

# Northern Ireland Quarterly Construction Enquiry

## Impact of Seasonal Adjustment Review

Theme: Economy

Date: 28 September 2023

### 1 Introduction

This is the report of a seasonal adjustment review of Construction Output time series for Northern Ireland. The review was carried out in July, 2023 and performed by the ONS Methodology Advisory Service (MAS) in accordance to the specification agreed with the Northern Ireland Statistics Research Agency (NISRA).

### 2 Objectives of the review

The aim of the review was to ensure that seasonal adjustment for the Construction Output series listed in Table 1 is appropriate. The seasonal adjustment currently being used by NISRA was determined in a previous MAS review, carried out in April 2022.

The 20 quarterly series reviewed are shown in Table 1. The name is a code that is used to refer to each series throughout this report, consistent with the names used in the previous review for the same series.

Table 1: The 20 current series reviewed

Name	Description
AW	All Work
ANW	All New Work
ARM	All Repair and Maintenance
IH	Index of Housing
II	Index of Infrastructure
IOW	Index of Other Work
NHPR	New Housing: Private
NHPU	New Housing: Public
NIPR	New Infrastructure: Private
NIPU	New Infrastructure: Public
ONWP	Other New Work: Public
ONWPR	Other New Work: Private
PRI	All work: private
PUB	All work: public
RMHPR	Repair and Maintenance – Housing: Private
RMHPU	Repair and Maintenance – Housing: Public
RMIPR	Repair and Maintenance – Infrastructure: Private
RMIPU	Repair and Maintenance – Infrastructure: Public
RMOWPR	Repair and Maintenance – Other Work: Private
RMOWPU	Repair and Maintenance – Other Work: Public

Any exact additive relations that hold between series before seasonal adjustment are not guaranteed to be preserved between the seasonally adjusted series. However, such relations will still hold approximately.

The seasonal adjustment of each series was reviewed by MAS 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.

A detailed analysis for each series can be found later in [sections 4.1 to 4.20](#), but first the time series as a group are described in a little more detail.

### 3 Time series data

There are 20 quarterly series reviewed in this report, and there have been revisions to the unadjusted data that were previously used in the 2022 seasonal adjustment review. The revisions encompass the full span of the series and are shown in Table 2. The values reflect the absolute difference between the latest raw data used for the 2023 seasonal adjustment review and the previous data used in 2022, 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.

The data changes from the last review are reflected predominantly in revisions to the series, and updates to the [construction output indices](#) (OPIs), but the patterns are generally preserved. The series remain rebased to 2019.

For details on revisions to construction output data please consult our [revisions policy](#).

*Table 2: Mean absolute revisions to NSA time series relative to data for the last review. Revisions are shown for four different spans of common data (full span, last three years, final year, and latest data point) expressed as a proportion.*

Name	MEAN 2000 Q1 – 2022 Q1	MEAN 2019 Q1– 2022 Q1	MEAN 2021 Q1 – 2022 Q1	2022 Q1
AW	0.000	0.002	0.005	0.002
ANW	0.000	0.003	0.008	0.000
ARM	0.000	0.001	0.003	0.005
IH	0.000	0.001	0.001	0.001
II	0.001	0.002	0.004	0.015
IOW	0.001	0.006	0.016	0.006
NHPU	0.001	0.004	0.010	0.037
NHPR	0.000	0.001	0.002	0.001
NIPU	0.001	0.003	0.008	0.032
NIPR	0.001	0.002	0.006	0.020
ONWP	0.004	0.024	0.061	0.064
ONWPR	0.002	0.008	0.022	0.061
PUB	0.001	0.005	0.013	0.019
PRI	0.000	0.002	0.004	0.011
RMHPR	0.002	0.007	0.018	0.080
RMHPU	0.003	0.012	0.030	0.141
RMIPR	0.006	0.011	0.028	0.127
RMIPU	0.001	0.001	0.002	0.002
RMOWPR	0.001	0.005	0.013	0.056
RMOWPU	0.001	0.005	0.013	0.056

## 4 Analysis

The recommended seasonal adjustment is shown in Table 3. There have been changes to the recommended parameters for 10 of the series described in the sections below. Following the April 2022 review, several outliers were added for Q2 2020 as a result of the Coronavirus pandemic. These outliers have remained a consistent addition following the July 2023 review. 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 2000. The revisions are described later in [Section 5](#).

The revised SA models will be introduced in the Q2 2023 publication results. Seasonal adjustment models and parameters will be reviewed annually with the starting point for subsequent reviews being the revised SA models outlined in Table 3.

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

Table 3: 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
AW						No
ANW						No
ARM	Log	(1 0 1)(0 1 1)	5	s3x5	LS2001.1, LS2013.1, AO2020.2	Yes
IH	None	(0 1 0)(1 0 1)	5	S3x5	AO2000.2, LS2001.1, LS2005.2, AO2005.4, LS2007.3, LS2008.3, LS2011.1, AO2018.1, AO2018.3, AO2020.2, AO2020.4, AO2022.3	Yes
II						No
IOW	Log	(0 1 1)(0 1 1)	5	s3x5	LS2001.1, LS2015.1, AO2020.2	Yes
NHPR	Log	(0 1 1)(0 1 1)	5	s3x5	Rp2007.02-2008.4, LS2011.1, LS2012.2, AO2020.2	Yes
NHPU	Log	(1 0 0)(1 1 2)	5	s3x5	LS2005.4, LS2009.3, LS2011.1, LS2013.1, LS2013.4, LS2015.2 AO2020.2	Yes
NIPR						No
NIPU	Log	(0 1 1)(0 1 1)	5	S3x5	AO2000.4, LS2013.1	Yes
ONWP	Log	(0 1 1)(0 1 1)	5	s3x5	AO2013.4, Rp2014.2-2015.1, AO2020.2	Yes
ONWPR	Log	(0 1 1)(0 1 1)	5	s3x5	Rp2008.3-2009.3, Rp2016.1-2017.1, AO2020.2	Yes
PRI	Log	(0 1 1)(0 1 1)	5	s3x5	AO2001.1, LS2006.1, Rp2008.2-2008.4, LS2011.1, LS2012.2, LS2013.1, AO2020.2, AO2020.4	Yes
PUB	Log	(0 1 1)(0 1 1)	5	s3x5	AO2000.4, LS2013.1, AO2020.2, Rp2009.4-2010.2,	Yes
RMHPR	None	(0 1 1)(0 1 1)	7	s3x9	AO2003.3, AO2005.1, AO2009.2, AO2018.2, AO2018.3, AO2018.4, AO2020.2, AO2023.1	Yes
RMHPU	Log	(0 1 1)(0 1 1)	5	s3x5	AO2001.3, LS2002.1, LS2010.2, LS2013.1, LS2022.4	Yes
RMIPR						No
RMIPU	None	(1 0 0)(0 1 1)	5	s3x5	AO2000.3, LS2007.1, LS2020.4	Yes
RMOWPR						No
RMOWPU	None	(0 1 1)(0 1 1)	5	s3x5		Yes

