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Mairi Spowage and Kate Milne

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TECHNICAL REPORT

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Abstract

Accurate and timely regional economic data is crucial for effective policymaking and informed decision-making at all levels. Understanding the economic performance of different regions and countries within the UK allows policymakers to identify areas of strength and weakness, target support to those most in need, and develop policies that promote balanced and sustainable growth. Businesses can also use this information to make informed decisions about investment, expansion, and resource allocation.

In recent years, the UK Office for National Statistics (ONS) has significantly invested in the development of new and novel sub-national statistics to support economic analysis and insight at a regional and country level. One of these innovations was the introduction of experimental Quarterly Country and Regional Gross Domestic Product (QCRGDP) estimates in 2019. These aimed to provide detailed, timely insights into economic performance at a regional level.

However, despite initial success, the series faced some challenges that led to a temporary suspension in 2023. ESCoE was then commissioned to complete a review of its methods and processes.

This report provides findings from the review, showing how the experimental nature of the series, coupled with its reliance on administrative data, gave rise to some challenges. It then outlines several recommendations to address these issues and rebuild user confidence.

Keywords: sub-national statistics, regional indicators, GDP, regional GDP

JEL classification: C18, E01, R11, R12

Mairi Spowage, University of Strathclyde
mairi.spowage@strath.ac.uk

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King’s College London
Strand
London
WC2R 2LS
United Kingdom
www.escoe.ac.uk

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Background to this Review

The Office for National Statistics (ONS) introduced experimental Quarterly Country and Regional Gross Domestic Product (**QCRGDP**) in September 2019 with the aim of shedding light on subnational economic activity in a timelier manner. These estimates provided a detailed breakdown by both industry and region on a quarterly basis and were considered advanced by international standards.

Early in their development, ONS decided that these estimates should be produced almost entirely from administrative data, specifically turnover data Value Added Tax (VAT) returns rather than using data from business surveys. VAT turnover data are used extensively by the ONS for estimating growth at the UK level on a quarterly basis, although business survey data and other sources are used for some industries (and in particular are used for larger businesses in most industries). Extensive research into the use of VAT data in the National Accounts has been carried out by ONS, and the use of this data has expanded over the last decade (ONS, 2017).

ONS also historically used separate innovative methods developed via ESCOE (ESCOE, 2020) which used mixed-frequency vector autogressive methods. This created nowcast data for quarterly regional estimates in near-real time as an alternative to the existing QCRGDP VAT based estimates (ONS, 2022).

This report does not consider or evaluate the mixed-frequency vector autogressive approach.

The QCRGDP estimates were also novel in terms of the used to produce them. As estimates relied largely on administrative data, the ONS introduced methods to ensure that where possible, when the other measures were published, the quarterly regional estimates were constrained to be aligned with them and tell a consistent story.

The approach by ONS has evolved over time, particularly in regards to how and how often the QCRGDP are constrained to Annual Regional Gross Value Added (**ARGVA**) (ONS, 2024a) and UK Quarterly GDP (**UKQGDP**). In 2022, the ONS introduced the process currently followed to try to ensure complete consistency with both series at all times.

However, this did not deal with the primary concern of some users of the estimates, which was the volatility of the estimates and the tendency for large revisions. In some cases, revisions could change the direction of growth for certain regions, or industries within regions, impacting upon policy decisions and undermining confidence in the statistics.

In July 2023, the publication was paused as the data was deemed of insufficient quality, failing to provide value to users given the size of the revisions.

The Economic Statistics Centre of Excellence (ESCoE) were commissioned in late 2023 to carry out a review of the methods and approaches to producing regional GDP, to provide recommendations of the nature and frequency of constraining steps and other recommendations which would reduce revisions.

This included an examination of the steps taken by ONS to produce the QCRGDP, as well as a review of the input data used and the differential approaches to producing data of this type for the UK (and the methods used to produce Scottish data by the Scottish Government to provide a comparator of an organisation producing, in theory, similar estimates for a similar purpose with similar data sources).

We would like to acknowledge the support of the QCRGDP team in the ONS as part of this project: without their support in accessing the details of their process and the outputs at each step this review would not have been possible.

We would also like to thank many others in the ONS who reviewed this document, as well as the National Accounts team in the Scottish Government who have also reviewed this paper for accuracy.

Finally, before this review began we have had discussions with users of the statistics, which has been really helpful in framing the issues from the users perspective.

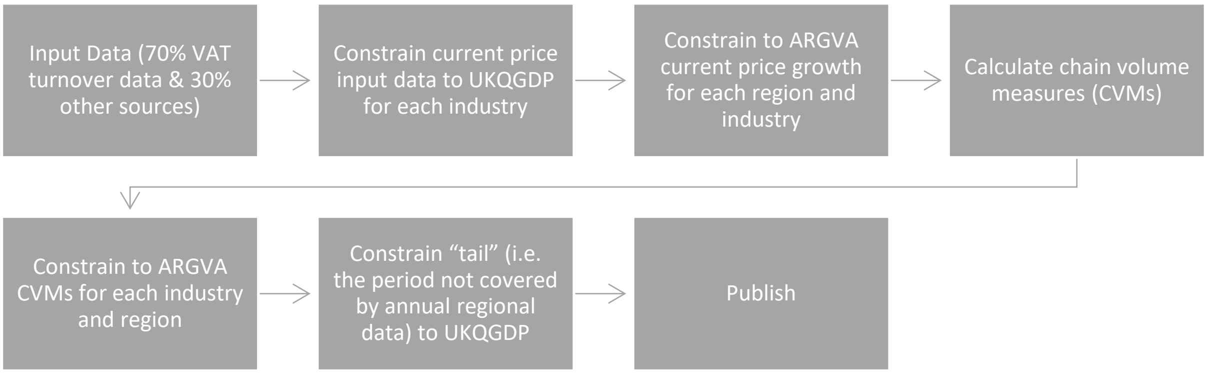
Throughout this document, we will be referring to different series produced by the ONS. These have been defined in the introductory paragraphs above, but it is worth reiterating here to ensure the discussion in the document can be followed properly.

- **QCRGDP** – Quarterly Country and Regional GDP – the ONS series which is produced to estimate quarterly GDP growth in Wales and he regions of England, and the series which is the subject of the review – latest publication at ONS, 2023a, ;
- **ARGVA** – Annual Regional GVA (Balanced) by industry – the ONS series which is produced to estimate GDP and GVA by industry for ITL1, 2 and 3, both in current prices and also chain volume measures – latest publication at ONS, 2024a;
- **UKQGDP** – UK Quarterly GDP, produced to measure quarterly growth at a detailed industry level, produced and updated twice a quarter and culminating in the quarterly national accounts roughly three months after the end of a quarter – latest publication at ONS, 2024b. The reference to the series throughout this document is generally UKGDP(O), GDP on the output method, given this gives short-term estimation by industry.

Current approach to producing QCRGDP

Figure 1 below sets out the current process or production of the QCRGDP estimates. This is a simplified version of the process followed, and we focus here on the constraining steps used.

