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Composite Indicators as a Tool for Better Understanding of Socio-Economic Development

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Abstract

Demand for a more focused presentation of statistical indicators for socio-economic indicators such as well-being has increased during the last decade. The main reasons behind this are an increased complexity in economic and social development as well as an aim to link micro data to macro data.

The System of national accounts (SNA) forms a solid base for indicators, with links to microeconomic statistics. SNA can be used as a base for the construction of indicators for both economic and socio-economic use. As these indicators tend to be complex the calculation and dissemination of these must be made clear and transparent, to help users in the interpretation of data. This can be done by the use of dash-boards or by the construction of composite indicators.

The UNECE TF on Leading, Coincident and Sentiment indicators (LCS) aims to give advice to National Statistical Office (NSO): s of how to use composite indicators in a simple and transparent way. By standardizing the NSO use of models for composite indicators comparison between countries will also be made easier for users. By the use of composite indicators it is possible to find changes in trends for economic and socio-economic indicators, such as wellbeing trends and cross-national differences at an earlier stage.

1. Introduction

The use of the Leading, Composite and Sentiment (LCS)-indicators, may offer new tools and measures in the society, as a help to users and policymakers, who do not have the time and resources to handle and analyze large amounts of statistical data. They need to get alerted at an early stage and demand the higher degree of consistency and comparability that a dashboard or LCS-indicators can offer. LCS- indicators may also be a first step to form standardized indicators aimed to measure such phenomena as the Sustainable Development Goals (SDG) or Beyond GDP/Quality-of-life concepts, as these indicators can be adapted for specific purposes.

Several National Statistical offices (NSOs) and international organizations are already producing LCS-indicators to meet demands on evidence based data. Although the NSOs have been acting in different ways in meeting the policy demands and some countries have been

reluctant to get involved as they are concerned about the possible compromise to statistical institutions "objectivity or reliability" when engaging in the production of theseindicators. Others have stressed the urgency to meet evolving user needs in the best way they can, considering the Fundamental Principles of Official Statistics.

By producing standardizing LCS- indicators the image of official statistics can be boosted with the NSO as a main provider of timely and composite indicators. A considerable number of different indicators already exist and new indicators emerge constantly. Today, it is difficult for users to assess the quality and reliability of the different indicators, and the NSOs can help to harmonize and set an international standard to secure quality regarding comparability and consistency.A further coordination of statistical micro data is already underway within the social and economic statistical spheres. A natural consequence of this should be to harmonize LCS-indicators in a way that they can make use of the new micro data sets.

2. Growing and changing user needs

Over the last decades user needs have evolved quickly reflecting technological and economic change. In a number of areas such as well-being, IT-investments, business cycle indicators, environment and sustainable development policy makers and societies at large have demanded morecoherent, consistent and timely data and new types of statistics. In recent years the demand for integrated statistical systems[1] has increased to assure better quality of data.

The Stiglitz–Sen-Fitoussi Commission (SSFC)[2]on the measurement of economic performance and social progress looked beyond the traditional GDP measure and suggested areas where statistical information is needed. The report had four main messages:

- *The indicators produced by the national accounts should be put to better use. GDP is only one of them. GDPwas initially designed for the purpose of tracking economic activity and is not the index best suited to the notion of the population´s well-being. Other monetary indicators produced in the national accounts may be preferred to GDP.*

[1]UN: Integrated economic statistics (2013)
[2] INSEE 2011

- *Many aspects of well-being remain difficult or impossible to measure in money units and greater importance should be attached to more quality-oriented indicators. Some of these non-monetary indicators remain objective but the report also recommends the use of subjective indicators.*

- *The measurement of current well-being and that of its sustainability are two issues that should be clearly separated. With sustainability, the question is whether we are passing sufficient resources on the future generations to assure them a standard of well-being at least equivalent to ours. This questions has several sub-dimensions; economic sustainability which can be appraised using monetary indicators and environmental sustainability which is best explored via a set of physical indicators*

- *Irrespective of the domain, aggregated indices cannot be used to capture the disparity between individual situations. The commission recommendscomplementing them within indicators of dispersion, where possible.*

Well-being or quality of life can be measured in many ways, of which three approaches wererecommended by the SSFC.These are;

1. *Satisfaction with life, i. e. a person's overall judgment of his lift at a given moment*
2. *The presence of positive feelings or affects, i.e. the flows of positive emotions felt over a time period.*
3. *The absence of negative feelings or affects, i.e., negative emotions over a time period*.