## 5 Revisions

Revisions have been caused by the changes to the NSA data and new data points being added for each series, as well as changes to the specifications for 11 series. Revisions to NSA values are summarised in Table 2, and the resulting revisions on SA values (comparing seasonally adjusted data from the 2022 models to seasonally adjusted data from the new models for the common time span) are summarised in Table 4. The latter incorporates revisions due to changes of the NSA data and the seasonal adjustment specifications. Overall, the revisions are not large, meaning that the seasonal adjustment is quite stable.

*Table 4: Mean absolute revisions to seasonally adjusted time series relative to the last review for four different spans, expressed as a proportion.*

Name	MEAN 2000 Q1 – 2023 Q2	MEAN 2020 Q2 – 2023 Q2	MEAN 2022 Q2 – 2023 Q2	2023 Q2
AW	0.00	0.00	0.00	0.00
ANW	0.00	0.00	0.00	0.00
ARM	0.00	0.00	0.00	0.00
IH	0.00	0.01	0.01	0.01
II	0.02	0.02	0.02	0.02
IOW	0.00	0.00	0.00	0.00
NHPR	0.00	0.01	0.00	0.00
NHPU	0.02	0.00	0.00	0.00
NIPU	0.00	0.00	0.00	0.00
NIPR	0.00	0.00	0.00	0.00
ONWP	0.01	0.02	0.02	0.02
ONWPR	0.00	0.00	0.00	0.00
PRI	0.00	0.00	0.00	0.00
PUB	0.00	0.00	0.00	0.00
RMHPR	0.02	0.05	0.04	0.05
RMHPU	0.02	0.03	0.03	0.00
RMIPR	0.00	0.00	0.00	0.00
RMIPU	0.01	0.01	0.01	0.00
RMOWPR	0.00	0.00	0.00	0.00
RMOWPU	0.02	0.01	0.01	0.01

Revisions are an inevitable part of the seasonal adjustment process. It is recommended to revise the seasonal adjustment parameters (as done above) when there are revisions to the unadjusted estimates over more than two years and to inform users of the revisions. Where revisions occur due to additional data at the current end of the time series parameters do not need to be revised but revisions are expected to the seasonally adjusted estimate and should ideally be made to the past three years of the seasonally adjusted estimates. Revisions to the seasonally adjusted estimates should be made in accordance with the [QCE published policy on revisions](#) for this dataset. Revisions policies for seasonally adjusted estimates should be informed by the [ESS Guidelines on Seasonal Adjustment \(PDF 545KB\)](#) (See box A.) Users should be informed of the revisions policy.