Figure 1: Overview of ONS QCRGDP process



Source: Author's interpretation of ONS process

The constraining steps are:

- Quarterly estimates by industry are constrained to the **UKQGDP** series, to make sure that the growth in any industry by region "adds up" to the figure published for the UK.
- Quarterly estimates by industry in current prices are constrained to the **ARGVA** series, to ensure that the growth by quarter in a region "adds up" to the annual growth.
- A secondary benchmark to the **ARGVA** data of the Chain Volume Measure (CVM), to ensure that the growth by quarter in a region still "adds up" to annual growth.
- Finally, a constraint in the "tail" (i.e. the period that is not covered by the **ARGVA** data) to **UKQGDP**.

The instinct to align with all currently published estimates is understandable, although one issue is immediately apparent from this approach – the manner in which the annual Blue Book (ONS, 2024c) revisions that are made to the UK accounts flow into the QCRGDP estimates.

In practice, given the process followed, this will happen twice during the year – when these revisions impact on UKQGDP, and separately and additionally when they impact on the ARGVA series, usually 4-6 months later.

This is likely to be one of the reasons for the regular revisions of the series, and is unlikely to make sense, given that the QCRGDP series are being revised *before* the ARGVA have taken on the impact of these UK changes. This could lead to revisions which are unlikely to be reflective of real changes in regional growth, as the old vintage ARGVA and the new vintage of the UKQGDP are being made consistent with each other.

An approach more similar to the approach taken to the UK National Accounts is likely to make more sense and provide more stable estimates. The orderly approach would be to treat the ARGVA in the same way as the Blue Book and Supply and Use Tables are treated for the UK, not revising the back series until the new ARGVA data are published once a year. We cover this suggested approach in the recommendations section.

There are a number of constraints upon the ONS which make the approach to this estimation challenging. Currently, as referenced above, data are produced for Scotland by the Scottish Government and NI by NISRA. The purpose of this publication is to fill the gap this creates for users by providing equivalent data for Wales and the regions of England. However, the ONS system is estimating values for Scotland and Northern Ireland in order to benchmark values to UK totals.

ONS does not publish these estimates to not undermine the values produced by these other bodies or to confuse users. However, they are used in the constraints to UKQGDP to ensure regional estimates add up to the UK totals.

The differential approaches to producing growth rates for Scotland and Northern Ireland also provide an opportunity, of course, to compare and contrast the results produced by different approaches to estimation. This can be done in partnership, in the same way as improvements have been made in both SG and ONS data on the estimation of ARGVA, resulting in much smaller differences between their estimates. We cover this opportunity of working together in the recommendations section.

Revisions experienced by users

One of the user frustrations of the Regional GDP data series when it was being regularly produced were the magnitude and frequency of significant revisions to the data series.

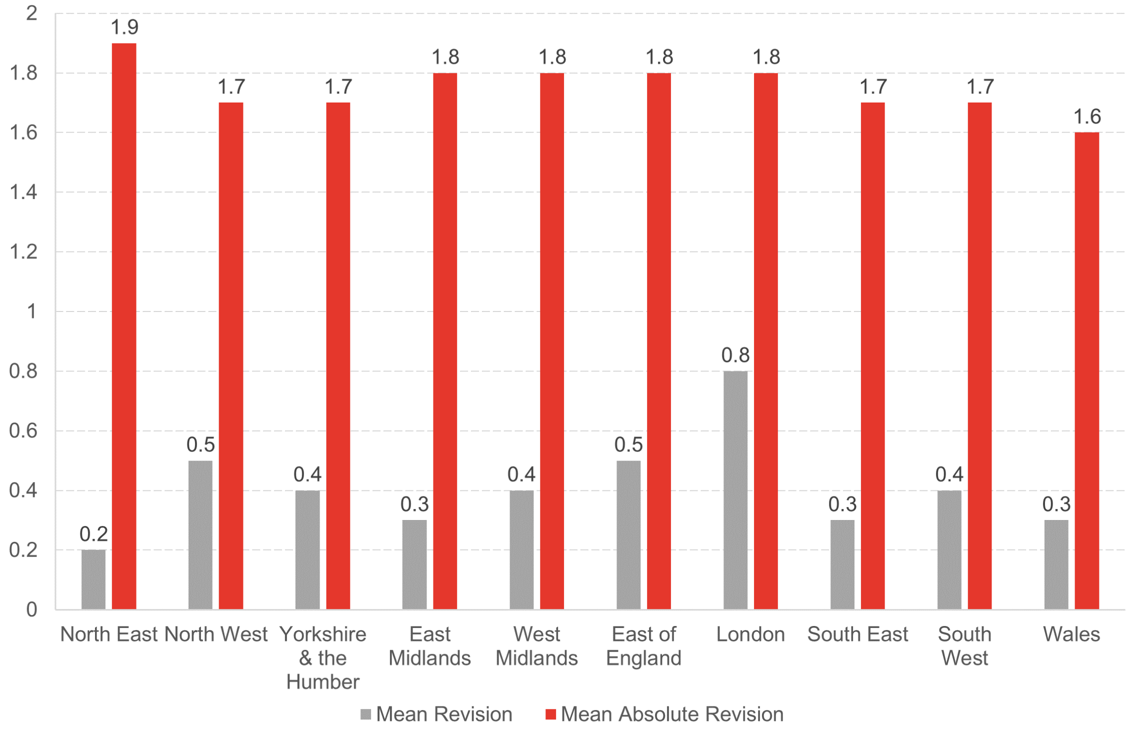
While not impacting all industries or all regions, it is likely that these revisions undermined some users’ trust in the data, as in some cases the changes revised users’ understanding of the economic circumstances – and sometimes economic history - of regions and industries within a region.

Analysis of the revisions that users have experienced suggest that they are relatively large, justifying the feeling from users that these were an issue with the publication.

To note, the revisions below have been calculated using the published revisions triangles (ONS, 2023b), and cover all periods, including the period where methods were changed. The revisions also refer to quarter-on-quarter growth rates. So, some of the revisions experienced by users were generated by ONS changing the methods used.

In addition, the periods covered include the start of the COVID-19 pandemic, and the overall revisions (particularly the mean absolute revisions, see more below) are very sensitive to the inclusion of Q2 &Q3 of 2020 due to the large revisions seen in these periods. To note, however, that the comparison for the UK also includes these periods.

Figure 2: Mean Revisions and Mean Absolute Revisions by region



Source: ONS Revisions triangles for quarterly country and regional GDP

Mean Revisions (MR) show whether revisions are biased in a particular direction. A positive sign indicates that, on average, earlier release have underestimated growth. The revisions here, whilst variable, are relatively very large (compared to equivalent figures for the UK – 0.05 for the same period (ONS, 2023c)) and all positive. London in particular has consistently seen earlier figures revised up considerably.

Mean Absolute Revisions (MAR) measure the average revisions in absolute terms, and are therefore used for assessing if revisions are relatively large without opposite signs cancelling out. The mean absolute revisions above are large, much bigger than the equivalent figure for the UK over the same period (of 0.12). It is worth saying that excluding the two problematic quarters referenced above reduces all of the MAR considerably, by around 30-50% depending on the region. However, even with this reduction, these are still large revisions.

