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Revisions of production data in the Swedish national accounts

2007:2

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Foreword

In the final report of the Commission on the Review of Economic Statistics (SOU 2002:118) a study on the revisions of the expenditure components of Gross Domestic Product (GDP) was included. The present report consists of a corresponding study on the revisions of the production, or value added side of the Swedish national accounts. With focus on the quarterly accounts the behaviour of different vintages of industries is analysed. The authors of this study as well as the earlier study are Karl-Gustav Hansson and Lars-Erik Öller.

Any views or opinions expressed in this background fact are those of the author.

Statistics Sweden, February 2007

Gunnel Bengtsson

Contents

Abstract

This is a continuation of the report Öller and Hansson (2002), of which an abbreviated and amended version was published as Öller and Hansson (2004). These studies analysed the revisions of the expenditure components of the Gross Domestic Product (GDP). The present report takes up the *production,* or *value added* side of the accounts, studying the behaviour of different vintages of industries. The focus is on the quarterly accounts. We find that GDP production components behave more or less in the same way as the expenditure components. Preliminary figures are downward biased, some revision distributions are significantly non-normal and revisions are correlated with the business cycle, positive in upturns and negative in downturns.

1 Introduction

1.1 GDP: Expenditures, production and income

This is a continuation of the report Öller and Hansson (2002), of which an abbreviated and amended version was published as Öller and Hansson (2004). These studies analysed the revisions of the expenditure components of the Gross Domestic Product (GDP). By definition, GDP can equivalently be compiled from three different angles: *expenditures*, *production* and *income*. This report takes up the *production,* or *value added* side of the accounts, studying the behaviour of different vintages of industries. The focus is on the quarterly accounts, but we also look at some annual figures.

A term often met in revision studies is "vintage", also to be used in this study. It is defined as the numerical value of a time series for a certain time period (quarter, year) as available to the general public at a later point in time. Every time a figure is revised a new vintage is born, and the procedure goes on until a final figure is obtained. Often new definitions lead to revisions even after that, see Öller and Hansson (2004).

1.2 Problems with revisions

The difficulties in trying to assess the reliability of statistical figures that are subject to revision are thoroughly discussed in Öller and Hansson (2002), (2004). Here we shall only highlight some important issues.

First, National Accounts (NA) are based on statistical *estimates*. Even a figure that is labelled as "final" is an estimate, the accuracy of which is unknown. When holding up this figure as a benchmark for preliminary figures, so as to assess its accuracy, we have to keep in mind that we are only comparing two estimates, hoping that a later estimate is more accurate than an early one. The same problem also mars forecast accuracy studies.

Second, equating accuracy with small revisions subsumes that we are dealing with diligent and honest statisticians who try their best to find errors and shortcomings in their data, and who are willing to admit that a previous publication has to be revised.

Furthermore, we are only dealing with data as registered and processed at Statistics Sweden (SCB). Despite efforts at editing incoming data, they may still contain major undetected errors and uncertainties, originating from the respondents in SCB's surveys.

1.3 Previous studies

The demand for accurate national accounts has been around since the 17th century when Sir William Petty estimated the first modern national income figure using simple extrapolation from demographic data. In the late 1940s and early 50s, the need for such accounts became acute. The list of contributors to the accomplishment is impressive and contains names such as: Kuznets, Gilbert, Jaszi, Stones, Kennessay, Morgenstern, Ohlson and Malinvaud.

It has been said that compiling statistics is like looking into a black box without a lamp, or in the words of Sir Harry Campion (1958, p. 4) "papering over the vacuums of knowledge". Still, as Goldberg et al. (1965, p. 4) state: "The question of whether the accounts are as accurate as they should be must be faced".

The expenditure decomposition of GDP attaches much more public interest than the production accounts. Consumption forms more than one half of GDP in developed economies and is a variable of interest to every consumer. Investments signal future growth and exports reflect the competetiveness of the economy on the world market.

The only production variable often shown in economic reports is *Manufacturing*. However, in post-industrial economies its share in total GDP is decreasing, giving way to an expanding service sector. But in business tendency surveys and as a reference variable for leading indicators it is still popular.

When studying expenditure revisions of NA it was easy to find studies from many countries. In particular, the US NA are subject to thorough revision studies at regular intervals. However, only expenditure and income variables are studied. The only papers analyzing revisions of production variables that we have been able to trace are Barklem (2000) for the UK and Tengblad (1992) for Sweden. Symons (2001) studies UK annual production figures, but since our emphasis is on quarterly observations we will in Section 4.6 compare Barklem's figures with ours. The smaller interest in value added revisions does not mean that these are negligible, as our results in Section 4 will show.

The consequences of using preliminary vs. final data for policy and modelling, have been analyzed. The former in Swanson et al.(1999), the latter in Boucelham and Teräsvirta (1990).

1.4 This study

What should one expect from revisions? Naturally, large revisions are not popular. Revisions should be rational in the sense that the difference between preliminary and final outcomes should be independently and normally distributed with mean zero (unbiased) and constant variance. Furthermore, they should not correlate with any other known variable, e.g. the final figures themselves.

In Öller and Hansson (2004), the 13 most important expenditure variables were studied. Here we will focus on the five most important production aggregates.

The emphasis of this study is on graphical display. Diagrams are ideal to show how time series change after revisions. Section 2 describes the observations and variables to be analyzed. In Section 3 we comment on the diagrams used to show the results and the statistical characteristics estimated from the data.

Section 4 contains the results of the study. We start with histograms of revisions in Figure 1. The distributions are tested for normality, and where possible, for bias. For the period 1981-1996 the residuals between expenditure and production accounts are available, these merit some comments.

Statistical characteristics of the revisions are also shown numerically. In the next paragraph we look at how growth rates have been revised for each quarter, starting with the first preliminary estimate, in Figure 2. We then show the time series of vintages, splitting up the variation into a business cycle component in Figure 3, as reflected in different vintages, and seasonal patterns in Figure 4. Some more detailed comments conclude this section.

Section 5 summarises the results.

2. Data

2.1 Production sectors

The main aggregates to be studied are: *Gross Domestic Production (GDP), Producers of Goods, Manufacturing, Producers of Services, and Government Production*. Observations are mostly in *annual change*, but Figures 3-4 are in levels. A shorter time series of the discrepancy between the expenditure and production accounts, called "Residual" will also be analysed.

2.2 Period of study

The period of study is 1980-2003[1]; observations are *quarterly* and *annual* figures at constant prices. The latest data are from 2005.

2.3 Vintages

Final figures are those released in December in year $t + 2$. These are compared with preliminary figures published some 70 days after the end of the quarter, as in Öller and Hansson (2002). Additionally, revised figures from December $t + 1$ are studied in Figures 2-4.

The preliminary figure of the first quarter is revised three times, the second is revised twice and the third once; the fourth quarter figure is only revised in connection with revisions of annual accounts. The revisions of quarterly figures originating from the annual accounts are said to be implemented into the quarterly accounts mainly by lifting or lowering the seasonal pattern, but the different seasonal patterns in Figure 4 in many cases contradicts this claim.

Recalculation of series with year 2000 as base year are also shown, as is a shorter series based on special input-output matrices, here called IOR, for the years 1980-1989.

2.4 Calculation frames and processing

Lupi and Peracchi (2003) list the sources of revisions:

1) Approximations to the conventional definitions of GDP,
2) Incomplete information,
3) Sampling errors,
4) Non-sampling errors, such as measurement, reporting, coverage, or non-response errors,
5) Preliminary treatment,
6) Indirect estimation of quarterly variables,
7) Adjustment in order to respect accounting constraints, and
8) Human errors.

[1] Note that the residual between expenditure and value-added-based GDP has not been published after 1998.

3. Methods

3.1 Methodological approach

The present study is mainly explorative, documenting and displaying the data in diagrams and through statistical characteristics in tables. A few statistical tests will be made.

Revisions are calculated as the difference between final figures (as of December $t + 2$) and the previous vintages.

3.1.1 Statistical characteristics

Another way to summarise information in numerical data is to calculate descriptive statistical characteristics. Here the properties of revisions are described by the following statistical measures: Bias, as measured by the mean and the median, mean absolute revision (*MAR*), standard deviation (*Std*), range, correlation between revisions and business cycles (*Corr*), as expressed in final figures, root mean square revisions (*RMSR*) and impact of component revisions on GDP. Both S*td* and *RMSR* are also presented in relation to the *Std* of final figures (*rStd, rRMSR*). This is because larger revisions may be expected in variables with large variance than in variables that change little over time. If this *Theil Measure* is above unity, then reporting the historical mean instead of a preliminary figure would have resulted in smaller revisions.