#### 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.

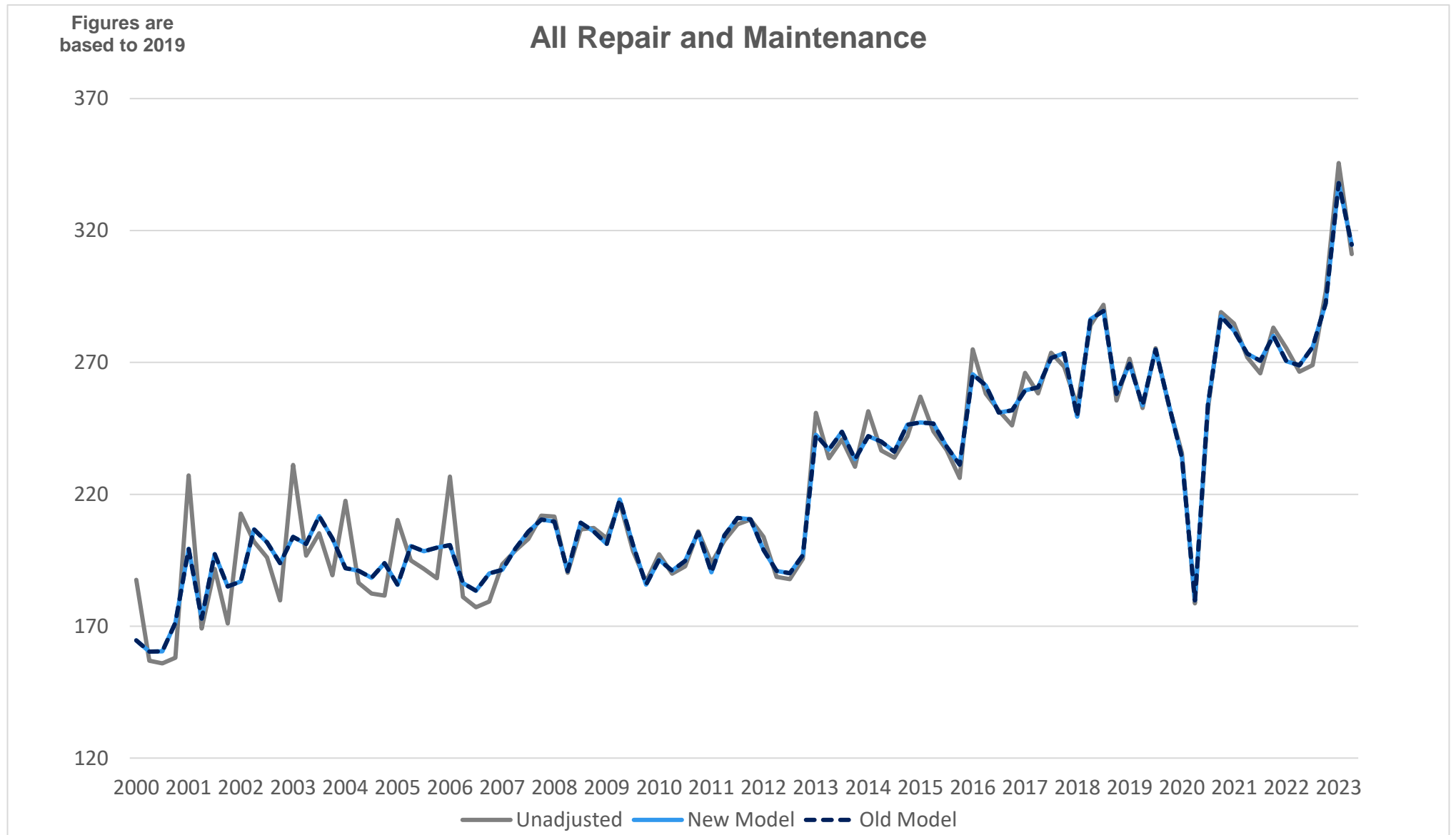
##### *Horizon for published revisions*

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.

## 6 Recommendations

- a) The seasonal series should be adjusted according to the parameters specified in Table 3. The specification files, and associated files, provided should be used for this purpose.
- b) All of the series should be run using a single command by calling the program with the meta file as input. The meta file has been supplied – it is called constructionMTA.mta
- c) Non-seasonal series will not be seasonally adjusted – if they were then artificial distortions might be introduced that would make interpretation of movements more difficult. The specification files for the non-seasonal series are designed to output a seasonally adjusted series that is identical to the input series. The user should run these specification files along with those for the seasonal series – this provides a record of what has been done for every series. The meta file will do this automatically.
- d) Seasonal adjustment models and parameters should be reviewed annually. The starting point for subsequent reviews should be the current parameter settings.
- e) Revisions to the seasonally adjusted estimates should be made in accordance with the [QCE's published policy on revisions](#) for this dataset. Revisions policies for seasonally adjusted estimates should be informed by the [ESS Guidelines on Seasonal Adjustment \(PDF 545KB\)](#) (See box A in Section 5).