Overall, then, there are many justifiable reasons why revisions experiences by some users were larger than one would expect in normal times: the COVID period and the fact that the QCRGDP estimates were experimental and developing are both contributors to the revisions experienced. However, it is still reasonable to conclude that the revisions experienced by users were relatively large, contributing to the recommendations made as part of this review.

Differential Approaches to Measurement of Quarterly GDP

The methods used for QCRGDP are in many cases different to those used for UKQGDP, and differ also from the methods that are used by the Scottish Government and NISRA to produce their respective estimates. It is useful to compare approaches, to determine what can be learned from the different sources used in each region.

Table 1 presents a simplified and stylised table of the different approaches that are used by the ONS for QCRGDP, for UKQGDP, and by the Scottish Government for Quarterly GDP for Scotland.

The sectors are categorised into 4 groups:

- Green – Sectors for which QCRGDP, UKQGDP, and SG all use the same source data;
- Orange – Sectors for which QCRGDP and UKQGDP use the same source data;
- Yellow – Sectors for which UKQGDP and SG use the same source data;
- Blue - Sectors for which QCRGDP and SG use the same source data; and
- Grey – Sectors which have different approaches for all three series.

The main driver of differences between many of the industries is different levels of use of VAT data. For many industries, we have QCRGDP being produced using entirely VAT data, Scottish GDP being produced using a regionalised version of the Monthly Business Survey, with the UKQGDP being produced using a combination of the two, with both VAT data and MBS being used for different sub-sectors and size of companies (in particular, with use of MBS data more prevalent in the largest companies, and VAT data rarely used for the largest companies)

In the table, to keep in simple, where there is a mixture of approaches at the sub-industry level for UKQGDP we have roughly quantified the extent of use of VAT data, so we broadly see the extent to which the UK quarterly estimates are relying on this information.

These have been calculated from the VAT selection matrix which has been published by the ONS (ONS, 2024d). This resource sets out the industries and size bands that the ONS has deemed suitable for using VAT data to estimate growth. To note, this is simply a share of the cells where VAT data are used within an industry, and has not been weighted by value.

The VAT selection matrix shows the extent of use of VAT data for size bands 1,2 and 3 for production and services. The definition of these bands is not shown in the matrix, we understand (through discussion with the ONS) because the definition of these bands is different for every industry. For all production and services industries, Band 4 (which corresponds for each industry where companies are in the census band for the MBS) does not draw upon VAT data. However, VAT data are used for some of Band 4 construction estimation.

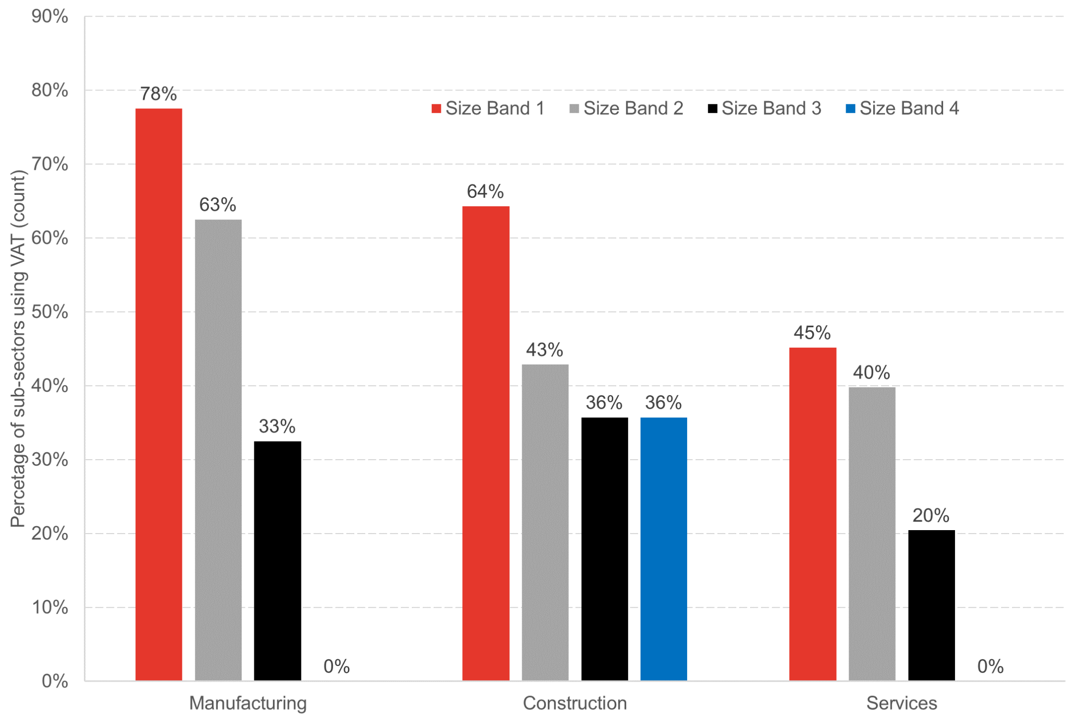
To summarise the rough sizes of the different bands with examples of ranges:

- Band 1 – the smallest companies in a sector, for most industries 0-10 employees, but for some 0-5 employees;
- Band 2 – for most industries 10-50 employees, but for some 5-20 employees or 5-10 employees;
- Band 3 – varies 50-100, 50-150, 50-250, 10-100, 20-100 employees depending on the industry; and
- Band 4 – 100+, 150+, 250+ - depending on the industry,

Overall, the Vat Selection Matrix shows that VAT data are used extensively in the estimation of UKQGDP, although the use of the data are clustered into particular sectors and particularly focussed on smaller companies, where MBS data will be much poorer quality.

Figure 3 below summarises this. Please note that this is just a count of sectors and is not weighted by value.

Figure 3: UKQGDP: Percentage of Sectors which use VAT data for estimation, by size band – for UK GDP(O)



Source: ONS VAT selection matrix

Table 1: Stylised and Summarised sources for QCRGDP, UKQGDP & Scottish Government GDP