For a more detailed discussion of these characteristics, see Öller and Hansson (2004).

3.1.2 Graphs

The distribution of revisions can best be shown in *histograms*, from which the reader can in a glimpse see if there is a bias – a tendency to report too low or too high figures in preliminary estimates. A histogram also shows the spread of revisions, which translates into uncertainty or inaccuracy. Skewness and kurtosis (fat/thin tails or flat/thin centre) can be detected by eye, but will also be tested against the normal distribution, using the Anderson-Darling test.

Time series of annual growth rates, as shown by different vintages, provide the reader with an idea of how business cycles, peaks and troughs have been reported at successive points in time. Quarterly time series in levels reveal if the seasonal patterns of the vintages are more or less the same. Deseasonalising preliminary values using models for final data requires unchanged seasonal patterns across vintages.

4. Results

The following most important variables are shown: *GDP*, *Producers of Goods*, *Manufacturing*, *Producers of Services* and *Government Production*.

4.1 Histograms and characteristics of revisions

Starting with *GDP*, the histogram in Figure 1 looks much the same as in Öller and Hansson (2002)(2004). The mean (bias) in Table 1 is 0.29 and the median is 0.20, hinting at some skewness. Non-normality is supported by the Anderson-Darling test, so that the bias can not be tested using a *t*-test. As expected for so large an aggregate, the difference between the largest and the smallest revision is just 4½ percentage points, but note that this means that a quarterly preliminary value of GDP annual growth can be revised by more than two percentage points. Common growth figures lie in the interval 1-3 percent. The correlation (*Corr*) with the business cycle is large, but we refrain from using the *t*-test because of possible non-normality. The relative Root Mean Square Error (*rRMSR*) is 1.06, meaning that the preliminary value is no more accurate for that quarter's annual growth rate than the arithmetic mean of historical values.

Producers of Goods. The mass clearly tips over to the right, so that there is a positive bias. Table 1 shows that the mean is 0.34, so that there is a tendency to underestimate in the first publication. The median is slightly larger, expressing the apparent skewness. According to Table 1 the null hypothesis of normality cannot be rejected, but we are on the limit (P>0.07) of the 5 % confidence level. With some hesitation, the bias can be tested in a one-sided *t*-test. It is almost statistically significant (1.65<1.67). The *Range*, with extreme revisions of -7.8 and 4.5 is rather large for such a heavy aggregate. The revisions correlate with the business cycle, the correlation between revisions and final values is 0.53 and significant (assuming normality), meaning that upturns are overvalued and downturns undervalued. The ratio between the Root Mean Square Error (*RMSE*) and the standard deviation of the final values (*Std*), *rRMSE*=1.01, again meaning that preliminary quarterly values contain no more information about the annual growth rate than the mean of the time series.

Manufacturing has even more marked bias (0.5) and some skewness. Table 1 shows that non-normality is not statistically significant, but that the bias is. The largest revisions are of the same size as for the previous variable (-7.1 and 5.7). The same can be said about correlation (*Corr*) with the business cycle and the relative error, *rRMSE.*

Producers of Services is a more reliable variable than the previous ones, except for a large bias of 0.42. But since non-normality is hinted at, it is not tested. The spread is smaller (*Std*=1.1), and the *Rang*e is 7 percentage points. But *Corr*=0.4 and would have been statistically significant if the distribution could have been regarded as normal. Also for this variable the time series mean contains at least as much information on the annual growth rate as the preliminary value *rRMSE* = 1.07.

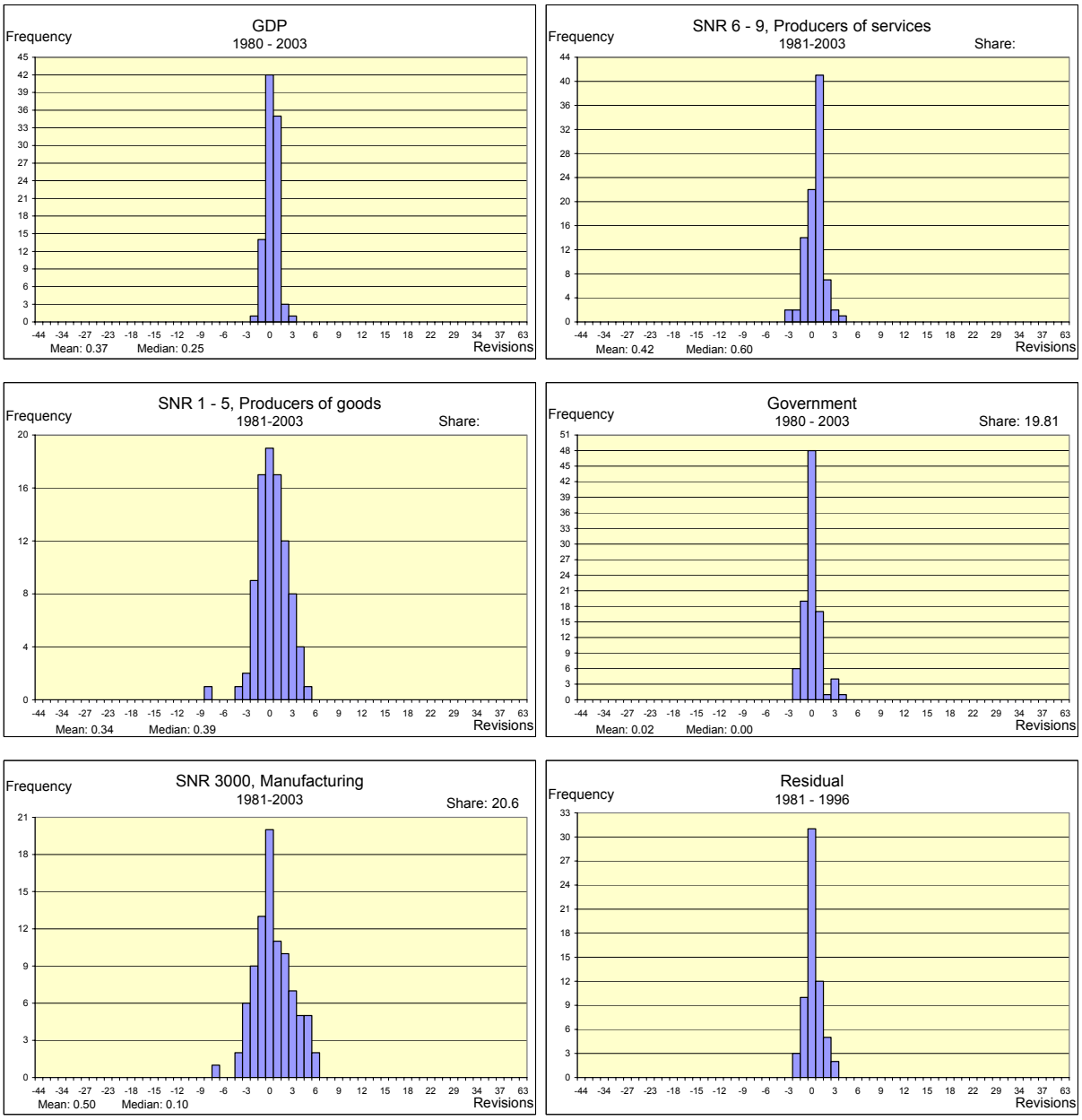
Government production. Compared to Government Consumption in Öller and Hansson (2004), this variable is much more reliable. It does not seem to have any bias and the *Std* is just one percentage point. However, the distribution of revisions is non-normal having very large kurtosis. Because *Corr*=0.4, underestimating swings is typical. The relative error is again larger than unity.

GDP Residuals. Residuals (in percent of GDP) across time and vintages between Expenditure and production accounts were published during the period 1981-1996. The mean is just 0.17, which is not statistically signify-cant. The normality hypothesis is not rejected. The spread is small but the correlation with the business cycle is significant. The relative *RMSE* is again unity. Note that the *Range* is 4.67, which is quite large, considering that the revisions of the residuals are measured in GDP growth percentage points.