The Commission listed the following dimensions of quality-of-life:material living conditions (income, consumption, and wealth), health, education, personal activities (including work), political voice, social connections and relationships, environmental conditions and physical and economic security.The work of the SSFCwas followed by an increased interest in measuring well-being, satisfaction with quality of life (including quality of employment), happiness and other 'subjective' areas of life and society that falls outside what was traditionally considered in scope for many statistical offices. This, in turn, has triggered a comprehensive work regarding research for new and more appropriate socio-economic indicators. At the moment these are presented in many different forms and forums.In the on-going process of setting up a system of indicators to the sustainable development SDG2030-

goals[3] a discussion has been how to best create an indicator framework, that is policy oriented i.e. formed around the policies that are of interest when the system is set up.

User's needs of timely data of good quality are increasing. The demand for new indicators has risen and available statistics are being adapted to show a better fit with macroeconomic accounts such as the System of national accounts and Balance of Payments Several users, such as Federal Reserve and IMF, are already producing their own "now-casting models" for GDP,[4] which are regressions models for GDP based on available coincident monthly data. This highlights the importance of a continuous development of statistical indicators to meet growing demands from users, also regarding their forecasting abilities. By the use of LCS-indicators it will be possible to construct indicators that have a leading or sentiment information ability.

One specific demand from policy-makers has been that statistical indicators should be presented as "sets of Indicators" – or "dashboards", so that politicians or business leaders can see many figures "at a glance". User needs will continue to evolve and change over time. As globalization progress the coordination of statistical methods and models will become increasingly important to be able to make comparisons between countries and regions. The demand for "evidence-based data" will trigger a paradigm shift towardsimproved and more stable statistical indicators as a solid base to make the right political decisions.

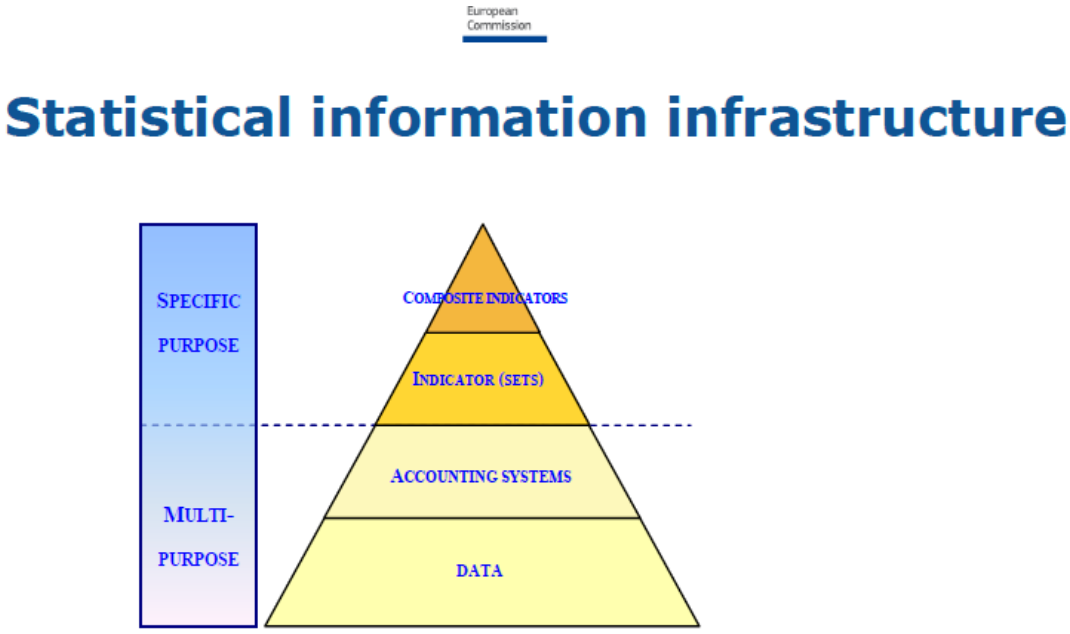
3. The statistical information structure

The statistical information structure can be illustrated by the "The Pyramid of Statistical Information structure"[5].The base of the pyramid consists of a statistical base, i. e. ordinary statistical data from surveys or registers. The primary information, or data layer, is the input for the accounting systems in the secondlayer, mainly national accounts and balance of payments. The bottom layers are multipurpose statistics that can have many different usages. The top layers are special purpose statistics that can be adapted for different user needs. So

[3] Palm 2015
[4]Higgins P, Federal Reserve of Atlanta
[5] Rademacher Eurostat 2010

far, consistency have not been a priority demand for these variables , but in the future the statistical base has to be consistent to secure quality of the accounting systems and the indicator set that are calculated using this information. Integration of all data in this system is then required.