INDUSTRY		QCRGDP SOURCE	RGDP TYPE	Method for UKQGDP	Method for Scottish Government GDP
AGRICULTURE, FORESTRY & FISHING					
01	Crop and animal production etc	DEFRA	CP	Same as RGDP	Equivalent regional data available from devolved body - Total Income from Farming
02	Forestry and logging	Forestry Commission	VM	Same as RGDP	Same as RGDP
03	Fishing and aquaculture	Marine Management Organisation (MMO)	CP	Same as RGDP	Equivalent regional data available from devolved body Marine Scotland
MINING & QUARRYING					
05	Mining of coal and lignite	DESNZ	VM	Same as RGDP	Same as RGDP
06	Extraction of crude petroleum and natural gas	DEZNZ	VM	Same as RGDP	Regionalised MBS
08	Other mining and quarrying	VAT	CP	Same as RGDP	Regional data available
09	Mining support service activities	VAT	CP	Workforce Jobs	GDP Low Level Aggregates
MANUFACTURING					
10	Manufacture of food products – Band 1 & 2	VAT	CP	Mixture of MBS and VAT (70% VAT)	Mixture of Regionalised MBS and some VM from devolved bodies
10	Manufacture of food products – Band 3	VAT	CP	Mixture of MBS and VAT (40% VAT)	Mixture of Regionalised MBS and some VM from devolved bodies
10	Manufacture of food products – Band 4	VAT	CP	MBS	Mixture of Regionalised MBS and some VM from devolved bodies
11	Manufacture of beverages – Bands 1 & 2	VAT	CP	VAT	Regionalised MBS
11	Manufacture of beverages – Band 3	VAT	CP	Mixture of MBS and VAT (33% VAT)	Regionalised MBS
11	Manufacture of beverages – Band 4	VAT	CP	MBS	Regionalised MBS
12	Manufacture of tobacco products	VAT	CP	MBS	N/A – industry not present
13	Manufacture of textiles – Bands 1-3	VAT	CP	VAT	Regionalised MBS
13	Manufacture of textiles – Band 4	VAT	CP	MBS	Regionalised MBS
14	Manufacture of wearing apparel – Bands 1-3	VAT	CP	VAT	Regionalised MBS
14	Manufacture of wearing apparel – Band 4	VAT	CP	MBS	Regionalised MBS

15	Manufacture of leather and related products – Bands 1-3	VAT	CP	VAT	Regionalised MBS
15	Manufacture of leather and related products – Band 4	VAT	CP	MBS	Regionalised MBS
16	Manufacture of wood and products of wood – Bands 1-3	VAT	CP	VAT	Regionalised MBS
16	Manufacture of wood and products of wood – Band 4	VAT	CP	MBS	Regionalised MBS
17	Manufacture of paper and paper products – Bands 1&2	VAT	CP	VAT	Regionalised MBS
17	Manufacture of paper and paper products – Band 3	VAT	CP	Mixture of MBS and VAT (50% VAT)	Regionalised MBS
17	Manufacture of paper and paper products – Band 4	VAT	CP	MBS	Regionalised MBS
18	Printing and reproduction of recorded media – Bands 1-3	VAT	CP	VAT	Regionalised MBS
18	Printing and reproduction of recorded media – Band 4	VAT	CP	MBS	Regionalised MBS
19	Manufacture of coke and refined petroleum	Some elements estimated from DESNZ data	VM	DESNZ	DEZNZ VM, Regionalised MBS & Commercial Sources
20	Manufacture of chemicals and chemical products – Bands 1-3	VAT	CP	Mixture of MBS and VAT (33% VAT)	DEZNZ VM, Regionalised MBS & Commercial Sources
20	Manufacture of chemicals and chemical products – Band 4	VAT	CP	MBS	DEZNZ VM, Regionalised MBS & Commercial Sources
21	Manufacture of basic pharmaceutical products	VAT	CP	MBS	Regionalised MBS
22	Manufacture of rubber and plastic products – Bands 1&2	VAT	CP	VAT	Regionalised MBS
22	Manufacture of rubber and plastic products – Band 3	VAT	CP	Mixture of MBS and VAT (50% VAT)	Regionalised MBS
22	Manufacture of rubber and plastic products – Band 4	VAT	CP	MBS	Regionalised MBS
23	Manufacture of other non-metallic mineral products – Band 1	VAT	CP	VAT	Regionalised MBS & Commercial Sources
23	Manufacture of other non-metallic mineral products – band 2	VAT	CP	Mixture of MBS and VAT (75% VAT)	Regionalised MBS & Commercial Sources
23	Manufacture of other non-metallic mineral products – bands 3&4	VAT	CP	MBS	Regionalised MBS & Commercial Sources
24	Manufacture of basic metals – Band 1	VAT & VM data on iron and steel	CP/VM	Mixture of MBS and VAT (17% VAT) & VM data on iron and steel	MBS & VM data on iron and steel
24	Manufacture of basic metals – Bands 2-4	VAT & VM data on iron and steel	CP/VM	MBS & VM data on iron and steel	MBS & VM data on iron and steel
25	Manufacture of fabricated metal products, except machinery and equipment – Band 1	VAT	CP	VAT	Regionalised MBS

25	Manufacture of fabricated metal products, except machinery and equipment – Band 2 & 3	VAT	CP	Mixture of MBS and VAT (66% VAT)	Regionalised MBS
25	Manufacture of fabricated metal products, except machinery and equipment – Band 4	VAT	CP	MBS	Regionalised MBS
26	Manufacture of computer, electronic & optical – Band 1	VAT	CP	VAT	Regionalised MBS
26	Manufacture of computer, electronic & optical - Band 2&3	VAT	CP	Mixture of MBS and VAT (62% VAT)	Regionalised MBS
26	Manufacture of computer, electronic & optical – Band 4	VAT	CP	MBS	Regionalised MBS
27	Manufacture of electrical equipment – Band 1	VAT	CP	VAT	Regionalised MBS
27	Manufacture of electrical equipment – Band 2 & 3	VAT	CP	Mixture of MBS and VAT (63% VAT)	Regionalised MBS
27	Manufacture of electrical equipment – Band 4	VAT	CP	MBS	Regionalised MBS
28	Manufacture of machinery & equipment n.e.c.- Bands 1-3	VAT	CP	Mixture of MBS and VAT (60% VAT)	Regionalised MBS
28	Manufacture of machinery & equipment n.e.c. – Band 4	VAT	CP	MBS	Regionalised MBS
29	Manufacture of motor vehicles – Bands 1-3	VAT	CP	Mixture of MBS and VAT (33% VAT)	Regionalised MBS
29	Manufacture of motor vehicles – Band 4	VAT	CP	MBS	Regionalised MBS
30	Manufacture of other transport equipment – Bands 1-3	VAT	CP	Mixture of MBS and VAT (47% VAT)	Regionalised MBS
30	Manufacture of other transport equipment – Bands 4	VAT	CP	MBS	Regionalised MBS
31	Manufacture of furniture – Bands 1-3	VAT	CP	Mixture of MBS and VAT (33% VAT)	Regionalised MBS
31	Manufacture of furniture – Band 4	VAT	CP	MBS	Regionalised MBS
32	Other manufacturing – Bands 1-3	VAT	CP	Mixture of MBS and VAT (50% VAT)	Regionalised MBS
32	Other manufacturing – Band 4	VAT	CP	MBS	Regionalised MBS
33	Repair and installation of machinery and equipment – Bands 1-3	VAT	CP	Mixture of MBS and VAT (33% VAT)	Regionalised MBS
33	Repair and installation of machinery and equipment – Band 4	VAT	CP	MBS	Regionalised MBS
ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY					
35	Electricity, gas, steam and air conditioning supply	DESNZ	VM	Same as RGDP	Same as RGDP
WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES					
36	Water collection, treatment and supply	Regionalised MBS (Water Supplied)	VM	MBS (Water Supplied)	Same as RGDP
37	Sewerage – Bands 1-3	VAT	CP	VAT	Regionalised MBS
37	Sewerage – Band 4	VAT	CP	MBS	Regionalised MBS