Table 1. Statistical characteristics, units: per cent

	GDP	Produc-tion of Goods	Manufact.	Produc-tion of Serv.	Govern-ment Pro-duction	Residual
Mean	0.29	0.34	0.5*	0.42	0.02	0.17*
Median	0.2	0.39	0.1	0.6	0	-0.03
MAR	0.63	1.52	1.85	0.93	0.7	0.74
Std	0.77	1.96	2.4	1.1	1	0.97
Range	4.5	12.3	12.83	7	6.2	4.67
Corr	0.41	0.53	0.55	0.4	0.38	0.34
rMean	0.16	0.14	0.16	0.17	0.05	1.27
rMAR	0.26	0.39	0.36	0.34	0.5	1.33
rStd	0.36	0.47	0.42	0.53	0.61	1.25
RMSR	0.82	1.98	2.43	1.17	0.99	0.98
rRMSR	1.06	1.01	1.02	1.07	1	1.01
Norm, p	0.001*	0.07	0.08	0.001*	0.005*	0.21
Impact %	..	43	35	41	12	0.3

Figure 1. Histograms of Revisions. Quarterly National Accounts



Notes: Annual growth rates; number of occurrences on the vertical axis; revisions in percentage points on the horizontal axis.

4.2 How the figure of each quarter chages over time

Here we show in a concrete way how quarterly figures are revised over a two year period. As mentioned in Section 1.4, ideally revisions should be small and unsystematic. But there definitely are systematic features in the graphs. Revisions are not randomly fluctuating around a final value. Instead, they have a tendency to move in the same direction, usually upwards, reflecting the downward bias in early figures. Note, however, that they also tend to fall in a systematic way in recessions. A case in point is manufacturing in the beginning is the 90s. This is another way of showing how the revisions correlate with the business cycle.

Visual inspection detects some outliers. GDP, 3rd quarter 2004 is growing by more or less 4 percent in the three first publications. Then in the following two publications growth is zero, but in the last publication it is almost back at the starting value. Producers of Goods dives from the zero level to almost -7 percent, probably an error. All quarters, except the first seem to have been seriously undervalued during the expansion of the second half of the 90s.

As mentioned in the previous paragraph, Government Production is much more reliable than Government Consumption. However we see the same tendencies of systematic movements here, too. In quarter 4, 1992, there seems to be a typo, where the figure goes from close to -4 percent to +4 percent, and then back again.

The residuals between expenditures and value added have large systematic movements during the 3rd and the 4th quarters in the 80s.The reason is unknown. The discrepancies taper out in the 90s.

Figure 2. Vintages of Growth Rates 1980-2005 Quarterly National Accounts

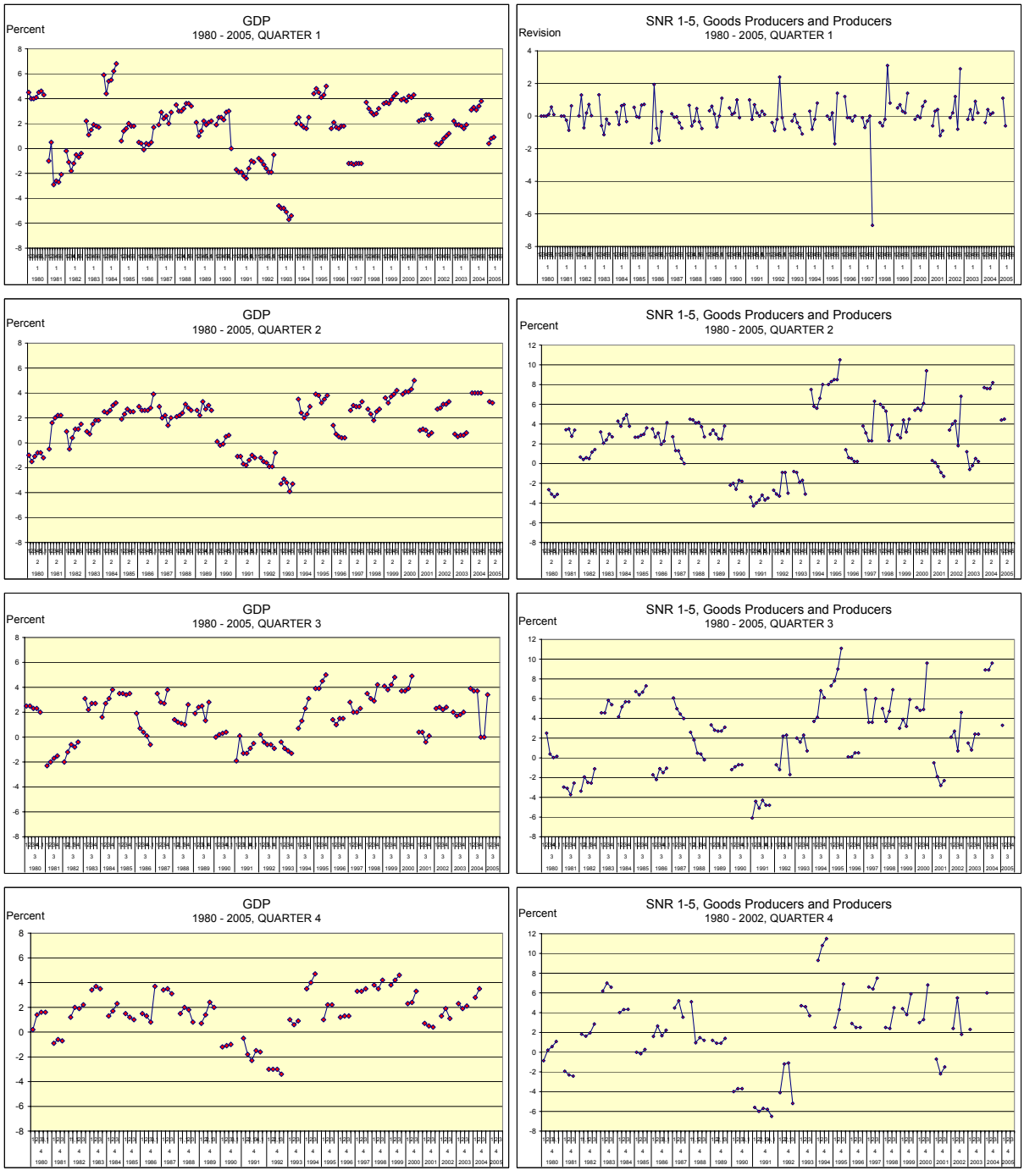
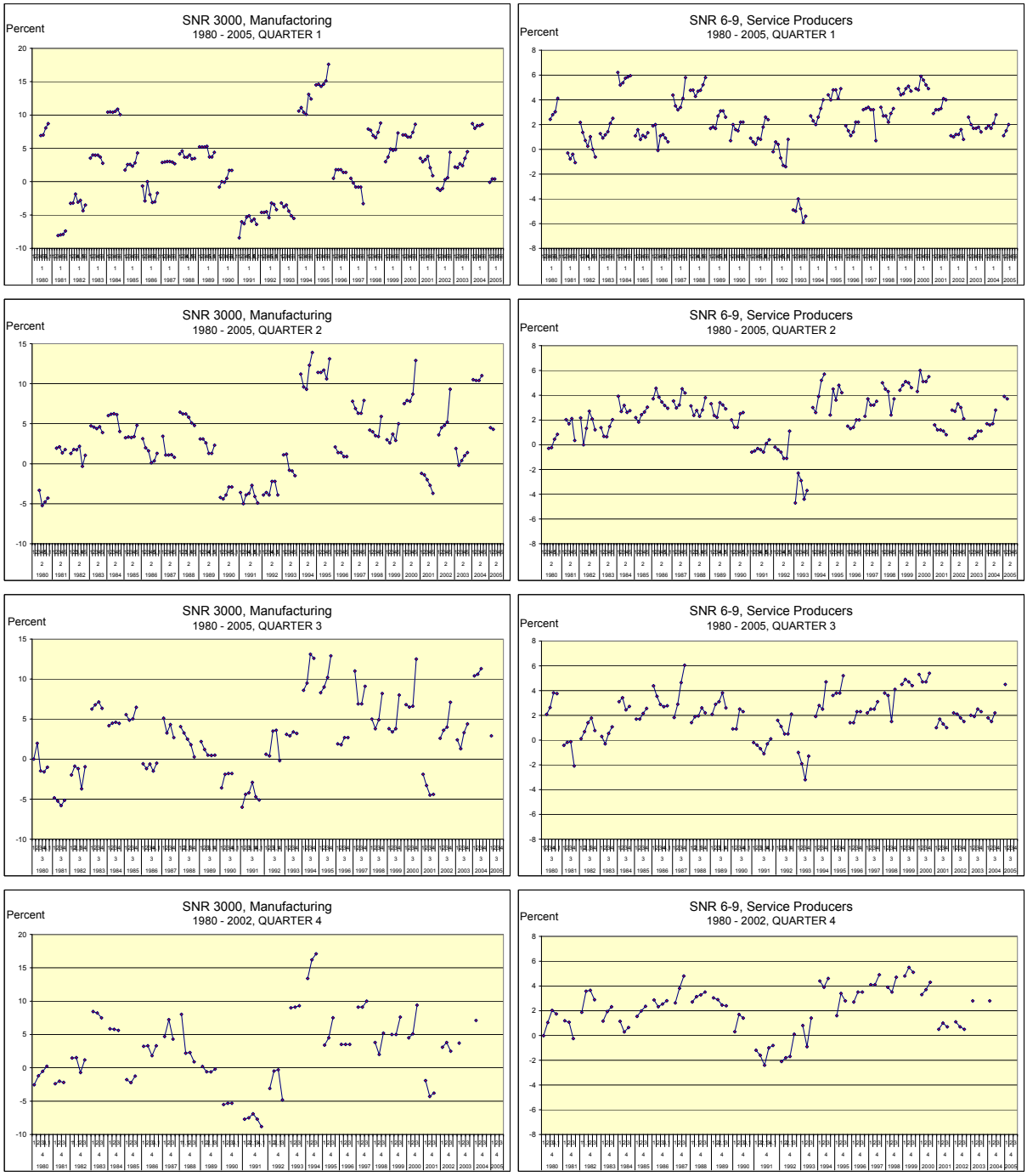


