UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Regional Project SAP 120443

Regional Seminar on Indices of Industrial Production (IIP)
14-16 May 2014, Saint Petersburg, Russia

Methods and Practical Experiences in Compiling the IIP (Norbert Herbel)

Acknowledgements to
Ralf Becker, United Nations Statistics Division
Shyam Upadhyaya, United Nations Industrial Development Organization

For their RECOMMENDED POWERPOINT-PRESENTATIONS (see ANNEX)

PRELIMINARY REMARKS

1. Approximation of industrial production and related variables (15 May, 09:00 – 10:30)
1.1. Output measures
1.2. Input measures (labor input, materials consumed)
1.3. Methods of obtaining volume measures of industrial production
1.3.1. Volume extrapolation and deflation
1.3.1.1. Volume extrapolation
1.3.1.2. Deflation
2. Methods of compilation of IIP (15 May, 11:00 – 12:30)
2.1. Basic principles of index compilation
2.2. Laspeyres, Paasche and Fisher volume indices
2.3. Building IIP from the lowest level
3. Weighting and aggregation (15 May, 14:00 – 15:30)
3.1. Role of weights in index compilation
3.2. Weighting index data in IIP
3.3. Fixed weight versus chained index
4. Index compilation steps (15 May, 16:00 – 17:30)
4.1. Other compilation issues – introducing new products, reweighting and linking methods
4.1.1. Introducing new products
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5. Quality assurance of IIP (16 May, 09:00 – 10:30)
5.1. Comparison of monthly/quarterly indices with annual data
5.2. Seasonal adjustment
5.3. Other quality issues
5.3.1. Quality Adjustment
5.3.2. Dimensions of quality
5.3.3. Evaluating the suitability of data variables and methods
6. Methods of compilation of IIP for various industrial sectors (16 May, 11:00-12:30)
6.1. Special consideration for IIP compilation for mining and quarrying, manufacturing and utility sectors

International Recommendations for Industrial Statistics 2008

Preliminary Remarks

Международные рекомендации по статистике промышленности 2008 год

Statistical papers Series F No. 107

International Recommendations for the Index of Industrial Production

2010

Revision of the "International Recommendations for the Index of Industrial Production" (IRIIP)

The draft text of this publication has been prepared by the United Nations Statistics Division (UNSD) in accordance with the decision of the United Nations Statistical Commission at its thirty-fifth session in 2004 to revise the existing recommendations on the Index Numbers of Industrial Production of 1950. This draft text has been endorsed for global country consultation by the United Nations Expert Group on Industrial Statistics following a review of text and discussion of issues at meetings in 2005, 2007 and 2008.

This revision of the 1950 *Index Numbers of Industrial Production* manual takes into account methodological developments in the field of index number calculation that emerged over the past decades and describes new recommended methodological standards for the compilation of index numbers of industrial production.

In addition, this updated publication also provides practical guidance for actual steps in the index number calculation and presents recommended methods for each industry in its scope to assist countries in producing high-quality short-term economic indicators that are also internationally comparable.

A final global consultation has been undertaken in January and February 2009. The feedback received during this consultation has been incorporated into the final document, which was submitted for approval to the United Nations Statistical Commission in February 2010.

The document below presents the text of the new publication, prior to official editing and printing.

(1.2 MB)

International Recommendations for the Index of Industrial Production 2010

National Accounts

GERMANY

Gross value added by industries

Industry	2011	2012	2013
current prices, Euro billion			
Agriculture, forestry and fishing	18.46	19.98	19.27
Industry, excluding construction	607.80	616.94	625.48
including: Manufacturing	529.79	534.36	535.18
Construction	109.18	111.32	115.80
Trade, transport, accommodation and food services	339.09	347.48	355.55
Information and communication	94.66	96.02	96.52
Financial and insurance services	101.47	94.42	98.55
Real estate activities	283.15	289.29	298.59
Business services	253.94	264.51	281.12
Public services, education, health	421.87	438.11	450.75
Other serivces	105.27	108.72	112.35
Total	2,334.89	2,386.79	2,453.98
price adjusted, chain-linked index (2005=100)			
Agriculture, forestry and fishing	93.98	95.51	95.32
Industry, excluding construction	112.82	112.32	112.32

MBS

Monthly Bulletin of Statistics Online

How important is the Industrial Production Index?

2014

- Monthly Bulletin of Statistics Online

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Most Viewed Data

Ranking	Table Name	ExtractedRecords	PercentageShare
1	Industrial production indices	3226878	12.87
2	Consumer price indices	2215745	8.83
3	Total imports and exports by regions and countries or areas	1788566	7.13
4	Exchange rates	1436109	5.73
5	Construction of new buildings	1361116	5.43
6	International reserves minus gold	1154978	4.6
7	Crude birth rates	1136923	4.53
8	Producer prices indices	881063	3.51
9	Gold reserves	861873	3.44
10	Estimates of mid-year population	813042	3.24
11	Crude death rates	802121	3.2
12	Total imports and exports: value and index numbers of volume and unit value	797195	3.18
13	Money supply	749587	2.99
14	Unemployment	714459	2.85
15	Retail price indices relating to living expenditures of United Nations officials	713766	2.85

1 2 3 4

ISIC Rev.4

(International Standard Industrial Classification of All Economic Activities, Rev.4)

- A - Agriculture, forestry and fishing
- B - Mining and quarrying
- C - Manufacturing
- D - Electricity, gas, steam and air conditioning supply
- E - Water supply; sewerage, waste management and remediation activities
- F - Construction
- G - Wholesale and retail trade; repair of motor vehicles and motorcycles
- H - Transportation and storage
- I - Accommodation and food service activities
- J - Information and communication
- K - Financial and insurance activities
- L - Real estate activities
- M - Professional, scientific and technical activities
- N - Administrative and support service activities
- O - Public administration and defence; compulsory social security
- P - Education
- Q - Human health and social work activities
- R - Arts, entertainment and recreation
- S - Other service activities
- T - Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
- U - Activities of extraterritorial organizations and bodies

ISIC Rev.4

(International Standard Industrial Classification of All Economic Activities, Rev.4)

Click on any code to see more detail. Click here for top level only.

