SPECIAL ANALYSIS

Uncertain preliminary national accounts data complicate forecasting

National accounts data are revised over time as more detailed information becomes available. It is important for economic statistics to be updated once Statistics Sweden gains access to better data and methods, but major revisions come at a cost to users, partly because they make economic forecasts more uncertain. It is also problematic if there are systematic patterns in the revisions. The following presents an analysis of the characteristics of historical revisions of GDP, the components of demand (the expenditure side) and production in various sectors (the production side).[43] On balance, the results show that the characteristics of the revisions are more problematic for the production side than for GDP and the expenditure side.

NATIONAL ACCOUNTS DATA ARE REVISED REPEATEDLY

The quarterly national accounts are initially published around 60 days after the end of a quarter and are based largely on surveys. There are then repeated revisions in connection with subsequent quarterly releases in line with the revision policy for the national accounts.[44] Data are also revised in connection with the annual estimates, which are based on more detailed information, such as tax returns and annual reports. Besides these regular quarterly revisions and annual estimates, there are more general reviews roughly every five years as a result of new estimation methods, new data sources and the general accommodation of EU requirements and recommendations. These reviews also lead to revisions, often stretching far back in time. Thus, revisions of national accounts data are only natural and ought to contribute to an increasingly accurate picture of the Swedish economy's performance at a given time. However, the fact that the initial statistics do not necessarily provide an accurate picture makes the work of forecasters and economic decision-makers more difficult. Major revisions of the data can also complicate evaluations of economic policy decisions if the revised series paint a

[43] This analysis is a summary of "En statistisk analys av revideringar till nationalräkenskapsdata" [A statistical analysis of revisions of national accounts data], *Specialstudie* 42, Swedish National Institute of Economic Research, 2014.

[44] See "Revideringspolicy för BNP-beräkningarna och reala sektorräkenskaperna – NR0103" [Revision policy for GDP estimates and the real sector accounts – NR0103], NR-PM 2012:07, Statistics Sweden, www.scb.se/NR0103.

different picture of the state of the economy to the data available when the decisions were taken.[45]

To gain an impression of the extent to which revisions of national accounts data might prove problematic for users, the characteristics of revisions of a number of key variables have been assessed, and the results of this analysis are presented here.[46, 47]

DATA

The variables assessed are listed in Table 15.

Table 15 Variables

GDP by expenditure	Production
GDP	General government production
Household consumption	Non-profit institutions serving households (NPISH)
General government consumption	Business sector (SNI A-U)
Gross fixed capital formation	Goods producers (SNI A-F)
Exports	Agriculture, forestry, fishing (SNI A)
Goods	Mining (SNI B)
Services	Manufacturing (SNI C)
Imports	Construction (SNI F)
Goods	Service producers (SNI G-U)
Services	Trade (SNI G)
	Financial services (SNI K)
	Real estate activities (SNI L)

Note. SNI codes refer to SNI 2007 which is the Swedish implementation of the NACE Rev. 2 classification.

Source: Statistics Sweden.

[45] The present study does not distinguish between the different types of revision. It should, however, be noted that while, for example, revisions following the general reviews due to changes in definitions may be problematic for users, they are largely inevitable, as the statistics need to be adapted to a changing world and new methods. Any shortcomings in the revisions resulting from these general reviews are therefore difficult to address.

[46] See "En statistisk analys av revideringar till nationalräkenskapsdata" [A statistical analysis of revisions of national accounts data], *Specialstudie* 42, Swedish National Institute of Economic Research, 2014, for a complete account of the analysis and results.

[47] Regarding the terminology used in this special analysis – and more generally in related literature studying similar issues – it should be noted that it is normally the revisions' characteristics that are discussed. This may be somewhat ambiguous. It seems reasonable to describe a "good" revision as a revision that means that the data provide a more accurate picture of the economy. It is also quite possible to imagine a situation where every revision of the data that is made leads to a more accurate picture being obtained, but where the characteristics of the revisions are still problematic. The origin of the problem in this case is, of course, that the initial publication has shortcomings and could, in theory, have been better. This terminological issue should be borne in mind when discussing the results.

