class of the employer, it is not possible to map this to an employee level in a consistent fashion.

It is conceivable that some organisations use certain PAYE schemes for particular employees. For example, managing teacher salaries under one scheme and healthcare workers under another. This could provide insight into COFOG at a detailed level. Alternatively, rather than capturing labour costs directly, we may be able to use PAYE RTI to derive weightings for apportioning national totals to local areas. We could explore this in the future.

## Analysis of PAYE RTI income tax

In addition to directly measuring expenditure on labour costs, PAYE RTI could also be used to add insight into central government tax receipts. By analysing the data, it is possible to derive detailed spatial distributions of PAYE income tax revenue as well as gaining valuable insights into changes observed in other public sector finance statistics.

## Coherence with public sector receipts

To assess the feasibility of using PAYE RTI to supplement income tax analysis, we must first establish its coherence with pre-existing information on PAYE income tax. In the financial year ending March 2021, PAYE income tax receipts totalled £168 billion, as shown in our [Public sector finances, UK: May 2023 bulletin](#). Estimates based on PAYE RTI were lower, with £152 billion in the equivalent tax year. Some tax charges can be cleared without a specific transfer of money to HM Revenue and Customs (HMRC), so we cannot fully replicate the tax receipts statistics from administrative data alone. Nevertheless, there are some potential refinements; current PAYE RTI estimates do not capture all income tax deducted from pension schemes. We could seek to include pension scheme tax receipts in the future.

## Share of PAYE RTI income tax liability

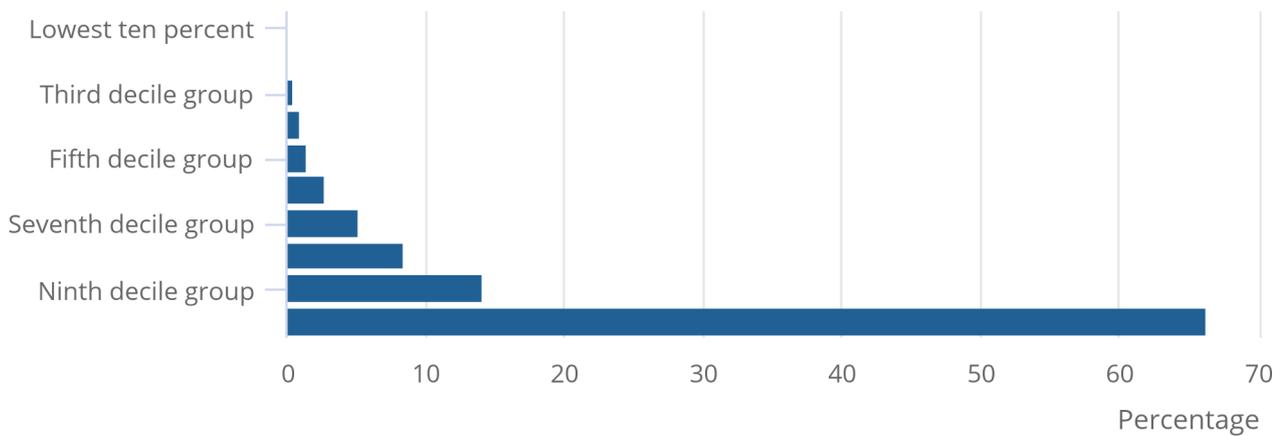
One example of how PAYE RTI could supplement tax analysis is by providing contextual information on the source of income tax. The top 10% of earners in PAYE RTI contribute approximately two-thirds of all PAYE income tax collected in the tax year ending 2021. The second highest decile accounts for approximately 15% of PAYE income tax. This means that the top fifth of earners accounted for around four-fifths of all PAYE income tax receipts.

**Figure 4: The top 10% of individuals contribute around two-thirds of income tax collected from PAYE**

Data are compiled from PAYE RTI for the tax year ending 2021

### Figure 4: The top 10% of individuals contribute around two-thirds of income tax collected from PAYE

Data are compiled from PAYE RTI for the tax year ending 2021



Source: Pay As You Earn Real Time Information from HM Revenue and Customs

**Notes:**

1. Totals may not sum as expected because of rounding.
2. Analysis includes all sectors.

## Value Added Tax

### Public corporation turnover Information

The public sector division already collects turnover information for public corporations. The existing data rely mainly on HM Treasury's Whole of Government Accounts, which is often only available at least a year after the reference point and contains only annual totals. These are supplemented using published annual reports, often only available several months after the reference period and again often only providing annual totals. In addition, we conduct a quarterly survey of the largest public corporations.