- A - Agriculture, forestry and fishing
  - 01 - Crop and animal production, hunting and related service activities
  - 02 - Forestry and logging
  - 03 - Fishing and aquaculture
- B - Mining and quarrying
  - 05 - Mining of coal and lignite
  - 06 - Extraction of crude petroleum and natural gas
  - 07 - Mining of metal ores
  - 08 - Other mining and quarrying
  - 09 - Mining support service activities
- C - Manufacturing
  - 10 - Manufacture of food products
  - 11 - Manufacture of beverages
  - 12 - Manufacture of tobacco products
  - 13 - Manufacture of textiles
  - 14 - Manufacture of wearing apparel
  - 15 - Manufacture of leather and related products
  - 16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
  - 17 - Manufacture of paper and paper products
  - 18 - Printing and reproduction of recorded media
  - 19 - Manufacture of coke and refined petroleum products
  - 20 - Manufacture of chemicals and chemical products
  - 21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations
  - 22 - Manufacture of rubber and plastics products
  - 23 - Manufacture of other non-metallic mineral products
  - 24 - Manufacture of basic metals
  - 25 - Manufacture of fabricated metal products, except machinery and equipment
  - 26 - Manufacture of computer, electronic and optical products
  - 27 - Manufacture of electrical equipment
  - 28 - Manufacture of machinery and equipment n.e.c.
  - 29 - Manufacture of motor vehicles, trailers and semi-trailers
  - 30 - Manufacture of other transport equipment
  - 31 - Manufacture of furniture
  - 32 - Other manufacturing
  - 33 - Repair and installation of machinery and equipment
- D - Electricity, gas, steam and air conditioning supply
  - 35 - Electricity, gas, steam and air conditioning supply
- E - Water supply; sewerage, waste management and remediation activities
  - 36 - Water collection, treatment and supply
  - 37 - Sewerage
  - 38 - Waste collection, treatment and disposal activities; materials recovery

1. Approximation of industrial production and related variables

1.1. Output measures

Output is defined as the set of goods and services (products) produced by an establishment. Output can be measured in monetary terms (values) or in physical quantities.
A representative monthly survey is required.

(a) Value of output
Includes **all products produced** and should be recorded at the time it is produced.

The volume measure is obtained through the use of **an appropriate price deflator is indispensable t**o ensure that quality changes of the products are reflected in the production volume.

(b) Physical quantity of output

Physical quantity of output measures product output in terms of the number of items, tons, liters, etc.

Used when the products are homogeneous and quality remains constant over time.

No deflation process is required.

(c) Value of output sold

Synonymous with such terms as turnover, sales or shipments

Disadvantages

- Value of output sold measures production sold rather than measuring the output of the production process in the reference period.
- Work-in-progress is excluded
- Value of output sold normally corresponds to the industry class (ISIC class)

Advantages

- Data are generally available in a more timely fashion
- Data collection is less costly due to the higher level of aggregation compared to product data.

To calculate volume data also an appropriate price deflator is needed

1.2. Input measures (labor input, materials consumed)

When reliable or accurate measures of output cannot be obtained.

(a) Labor input

Can be measured in the form of *number of hours worked, full-time equivalent jobs* or *numbers of persons engaged* and is used in a volume extrapolation method.
Number of hours worked is preferable.
Hours worked take into account effects like changes in standard weekly working hours, the proportions of part-time employees, and hours of overtime.
Caution is advised because of an increase in labor skills or the use of more or better capital equipment, the employment-based indicator will tend to underestimate the increase in value added.

Changes in the relationship between labor input and value added can be attempted by **applying productivity factors**. Sufficient information should be available about the development of the productivity trend. which therefore allows for the estimation of such adjustments.

(b) Material consumed

Is only useful when there is a clear relationship between material use and production.
Energy use e.g. has proven to be a poor quality variable and should no longer be used.

1.3. Methods of obtaining volume measures of industrial production

IIP is intended to measure the change in the volume of value added over time. Therefore any change from price effects should be eliminated.

1.3.1. Volume extrapolation and deflation

1.3.1.1. Volume extrapolation

Compares the volume measure in the current period to the volume measure in the base period and calculates the IIP with the resulting volume relatives.

Advantage

No collection of value data nor use of price indices to obtain volume measures.
The quality of the products should remain constant over time.
In the manufacturing service industries, volume extrapolation of hours worked is appropriate because there is no production of a good that can be measured.

The volume extrapolation method is mainly used to measure industrial production volumes in manufacturing industries where **production** of a single product can extend **over many months** (reference periods).

These industries include '**Building of ships**', '**Manufacture of railway locomotives and rolling stock**' and '**Manufacture of air and spacecraft**'.
The volume extrapolation of hours worked is the preferred method in these industries as the value of work-in-progress can be difficult to measure.
It is recommended that whenever 'hours worked' data are used, it should ideally be adjusted for changes in productivity to reflect the change in the relationship between hours worked and output of the production process over time.

In the following some details from the German experiences are presented

Special Case - Updating the IIP with Hours Worked

3020	**Manufacture of railway locomotives and rolling stock**	This class includes: - manufacture of electric, diesel, steam and other rail locomotives - manufacture of self-propelled railway or tramway coaches, vans and trucks, maintenance or service vehicles	- Electric, diesel, steam and other rail locomotives - Railway or tramway rolling stock - specialized parts (bogies, axles and wheels, brakes and parts of brakes; etc)	**Volume indicator (input-based)** Number of hours worked adjusted for changes in productivity	**Volume indicator (input-based)** Number of persons employed adjusted for changes in productivity	**Deflated indicator** Value of raw material consumption (major materials) used in production deflated by appropriate quality adjusted PPI