The assessment is based on data from the second quarter of 1999 (the first release based on the ESA 95 nomenclature) through to the fourth quarter of 2013.[48] Actual quarterly values in fixed prices (expressed as the annual percentage change, i.e. the percentage change relative to the same quarter the previous year, and also referred to below as the growth rate) have been used.

EMPIRICAL ANALYSIS

The revisions are defined as

$$r_{j,t} = x_{j,t} - x_{f,t}$$

where $x_{f,t}$ is the first estimate published for quarter *t* for a particular variable, and $x_{j,t}$ is the estimate for quarter *t* published *j* quarters after the first published estimate. The analysis spans *j=(1,2,..,7,s)* where *s* is the latest estimate published by Statistics Sweden.[49] The revisions at the different horizons have been assessed chiefly on the basis of two different characteristics.[50]

The first characteristic is *bias*. The expected value of the revision should be zero. If it is not, this means that there is systematic over/underestimation, or bias, in the first published estimate.

The second characteristic is the *volatility* – the standard deviation – in the revisions. If there is little volatility, this means that later estimates will not differ as much from the initial estimate. If, on the other hand, the volatility in the revisions is considerable, this means that the estimate originally published provides a poorer picture of the underlying state of the economy. Since different variables' growth rates vary to differing extents, there is a case for comparing the volatility of the revisions with the vari-

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[48] Statistics Sweden's real-time data for the expenditure side can be downloaded from its website on the "National Accounts, quarterly and annual estimates" page under the "Tables and Graphs" tab.

[49] The most recently published estimate in this study is from February 2014 with data through to the fourth quarter of 2013.

[50] "En statistisk analys av revideringar till nationalräkenskapsdata" [A statistical analysis of revisions of national accounts data], *Specialstudie* 42, Swedish National Institute of Economic Research, 2014, also looks at the characteristic of forecast efficiency, which means that the revisions cannot be explained using information that was available at the time of the first publication. A correlation with information that was available then means that it ought to be possible to improve the statistics published initially. The two efficiency tests carried out indicate that there are efficiency shortfalls for many variables on both the expenditure and production sides. The results indicate that, in theory, it ought to be possible to produce more accurate statistics in the earlier publications. However, shortfalls in efficiency are not necessarily easy to address in practice. The results of the efficiency tests must not therefore be interpreted as meaning that Statistics Sweden could have done a better job in those cases where the tests were significant. Instead, the results indicate where potential improvements could be made and/or additional resources could be deployed.

ables' own volatility, even though it is not necessarily the case that a more volatile variable will be revised more than a less volatile variable.[51] The higher the ratio between the volatility in the revisions and the volatility in the variable, the less information the first publication contains about the latest publication.

SYSTEMATIC UNDERESTIMATION OF GDP GROWTH…

The test for bias indicates that growth rates for GDP, household consumption, exports and imports have been systematically underestimated in the initially published estimates. On average, the growth rate for these variables has been revised up from the first to the latest estimate (see Table 16). In the case of exports, this bias stems from exports of services, whereas the bias in imports relates largely to imports of goods. The growth rates for public sector consumption, exports of goods, imports of services and gross fixed capital formation, however, are unbiased (see Table 16).

… AND OF GROWTH IN BUSINESS SECTOR PRODUCTION AND SERVICES PRODUCTION

The first publication of business sector production is not an unbiased estimate.[52] The positive value indicates that – as with GDP growth – the initial publication underestimates the latest publication (see Table 16). This is largely because the initial release for services production tends to be an underestimate. The production of services accounts for almost 70 per cent of business sector production and also has a significant bias. The production of goods, on the other hand, appears to be an unbiased estimate, but the same does not apply to all of its components. Neither construction, mining nor manufacturing production are unbiased estimates of the latest publication.[53] The coefficients have different signs, however, which means that the aggregate for goods production is not affected to the same degree. Despite substantial revisions, the initial publication of public sector production seems to be an unbiased estimate.

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[51] The variable's own volatility has been estimated on the basis of the latest data to be published.

[52] Production refers here to value added.

[53] The high negative value for construction production is due partly to a single major revision made in September 2013, when growth in construction production in 2011 was revised down by more than 10 percentage points.