We can use turnover information within Value Added Tax (VAT) returns to obtain more timely and higher frequency information. Moreover, if this information is consistent with that provided through the quarterly survey, it might be possible to use administrative data to ease the survey response burden.

To assess this, we attempted to replicate turnover information obtained by survey with information contained within VAT forms. We examined quarterly returns for three public corporations throughout 2020 and 2021.

The results of this small sample were mixed. For one corporation, we were able to replicate the survey information to within a few percentage points. For the second, estimates accounted for approximately half of the total turnover captured by the survey. The third corporation's figures were very different.

This could be partly because of differences in the definition of turnover in VAT returns compared with turnover reported in business accounts, and therefore the quarterly survey. For example, VAT return turnover may include the value of disposals of capital assets or may include the value of imported services. Crucially, VAT returns cover all supplies made by a VAT group, which may include associated companies, but not necessarily the whole group as reported in the survey.

### Coherence with public sector receipts

To assess the feasibility of using VAT data to supplement tax analysis, we tested its coherence with pre-existing information. Public sector receipts based on VAT data estimates were very different to the National Statistics in our [Public sector finances, UK statistical bulletins](#). This demonstrates that our estimates are not accurate at this stage; we believe this is at least partly because of the treatment of VAT repayments. We may seek to improve estimates in the future.

## 4 . Public sector labour cost estimates data

[Labour cost by International Territorial Level 2 breakdown of the UK](#)

Dataset | Released 29 June 2023

Public sector labour cost estimates for groups of administrative areas across the UK.

## 5 . Glossary

### Administrative data

This is information created when people interact with public services, such as the tax and benefits system, and is collated by government. These data, the majority of which were not originally created for research, can be reused to produce statistics on important aspects of society without having to collect additional information from the public.

## International Territorial Levels (ITLs)

There are a number of geographies used for international comparison of subnational statistics. As of 1 January 2021, the internationally comparable regional geography for the UK is the International Territorial Levels (ITLs). ITL1 represents the countries of the UK and the regions of England. ITL2 represents groups of administrative areas across the UK.

## Public sector

Central government departments and bodies (such as the Department for Work and Pensions), local authorities and other local government bodies (such as police authorities), and public sector-controlled corporations (such as Scottish Water).

# 6 . Data sources and quality

## Pay As You Earn Real Time Information

Pay As You Earn (PAYE) is the system employers use to take Income Tax and National Insurance contributions before they pay wages, salaries or occupational pensions to employees. Since April 2014, employers have been required to use the [Real Time Information \(RTI\) system](#). There were an estimated 30 million payrolled employees in May 2023 and PAYE RTI provides a valuable insight into this large proportion of the UK workforce. For more information, see our [Earnings and employment from Pay As You Earn Real Time Information, UK: June 2023 bulletin](#).

Labour costs represent the total expenditure incurred by employers for the employment of staff. The main cash components of labour costs are:

- taxable pay
- employee pension contributions
- employer National Insurance contributions
- employer pension contributions

PAYE RTI covers all but one of these components; employers are not required to report their pension contributions to HM Revenue and Customs (HMRC) and so this component is not present in PAYE RTI.

Employer pension scheme contributions account for a sizeable proportion of labour costs. This is especially true for the public sector. According to the [Institute for Fiscal Studies](#), the average public sector employer contribution rate was 18% of qualifying pay in 2021. As such, employer pension contributions must be considered in any measurement of public sector labour costs.

Employers are only required to register for PAYE where they meet the [PAYE and payroll for employers criteria](#), one of which is a minimum weekly earning rate. Average weekly earnings for the lowest paid decile of public sector workers well exceeds this minimum value, as shown in our [Earnings and hours worked, public and private sector: ASHE Table 13 dataset](#). As such, most public sector employees are captured by PAYE RTI.

## Value Added Tax

Organisations are required to submit information to HMRC if their taxable turnover exceeds the [Value Added Tax \(VAT\) threshold](#). Submissions include information on tax due and the value of sales; as such, we can determine turnover. Most organisations submit information once a quarter, but data are refreshed once a month to reflect recent changes.

Nearly all public corporations have a taxable turnover that exceeds the VAT threshold and they will therefore be present in VAT data. These data offers high frequency, detailed insight into the finances of public corporations. For more information, see our [UK business: activity, size and location dataset](#).