Figure 2. Vintages of published growth rates 1980-2005. Quarterly National Accounts



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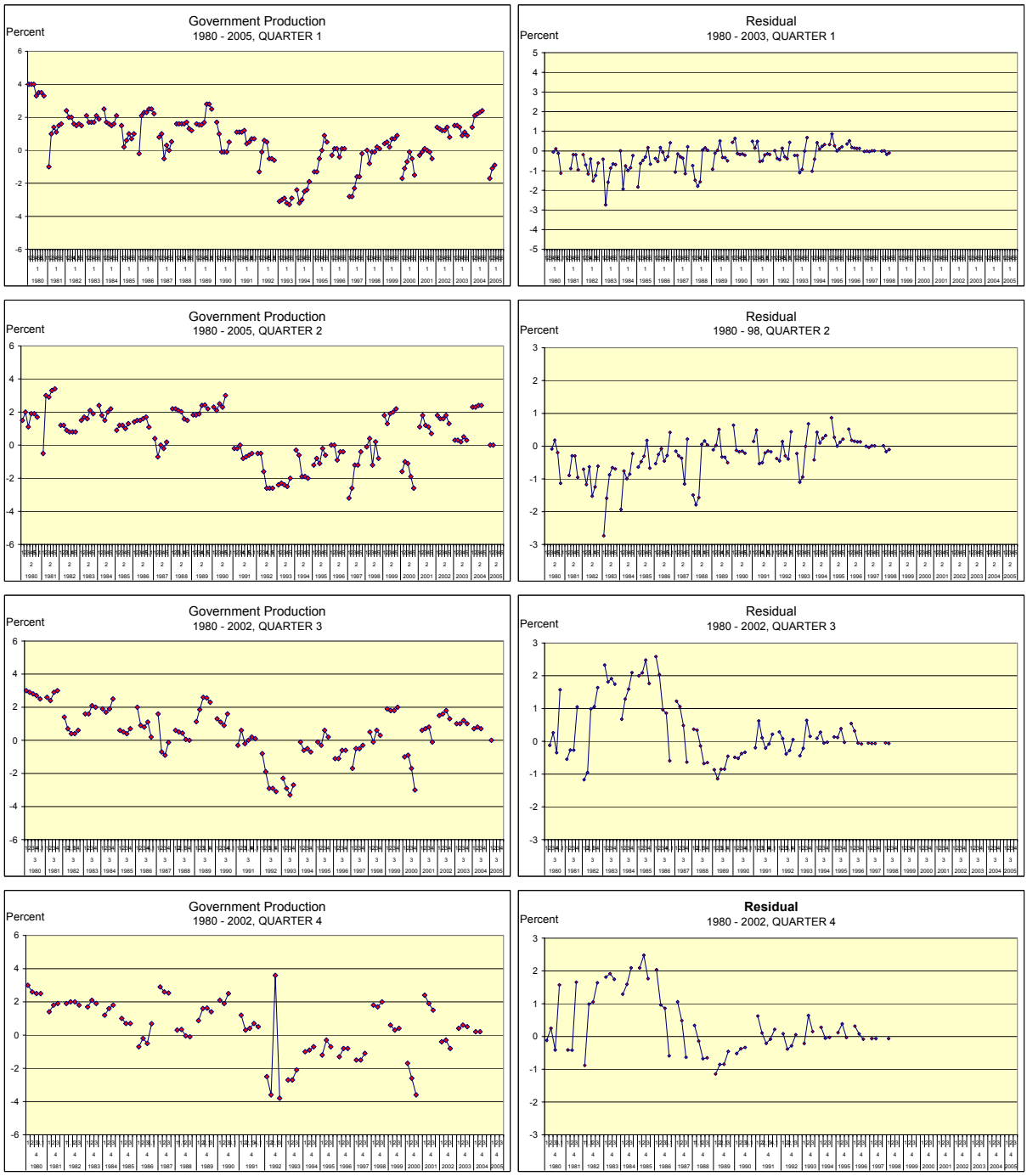


4.3 Time series of vintages

The time series of vintages will here be decomposed into two components: a business cycle component, where we follow the development of quarters over time, and a seasonal component, where we study the development of chronological level observations.

Unfortunately, only the final figures are transformed and saved when changes of base year and definitions are implemented. Consequently, the earlier vintages of levels have had to be reconstructed extrapolating annual changes.

4.3.1 Business cycles

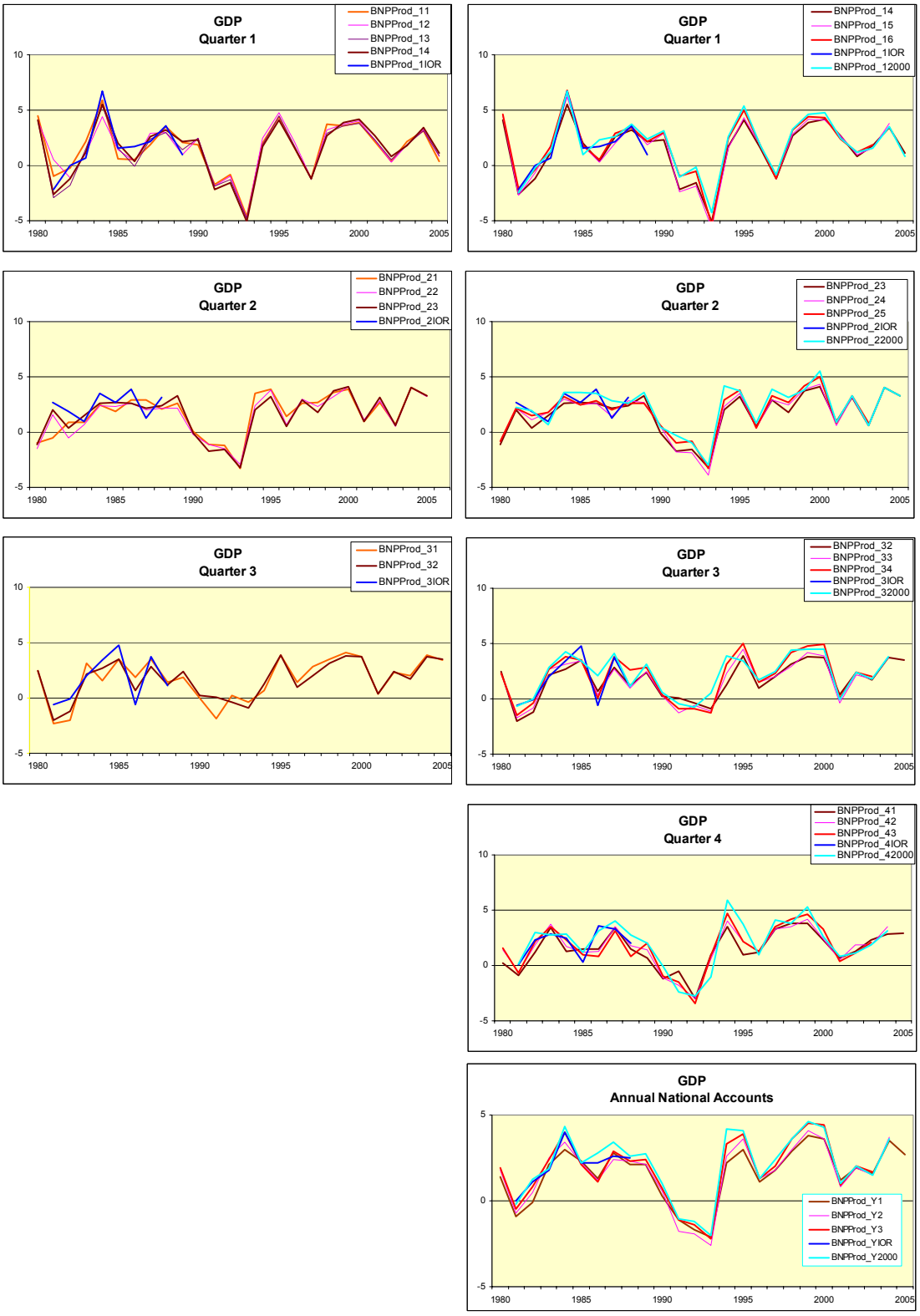
How well do early vintages inform about the business cycle? Are the peaks and troughs occurring at the same time in all vintages? In Figure 3 vintages of business cycles for quarters 1-3 of the main components of GDP are shown to the left. In an ordinary production cycle, quarter one is revised 6 times, curves11-16. For example BNPPROD_11 means GDP quarter 1, vintages 1. In the right hand diagram the vintages of "first IOR" (Input-Output Revision, i.e. revisions based on input-output tables) and GDP in reference year 2000 are included.

