Northern Ireland Quarterly Employment Survey
Impact of Seasonal Adjustment Review
Theme: Economy
Date: 12 September 2023

1 Introduction

This is a report on the latest seasonal adjustment review of the Northern Ireland Quarterly Employment Survey (QES) estimates. The QES provides short-term employee jobs estimates for Northern Ireland and is used by the Office for National Statistics (ONS) to calculate quarterly workforce jobs estimates for the UK. The QES has a sample size of approximately 6,000 and covers all employers with 25 or more employees, all public sector employers, all businesses with more than one industry activity and a representative sample of smaller firms. Seasonally adjusted figures are available at section level (A-S), broad sector level (i.e. manufacturing, construction, services and other industries) and for the public and private sector series.

A seasonal adjustment review was carried out in July 2023 by the QES team within NISRA in conjunction with the ONS. The aim of the review was to ensure that seasonal adjustment for the QES series is appropriate and working well. Prior to this review, the seasonal adjustment methodology used by NISRA was determined from an ONS review carried out in April 2022.

2 Background

Employee jobs estimates can be affected by events throughout the year, some work may be seasonal (for example shops may recruit more staff during the Christmas period) or there can be changes to the workforce that coincide with academic years. Jobs estimates from the QES are seasonally adjusted to account for such seasonal trends. Over time these trends can change, so seasonal adjustment models are periodically reviewed. Estimates released from September 2023 are based on updated seasonal adjustment models.

3 Review methodology

The QES seasonal adjustment review was carried out for each of the nineteen A-S industry sections by gender, and by public and private sector. This resulted in 40 quarterly series to be reviewed, as shown in Table 1 on the following page. Each series in Table 1 was reviewed using a seasonal adjustment program called X-13ARIMA-SEATS. The span of data used in the review was from Q1 2005 to Q2 2023.

More detailed information on the review process and methodology can be found in the Technical Annex.

Table 1: The 40 current series reviewed.

Section	Description
A (Males and Females)	Agriculture, Forestry and Fishing
B (Males and Females)	Mining and quarrying
C (Males and Females)	Manufacturing
D (Males and Females)	Electricity, gas, steam and air conditioning supply
E (Males and Females)	Water supply, sewerage, waste management and remediation activities
F (Males and Females)	Construction
G (Males and Females)	Wholesale and retail trade; repair of motor vehicles and motorcycles
H (Males and Females)	Transportation and storage
I (Males and Females)	Accommodation and food service activities
J (Males and Females)	Information and communication
K (Males and Females)	Financial and insurance activities
L (Males and Females)	Real estate activities
M (Males and Females)	Professional, scientific and technical activities
N (Males and Females)	Administrative and support service activities
O (Males and Females)	Public administration and defence; compulsory social security
P (Males and Females)	Education
Q (Males and Females)	Human health and social work activities
R (Males and Females)	Arts, entertainment and recreation
S (Males and Females)	Other service activities
Public	
Private	

4 Findings of the review

Following the seasonal adjustment review a number of changes were identified as to which sections (A-S, Public and Private) are seasonally adjusted. A summary of these changes are outlined in Table 2. Please note the Public and Private series are seasonally adjusted as totals only, there is no split by sex.

Table 2: Seasonally adjusted industry sections comparing the 2022 and 2023 seasonal adjustment reviews

Section	Adjusted previously? MALES	Adjusted now? MALES	Adjusted previously? FEMALES	Adjusted now? FEMALES
A - Agriculture, Forestry and Fishing	No	No	Yes	No
B - Mining and quarrying	Yes	No	No	No
C - Manufacturing	No	No	Yes	Yes
D - Electricity, gas, steam and air conditioning supply	No	No	Yes	No
E - Water supply, sewerage, waste management and remediation activities	Yes	Yes	Yes	No
F - Construction	Yes	No	Yes	Yes
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	Yes	Yes	Yes	Yes
H - Transportation and storage	Yes	Yes	Yes	Yes
I - Accommodation and food service activities	Yes	Yes	Yes	Yes
J - Information and communication	Yes	Yes	No	No
K - Financial and insurance activities	No	No	No	No
L - Real estate activities	Yes	Yes	Yes	Yes
M - Professional, scientific and technical activities	Yes	Yes	Yes	Yes
N - Administrative and support service activities	Yes	Yes	Yes	No
O - Public administration and defence; compulsory social security	Yes	Yes	Yes	Yes
P - Education	Yes	Yes	Yes	Yes
Q - Human health and social work activities	Yes	No	Yes	No
R[1] - Arts, entertainment and recreation	Yes	Yes	Yes	Yes
S - Other service activities	Yes	Yes	Yes	No

---

[1] A permanent adjustment has been applied to series R for the years 2005 to 2011 to account for seasonality. However, from 2012 onwards the series is deemed to be non-seasonal, and no adjustment has been applied to the data.