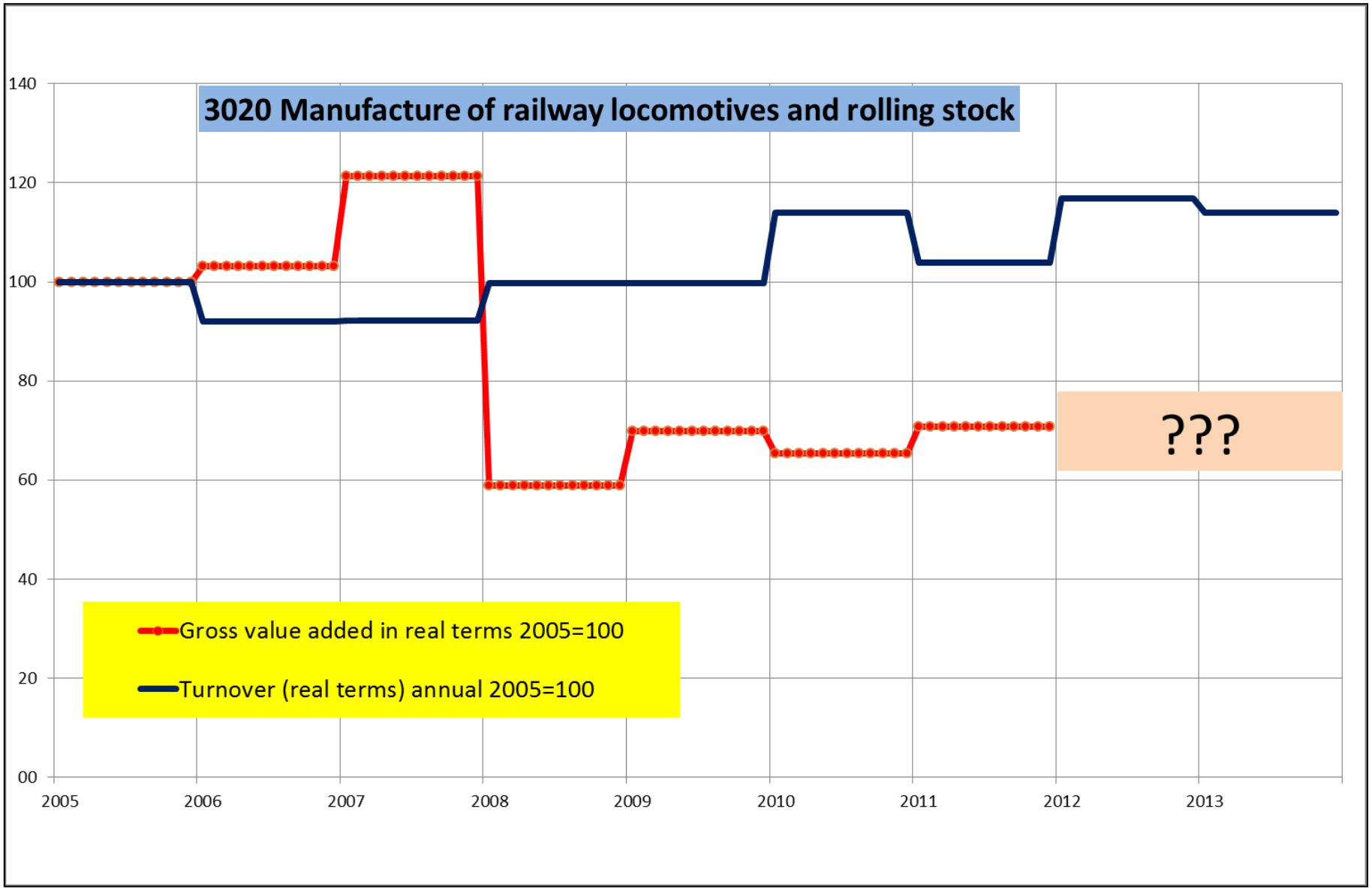
Technical Influence

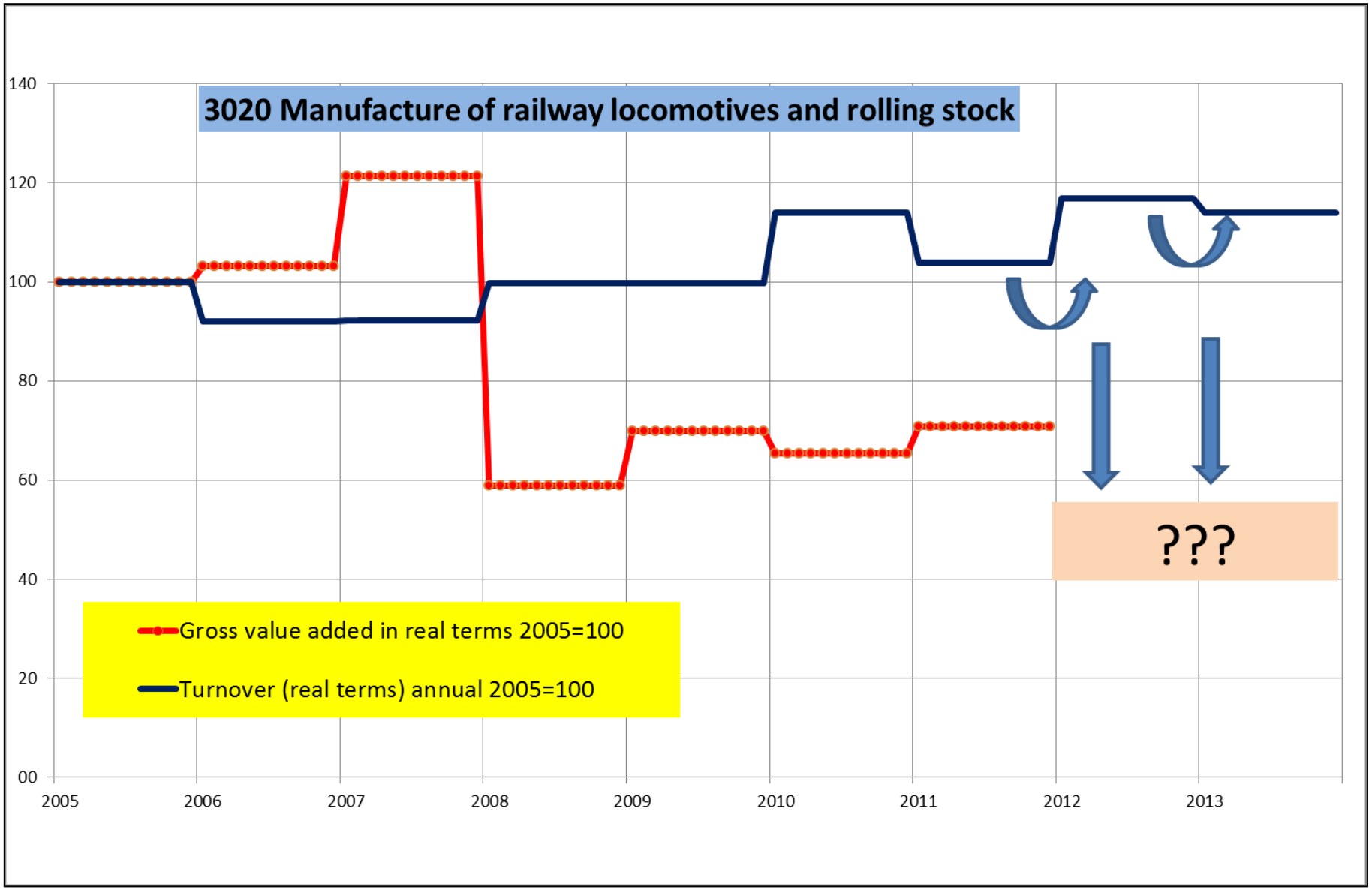
"output per hour worked"