Figure 1. The statistical infrastructure



Source: Eurostat 2010: Measuring progress of societies.

The top layers in the pyramid consist of indicator for specific purposes. This can be dashboards of indicators such as the EU MIP (Macroeconomic Imbalance Scorecard)[6] or the IMFs SDDS (Special Data Dissemination Standard)[7] that present the statistical indicators in a special framework. It can also be composite indicators, constructed for special purposes such as sentimentindicators i.e. Consumer Confidence,or Composite Indicators of different kinds. These composite indicators (LCS-indicators) could be cyclical or non-cyclical, have leading or lagging abilities and measure either sentiment, economic or socio-economic issues.The LCS-indicatorscan have different constructions depending on their use or purpose.Today, they are produced by many NSOs on a regular basis, but is not yet part of official statistics. [8] By

[6]EU MIP
[7]IMF: SDDS plus
[8] A list of produced LCS-indicators by NSOs is available in the annex.

standardization of the LCS-indicators it would be possible to streamline the use of these indicators and make them part of the official statistics. This would then guarantee methodological quality of the LCS-indicators and increase the area of official statistics to meet user needs also in this area.

Before the financial crisis in 2008-09 statistics mainly consisted of a multitude of different survey data without coordination. The financial crisis made this lack of harmonization visible and led to a newdemand for better data and indicators from policy makers and other users of statistics. The aim for an integrated statistical system has risen and in 2013 UN guidelines on Integrated Economic Statistics was presented[9]. The main benefits from integration of statistics are higher consistency between monthly data and short–term indicators, consistency across sectors in depicting trends, consistency across countries for key measures such as real GDP and inflation, Higher transparency and consistency across different statistical areas in concepts and definitions, greater accuracy in the economic data, reduction in reporting burden for business and increased efficiency in the production of data. In total, more relevant statistics that more timely address of user needs through the development of integrated links to new data disseminations systems.

By inclusion of socio-economic data to these statistical infrastructure new possibilities emerge in creating new specific measures and composite indicators for the new SDG goals as well as Beyond GDP and Quality of life.

4. The socio-economic field

In the sociological field an example of new data demand is the life satisfaction or happiness index (HPI)[10]. This area has grown during the last decade as policy-makers are even more interested in the real life of their citizens, not only the income or production figures. To a great extent the rise in attention is a result of the report on measuring economic performance

[9] UN/UNECE 2013
[10] http://www.sciencealert.com/the-world-happiness-index-2016-just-ranked-the-happiest-countries-on-earth

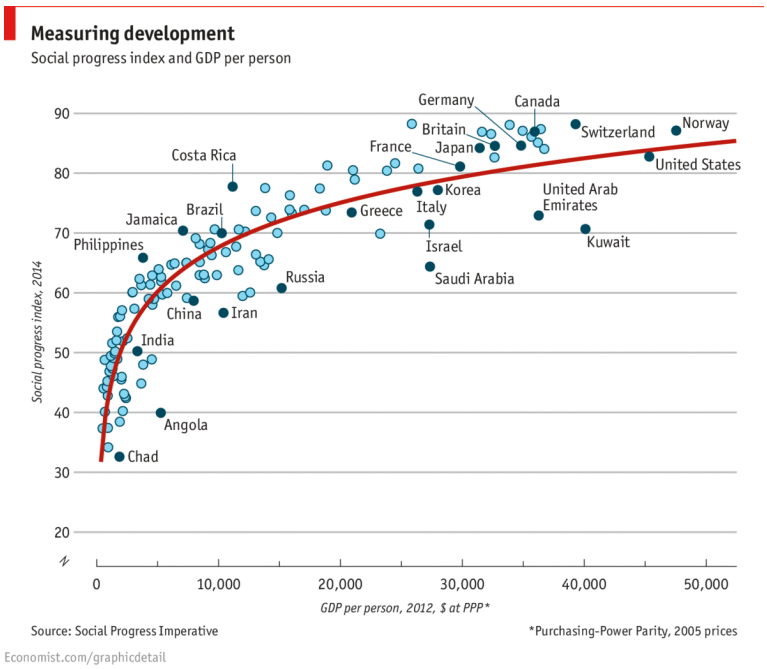
and social progress[11] , although the tradition of social indicators dates further back. There are today many different measures for life satisfaction and happiness, presented from a variety of different actors.