Looking at GDP, paradoxically, the first quarter that undergoes the largest number of revisions seems to change slightly less than the other quarters. Another observation is that the change of base year to 2000 (blue line) has had a considerable impact on the series.

The profile of the recession in the 90s differs for quarter 3. This quarter contains the month July when most Swedes spend their annual holidays, and here the strong seasonal component may have dominated over the business cycle. Furthermore, the profiles of the booms in the 80s and 90s, even for the annual figures differ between the base 2000 and the other figures. Why a change of base year could have such an effect is not clear.

The other graphs may speak for themselves. Here, too, cyclic profiles change, as do turning points. The chronological order of revisions is given in the colour key in each graph.

Figure 3. Vintages of Business Cycles 1980-2005. Quarterly National Accounts



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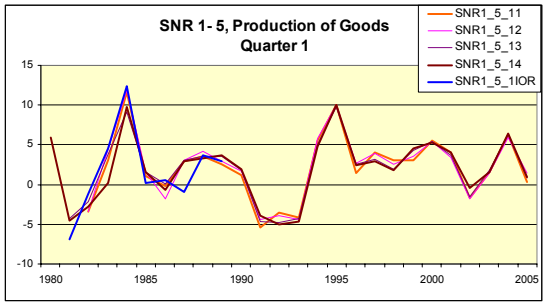

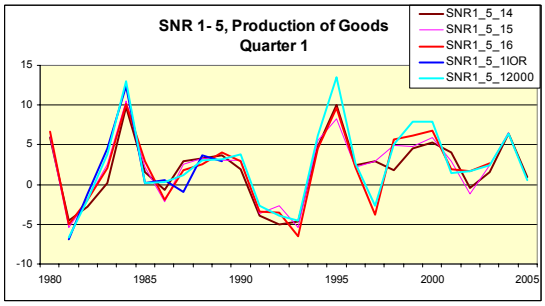

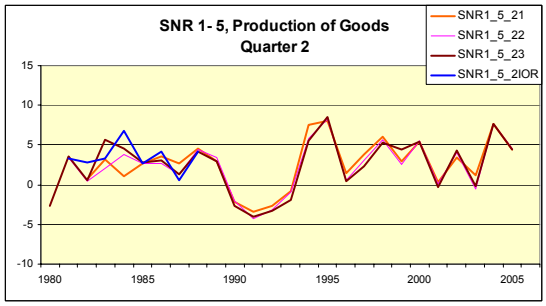

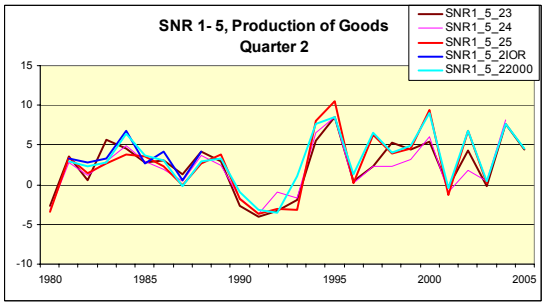

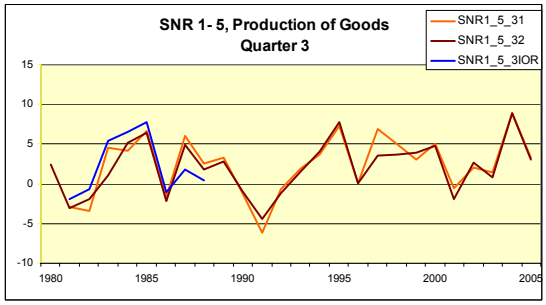

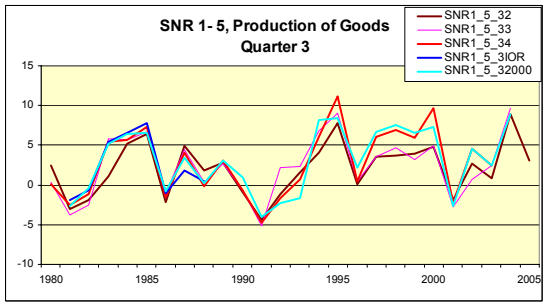

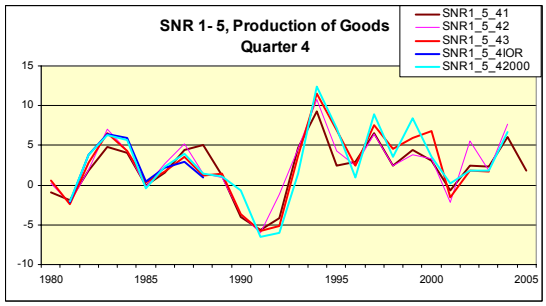

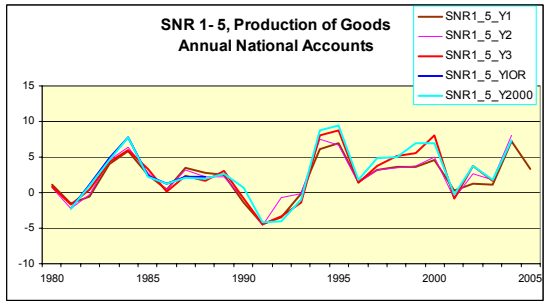

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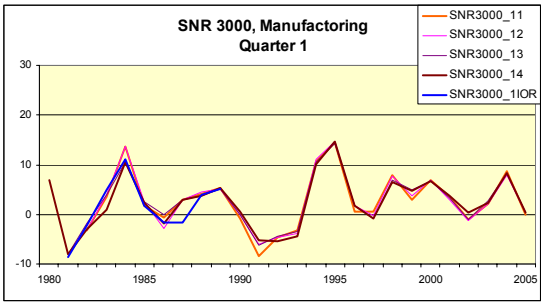