## Annex: Seasonal Adjustment Time Series Comparison



Figures are based to 2019

# Index of Housing





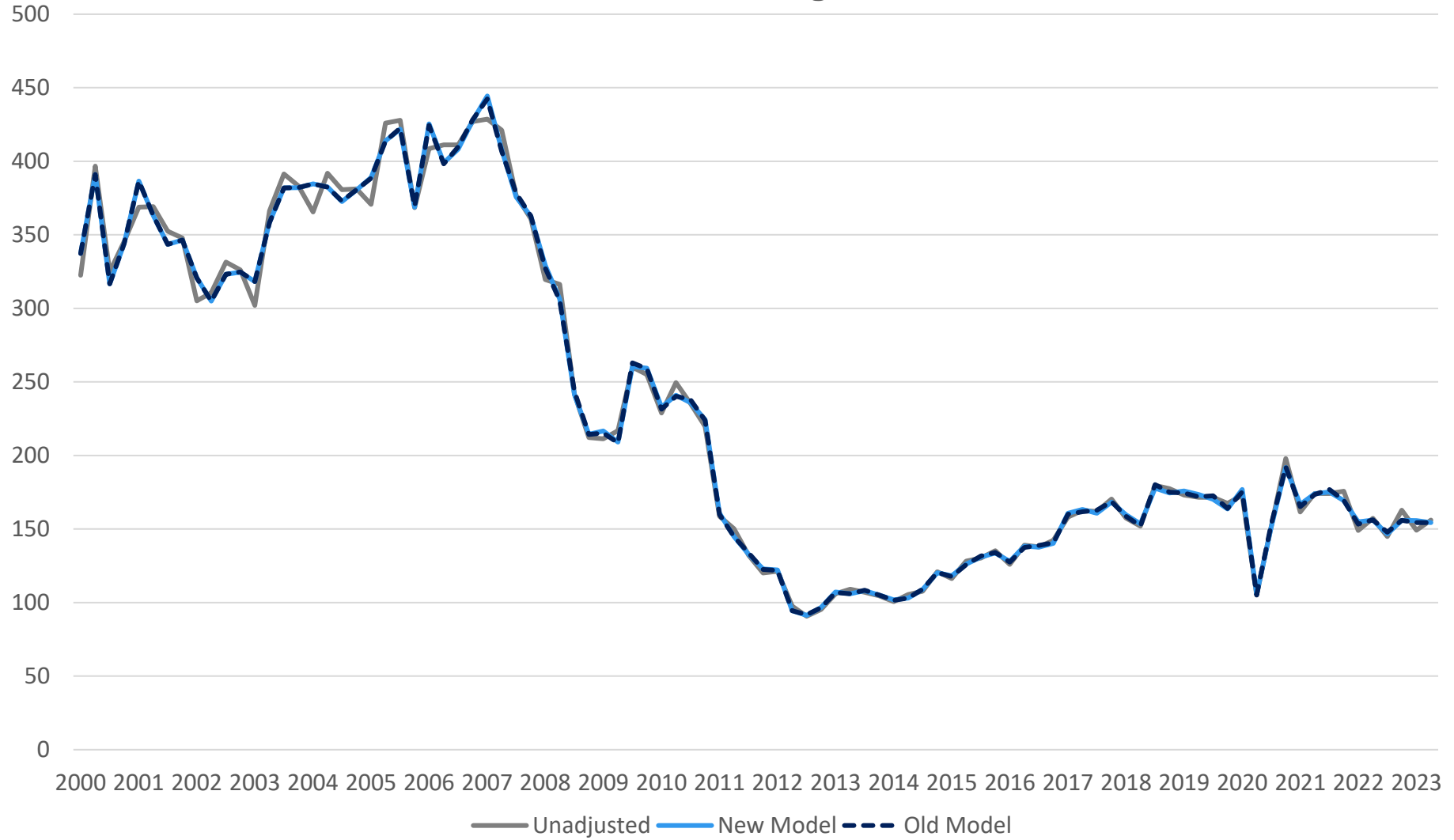
Figures are based to 2019