Various measures has evolved regarding “happiness”, quality of life”, well-being and life situation. Environmental concepts such as carbon emissions and other ecological footprints are used as input in this index. The concept of sustainable growth (SDG) is still under development but the underlying data is often gathered from different areas and constructed in many different ways. This arena includes economy, environment and social aspects in the same place, which is a challenge as the data stems from very different sources.

Human Development Index (HDI) is the most known socio-economic composite index, measuring the social progress. This includes such variables as life expectancy, educational attainment and income in one index. This may be seen as a complement to the ordinary GDP-measure, and they may not always show the same pattern, see graph 1 below. A wealthy society may not always have the best conditions from the individuals’ point-of-view. By combining the information from the two measures it will be possible to show a broader perspective of the present situation in society. As the input data of the multi-purpose indicators GDP and HDI can be applied for constructing composite indicators this gives possibilities to create special- purpose measures of the present development as well.

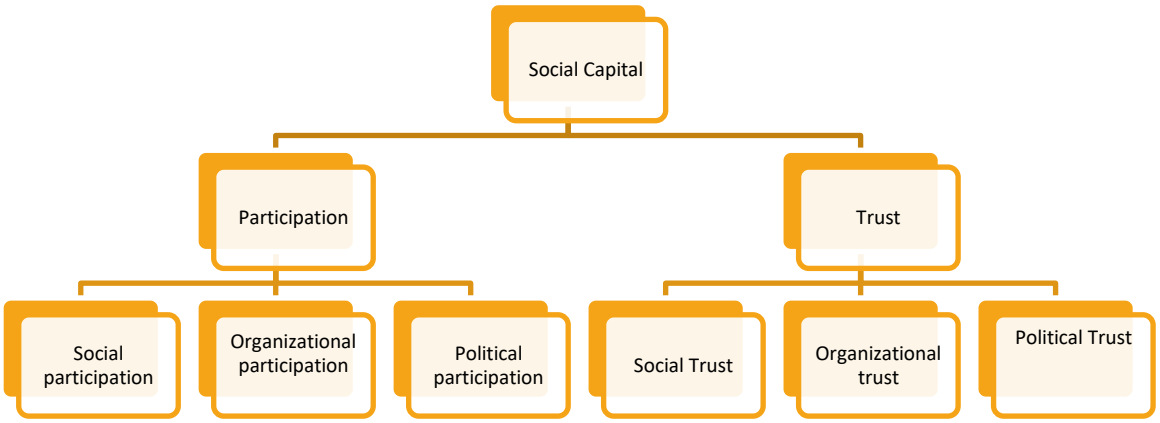
Graph 1: GDP and Social progress

[11]Stiglitz, Sen, Fitoussi 2009



Several NSOs have developed their own Social capital indices, such as Germany or Holland. The social capital index for Netherlands [12] is based on data from the permanent survey on Living Conditions 2009. The structure of the model is shown in figure 2. This can also be developed to form socio-economic indicators .

Figure 2: A conceptual model of a social capital index for Holland



Source: Van Beuningen J, Schmeets H (2013

[12] Van Beuningen J, Schmeets H (2013)

5. Standardization ofLCS indicators

Traditionally, NSOs produce multipurpose statistical indicators, such as consumer price index and GDP. They follow international standards and adapt these to national demands when needed. NSOs have a restrained history in producing forecasts, even though their statistics and methods often are based on the judgments or estimates of the statisticians themselves. Most NSOs have not been very involved in the production of LCS- indicators due to a variety of reasons; such as lack of adequate data inputs or long time series, budget constraints, concerns about dissemination and possible misinterpretation of data. As the LCS-indicators are produced for specific needs, and not standardized as such, this is also a reason for NSOs to avoid them. The production will demand more skilled methodologist competence. High demands on NSOs for higher data quality, objectivity and standardization of production are also some reasons for not producing LCS-indictors, as resources and experts are scarce..