38	Waste collection, treatment and disposal	VAT & PSE	CP/VM	MBS & PSE	Regionalised MBS
39	Remediation activities and other waste	VAT	CP		Regional data available
CONSTRUCTION		Output in the Construction Industry: subnational & subsector: modelled	CP	Mixture of MBS and VAT (45% VAT for bands 1-4)	UK Low Level Aggregates
WHOLESALE AND RETAIL TRADE		VAT	CP	MBS & Retail Sales	Regionalised MBS
TRANSPORTATION AND STORAGE					
49	Land transport and transport via pipelines	ORR VM data for rail, VAT for the rest	CP/VM	ORR & Mixture of MBS and VAT (38% VAT)	Scotrail, DfT & Regionalised MBS
50	Water transport	DfT	VM	DfT & Balance of Payments	UK Low Level Aggregates
51	Air transport	Civil Aviation Authority (CAA)	VM	Same as RGDP	Same as RGDP
52	Warehousing and support activities for transportation	VAT	CP	MBS & GGFCE	MBS & IDBR
53	Postal and courier activities	VAT / other for PO		Mixture of MBS and VAT (25% VAT) /other for PO	Regionalised MBS
ACCOMMODATION AND FOOD SERVICE ACTIVITIES					
55	Accommodation Services	VAT	CP	Mixture of MBS and VAT (38% VAT)	Regionalised MBS
56	Food and beverage serving activities – Bands 1-3	VAT	CP	VAT	Regionalised MBS
56	Food and beverage serving activities – Band 4	VAT	CP	MBS	Regionalised MBS
INFORMATION AND COMMUNICATION					
58	Publishing activities – Bands 1-3	VAT	CP	VAT	Regionalised MBS
58	Publishing activities – Band 4	VAT	CP	MBS	Regionalised MBS
59	Motion picture, video and television programme production – Bands 1&2	VAT	CP	VAT & GGFCE	Regionalised MBS
59	Motion picture, video and television programme production – Bands 3&4	VAT	CP	MBS & GGFCE	Regionalised MBS&IDBR (for the BBC)
60	Programming and broadcasting activities – Bands 1 & 2	VAT & Workforce Jobs	CP	VAT & GGFCE	Regionalised MBS
60	Programming and broadcasting activities – Bands 3 & 4	VAT & Workforce Jobs	CP	MBS & GGFCE	Regionalised MBS&IDBR (for the BBC)
61	Telecommunications – Band 1	VAT	CP	VAT	Regionalised MBS
61	Telecommunications – Band 2	VAT	CP	Mixture of MBS and VAT (33% VAT)	Regionalised MBS

61	Telecommunications – Bands 3 & 4	VAT	CP	MBS	Regionalised MBS
62	Computer programming, consultancy	VAT	CP	Mixture of MBS and VAT (44% VAT)	Regionalised MBS
62	Computer programming, consultancy	VAT	CP	MBS	Regionalised MBS
63	Information service activities – Band 1	VAT	CP	VAT	Regionalised MBS
63	Information service activities – Bands 2-4	VAT	CP	MBS	Regionalised MBS
FINANCIAL AND INSURANCE ACTIVITIES					
64	Financial service activities, except insurance and pension	UK Low Level Aggregates, BoE and Workforce Jobs	CP/VM	Finco, FISIM, IMA AIC and Workforce Jobs	UK Low Level Aggregates & the BoE
65	Insurance, reinsurance and pension funding	UK Low Level Aggregates	CP	Finco & AbIns	UK Low Level Aggregates
66	Activities auxiliary to financial services and insurance	UK data regionalised using IDBR Emp	CP	VM from LSE & NYSE, IMA, AIC & FinCo	UK data regionalised using IDBR Emp
REAL ESTATE ACTIVITIES					
68	Real estate activities	VAT, IPD & HHFCE	CP	MBS, IPD & HHFCE	UK Low Level Aggregates & SUTs (for imputed rent)
PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES					
69	Legal and accounting activities – Bands 1&2	VAT	CP	VAT & NPISH	Regionalised MBS
69	Legal and accounting activities – Bands 3&4	VAT	CP	MBS & NPISH	Regionalised MBS
70	Activities of head offices; management cons – Band 1	VAT	CP	Workforce Jobs & VAT	Regionalised MBS
70	Activities of head offices; management cons – Bands 2-4	VAT	CP	Workforce Jobs & MBS	Regionalised MBS
71	Architectural and engineering	VAT	CP	MBS	Regionalised MBS
72	Scientific research and development – Bands 1&2	VAT & Workforce Jobs	CP/VM	VAT & NPISH	Regionalised MBS
72	Scientific research and development – Bands 3&4	VAT & Workforce Jobs	CP/VM	MBS & NPISH	Regionalised MBS
73	Advertising and market research – Bands 1&2	VAT	CP	Mixture of MBS and VAT (50% VAT)	Regionalised MBS
73	Advertising and market research – Bands 3&4	VAT	CP	MBS	Regionalised MBS
74	Other professional, scientific and technical activities – Bands 1&2	VAT	CP	VAT	Regionalised MBS
74	Other professional, scientific and technical activities – Bands 3&4	VAT	CP	MBS	Regionalised MBS
75	Veterinary activities – Bands 1-3	VAT	CP	VAT	Regionalised MBS
75	Veterinary activities – Band 4	VAT	CP	MBS	Regionalised MBS

ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES					
77	Rental and Leasing Services – Bands 1 & 2	VAT	CP	Mixture of MBS and VAT (66% VAT)	Regionalised MBS
77	Rental and Leasing Services – Bands 3 & 4	VAT	CP	MBS	Regionalised MBS
78	Employment Services	VAT	CP	Mixture of MBS and VAT (75% VAT) & NPISH	Regionalised MBS
79	Travel Agency etc – Bands 1 & 2	VAT	CP	VAT	Regionalised MBS
79	Travel Agency etc – Band 3	VAT	CP	Mixture of MBS and VAT (50% VAT)	Regionalised MBS
79	Travel Agency etc – Band 4	VAT	CP	MBS	Regionalised MBS
80	Security and Investigation Services – Bands 1&2	VAT	CP	VAT	Regionalised MBS
80	Security and Investigation Services – Bands 3&4	VAT	CP	MBS	Regionalised MBS
81	Services to buildings and landscape – Bands 1&2	VAT	CP	VAT	Regionalised MBS
81	Services to buildings and landscape – Bands 3&4	VAT	CP	MBS	Regionalised MBS
82	Office administrative, office support etc	VAT	CP	MBS	Regionalised MBS
PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY					
84	Public administration and defence	Civil Service Employment Statistics, Public Sector Employment & GGFCE	CP/VM	Same as RGDP	Civil Service Employment Statistics, Public Sector Employment in Scotland, Scottish Prison Service, Scottish Police Statistics, Scottish Fire & Rescue Statistics, DWP calimant count actvitity index
EDUCATION					
85	Education	GFCE & VAT	CP	GGFCE, NPISH, Workforce Jobs, ISCI, & a mixture of MBS & VAT (75% VAT)	Scottish Government, Scottish Council of Independent Schools, Higher Education Statistics Agency
HUMAN HEALTH AND SOCIAL WORK ACTIVITIES					
86	Human health activities	GGFCE & VAT	CP	GGFCE, NPISH & Mixture of MBS and VAT (50% VAT)	NHS Scotland & Scottish Government
87	Residential care activities	GGFCE & VAT	CP	GGFCE & NPISH	CHILDREN'S SOCIAL WORK STATISTICS; NRS VITAL EVENTS; NHS CARE HOMES CENSUS; SOCIAL CARE SERVICES