# Index of Other Work



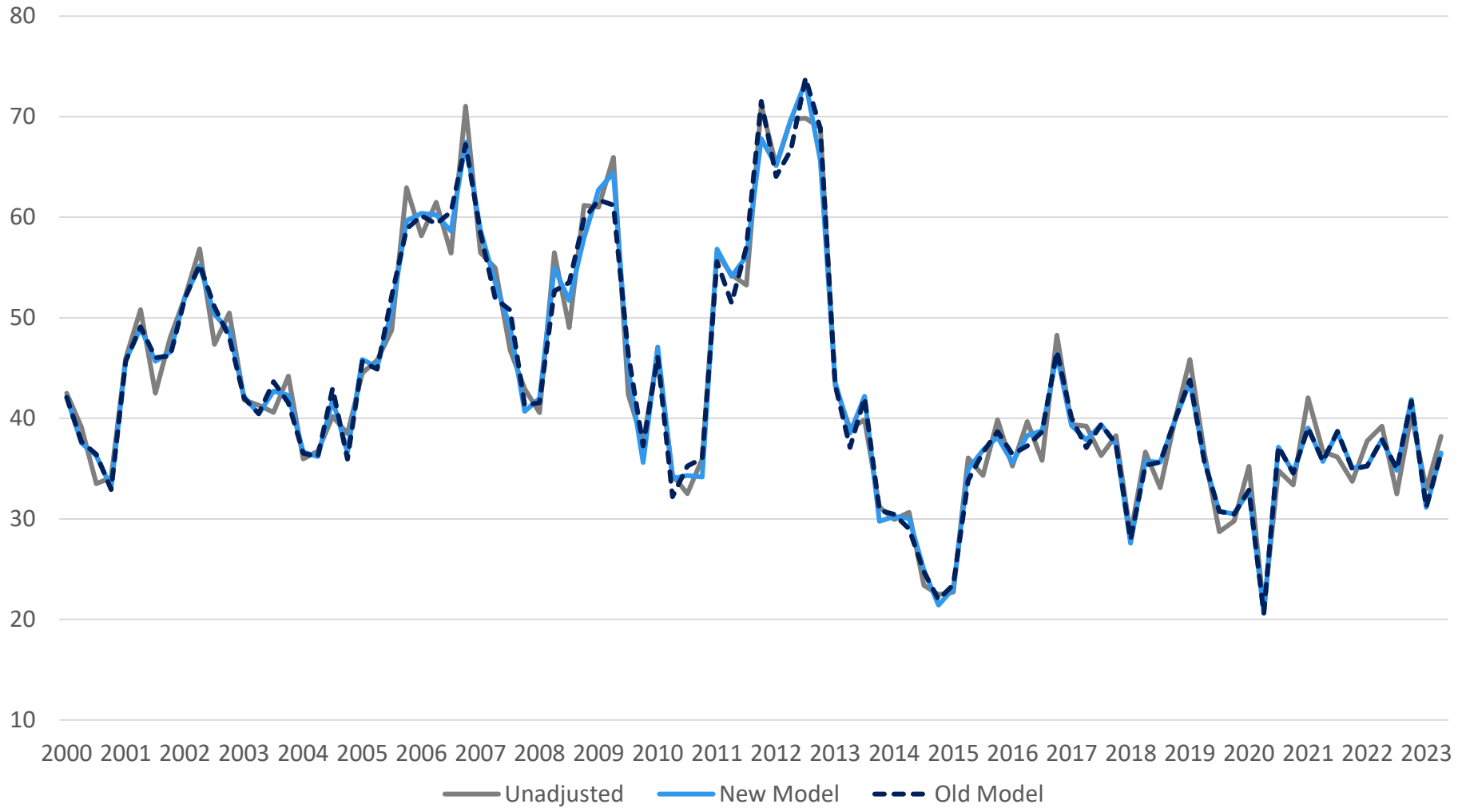
Figures are based to 2019

# New Work Housing Private



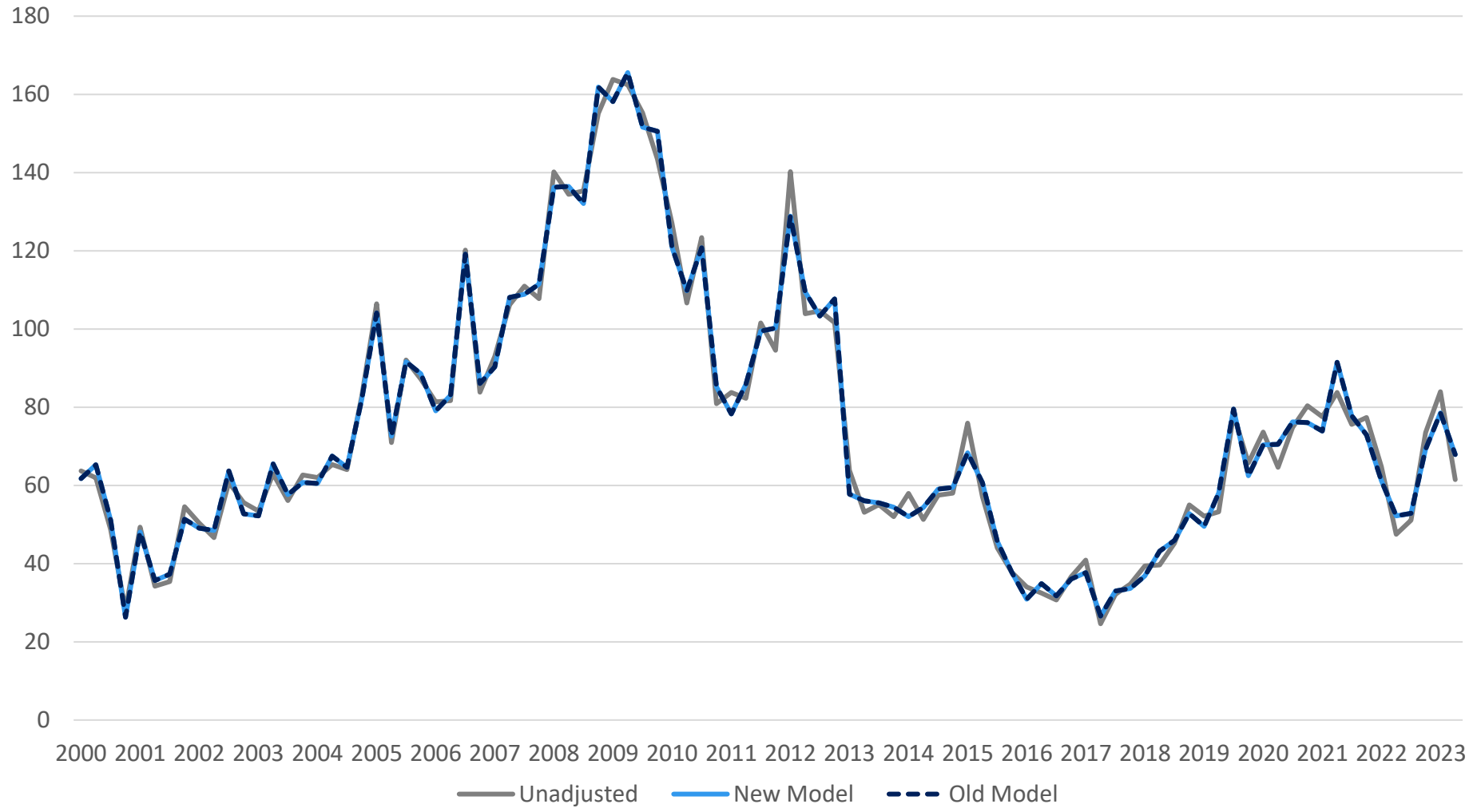
Figures are based to 2019