As there are many different users it is important to communicate official statistics correctly to the different groups. While users with a general interest, such as media or students, need simple explanations and story-telling other groups are more demanding, users in specific domains or within the scientific community may have very demanding request for data on a very specific or detailed level. Statisticians need to be preparing for all kinds of demands to meet the various user needs.

From this perspective LCS-indicators are a user of official statistics as an input in the construction of composite indicators. This means that the development of composite indicators can also be part of the quality assessment at the NSOs, as underlying data will be thoroughly tested.The value added of official statistics increases with an increasing use of the data. Therefore the users should be put in focus of the NSOs planning and production of statistics.

Lack of harmonization and standardization in the area of LCS-indicators has led tolarge differences in the use of LCS indicators between NSOs, and the present indicators may also be too complex in the construction. Despite this some countries has succeeded in presented these kinds of indicators successfully for many years This shows that the NSOs have the

knowledge and abilities to be able to construct and produce good and reliable LCS-indicators, if they decide to do so.

Graph2: Sweden Leading Indicator

Source: The National research Institute of Sweden/Macrobond

The Composite Leading indicator for Sweden is part of official statistics, though it's produced by the National Research institute. The basic components are a sentiment survey of all sectors, weighted by value added in industry and number of employees in other sectors. This indicator is usually a good predictor of GDP.

The UNECE guide on LCS-indicators will give advice and present examples

The UNECE TF on Leading, Composite and Sentiment[13] indicators aims to present a guide-line that will advise national statistical offices in the construction and use of LCS-indicators. By using standardized methods, such as the OECD model for construction of composite indicators[14] or the UN/Eurostat methods in The Handbook on Cyclical Composite Indicators[15], theconstruction of these indicators can be harmonised between different countries.
The models will be applicable to all kinds of data, but by using statistical input quality will be improved. The NSOs have the methodological skills and knowledge to be able to build these kinds of indicators in an appropriate way. By select the best input data and use the correct models for the user needs it will be possible to adapt statistical data to more specific needs from a user point of view.

[13] The guide will be presented in a seminar in July 2017
[14]OECD et. al (2008)
[15]UN /Eurostat (2016)

6. Conclusions

There is an increasing need for new, broad-based indicators that give a full picture of both the socio-economic and the economic development world-wide. LCS-indicators can be a useful tool in measuring different aspects of societal change that involves not only economic change but also environmental and social change.

As the statistical system becomes even more integrated, coordination and comparability of different statistical variables increases. This means that the supply of available data input grows over time, something that is visible in the creation of the Human development index (HDI). This index is to be seen as a first complement to GDP as a broad measure of the situation in the socio- economic change within society, including social, economic and environmental aspects.

National statistical offices have the competence to construct these composite indicators. The aims are to keep them as simple and standardized as possible to make the use of the indicators available to all kinds of users. This is best done if the indicators are produces by the NSOs as part of official statistics, on a base of high quality, comparability and on a solid statistical ground.

Annex: Examples from Sweden – composite sentiment indicator

Indicators of innovation and IT-use

As a result of the partial coordination between the CIS questionnaire and the questionnaires for IT in firms, there are about 1 800 mutual observations that enable us to conduct meaningful analyses of the correlations between IT usage by firms and their level of innovation. The particularly interesting questions to analyse in this context concern the degree of integration and automation of IT usage in the firms.

The questions relate to five areas: automated information exchange, electronic exchange of information with customers and suppliers, automated systems that disseminate information within the firm after orders and purchases, and if the firms use business systems (ERP) or software that enables customer analysis. Two to four questions with a yes-no response are asked in all these areas. These are reported separately and summed in each area, and then aggregated into an indicator of the firm's use of IT.

All partial measures and aggregates have been standardised and can vary between 0 and 1. This means that the different correlation coefficients can be meaningfully compared. The significance is marked similarly by colours as previously, where green indicates a positive correlation and red a negative correlation. A more intense colour indicates a stronger correlation and a less intense colour indicates a weaker correlation. The different levels are: highest at the 1-percent level, highest at the 5-percent level and highest at the 10-percent level.

The summary measure of IT use provides a very clear result for all innovation categories. A more advanced use of IT is clearly associated with innovation. All the company groups that managed to develop something that has come onto the market or into use during 2010-2012 have a highly significant positive correlation with the use of IT, and the non-innovative firms have an equally clear negative correlation. The size of the correlation coefficients also follows the degree of innovativeness.