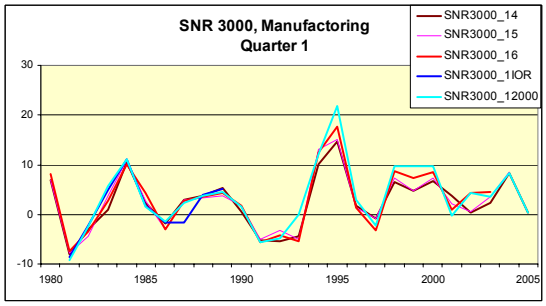

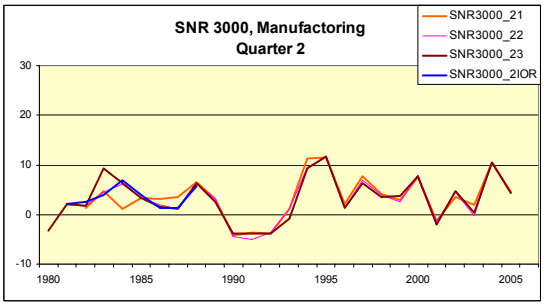

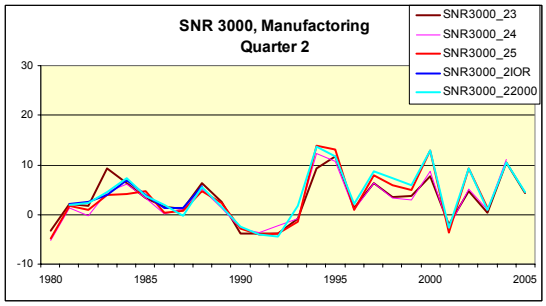

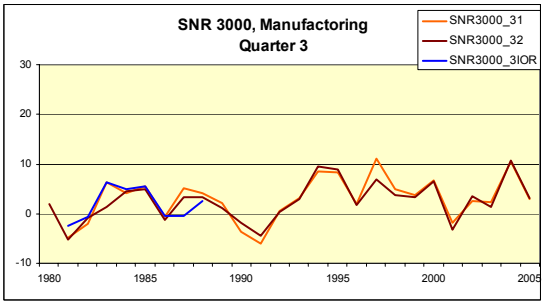

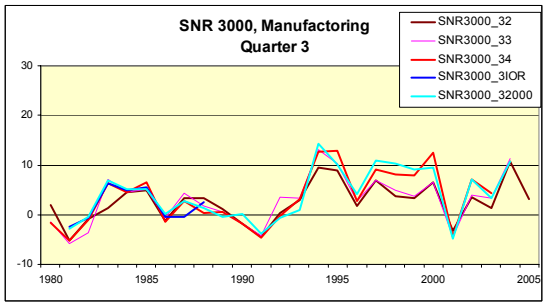

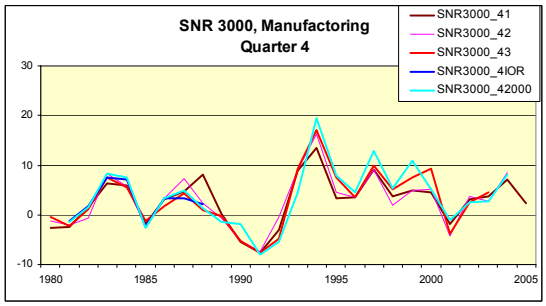

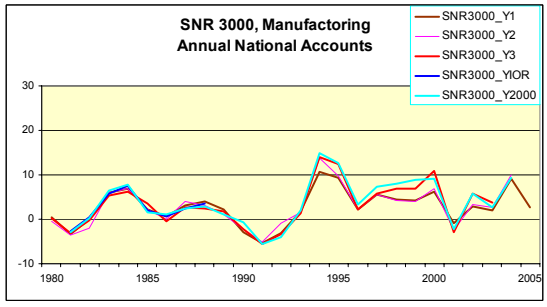

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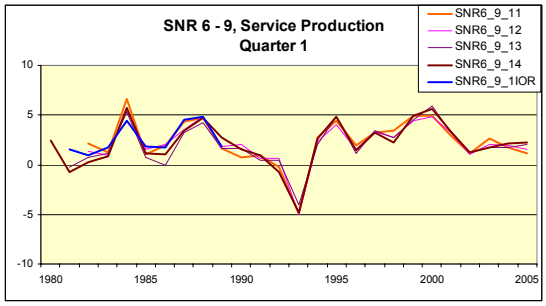