5 Impact of the review

5.1 Impact of the review on each QES series

There were 40 quarterly series reviewed. The revisions encompass the full span of the series up to the current quarter results and are shown in Table 3. The values reflect the absolute difference between the latest data and the previous data, expressed as a proportion, such that:

Revision = $|y_T - y_t|/y_t$ where y_T = value from the current review and y_t = value from the previous review.

As seen in Table 3 the values are small with the largest revision being 0.008.

The data changes from the last review are reflected predominantly in shifting the level of the series, but the patterns are generally preserved.

Table 3: Mean absolute revisions by section for the new seasonally adjusted (SA) data relative to SA data for the previous models, expressed as a proportion.

Section	MEAN Q1 2005 –Q2 2023 (MALES)	MEAN Q1 2005 –Q2 2023 (FEMALES)
A - Agriculture, Forestry and Fishing	0.000	0.003
B - Mining and quarrying	0.004	0.000
C - Manufacturing	0.000	0.001
D - Electricity, gas, steam and air conditioning supply	0.000	0.005
E - Water supply, sewerage, waste management and remediation activities	0.000	0.008
F - Construction	0.004	0.002
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	0.001	0.001
H - Transportation and storage	0.001	0.002
I - Accommodation and food service activities	0.003	0.001
J - Information and communication	0.001	0.000
K - Financial and insurance activities	0.000	0.000
L - Real estate activities	0.000	0.002
M - Professional, scientific and technical activities	0.003	0.002
N - Administrative and support service activities	0.001	0.005
O - Public administration and defence; compulsory social security	0.000	0.001
P - Education	0.001	0.000
Q - Human health and social work activities	0.003	0.002
R - Arts, entertainment and recreation	0.005	0.001
S - Other service activities	0.002	0.002

5.2 Impact of the review on total NI employee jobs estimates

The employee jobs estimates for each industry section A-S are added to give the total number of seasonally adjusted employee jobs for NI. The impact of the seasonal adjustment review on the total numbers of employee jobs is minimal (average quarterly difference of +/-0.05%), meaning that the seasonal adjustment is quite stable, as can be seen in Table 4 below.

Figure 1: Comparison between the old and new seasonal adjustment models at NI total level, March 2005 – June 2023
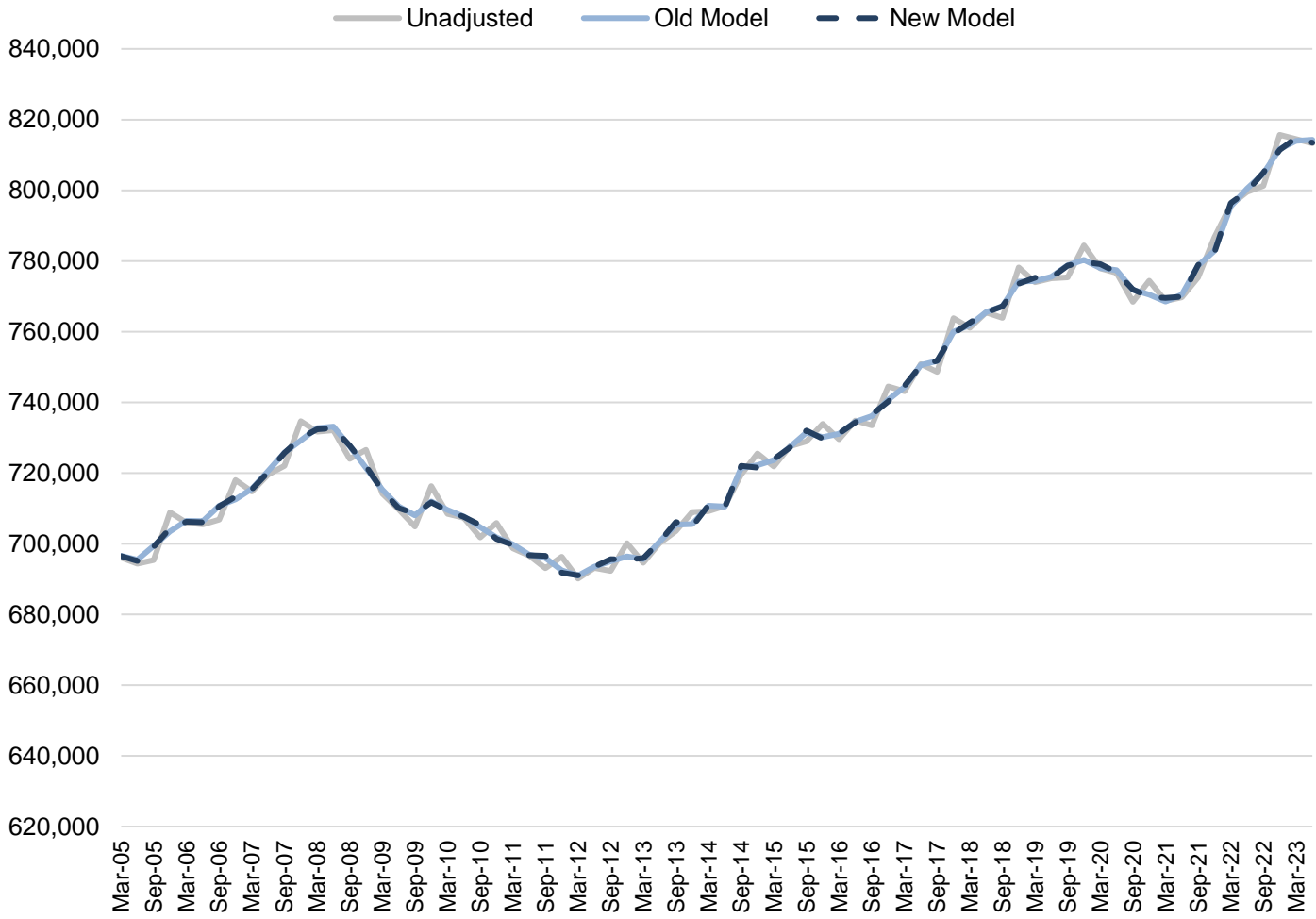
Table 4: Comparison between the old and new seasonal adjustment models at NI total level