The picture becomes slightly more diffuse when studying the different sub-aggregates and individual components, but it is essentially the same. The correlations for all components for the innovators have a strongly positive significance as well as a strongly negative significance for the non-innovative firms. For market developers, all the sub-aggregates and most of the individual components are also strongly significant. Only a couple of these are outside the significance threshold and an additional three are significant at the second highest level. The picture actually becomes diffuse only for the firm developers, with a large number of individual coefficients that admittedly are positive but not significant, and/or significant at a lower level. A single aggregate also becomes non-significant, namely the automatic dissemination of information within the firm after purchases. This area is obviously least linked to innovation success. At the other end of the scale we find the area business systems and software for the analysis of customers. All individual components for this area are significant for all four innovation groups, and they are equally important for market developers and the true innovators.

Overall, we can conclude that there is a very strong and broad correlation between innovativeness and IT use.

The correlations remain when factors that stimulate IT are taken into account

The estimates carried out in the previous section can also be made for the more limited number of observations, where innovation and IT variables are available. The results are similar to those reported above. If the total indicator for IT use as described above is added to these variable directories, then the first equation, which measures the probability that a firm has launched a new product or process during the time period, becomes positive and significant at the highest level.

The IT use question has also been introduced into the equation that tests if a firm, given that it has developed something, has developed a unique product that was first on the world market. The result is positively significant in this case as well, but at the second highest level (0.02). As noted above, factors that normally are stimulating the use of IT – firm size, membership in a corporate group, and a detailed description of the educational level – have been taken into account. The coefficient value is also very high, namely 0.5 in both cases. This means that for each sub-component used by the firm (there are 16), the probability that the firm will be innovative and that it will create a world first increases by an average of 3 per cent.

However, the second equation becomes positive but not significant. This means that a more advanced use of IT does not seem to clearly affect how much a firm invests in its product or process development, but rather if it does invest.

Table 1. Correlations between different IT activities and the four innovation groups

	Innovators	Market developers	Firm-developers	Non-innovative firms
Automated information exchange	0.12	0.07	0.06	-0.16
Send payment instructions	0.06	0.08	0.08	-0.16
Send or receive product information	0.10	0.06	0.02	-0.11
Send or receive transport documents	0.14	0.05	0.03	-0.14
Electronic exchange of information	0.14	0.07	0.04	-0.16
The firm shares information electronically with suppliers	0.08	0.10	0.05	-0.15
The firm shares information electronically with customers	0.14	0.02	0.01	-0.09
The firm shares information via websites	0.10	0.07	0.04	-0.14
The firm shares information via EDI	0.11	0.07	0.05	-0.15
Information is shared after customer order	0.18	0.09	0.03	-0.19
Control of inventory levels - by customer order	0.20	0.05	0.00	-0.14
Accounting - after customer order	0.12	0.11	0.02	-0.15
Production or service management	0.13	0.08	0.05	-0.17
Distribution control	0.17	0.07	0.03	-0.16
Information is shared when purchasing	0.16	0.06	0.00	-0.13
Control of inventory levels - when purchasing	0.16	0.04	-0.02	-0.10
Accounting - when purchasing	0.13	0.07	0.02	-0.13
The firm uses business system (ERP) or software for customer info	0.13	0.14	0.09	-0.24
The firm uses an ERP system	0.12	0.11	0.07	-0.20
The firm uses CRM system to collect, store and make available	0.09	0.13	0.08	-0.20
The firm uses CRM system to analyse customer information	0.09	0.10	0.06	-0.16
IT use	0.19	0.12	0.06	-0.23

Source: Hagén (2016)

Sweden Business Production Indicator (PIN) – composite economic indicator

Definitions and explanations

From December 2012, Statistics Sweden produces monthly statistics on production in the business sector. The statistics are compiled based on requests from users. They are an important indicator of the business cycle, as business production accounts for approximately 70 percent of the gross domestic product (GDP). These statistics should be seen as experimental until further notice.