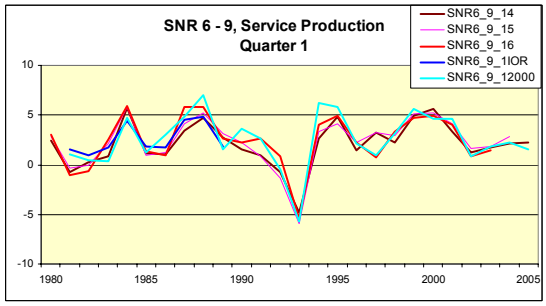

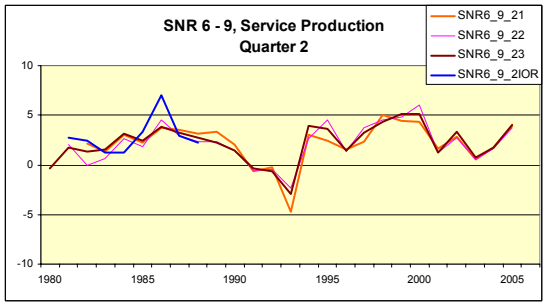

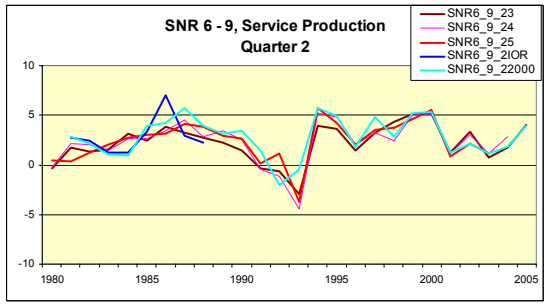

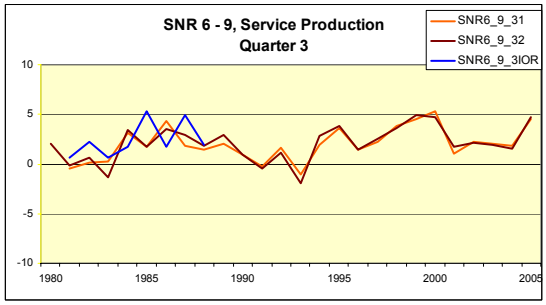

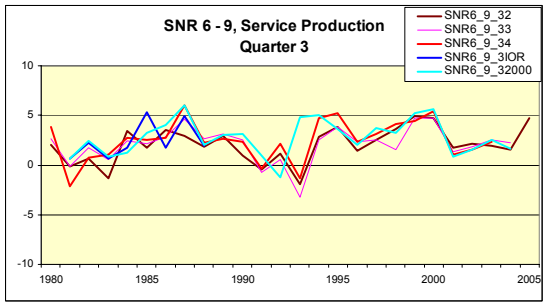

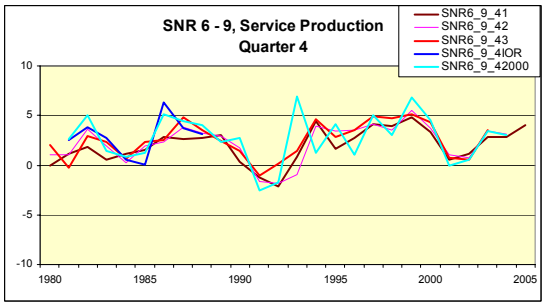

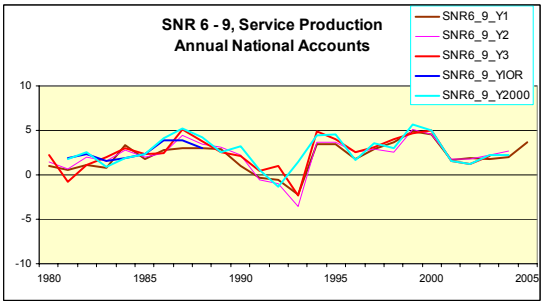

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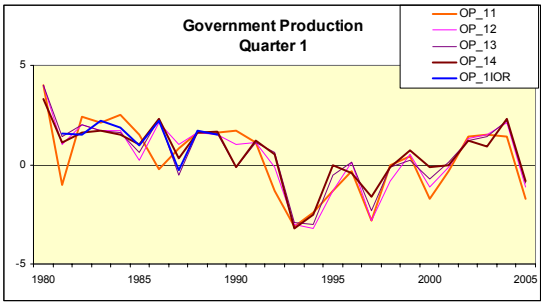
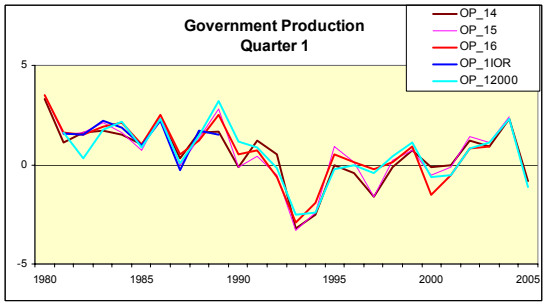
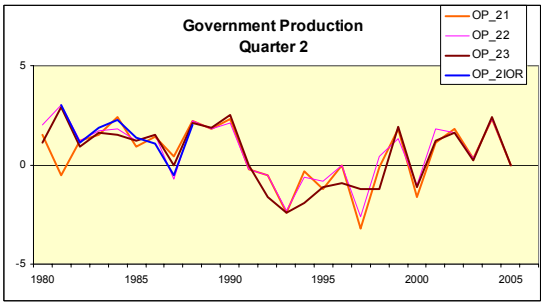
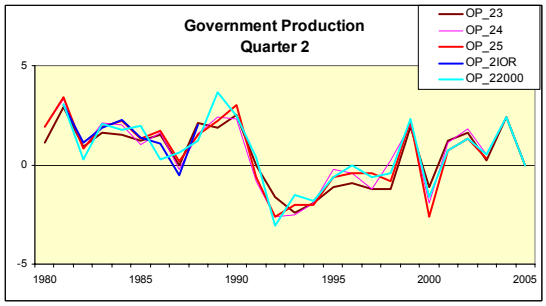
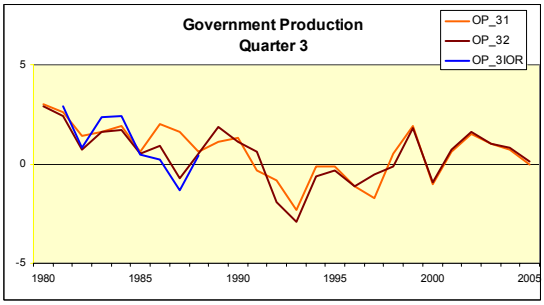
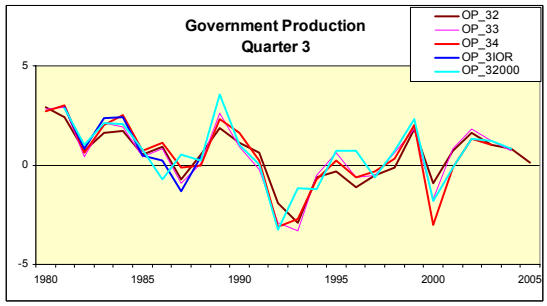


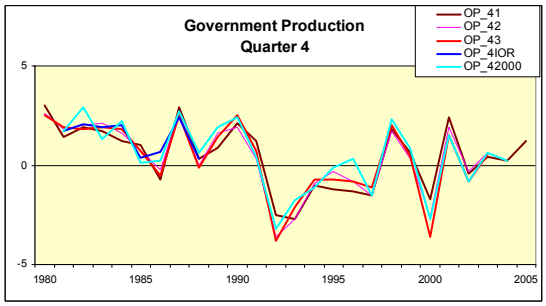


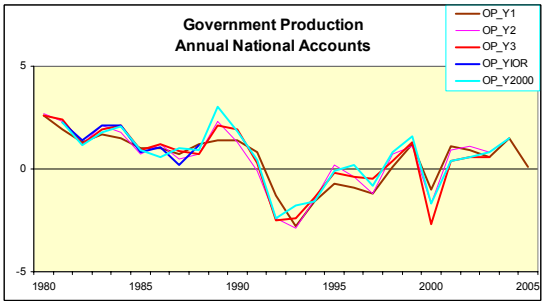












4.3 Seasonal patterns

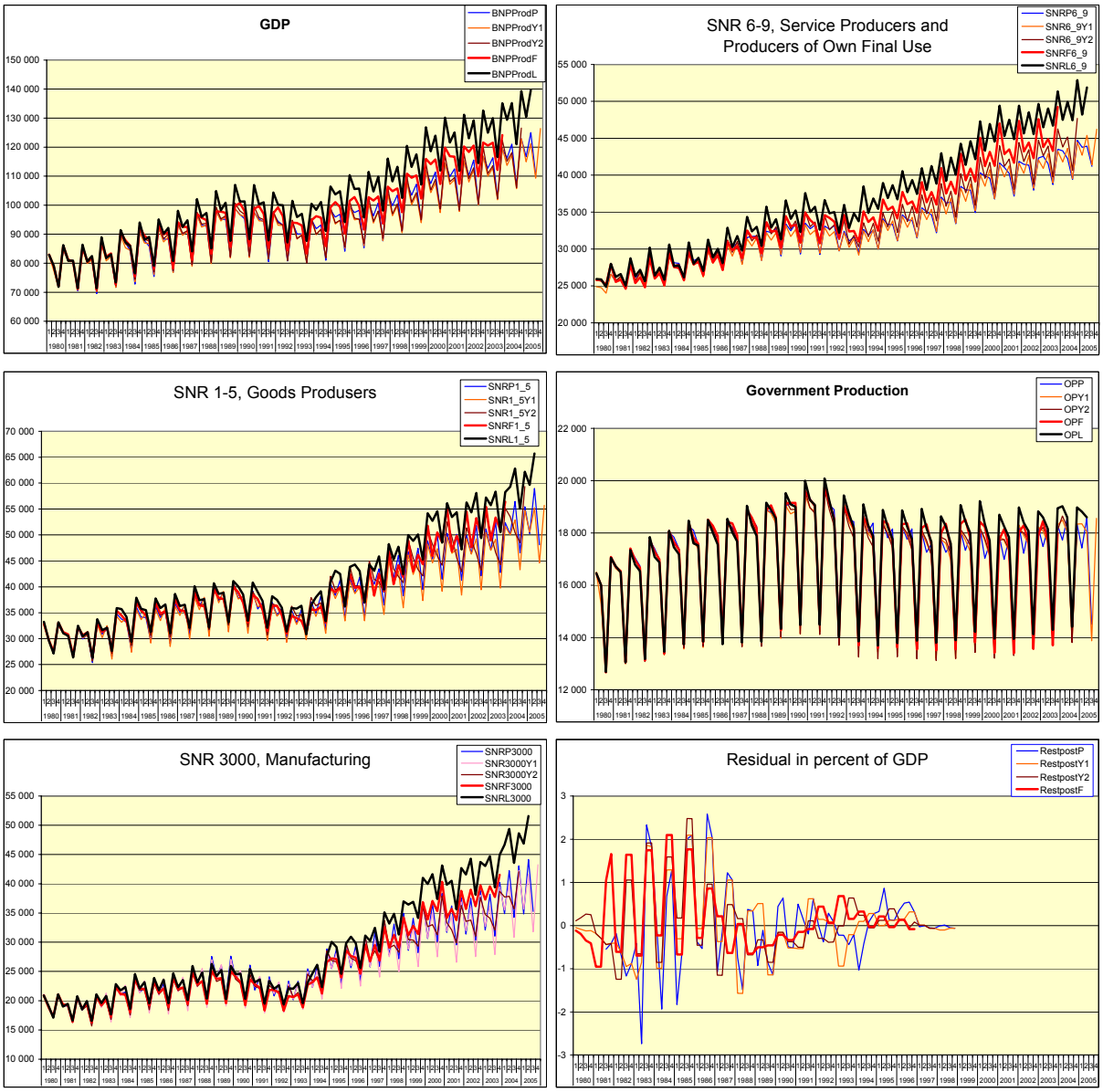
Does the seasonal pattern change between vintages? The answer is: yes, it does. The change in GDP seasonals over vintages was already commented upon in Öller et al. (2004). The final GDP figures mostly have a seasonal pattern looking like an upper case M, while the preliminary vintage looks differently, occasionally as an upside down U. The trend divergence is a result of downward biased first vintages that are subsequently revised upwards.

Note that deseasonalising uses mostly final figures for estimating the filter model. The resulting filter is then applied on *preliminary* figures that follow a different model. This generates bias in seasonally adjusted figures, obviously requiring additional revisions, on top of data revisions and ordinary seasonal adjustment revisions due to updating.

Key to Figure 4

Prel	Preliminary quarterly estimate
Rev 1	Vintage based on preliminary *annual* estimates
Rev 2	-"- -"- -"- revised annual estimates
Rev 3	-"- -"- -"- final annual estimates
Rev 2000	-"- when the base year was changed to year 2000

Figure 4. Vintages of seasonal patterns 1980-2005. Quarterly National Accounts



4.4 Comparisons

Tengblad (1992) made a thorough study of NA revisions, also covering the production accounts. The data were from the 70s and 80s, so that the latter decade is common to the two studies. In Table 2 we compare his and our results for the variables that he reported on.