88	Social work activities without accommodation	GGFCE & VAT	CP	GFCE, NPISH & Workforce Jobs	CHILDREN'S SOCIAL WORK STATISTICS; NRS VITAL EVENTS; NHS CARE HOMES CENSUS; SOCIAL CARE SERVICES
ARTS, ENTERTAINMENT AND RECREATION					
90	Creative, arts and entertainment activities – Bands 1-3	VAT	CP	VAT, GGFCE & NPISH	Regionalised MBS
90	Creative, arts and entertainment activities – Band 4	VAT	CP	MBS, GGFCE & NPISH	Regionalised MBS
91	Libraries, archives, museums and other cultural – Bands 1-3	GGFCE & VAT		VAT, GGFCE & NPISH	UK Low Level Aggregates
91	Libraries, archives, museums and other cultural – Band 4	GGFCE & VAT		MBS, GGFCE & NPISH	UK Low Level Aggregates
92	Gambling and betting activities	UK Low Level Aggregates	CP	HHFCE	UK Low Level Aggregates
93	Sports activities and amusement and rec – Bands 1-3	Public Sector Employment & VAT		HHFCE, GGFCE, NPISH & VAT	Regionalised MBS
93	Sports activities and amusement and rec – Band 4	Public Sector Employment & VAT		HHFCE, GGFCE, NPISH & MBS	Regionalised MBS
OTHER SERVICE ACTIVITIES					
94	Activities of membership organisations	Workforce Jobs & LFS	VM	Workforce Jobs & NPISH	UK Low Level Aggregates
95	Repair of computers and personal and household goods – Band 1 & 2	VAT	CP	VAT	Regionalised MBS
95	Repair of computers and personal and household goods – Bands 3 & 4	VAT	CP	MBS	Regionalised MBS
96	Other personal service activities – Bands 1-3	VAT	CP	VAT	Regionalised MBS
96	Other personal service activities – Band 4	VAT	CP	VAT	Regionalised MBS
ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; UNDIFFERENTIATED GOODS-AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE					
		UK Low Level Aggregates	CP	HHFCE	UK Low Level Aggregates

Source : GDP(o) Sources Catalogue (ONS 2024e), Quarterly country and regional GDP - data source catalogue 2022 (ONS, 2023d), GDP Sources and weights (Scottish Government, 2023)

Suitability of source data

In some cases, the source data itself looks to be an issue, and constraints being applied are potentially masking issues with underlying sources that are being used at a regional level to estimate quarterly movements.

In general, a starting point to assess the suitability of data that will be used to derive the quarterly path for any region and industry is to calculate the extent to which the data source is correlated to annual data.

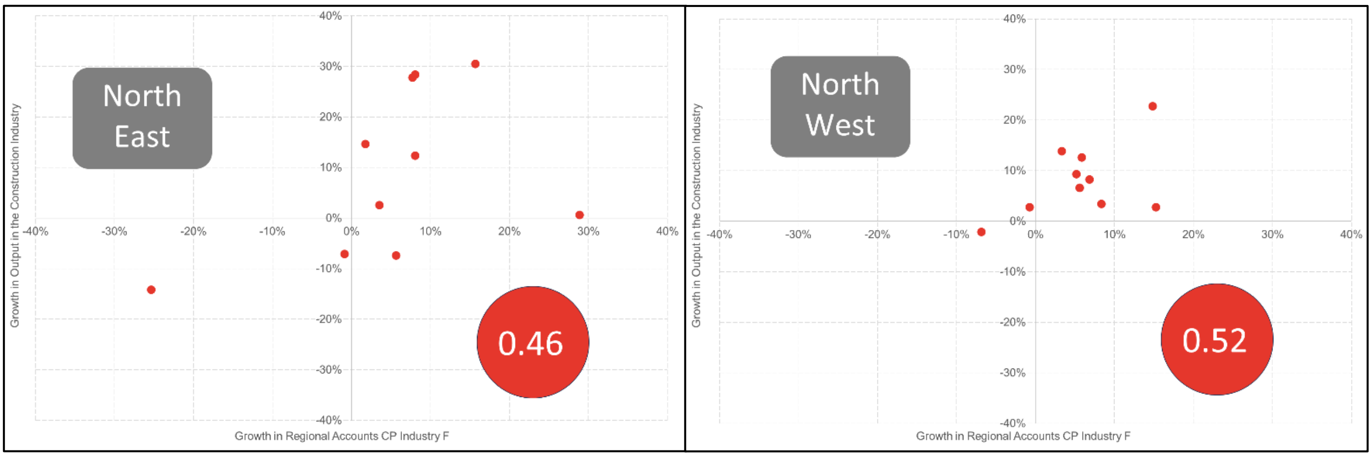
Academic research into methods for temporal disaggregation all support this. For example, both the Denton method (Denton, 1971) and the Chow-Lin method (Chow & Lin, 1971) set out that higher frequency data must have a correlation with the annual data of 0.8, or at least 0.7.