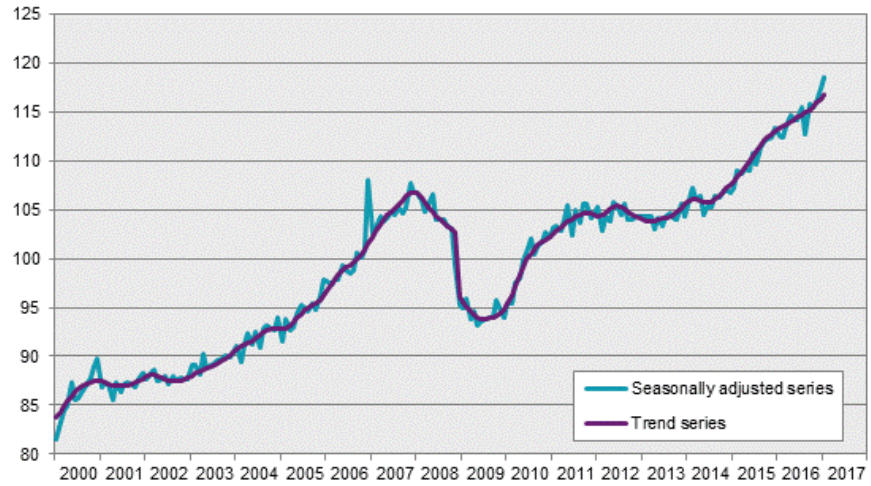
Quarterly PIN has been obtained by aggregating monthly values in order to make growth rates between PIN and GDP comparable and also to produce forecast for the next period (quarter 4, 2016). These figures are not published but only used for the purpose of analysis.

Production in the business sector increased by 0.24 percent in seasonally adjusted figures in quarter 3 2016 compared with quarter 2. At the same time, quarterly GDP shows increase of 0.49 percent so the PIN growth rates slightly underestimates the GDP growth rate at this occasion. PIN forecast for the rate of change from quarter 3 to quarter 4 is about 1.4 percent.

Observe that the results are heavily influenced by the choice of method for temporal aggregation/ disaggregation. The method may vary since the index construction is quite complex.

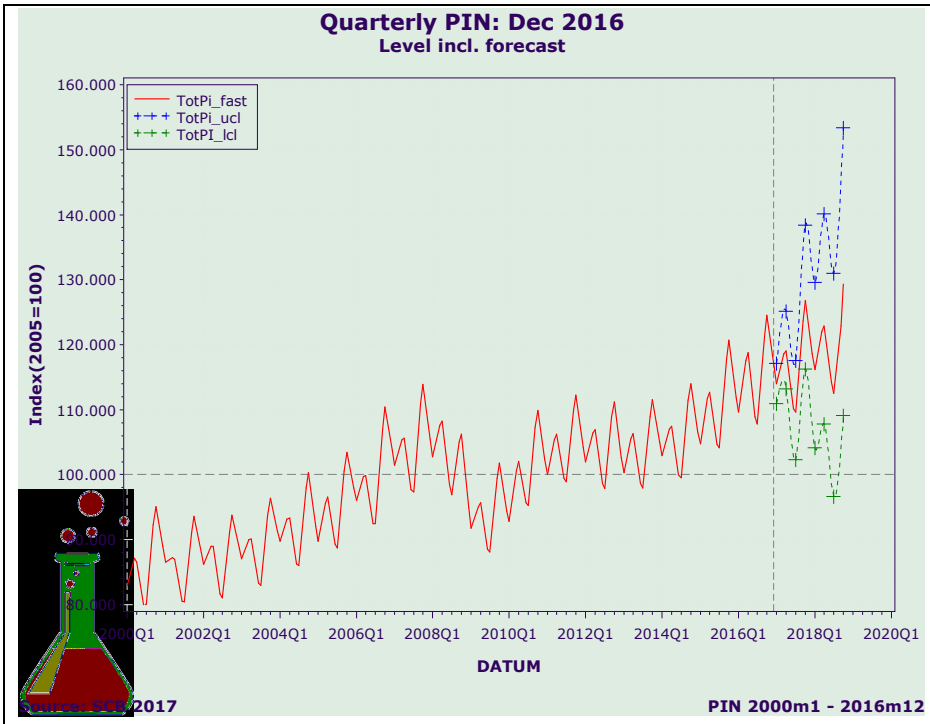
Statistical news from Statistics Sweden 2017-03-09 9.30

Production in the business sector increased by 0.9 percent in seasonally adjusted figures in January 2017compared with December 2016. Compared with the corresponding month of the previous year, production in the business sector increased by 5.3 percent in calendar adjusted figures.