From Table 2 we see that for GDP the bias has increased, as has both the mean absolute revisions (*MAR*) and the latter divided by the standard deviation of the final figures (*rMAR*). The same features prevail for the rest of the variables, except tax receipts. Revisions have become larger; the bias is higher and the spread has increased.

Table 2. Tengblad's study (1992)

	GDP not	Harmon.	Manufacturing		Private Services		Taxes		GOV prod	
	Tengblad	Our	Tengblad	Our	Tengblad	Our	Tengblad	Our	Tengblad	Our
Mean	0.17	0.26	0.46	0.50	0.3	0.42	-0.06	-0.25	-0.04	0.02
MAR	0.67	0.72	1.18	1.85	0.79	0.93	1.5	1.12	0.61	0.70
rMAR	0.28	0.33	0.29	0.36	0.32	0.34	0.48	0.44	0.31	0.50

In Table 3 we compare our results to those for the UK. Both the bias and the spread are much larger for Swedish GDP than for UK data. The better figures, in the sense of smaller revisions, are marked bold in the table. In three cases out of four the British revisions are smaller. This can partly be explained by the law of large numbers; the UK economy is seven times larger than the Swedish one.

Table 3. Barklem' study (2000) (UK), 1988-1998

	GDP not	Harmon.	Agr., Forest., Fish.		Manufacturing		Construction		Transport	
	Barklem	Our	Barklem	Our	Barklem	Our	Barklem	Our	Barklem	Our
Mean	0.14	0.29	-0.08	0.65	0.06	-0.86	0.61	-0.04	0.64	0.80
MAR	0.41	0.63	3.62	3.03	0.67	2.16	1.36	2.12	1.81	2.58
Std	0.5	0.77	4.36	3.97	0.88	2.47	1.66	2.54	2.05	3.35
Range	2.23	4.5	20.51	24.47	4.42	10.9	8.19	11.4	8.87	16.72

In Table 4 we compare two major components of the expenditure accounts with the production revisions.

Table 4. Comparison of two major components from the production and the expenditure accounts from Öller and Hansson (2004)

	Producers of Goods	Investments	Producers of Services	Private Consumption
Mean	0.34	-0.4	0.42	0.3*
MAR	1.52	2.7	0.93	0.5
rMAR	0.39	0.4	0.34	0.3
Corr	0.53	0.39	0.4	0.08

The biases are of the same (absolute) size. The mean absolute revisions *(MAR)* are the largest for the expenditure variable Investments and smallest for Private Consumption, the spread of the two production variables lying between the extremes. The relative mean square revision (*rRMSR)* in the two sets of revisions are of the same order of magnitude. All variables, except Private consumption correlate with the business cycle. So that, by and large, the revisions of two important production variables have the same features as the revisions of two major expenditure variables.

4.5 A closer scrutiny

The Table in Appendix A reveals that preliminary quarterly production figures are not very informative. The relative mean square revision *(rRMSR)* is greater than unity for most variables and close to unity for the rest. As mentioned in the text this means that the historical man of the series would have resulted in smaller revisions than the published preliminary figure. The range of the revisions is generally large, and above

40 percentage points for SNR2 and SNR37. Some variables have large biases (means). Comparing means and medians we find that skewness is common. So is correlation between revision and the business cycle; in several cases this lies above 0.5.

5. Conclusions

We have seen that, by and large, the production components of the NA behave like the expenditure components in Öller and Hansson (2002) and (2004). Early figures are predominantly too low (bias), but not necessarily in cyclical downturns, revealing correlation between revisions and the business cycle. The spread of revisions is larger than one might expect, and the first preliminary quarterly production figures have little to say about the annual growth rate of the quarter in question. For some of the smaller aggregates, it is questionable whether early quarterly figures contain much information at all, so large is the spread of revisions

Different vintages mostly provide more or less the same information about the business cycle. However, there are exceptions. In particular, the base year change to the year 2000 seems to have somewhat changed the picture. This is surprising and would require an in deep study, because such a change should ideally have no impact on the business cycle profile.

As with expenditure items, the production components have different seasonal patterns. This complicates seasonal adjustment and gives rise to additional revisions, on top of those studied here and those due to the use of forecasts in the moving average applied to the last figures of the series.

Bajada (2002) emphasises the role of bad price estimates in shaky early figures. Öller and Hansson (2002) also studied the current price series and the deflators of the expenditure components. This is a topic worth following up for value added statistics.

Including published forecasts into the scrutiny it is possible to measure the quality of the statistics, see Öller and Teterukovsky (2007).

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Appendix

Characteristics of disaggregate value added variables

Table A1. Statistical characteristics of all production variables, 1980-2003

	SNR1000	SNR2	SNR3000	SNR37	SNR40	SNR50	SNR6000	SNR61	SNR63	SNR7000
Mean	0.65	-0.47	0.5	1.63	0.17	-0.04	0.14	0.08	1.03	0.8
Median	0.4	-0.2	0.1	2.2	-0.3	-0.3	-0.13	-0.3	0.6	0.5
MAR	3.03	6.33	1.85	5.06	2.6	2.12	1.48	1.66	2.99	2.58
Std	3.97	8.06	2.4	6.65	3.51	2.54	1.95	2.16	3.93	3.35
Range	24.47	46.1	12.83	48.5	17.5	11.4	10.48	12	23.2	16.72
Min	-6.97	-21.2	-7.13	-30.8	-8.9	-5.8	-3.88	-4.4	-10.6	-5.7
Max	17.5	24.9	5.7	17.7	8.6	5.6	6.59	7.6	12.6	11.02
Corr	0.57	0.45	0.55	0.62	0.17	0.2	0.4	0.41	0.49	0.58
rMean	0.46	2.96	0.16	0.51	0.08	-0.1	0.06	0.03	0.81	0.27
rMAR	0.7	0.82	0.36	0.75	0.41	0.66	0.45	0.5	0.76	0.63
rStd	0.71	0.81	0.42	0.82	0.42	0.62	0.6	0.65	0.82	0.83
RMSE	4	8.03	2.43	6.82	3.49	2.53	1.94	2.15	4.04	3.43
rRMSE	1.01	1	1.02	1.02	1	0.99	1	1	1.03	1.02

	SNR71	SNR72	SNR8000	C. Gov	L. Gov	Gov	Resid.	GDPpr	GDPqu	TaxNet
Mean	0.63	0.81	0.53	0.32	-0.09	0.02	0.17	0.29	0.26	-0.38
Median	-0.1	1.2	0.46	0.1	-0.1	0	-0.03	0.2	0.35	-0.55
MAR	3.04	4.14	0.95	0.89	0.75	0.7	0.74	0.63	0.72	1.06
Std	3.91	5.1	1.19	1.25	1.07	1	0.97	0.77	0.85	1.2
Range	16.6	22.5	7.04	7.6	6.6	6.2	4.67	4.5	4.61	5.38
Min	-6.4	-9.8	-2.5	-3.1	-3.4	-2.3	-1.86	-1.8	-2.53	-2.78
Max	10.2	12.7	4.54	4.5	3.2	3.9	2.81	2.7	2.08	2.6
Corr	0.59	0.77	0.38	0.51	0.3	0.38	0.34	0.41	0.4	0.36
rMean	0.38	0.15	0.25	-1.12	-0.12	0.05	1.27	0.16	0.18	-0.73
rMAR	0.7	0.67	0.38	0.63	0.43	0.5	1.33	0.26	0.33	0.42
rStd	0.75	0.97	0.59	0.73	0.54	0.61	1.25	0.36	0.38	0.36
RMSE	3.94	5.13	1.29	1.29	1.07	0.99	0.98	0.82	0.88	1.25
rRMSE	1.01	1.01	1.09	1.03	1	1	1.01	1.06	1.04	1.04

Table A2. Key to abbreviations

SNR1000	Agricultural products
SNR 2	Forestry products
SNR3000	Manufacturing
SNR 37	Other manufacturing
SNR 40	Gas, steam and hot water
SNR 50	Trade, repair of cars
SNR6000	Transport
SNR 61	Water transport services
SNR 63	Supporting transport services
SNR7000	Real estate services, machine rents, computer serv., research, public adm. & defense
SNR 71	Renting of machinery and equipment
SNR 72	Computer & related services
C. Gov	Central government
L. Gov	Local Government
Gov	Government
Resid.	Residual: supply-demand acc.
GDPpr	GDP from the production acc.
GDPqu	GDP from quarterly acc.
TaxNet	Net taxes = taxes-subsidies

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