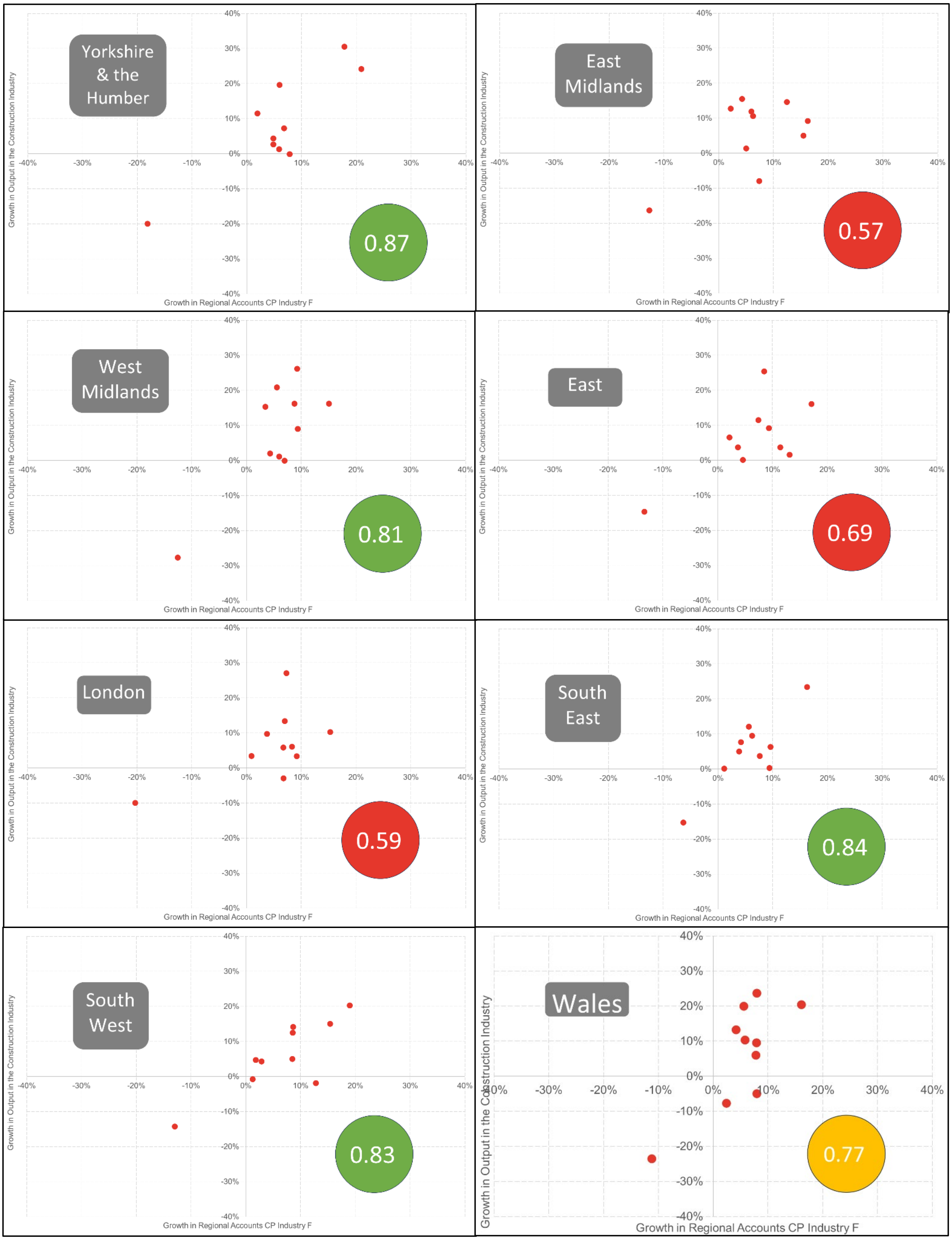
More sophisticated approaches, such as Mixed-Frequency Vector Autoregressive (MF-VAR) models, also require indicators with a high level of correlation to the target indicator, in this case ARGVA.

In our work, we have not been given access to all source information as it is provided to ONS, but to illustrate this potential issue we have examined correlation between "source data" and the ARGVA for two different sets of data.

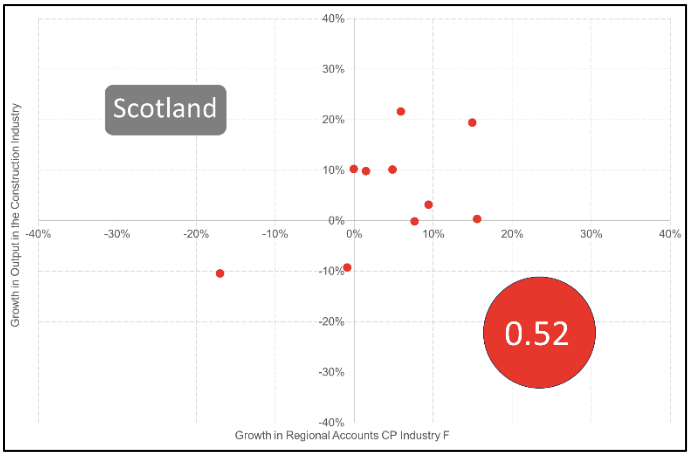
Firstly, we examine the construction industry for all regions, using the publicly available source data for QCRGDP "Output in the Construction Industry: subnational & subsector" (ONS, 2024f) and the annual growth rates from ARGVA. Figure 4 shows the congruence of this source data in terms of annual growth for each region.

Figure 4: Comparison of Annual Growth Rates, ARGVA for Construction industry (Industry F) compared to source data from Output in the Construction Industry





Yorkshire & the Humber
0.87
East Midlands
0.57
West Midlands
0.81
East
0.69
London
0.59
South East
0.84
South West
0.83
Wales
0.77
Growth in Output in the Construction Industry
Growth in Regional Accounts CP Industry F
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%



Source: ONS Output in the Construction Industry, ARGVA by Industry, FAI Calculations

As shown in Figure 4 above, the construction data used to derive the quarterly path is highly correlated with the annual growth rates for about half of the regions.

Next, for one region for all industries, we use data provided by ONS which removes, step by step, all constraints from the published data to display series which are sloe to the source data used for each region.

Please note that this is not a perfect analysis, due to the level of data we have been able to see, and the adjustments that ONS make to the data at the very detailed series level. Therefore, it is not straightforward to compare the composite unconstrained data with the published ARGVA data. Table 2 below highlights issues for further investigation by the ONS, who will be able to make these comparisons at a detailed level for all regions within their system.

Close working with the ARGVA team in ONS will be required as methods are reviewed, to understand where data sources are used across both products and identifying opportunities for more congruence.

Table 2: Comparison of Annual Growth Rates, ARGVA for all industries for a region compared to composite unconstrained data from the ONS system

Section	Section Name	Correlation
A (1-3)	Agriculture, forestry and fishing	
B (5-9)	Mining and quarrying	
C (10-33)	Manufacturing	
D (35)	Electricity, gas, steam and air conditioning supply	
E (36-39)	Water supply; sewerage and waste management	
F (41-43)	Construction	
G (45-47)	Wholesale and retail trade; repair of motor vehicles	
H (49-53)	Transportation and storage	
I (55-56)	Accommodation and food service activities	
J (58-63)	Information and communication	
K (64-66)	Financial and insurance activities	
L (68)	Real estate activities	
M (69-75)	Professional, scientific and technical activities	
N (77-82)	Administrative and support service activities	
O (84)	Public administration and defence	
P (85)	Education	
Q (86-88)	Human health and social work activities	
R (90-93)	Arts, entertainment and recreation	
S (94-96)	Other service activities	
T (97-98)	Activities of households	

KEY:

PURPLE: Correlation less than 0.5

RED: Correlation between 0.5 and 0.7

ORANGE: Correlation between 0.7 and 0.8

GREEN: Correlation more than 0.8

Source: ONS ARGVA, ONS composite unconstrained data, FAI calculations

Table 2 above demonstrates strong correlation between the ARGVA and the input data that we have seen in the ONS system for some industries, whereas others have a much weaker relationship.

Overall, this is an area which requires significant further investigation, which we set out in the recommendations.

Recommendations

Following a thorough assessment of the approach taken to produce regional GDP, we present the following recommendations to ensure the methods are:

- Consistent and comparable with the way that the UK National Accounts are produced; and
- Likely to produce consistent and stable estimates, which will give confidence to users of the estimates.

Short-Term Recommendations

Recommendation 1: The primary constraint should be ARGVA.