### New Work Housing Public



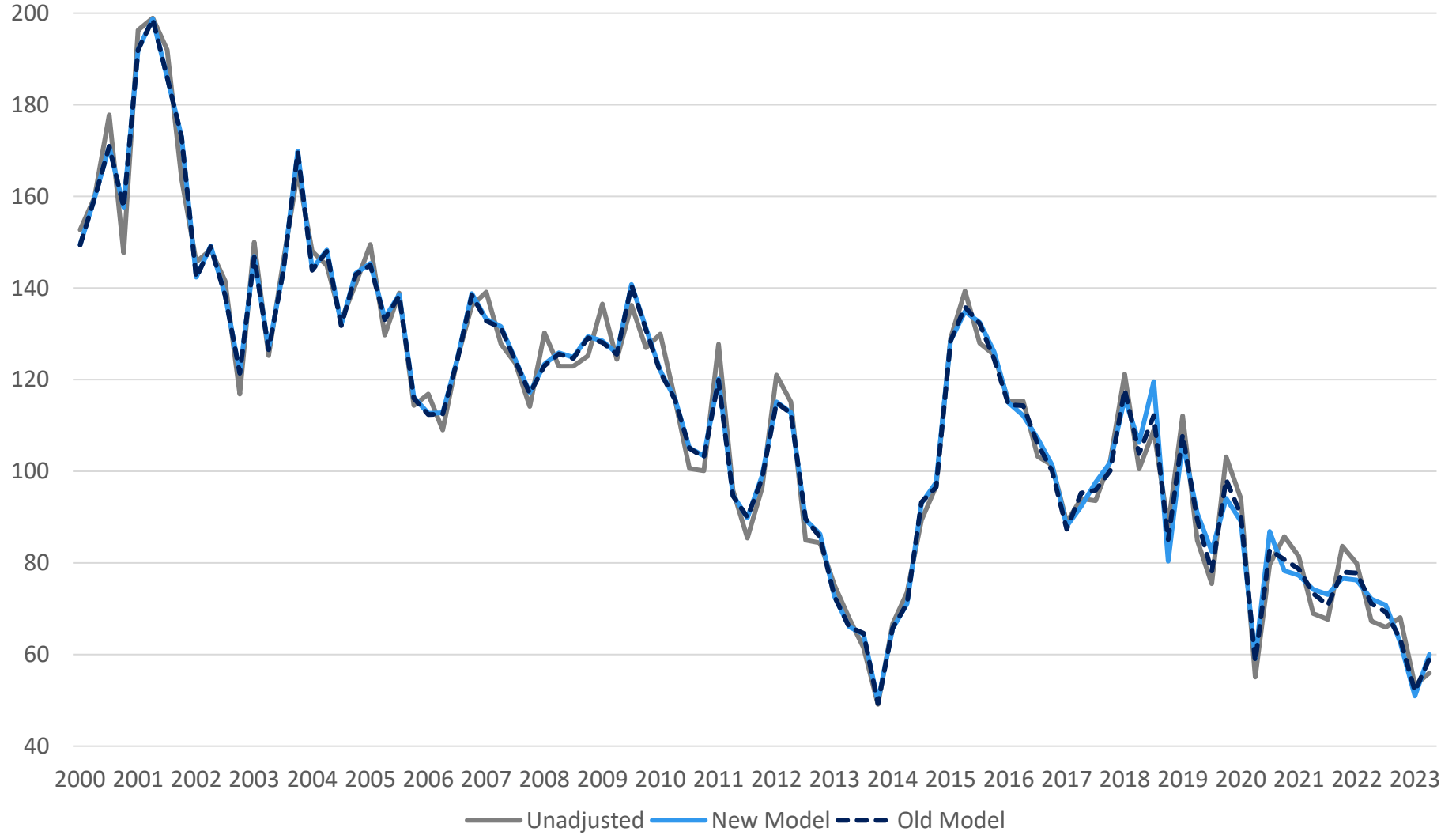
Figures are based to 2019

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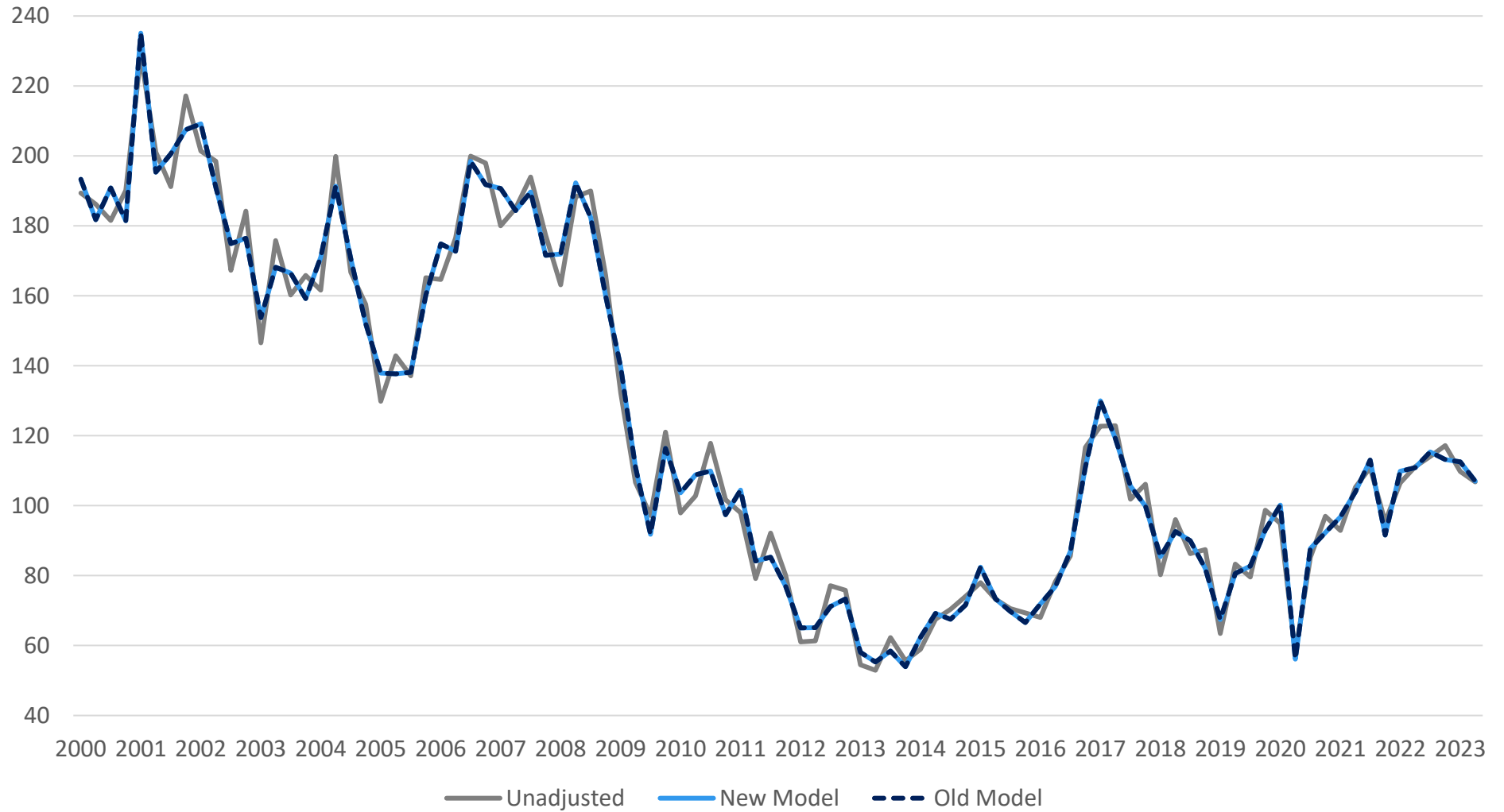
Figures are based to 2019