Table 16 Results

	Unbiasedness	Volatility ratio
GDP	0.3[b]	0.2
Household consumption	0.5[a]	0.4
General government consumption	–0.1	0.7
Gross fixed capital formation	0.4	0.3
Exports	0.6[b]	0.2
Goods	0.3	0.1
Services	1.9[b]	0.6
Imports	0.7[a]	0.2
Goods	0.8[a]	0.1
Services	0.2	0.5
General government production	–0.2	0.9
Non-profit institutions serving households	–0.8	0.3
Business sector	0.5[a]	0.3
Goods producers	0.6	0.4
Agriculture, forestry and fishing	1.5	1.0
Mining	–3.8[b]	0.7
Manufacturing	1.7[b]	0.4
Construction	–2.9[a]	0.9
Service producers	0.5[b]	0.4
Trade	0.4	0.7
Financial services	1.5	1.1
Real estate activities	0.7	0.8

Note. Values refer to an analysis based on the most recently published data, i.e., *j=s*. The volatility ratio is the standard deviation for the revision divided by the standard deviation for the variable. The ”Unbiasedness” column shows the average revision on the *j=s horizon*. Superscripts ”a” and ”b” denote rejection of the null hypothesis on the one and five per cent level, respectively.

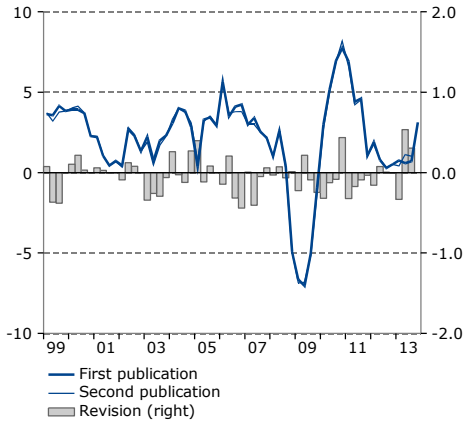
Source: NIER.

GENERALLY LIMITED VOLATILITY IN THE REVISIONS OF GDP AND THE EXPENDITURE SIDE

The volatility in the revisions increases with the revision horizon. Diagrams 125 and 126 present time series with the first, second and latest publications of GDP growth and the revisions between these series. The revision is greater for the latest publication than for the second publication, which is to be expected, as the statistics are revised further relative to the initial publication as more detailed information becomes available.

Diagram 125 GDP

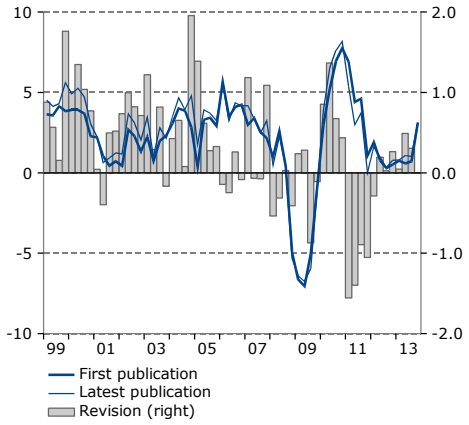
Percentage change and percentage points, respectively



Sources: Statistics Sweden and NIER.

Diagram 126 GDP

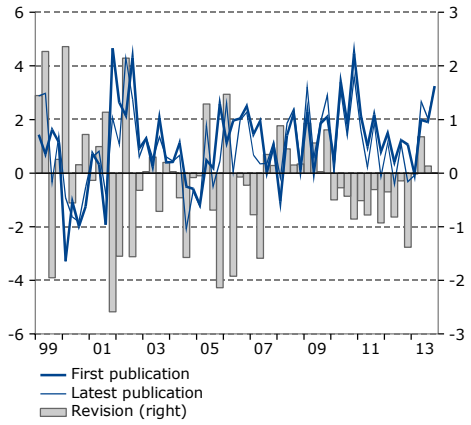
Percentage change and percentage points, respectively



Sources: Statistics Sweden and NIER.