Quarter	NI employee jobs - Old SA method	NI employee jobs - New SA method	Absolute Difference	% Difference
2005Q1	696,590	696,480	110	0.02%
2005Q2	695,500	695,140	360	0.05%
2005Q3	699,380	699,160	230	0.03%
2005Q4	703,530	704,350	830	0.12%
2006Q1	706,490	706,270	210	0.03%
2006Q2	706,410	706,090	320	0.05%
2006Q3	710,730	710,560	170	0.02%
2006Q4	712,580	713,330	750	0.11%
2007Q1	715,580	715,340	230	0.03%
2007Q2	720,620	720,270	350	0.05%
2007Q3	725,770	725,740	30	0.00%
2007Q4	729,200	729,890	690	0.10%
2008Q1	732,690	732,420	260	0.04%
2008Q2	733,130	732,720	410	0.06%
2008Q3	727,570	727,750	180	0.02%
2008Q4	721,410	721,920	520	0.07%
2009Q1	715,290	715,070	220	0.03%
2009Q2	710,580	710,080	500	0.07%
2009Q3	708,070	708,570	500	0.07%
2009Q4	711,960	711,740	220	0.03%
2010Q1	709,590	709,420	170	0.02%
2010Q2	707,720	707,580	140	0.02%
2010Q3	704,740	705,340	600	0.08%
2010Q4	701,760	701,400	360	0.05%
2011Q1	699,870	699,700	160	0.02%
2011Q2	696,910	696,790	120	0.02%
2011Q3	696,000	696,570	570	0.08%
2011Q4	692,450	691,800	640	0.09%
2012Q1	690,980	691,050	70	0.01%
2012Q2	693,540	693,530	10	0.00%
2012Q3	695,040	695,680	640	0.09%
2012Q4	696,390	695,570	820	0.12%
2013Q1	695,630	695,860	230	0.03%
2013Q2	700,630	700,560	70	0.01%
2013Q3	705,400	706,140	730	0.10%

Table 4: Comparison between the old and new seasonal adjustment models at NI total level (continued)