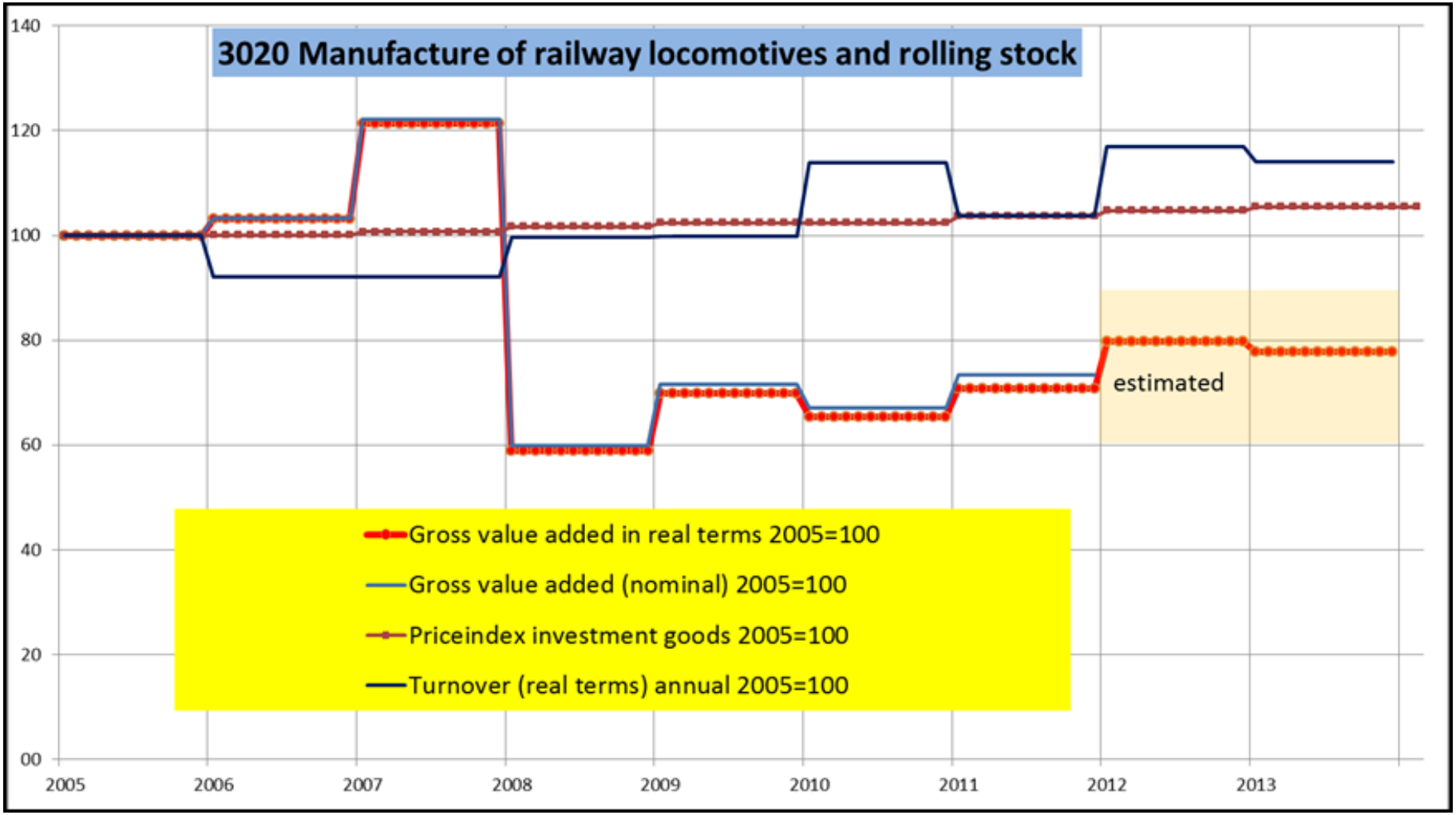
Economic Influence

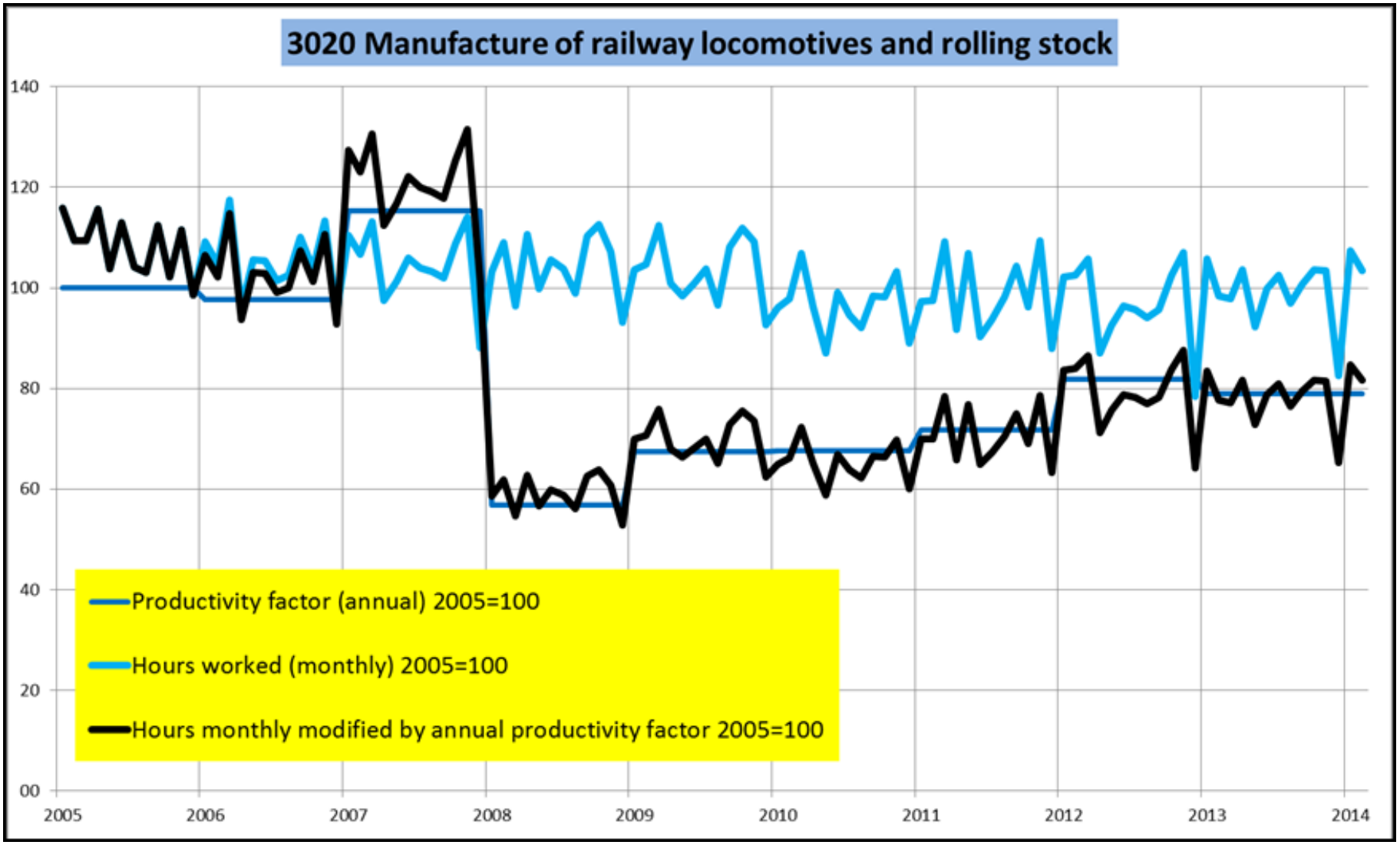
Productivity factor is defined as
"deflated value-added per hour worked on a yearly basis"