Diagram 127 General government consumption

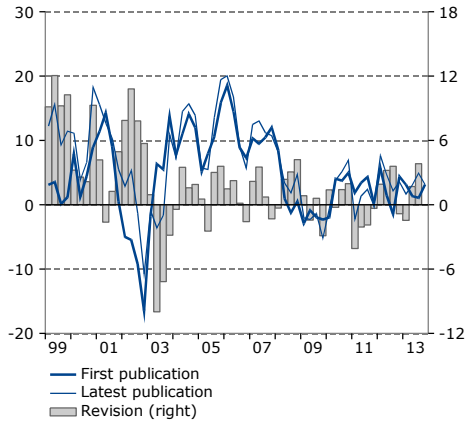
Percentage change and percentage points, respectively



Sources: Statistics Sweden and NIER.

Diagram 128 Exports of services

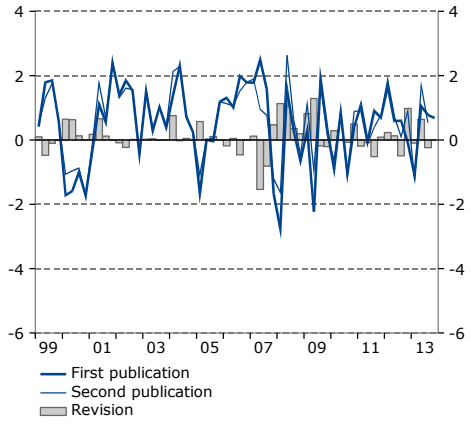
Percentage change and percentage points, respectively



Sources: Statistics Sweden and NIER.

Diagram 129 General government production

Percentage change and percentage points, respectively



Sources: Statistics Sweden and NIER.

The volatility in the revisions of GDP and most of the variables analysed on the expenditure side is relatively low, however. The ratio between the volatility in the revisions for the latest publication (i.e. *j=s*) and the volatility in the variable itself is 0.3 or less for most of the variables (see Table 16).

It is primarily the volatility in the revisions of public sector consumption and exports of services that appears to be problematic (see Diagrams 127 and 128). These variables are revised substantially further, and the ratio between the volatility in the revisions for the latest publication and the volatility in the variable itself is more than 0.7 for public sector consumption and more than 0.6 for exports of services (see Table 16).[54] The ratio for imports of services is also relatively high.

CONSIDERABLE VOLATILITY IN THE REVISIONS OF PRODUCTION IN DIFFERENT SECTORS

On the production side, public sector production – which accounts for almost 20 per cent of GDP – is heavily revised. The volatility in the revisions of public sector production is considerable in the second publication (i.e. *j=1*) and even higher in the latest publication (see Diagrams 129 and 130). The ratio between the volatility in the revisions for the latest publication and the volatility in the variable itself is 0.9 (see Table 16), which indicates that it is difficult to draw any conclusion about production from the first data published.

The volatility in the revisions for business sector production is smaller (see Diagram 131). The ratio between the volatility in the revisions for the latest publication and the volatility in the variable itself is 0.3.[55]

The volatility in the revisions for the production of goods and the production of services is somewhat higher than for the business sector as a whole. The ratio between the volatility in the

[54] Some variables were affected more than others by the financial crisis. This means that there is also a case for comparing the volatility in the revisions with the volatility in the variable over a shorter time period, so that the volatility in the revisions is not compared with a period when the variable's volatility was abnormally high. In the case of GDP and gross fixed capital formation, the ratio rises to 0.5 when compared with volatility in the variable for the period from the second quarter of 1999 to the third quarter of 2008 (i.e. excluding the financial crisis and subsequent period). See "En statistisk analys av revideringar till nationalräkenskapsdata" [A statistical analysis of revisions of national accounts data], *Specialstudie* 42, Swedish National Institute of Economic Research, 2014, for detailed results.

[55] Growth in business sector production has been unusually volatile since the financial crisis. If the period since the third quarter of 2008 is excluded, the ratio climbs to 0.5.

revisions and the variables' own volatility is 0.4 for both aggregates.[56]

For all of the smaller sector aggregates assessed, the revision volatility in the revisions is considerable. The production of financial services stands out with substantial revisions as early as the second publication (see Diagram 132). The ratio between the volatility in the revisions for the second publication and the volatility in the variable itself is 0.8. Compared with the latest estimate to be published, the ratio rises to 1.1, which means that the volatility in the revisions is greater than the volatility in the variable itself.