# Other New Work Public



Figures are based to 2019

## Other New Work Private



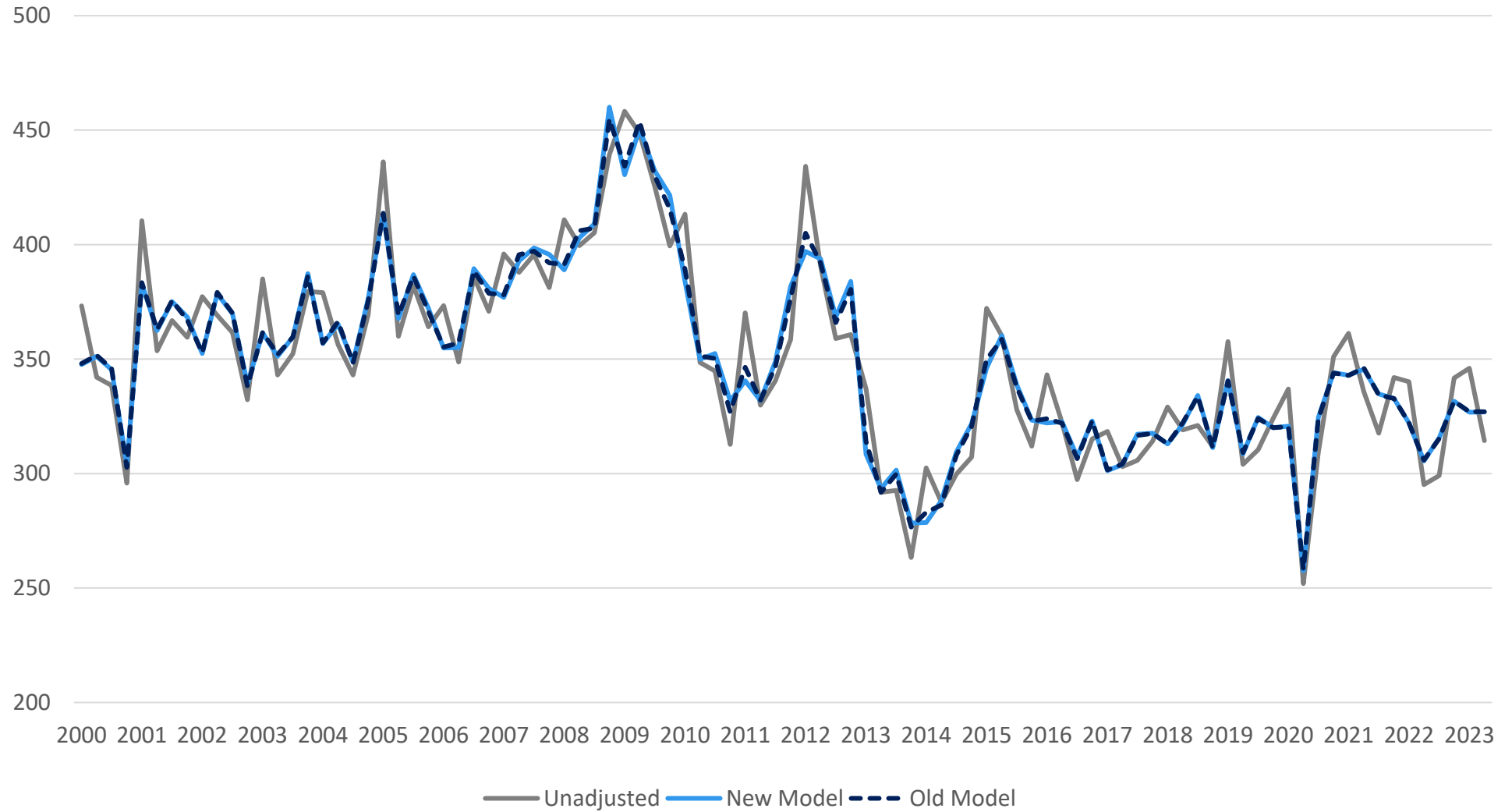
Figures are based to 2019

# Private



Figures are based to 2019

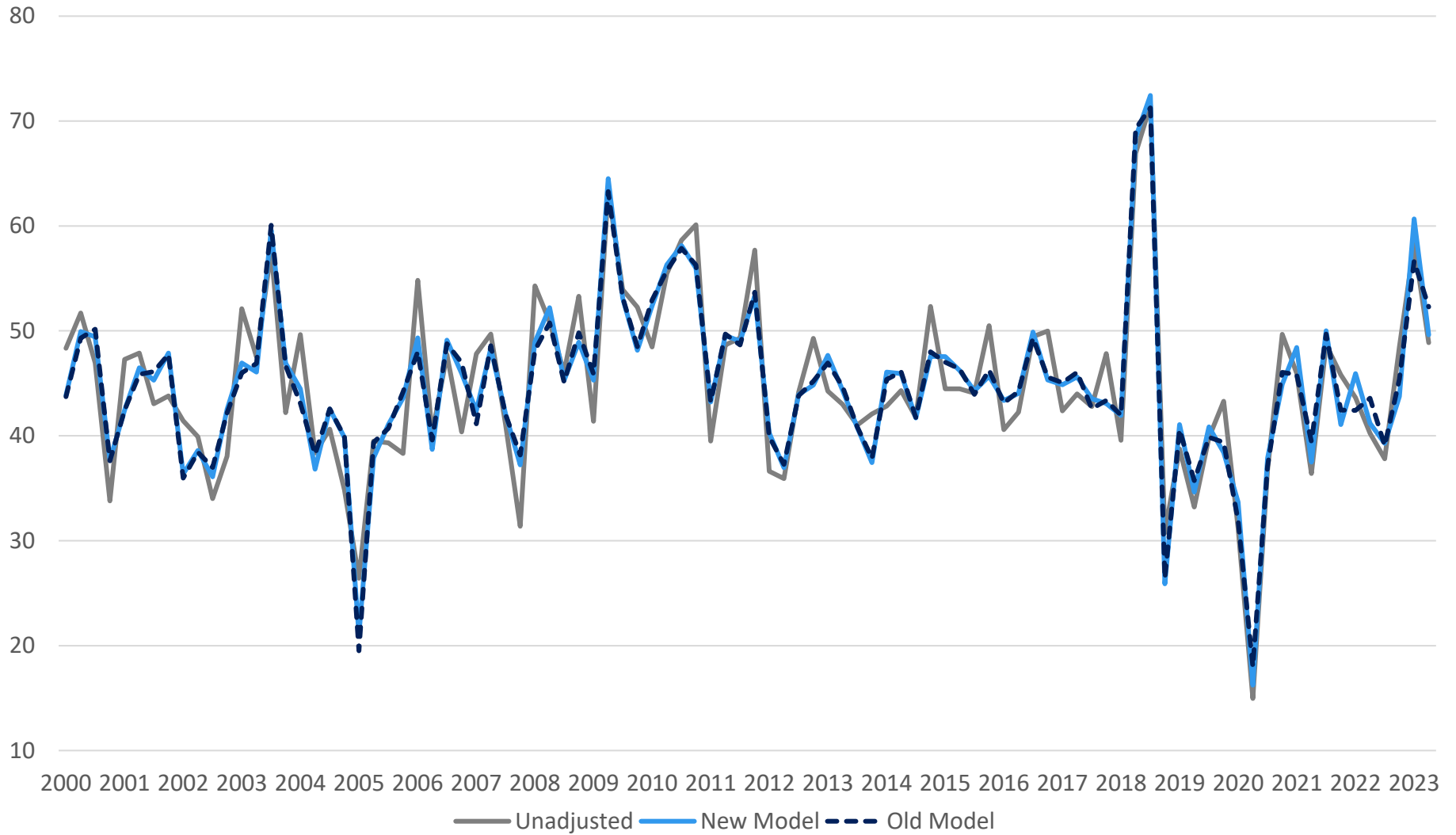
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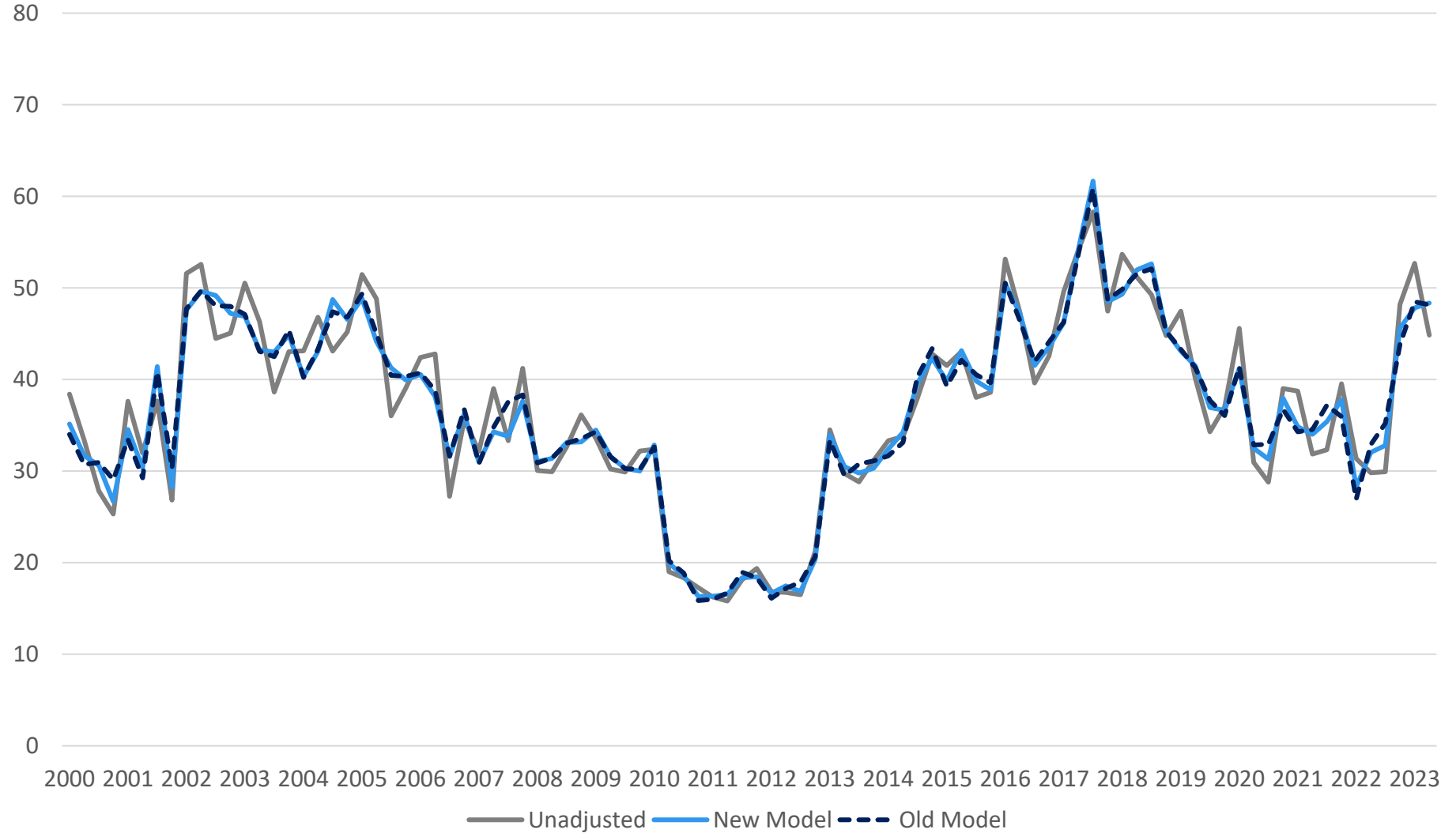
Figures are based to 2019