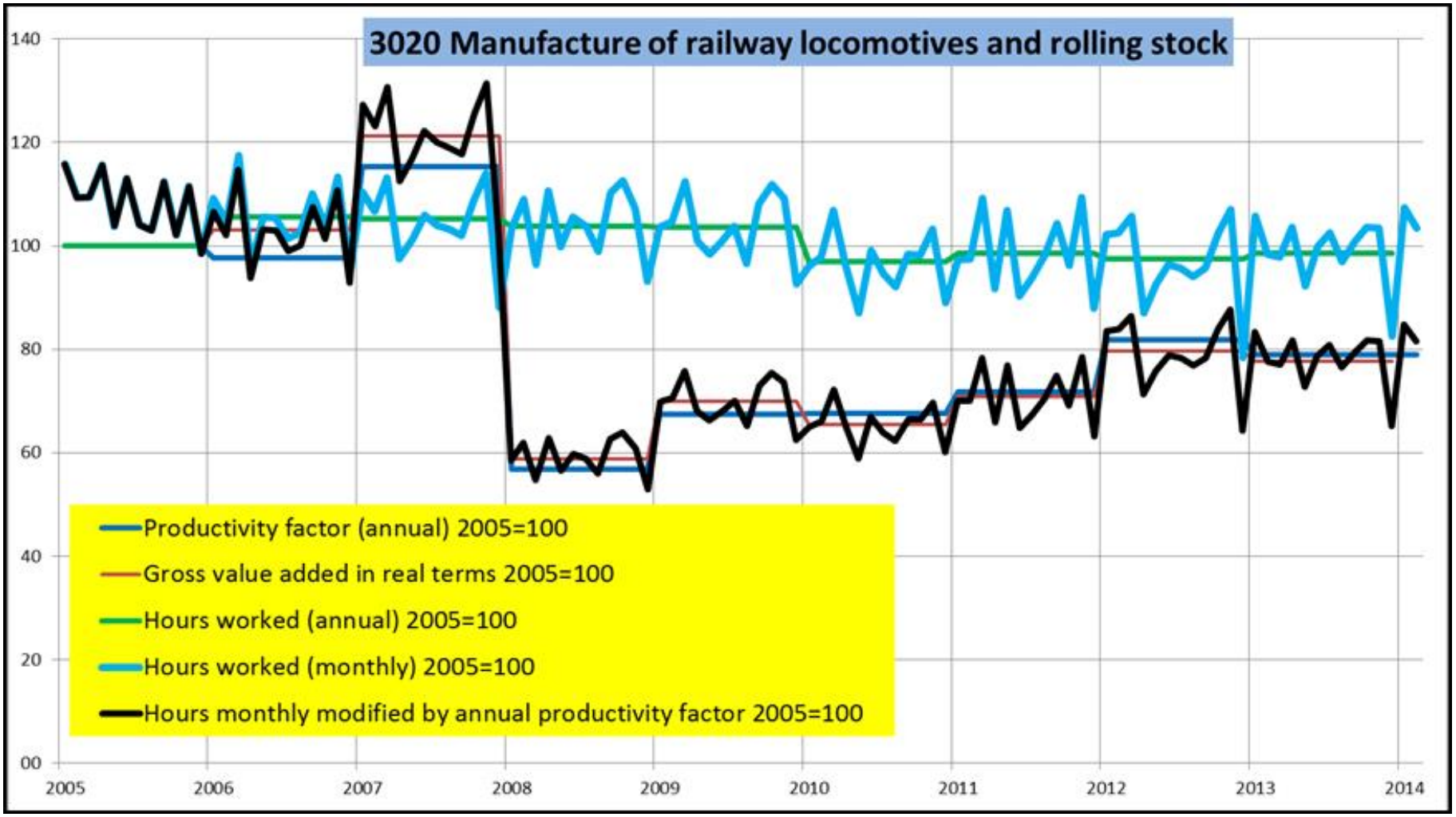

3020 Manufacture of railway locomotives and rolling stock
200
180
160
140
120
100
80
60
40
20
00
2005
2006
2007
2008
2009
2010
2011
2012
2013
Gross value added in real terms 2005=100
???

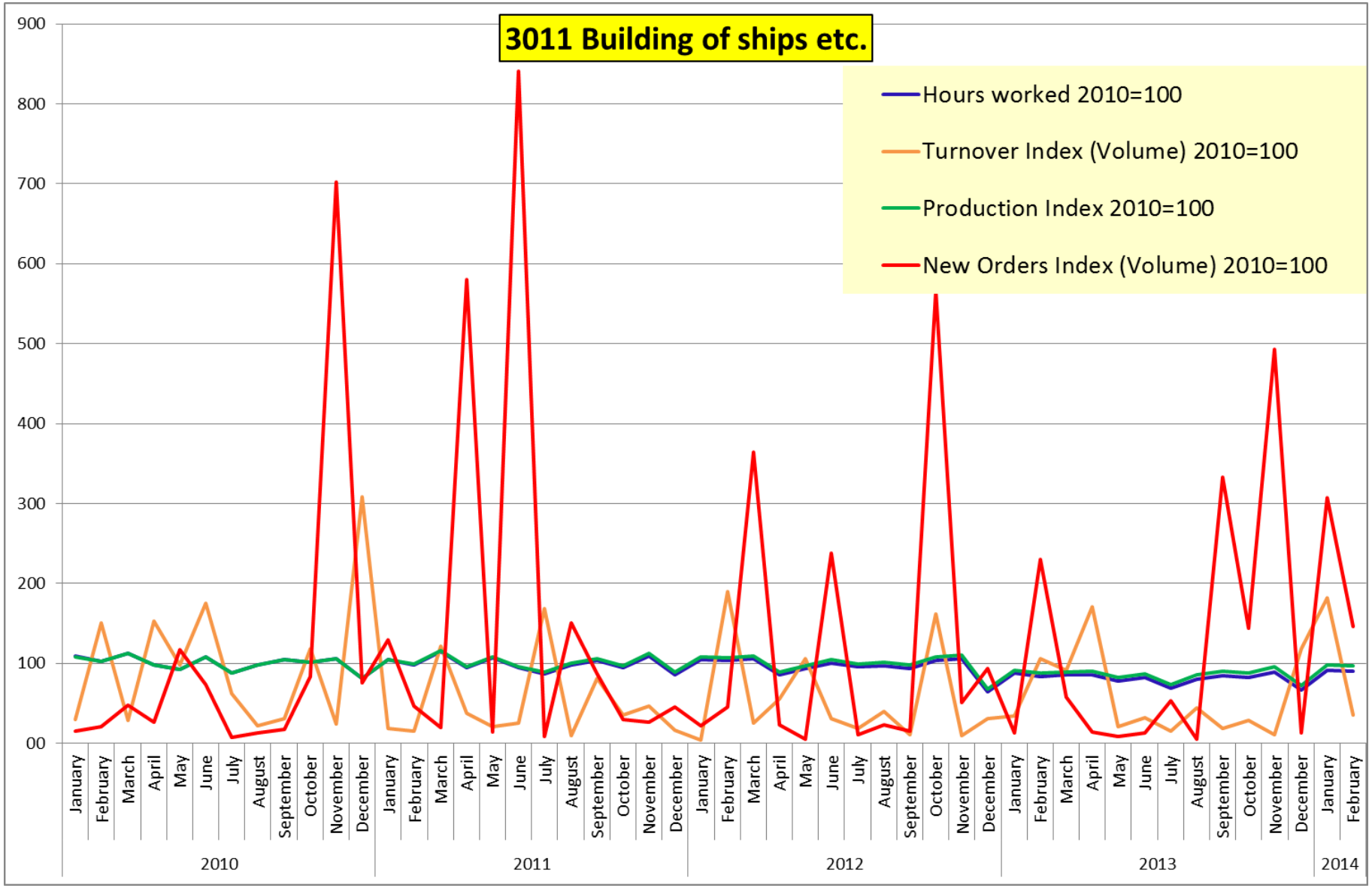

3020 Manufacture of railway locomotives and rolling stock
140
120
100
80
60
40
20
00
2005
2006
2007
2008
2009
2010
2011
2012
2013
???
Gross value added in real terms 2005=100
Turnover (real terms) annual 2005=100


3020 Manufacture of railway locomotives and rolling stock
140
120
100
80
60
40
20
00
2005
2006
2007
2008
2009
2010
2011
2012
2013
???
Gross value added in real terms 2005=100
Turnover (real terms) annual 2005=100