## Inter-Departmental Business Register

To produce accurate estimates for public sector labour costs and VAT turnover, we must be able to identify the public sector reliably and accurately. To do so we have used the Inter-Departmental Business Register (IDBR), which includes the legal status of an organisation: legal status 4, 5, and 6 represent public corporations and nationalised bodies, central government, and local authorities, respectively. While legal status is validated manually using the public sector classification guide, and so is expected to be largely correct, our use of legal status may not be fully consistent with other public sector statistics, making the resulting figures less comparable. For example, the Bank of England is often treated as a distinct subsector of the public sector, whereas using legal status it is classed as a public corporation.

## Accruals adjustments

Both PAYE RTI and VAT records are generated when the transaction occurs, or is reported, and not necessarily when the economic activity took place. To comply with the [European System of Accounts 2010 \(ESA 2010\)](#), PAYE RTI and VAT records must be on an accruals basis.

### PAYE RTI

We have successfully tested the use of an accruals adjustment developed jointly with HMRC to PAYE RTI to align each payment with the estimated work period. We could apply this adjustment to PAYE RTI analysis in the future. To date, only the income tax analysis has been adjusted. For more information on the accruals adjustment, see our [New methods for monthly earnings and employment estimates from Pay As You Earn Real Time Information \(PAYE RTI\) data: December 2019 article](#).

### VAT

There is [detailed guidance on GOV.UK](#) for working out the time when a supply of goods or services is treated as taking place for VAT returns. Nevertheless, it is still necessary to consider the lag between when the tax liability was raised and when the form was submitted. The VAT turnover figures used in this paper are adjusted accordingly.

## Measuring employer pension contributions

Employer pension scheme contributions account for a sizeable proportion of labour costs, but they are not present in PAYE RTI. In this paper, where relevant, we apply an adjustment to account for this. We applied the same adjustment to all sectors. This is a reasonable approach, but it overlooks the different contribution rates between schemes, and across pay bands. In future, we could apply the method used within our [Public and private sector earnings: 2019 article](#) to refine estimates. Alternatively, it may be possible to derive employer pension contributions from Department for Work and Pensions data.

## How to interpret differences between these Experimental Statistics and other sources of public sector statistics

Statistics in this research article are experimental, and users of public sector statistics are recommended to use our [Public sector finances, UK bulletin](#) as the definitive source of statistics on public sector finances.

There are certain limitations in using administrative data to produce statistics that can make comparisons with other sources of statistics difficult. These can be caused by a difference in content, for example, where the data from the administrative system do not measure the same statistical concept that is measured by a survey. Or alternatively, they can be because of coverage differences, where the administrative data cover a different population than the one covered elsewhere. More information on the issues caused by content and coverage of administrative data is available from the UK's Office for Statistics Regulation.

## 7 . Future developments

These experimental statistics are still under development. We welcome and encourage user feedback about how they used these statistics, what they have found useful and what they would potentially like to see in the future.

Future areas of development include, but are not limited to:

- refining the statistics presented here and producing lower-level geographical breakdowns where possible
- improving the estimate of employer pension contributions within Pay As You Earn Real Time Information (PAYE RTI) labour costs
- establishing and quantifying coverage differences between PAYE RTI income tax estimates and other sources of this information
- continuing to investigate whether Value Added Tax (VAT) forms provide a viable source of information to enhance public corporation turnover information and tax receipts
- considering gathering information on PAYE schemes used by local government and subsidiaries included in the public corporation survey to improve the consistency of these statistics
- exploring other administrative data, such as corporation tax or benefits information

## 8 . Related links

[Country and regional public sector finances, UK: financial year ending 2022](#)

Article | Released 26 May 2023

Information on public sector revenue, expenditure and net fiscal balance on a country and regional basis.

[Public sector finances, UK: May 2023](#)

Bulletin | Released 21 June 2023

Information on how the relationship between UK public sector monthly income and expenditure leads to changes in deficit and debt.

[Using local authority financial data to improve the granularity of public sector expenditure, UK: financial year ending 2019](#)

Article | Released 29 June 2023

An investigation into the feasibility of using local authority financial data to help improve the granularity of public sector finance statistics.

## 9 . Cite this article

Office for National Statistics (ONS), released June 2023, ONS website, article, [Using administrative data to improve public sector finance statistics, UK](#)