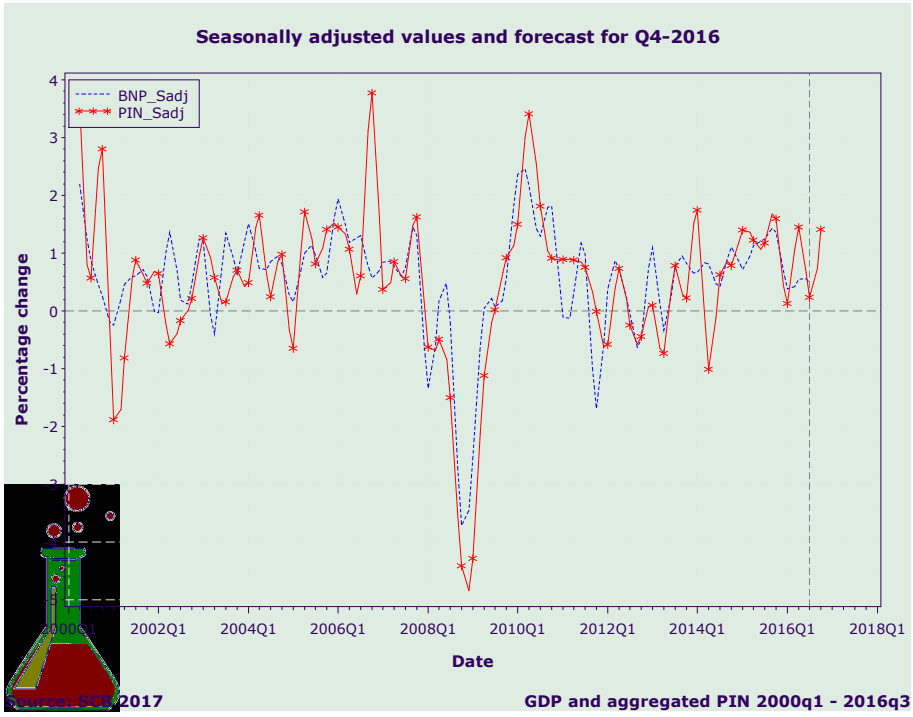


Source: Statistics Sweden

Graph 4*Sweden Business Production Indicator (published figure: http://www.scb.se/en/finding-statistics/statistics-by-subject-area/business-activities/general-statistics/business-production-index/pong/statistical-news/business-production-index-january-2017/)*

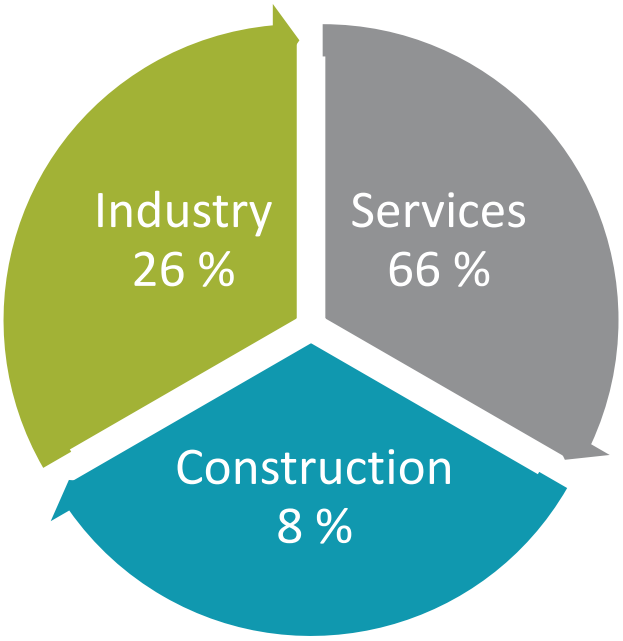


Graph 5:*Quarterly PIN including forecasts with prediction intervals, non-adjusted values (computed at January 2017);*



Graph 6:*Sweden Business Production Indicator compared with quarterly GDP: Seasonally adjusted values, percentage changes from previous quarter; monthly PIN interpolated to quarterly values in order to make it comparable with GDP; blue dashed line represents GDP from quarter 3 2016; monthly PIN from January 2017(red starred line).*

The parts of the composite indicator PIN are primary statistics: Service production index (66%), Construction (8%) and Industrial production index (26%).The index is constructed by aggregation of annual monthly links of the underlying indices using weights according to the value added of each part. The base of the underlying indices is different and has to be adjusted. The construction index is of lower quality than the other two sources.



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