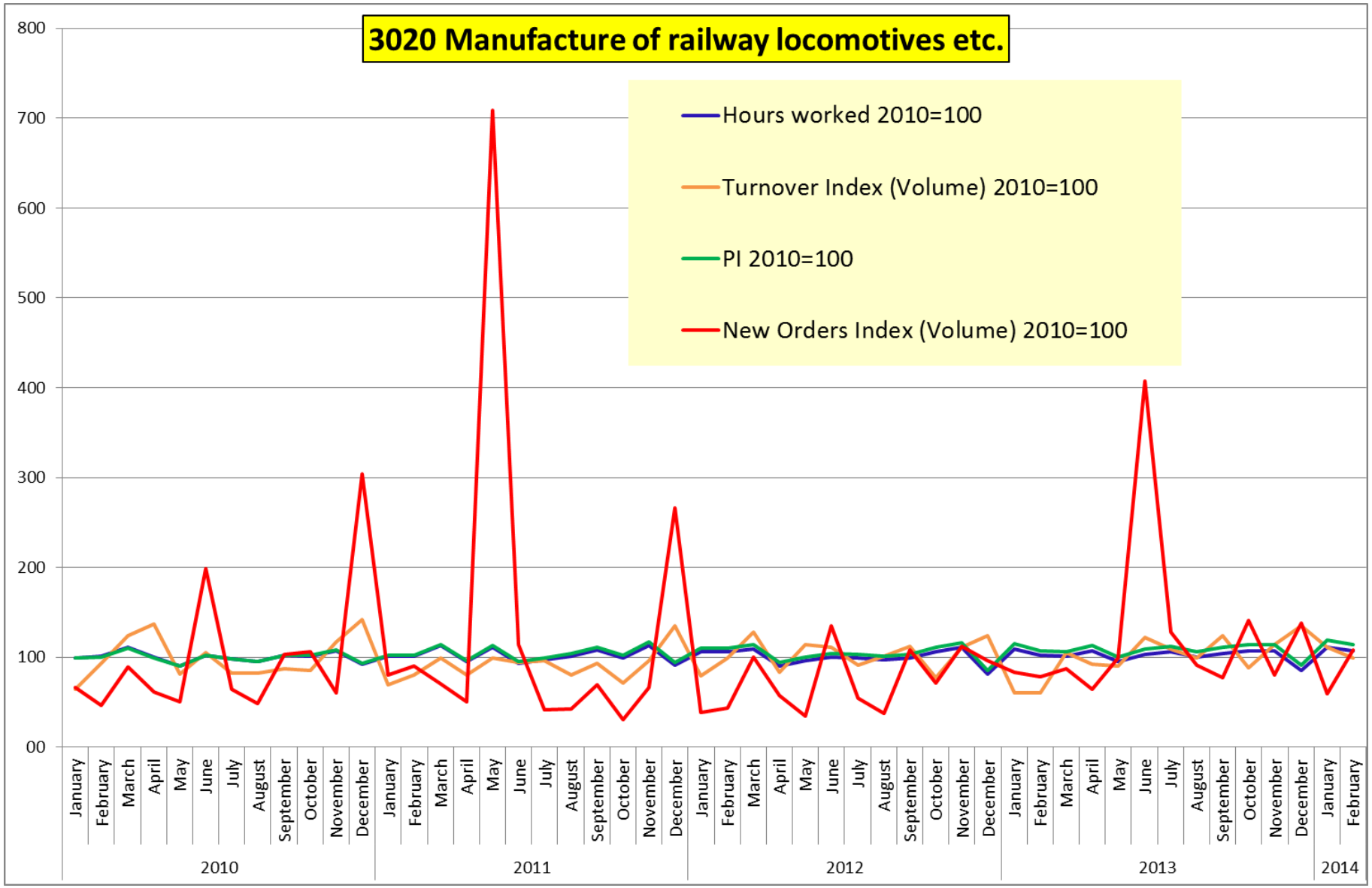

3020 Manufacture of railway locomotives and rolling stock
140
120
100
80
60
40
20
00
2005
2006
2007
2008
2009
2010
2011
2012
2013
estimated
Gross value added in real terms 2005=100
Gross value added (nominal) 2005=100
Priceindex investment goods 2005=100
Turnover (real terms) annual 2005=100


3020 Manufacture of railway locomotives and rolling stock
140
120
100
80
60
40
20
00
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Productivity factor (annual) 2005=100
Hours worked (monthly) 2005=100
Hours monthly modified by annual productivity factor 2005=100