Only when new data are published as ARGVA should the closed period be opened for revision back to the start of the series. UKQGDP should **not** be used in the closed years to constrain. Implicitly, the QCRGDP estimates *are* constrained to the UK through the ARGVA constraints, but in an orderly fashion.

This pairs with the second recommendation below to implement strict revision windows.

ONS should see this as being consistent with the approach of published short term indicators for the UK, with the ARGVA publication being treated like the Supply and Use Table or Blue Book being published each year, which is the only time the whole series is open for revision.

This is also consistent with the approach taken by the Scottish Government, using their Supply and Use Tables published once a year.

UKQGDP should be used in the tail (i.e. the quarters for which there is no ARGVA estimate), but in line with the revisions policy below.

The constraint of ARGVA **should include** the provisional (latest) year, given it is the primary estimate of growth for each industry and within each region until it is superseded by a new ARGVA estimate.

Recommendation 2: Strict Revision windows should be introduced

Building on recommendation 1, the back series should only be open once a year for revisions.

When new data are published in ARGVA, the series will then be revised back to the start of the series, and the years covered by ARGVA will remain fixed for a year (including the provisional year).

The “tail”, i.e. the period which is not covered by ARGVA, will be at least five quarters and a maximum of eight quarters, based upon the current likely timing of the ARGVA data.

Below is an example of how this can work for 2025 and beyond. **This is purely illustrative, and should not be seen as a commitment to a particular reintroduction timetable**.

In doing this, we have drawn upon the National Accounts Revisions Policy (ONS, 2024g) for UK quarterly national accounts publications, which seem like the most helpful corollary.

Box 1: An illustrative revisions policy (not commitments to actual dates

If the next ARGVA in April 2025 which provides annual growth data up to 2023:

- QCRGDP Q3 2024 are published in May 2025.
  - 2012 – 2023 are constrained to the ARGVA (which implicitly makes them consistent with the UK, of course)
  - 2024 Q1 – 2024 Q3 data are constrained to UKQGDP.

- QCRGDP Q4 2024 are published in August 2025.
  - 2012 – 2023 are not revised.
  - 2024 Q1 – 2024 Q3 are not revised
  - 2024 Q4 data are constrained to UKQGDP

- QCRGDP Q1 2025 are published in November 2025.
  - 2012 – 2023 are not revised.
  - 2024 Q1 – 2024 Q4 are revised and constrained to UKQGDP
  - 2025 Q1 data are constrained to UKQGDP

- QCRGDP Q2 2025 is published in February 2026.
  - 2012 – 2023 are not revised.
  - 2024 Q1 -2024 Q4 are not revised
  - 2025 Q1 are revised and constrained to UKQGDP
  - 2025 Q2 data are constrained to UKQGDP

- ARGVA published up to 2024 in April 2026

- QCRGDP Q3 2025 are published in May 2026.
  - 2012 – 2024 are constrained to the ARGVA (which implicitly makes them consistent with the UK, of course)
  - 2025 Q1 – 2025 Q3 data are constrained to UKQGDP.

The exact revisions policy can be determined in conjunction with users – any policy is always a balance between minimising regular revisions and minimising the size of revisions when they eventually come.

For example, a decision could be made to leave 2024 unrevised for the whole year, although the revisions windows set out above are consistent with the approach taken for the national data and the approach that is taken by the Scottish Government (including avoiding revising history until ARGVA and therefore their Supply and Use Table is published).

In discussions with users, examples of how versions of the revisions window set out above would have evolved during (e.g.) 2023 and 2024 would be helpful to illustrate the trade-off implicit in different choices.

Recommendation 3: The source data needs to be assessed for suitability for use

If the annual signal in the source data has a weak relationship to the Annual Regional (which this series is trying to produce a quarterly path for) then there is a question about suitability for deriving the quarterly path, as discussed in the section above.

Related to this, and (perhaps) the reason for some of the difficulties with source data, if VAT data are not deemed suitable for use for deriving a quarterly path for particular industries or business size at the UK level, the use for regional purposes has the potential to be problematic. These industries and businesses sizes should perhaps be the first to consider (e.g. Architectural and Engineering Services, or Band 4 companies more generally).

Overall, it is important not to use a regional source just because it exists. Just because there is a regional measure, it should be rejected if it is unlikely to be a good predictor of the ARGVA. It is better not to introduce regional variability if it is simply a spurious product of a poor data source. It will lead to inevitable revisions as the ARGVA data are constrained to, and undermine user confidence in the statistics.

There is a reason that (e.g.) the Scottish Government use UK series for growth in some instances (e.g. for construction). It is because even though some regional data sources exist, they do not have good congruence with the indicator of interest, in this case Annual Scottish GDP.

So, before the statistics are reestablished, ONS should carry out an assessment of the extent to which the input current price datasets are congruent to ARGVA CP estimates. Only once this is done, will they know how many of the issues can be fixed by recommendations 1 and 2, and how many will require different approaches to source data. We have done some of this to illustrate the point in the section above, but we do not have access to all input series at the level of collection to be able to do this comprehensively.

Recommendation 4: Inter-Departmental Business Register shares used to derive VAT data should be checked for stability

If the VAT source data by region is looking volatile from quarter to quarter which may reduce its congruence with annual data, the shares used to derive the regional VAT data should be examined to see if this is contributing to spurious volatility. We were not able to examine this as part of this project because we did not have access to this data, but it is worth checking as the plan for reintroduction is being set out.

Medium Term Recommendations

Recommendation 5: Methods should be reviewed to identify the optimal source or method for regional estimation of this kind industry by industry

This should draw on existing expertise that exists across the UK. Academics From ESCoE are happy to support this work, and support the validation of new approaches to build user confidence. The aim *could* be a consistent approach across different producers unless there is a good reason for divergence (e.g. the public sector), drawing on some of the good practice that has been shown in the area of regional trade measurement in terms of sharing data and methods across administrations.

We suggest a methodology group to be convened made up of analysts from the devolved administrations who produce such series – this is a process of continuous improvement and will always be evolving. This is different to user group, who will have different interests. This group could identify priorities for investment in source data.

One possibility, depending on the review of potential issues with VAT source data, is to explore the use of regionalised MBS where MBS is used at the UK level. This is not as easy for all regions as it is for Scotland, given Scotland pay for a boost to the MBS, but it is a possibility, particularly for businesses in the top size band (all of whom will be in every MBS collection). Reporting unit splits of companies in the census band could be done fairly straightforwardly, and would improve the congruence of the estimates between UKQGDP and QCRGDP. Congruence issues between Annual Growth and the MBS would also have to be examined, although if this is an issue then it is one for National Accounts more widely.

More broadly though, this group can take forward the examination of congruence between different possible sources of input data and the ARGVA and UK measurement.

Longer term recommendations

Recommendation 6: New data sources which are equivalent to national measures should be developed to improve the quality of estimates

Building on recommendation 5 above, the methodology group can be drawn upon to identify priorities for developments in new source data. One area where there is significant issue for *some* regions is Construction, for example, as shown above. It is important to bring all producers together to evidence the use of new sources and the benefits it may bring to a whole range of users.

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