2013Q4	705,560	704,900	650	0.09%
2014Q1	710,750	710,910	170	0.02%
2014Q2	710,500	710,320	170	0.02%
2014Q3	721,450	722,070	620	0.09%
2014Q4	722,200	721,550	650	0.09%
2015Q1	723,650	723,920	270	0.04%
2015Q2	727,400	727,260	140	0.02%
2015Q3	731,450	732,010	560	0.08%
2015Q4	730,160	729,760	400	0.05%
2016Q1	731,070	731,170	100	0.01%
2016Q2	734,520	734,350	180	0.02%
2016Q3	736,160	736,580	420	0.06%
2016Q4	740,750	740,240	520	0.07%
2017Q1	744,330	744,670	330	0.04%
2017Q2	750,540	750,520	30	0.00%
2017Q3	751,690	751,800	110	0.01%
2017Q4	759,980	759,440	540	0.07%
2018Q1	761,850	762,520	680	0.09%
2018Q2	765,530	765,460	70	0.01%
2018Q3	767,250	767,120	130	0.02%
2018Q4	774,170	773,590	580	0.08%
2019Q1	774,310	775,250	940	0.12%
2019Q2	775,530	775,280	250	0.03%
2019Q3	778,760	778,660	100	0.01%
2019Q4	780,320	779,720	590	0.08%
2020Q1	778,000	779,100	1,110	0.14%
2020Q2	777,400	776,850	550	0.07%
2020Q3	771,830	771,940	110	0.01%
2020Q4	770,470	769,910	560	0.07%
2021Q1	768,510	769,510	1,000	0.13%
2021Q2	770,530	769,900	620	0.08%
2021Q3	778,690	778,840	140	0.02%
2021Q4	782,870	782,460	410	0.05%
2022Q1	795,480	796,390	910	0.11%
2022Q2	800,440	799,710	730	0.09%
2022Q3	804,760	804,990	230	0.03%
2022Q4	811,630	811,390	240	0.03%
2023Q1	814,010	814,810	800	0.10%
2023Q2	814,290	813,450	840	0.10%

6 Review implementation

The revised seasonal adjustment models were introduced in the Q2 2023 publication results. Further reviews will be carried out on an annual basis and users will be informed of the results and impact of the reviews.

Revisions to the seasonally adjusted estimates will be made in accordance with the QES published policy on revisions, informed by the ESS Guidelines on Seasonal Adjustment (PDF 545KB).

Box A: European Guidelines on Revisions

Below are sections of the ESS Guidelines on Seasonal adjustment referring to revisions of seasonally adjusted estimates. The preferred approach under each heading is given.

General revisions policy
A) Revisions to seasonally adjusted data are published in accordance with a coherent, transparent and officially published revision policy and release calendar, that is aligned with the revision policy and the revision calendar for the unadjusted data. Revisions to the seasonally adjusted data should not be released more often than releases of the raw /unadjusted data. The public are informed about the average revisions of important seasonally adjusted macroeconomic variables which have been observed in the past.

Horizon for published revisions
A) The revision period for the seasonally adjusted data must at least cover the extent of the raw data revision period. Due to the property of filters, it is normally acceptable to revise the seasonally adjusted data from a point 3-4 years before the beginning of the revision period of the unadjusted data; earlier data should be frozen.

7 Technical Annex

This annex presents detailed methodological information for the more technical user.

7.1 Carrying out the seasonal adjustment review

The seasonal adjustment of each series was reviewed by ONS using X-13ARIMA-SEATS. Each review included:

- assessment of whether the series is seasonal
- choosing the appropriate decomposition type, that is additive or multiplicative
- calculating prior adjustments to be made to the series before seasonal adjustment. For example: temporary prior adjustments for outliers and level shifts; and permanent prior adjustments for trading days, Easter effects and seasonal breaks
- selecting the ARIMA forecasting model
- deciding the lengths of the seasonal and Henderson trend moving averages
- reviewing X-13ARIMA-SEATS diagnostics, both quantitative and visual
- plotting original and seasonally adjusted series
- For series common with the previous review, the old parameters were re-assessed and changed where appropriate.

The first stage of a review is a "default" run where all the parameters choices (decomposition, ARIMA model, outliers, seasonal and trend moving averages) are made automatically by X-13ARIMASEATS. The outcome from the default run is then refined with the over-riding aim being to fit the simplest appropriate adjustment. The end result is then compared with the choices made in any previous review. A decision to alter previous recommendations or to introduce complications must be supported by evidence and reasonable argument. User-defined files for prior adjustments (rmx and ppp files) from the previous review were tested for significance and updated where necessary, e.g. if transformation type for the series has changed.

This robust approach is taken to avoid uninformative revisions caused by minor changes to seasonal adjustment settings – changes that could easily revert back in the next review.

7.2 Seasonal adjustment models

The recommended seasonal adjustment is shown in Table 5. As a result of the impact of Coronavirus many of the series now have additive outliers for Quarter 2 2020. An additive outlier is a data point which falls out of the general pattern of the trend and seasonal component. This has resulted in revisions to these series back to Q1 2005.