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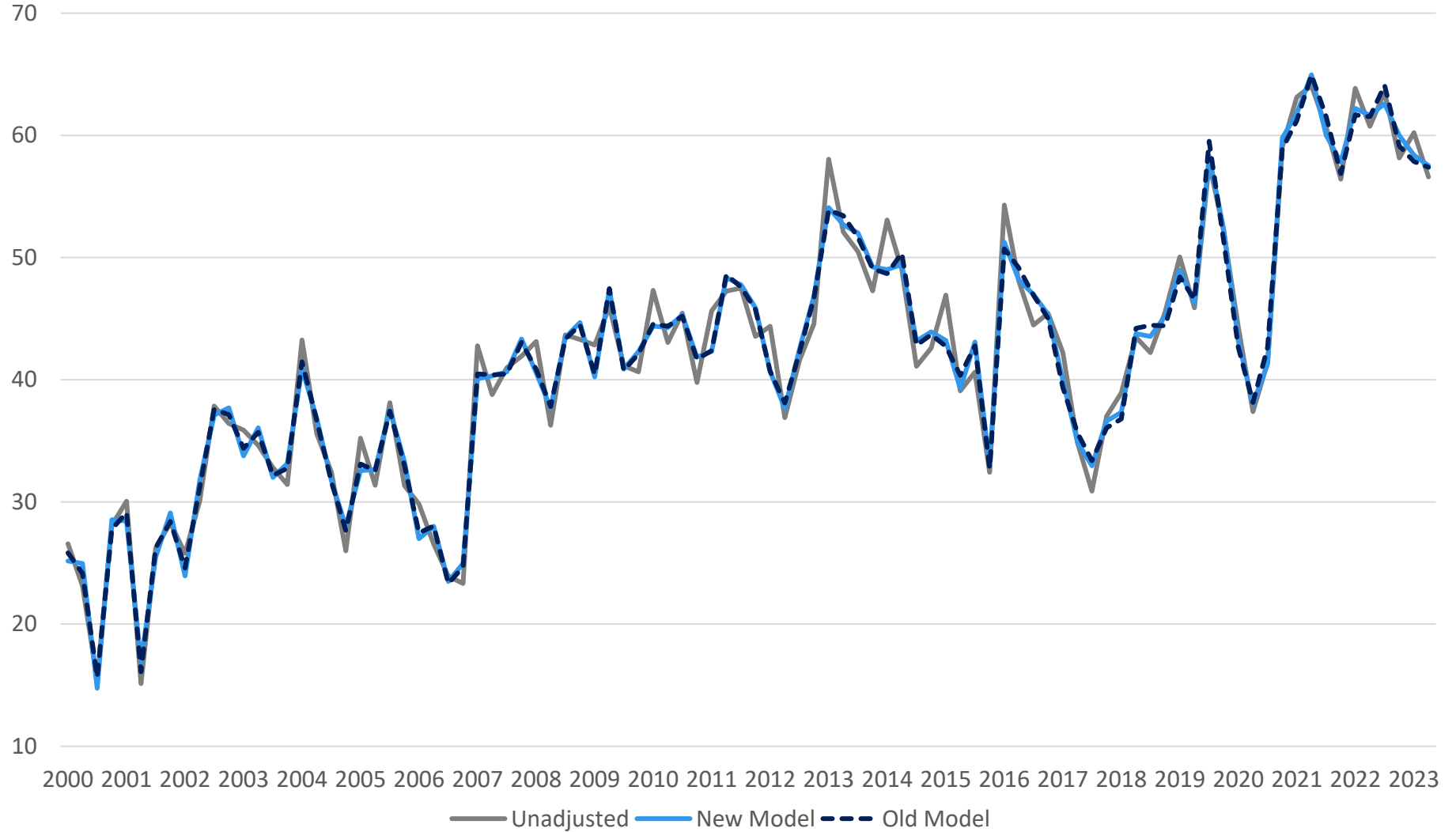
Figures are based to 2019

## Repair and Maintenance Housing Public



Figures are based to 2019

## Repair and Maintenance Infrastructure Public



Figures are based to 2019

# Repair and Maintenance Other Work Public