DISAGGREGATED DATA SHOULD BE INTERPRETED WITH CARE

The analysis of the revisions of national accounts data presented here indicates that there are various shortcomings in terms of both bias and volatility. Although these shortcomings can be found on both the expenditure and production sides, the production side is more problematic on account of what are, in some cases, highly volatile revisions.

One reason for the high volatility in the revisions on the production side is that the quarterly estimates lack information on intermediate consumption in different sectors, which means that Statistics Sweden is forced to make assumptions about input coefficients. The assumption is normally an unchanged input coefficient from the latest annual estimate. The revisions in connection with the annual estimates can therefore be considerable if the coefficients change. It can be difficult for Statistics Sweden to address this problem, however, as more complete sources are not available at the time of the initial estimates.

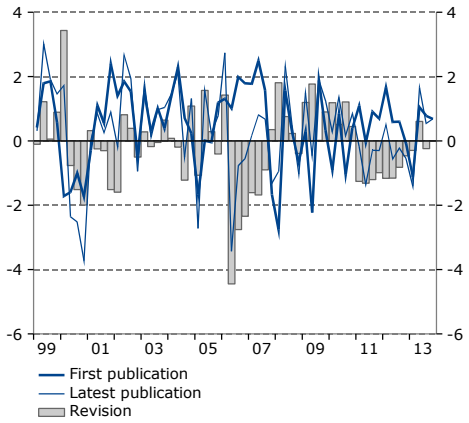
The NIER has a long tradition of producing forecasts for production in different sectors. The results of this analysis indicate, however, that the information value of the initial data for production in some sectors leaves something to be desired. The basis for producing sector analyses and forecasts is therefore not as good, which is something that users of statistics and forecasts need to bear in mind.

The bias observed for a number of variables on both the expenditure and production sides indicates that there is room for improvement in the production of the statistics. Bias also undermines the basis for high forecast accuracy, and it would be

[56] If the period since the financial crisis is excluded, however, the ratio rises to 0.9 for goods-producing sectors and 0.6 for services-producing sectors. The difference is explained by it mainly being the goods-producing sectors that were hit by the financial crisis.

Diagram 130 General government production

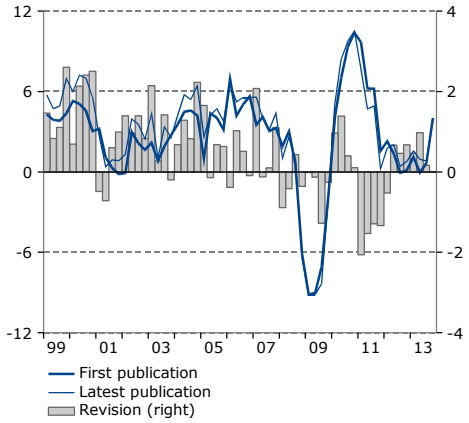
Percentage change and percentage points, respectively



Sources: Statistics Sweden and NIER.

Diagram 131 Business sector production

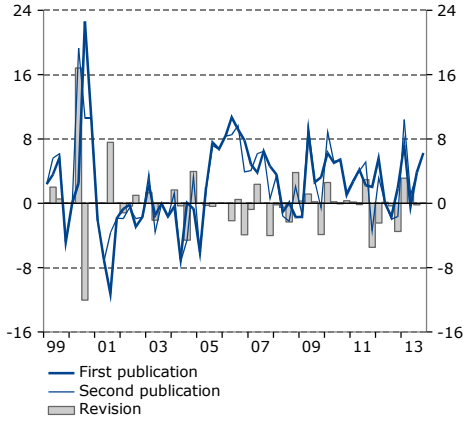
Percentage change and percentage points, respectively



Sources: Statistics Sweden and NIER.

Diagram 132 Financial services production

Percentage change and percentage points, respectively



Sources: Statistics Sweden and NIER.

useful for the causes of this bias to be investigated so that any problems can be resolved.