Table 5: Recommended seasonal adjustment parameters. TMA (Trend Moving Average) = Length of the Henderson Filter; SMA (Seasonal Moving Average) = Order of seasonal moving average.

Name	Transform	Model	TMA	SMA	Regressors	Seasonal
A_Females	none		5	3x9		No
A_Males	none					No
B_Females	none					No
B_Males	none					No
C_Females	log	(0 1 0)(1 0 0)	5	3x9		Yes
C_Males	none					No
D_Females	none					No
D_Males	none					No
E_Females	none					No
E_Males	none	(1 1 1)(1 1 1)	5	3x9	LS2011.3, LS2013.4, AO2014.2, LS2015.4, LS2016.3, LS2021.1	Yes
F_Females	log	(0 1 1)(0 1 1)	5	3x5	AO2015.3, LS2018.4, LS2020.2	Yes
F_Males	none					No
G_Females	log	(0 1 1)(1 1 1)	5	3x5	AO2015.4, AO2018.4, LS2021.1, AO2022.4	Yes
G_Males	log	(0 1 0)(0 1 1)	5	3x9	LS2014.4, LS2020.3, LS2022.1, LS2022.3	Yes
H_Females	log	(0 1 1)(1 1 2)	5	3x5	LS2011.3, LS2014.3, AO2018.4, RP2022.1-2022.4	Yes
H_Males	log	(0 1 1)(0 1 1)	5	3x9	AO2015.3, LS2016.4	Yes
I_Females	log	(0 1 1)(0 1 1)	5	3x5	AO2014.1, AO2017.2, AO2020.4, AO2021.1, AO2021.2	Yes
I_Males	log	(0 1 0)(1 0 0)	5	3x5	LS2018.1, AO2019.2, LS2019.2, LS2020.2, LS2020.4, LS2021.1	Yes
J_Females	none					No
J_Males	log	(0 1 1)(0 1 1)	5	3x9	LS2015.3, LS2020.1	Yes
K_Females	none					No
K_Males	none					No
L_Females	log	(0 1 1)(0 1 1)	5	3x9	LS2013.4, AO2014.1, LS2011.3, Rp2012.3-2012.4, AO2021.4	Yes
L_Males	log	(0 1 1)(0 1 1)	5	3x5	LS2005.4, AO2011.3	Yes
M_Females	log	(0 1 1)(0 1 1)	5	3x9	AO2017.1, LS2022.3	Yes
M_Males	log	(0 1 1)(0 0 1)	5	3x5	AO2007.1, AO2007.3, LS2009.4, AO2015.4, AO2017.4, LS2019.1 LS2022.3, AO2022.4	Yes
N_Females	none					No
N_Males	log	(0 1 1)(0 1 1)	5	3x3	LS2007.4, LS2014.3, LS2020.2, AO2021.1	Yes
O_Females	log	(0 1 1)(0 1 1)	5	3x5	LS2009.3, LS2009.4, LS2010.3, LS2013.4, LS2014.3, RP2015.3-2016.2, AO2023.1	Yes
O_Males	log	(0 2 1)(0 1 1)	5	3x9	AO2007.2, LS2010.3, LS2011.3,	Yes

					LS2013.4, LS2014.3	
P_Females	log	(0 1 1)(0 1 1)	5	3x9	AO2008.3, LS2009.4, LS2015.4, TC2005.3, LS2021.4	Yes
P_Males	log	(0 1 1)(0 1 1)	5	3x9	LS2015.4, AO2014.3	Yes
Q_Females	none					No
Q_Males	none					No
R_Females	none					Yes
R_Males	none					Yes
S_Females	none					No
S_Males	log	(0 1 1)(0 1 1)	5	3x9	LS2015.4, AO2016.2, LS2018.1, RP2020.2-2021.4	Yes
Private	log	(1 1 0)(0 1 1)	5	3x9	LS2008.4, LS2009.4, AO2014.2	Yes
Public	log	(0 1 1)(0 1 1)	5	3x5	LS2008.4, LS2013.4, AO2020.2	Yes

5 Further Information

If you require further information, please contact the Quarterly Employment Survey section using the details below:

Ciaran Kerr
Northern Ireland Statistics & Research Agency
Economic & Labour Market Statistics Branch
Colby House, Stranmillis Court
Belfast, BT9 5RR
Telephone: 028 9052 9218
Email: economicstats@nisra.gov.uk
Website: Quarterly Employment Survey
X: @NISRA