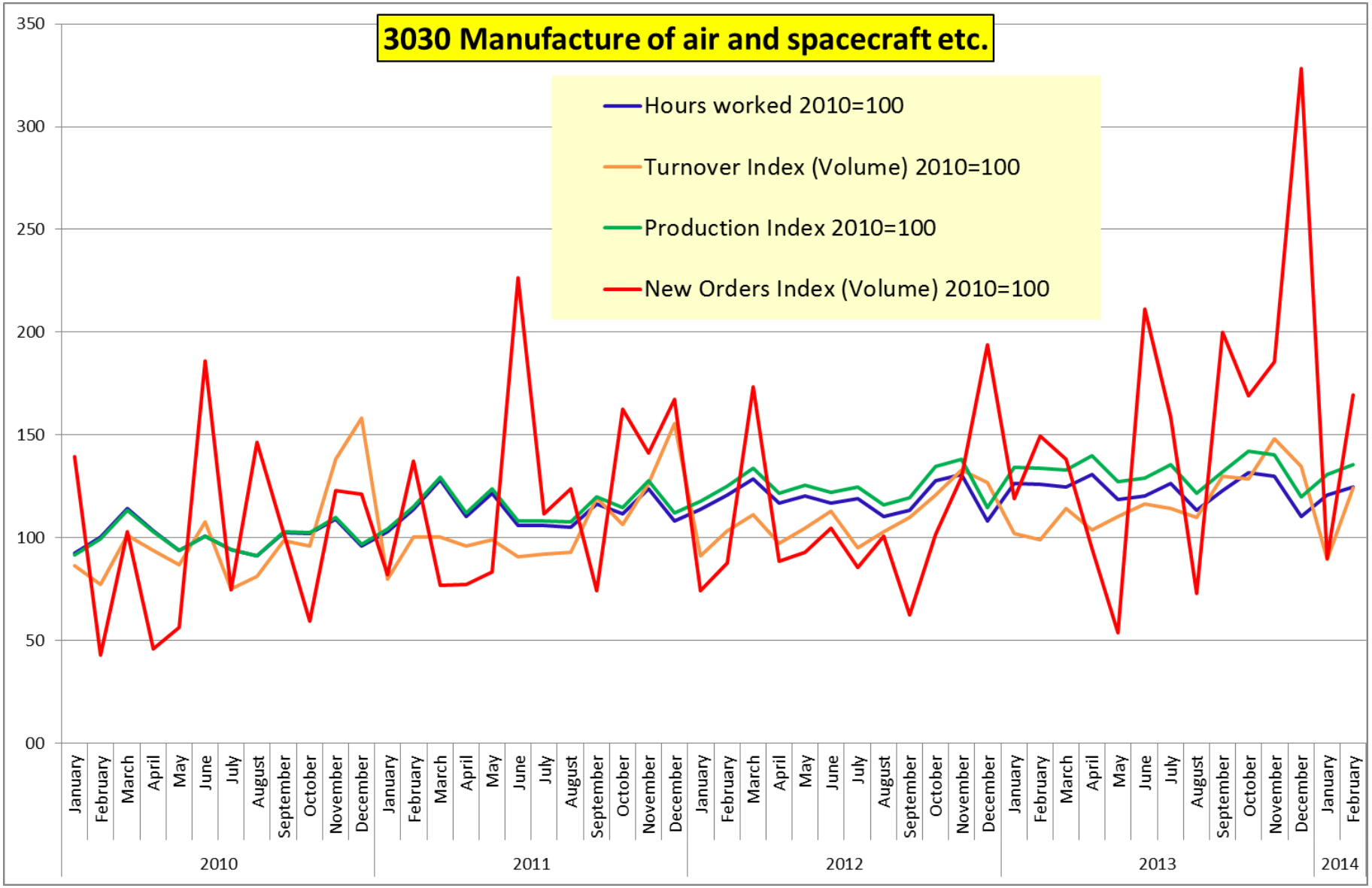

3020 Manufacture of railway locomotives and rolling stock
140
120
100
80
60
40
20
00
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Productivity factor (annual) 2005=100
Gross value added in real terms 2005=100
Hours worked (annual) 2005=100
Hours worked (monthly) 2005=100
Hours monthly modified by annual productivity factor 2005=100



Source: Federal Statistical Office of Germany – GENESIS-Online



Source: Federal Statistical Office of Germany – GENESIS-Online



Source: Federal Statistical Office of Germany – GENESIS-Online

1.3.1.2. Deflation

Deflation is defined as isolating the volume component (that is quantity and quality) from variables that have price and volume elements.

The volume measure is obtained by dividing the current period value by an appropriate price index.

There are generally four main price indices compiled by countries in the area of economic statistics. These are Producer Price Indices (PPI), Consumer Price Indices (CPI), Export Price Indices (EPI) and Import Price Indices (MPI).

The **PPI** is an index designed to measure the average change in the price of goods and services either as they leave the place of production or as they enter the production process.

The PPI is recommended as the price index to be used by countries when current price values are deflated to achieve volume measures of output for the IIP.

The PPI directly measures **product prices from the producer** (both input and output product prices of the production process) and **quality changes are usually taken into account**.
However, IIP compilers should first examine the details of the PPI indices available to ensure that:

(i) they are **representative** of the value aggregate to be deflated (the price survey may differ from the survey used for the value aggregates); and
(ii) quality changes do not significantly taint the PPI component measures.

The quality and application of the PPI is of great importance for the calculation and resulting quality of the IIP.

End of Session 1

Break

2. Methods of compilation of IIP

2.1. Basic principles of index compilation

General recommendations can be provided both in terms of methods and variables.

Measures of output are preferred to input measures, because
(i) The difficulty in identifying changes in the relationship between input variables and the value added of the production process; and
(ii) The need to consequently make adjustments to the data to take account of these changes.

Value of output or physical quantities of output are **preferred to value of output sold** being more accurate proxy measures of the volume of output in the reference period. Value of output sold is second-best.
Quantity indicators can be valid alternatives in measuring the industrial production in cases of homogenous goods and constant quality over time.

Deflation and volume extrapolation are *not* considered to be equivalent.
In general, the deflation process with the use of an appropriate price index is recommended.
For deflation a comprehensive suite of both value and price data needs to be available.

The main reasons for recommending deflation
• Deflation better accommodates a heterogeneous product mix due to the relative stability of prices;
• Price relatives for a representative sample of goods and services can be used as representative for all goods and services in the same group in a way that volume measures cannot provide
• The quality changes associated with changing, new and disappearing products can be properly reflected when current values are deflated by price indices.

Price indices are generally constructed with a **fixed basket approach** that holds **quality constant** over time. The price index therefore measures **pure price change**, ensuring any quality changes are reflected in the volume component.

2.2. Laspeyres, Paasche and Fisher volume indices

Three main types are used internationally when aggregating quantities over time.
For the **Laspeyres** index, the weights of some fixed base period are used.
For the **Paasche** index, the weights of the current period are used.

The Laspeyres volume index can be defined as the change in quantities (or volumes) of a specified basket of goods and services valued at the prices of the reference period 0. The Paasche index differs from the Laspeyres index in two respects. It uses a harmonic mean of quantity changes instead of an arithmetic average and the fixed period volumes are those of the current period *t*.

It is much less costly and time consuming to calculate a time series of Laspeyres indices than a time series of Paasche indices.

The geometric mean as an average for these two indices leads to the so called **Fisher ideal volume index**, which is generally considered as the best evenly weighted average of the Paasche and Laspeyres indices.

Laspeyres, Paasche and Fisher – How Do These Indices Fit Together?

Fisher-Price-Index FPI = $\sqrt[2]{\mathrm{LaPI} * \mathrm{PaPI}} = \sqrt[2]{\frac{\sum p_t q_0}{\sum p_0 q_0} \frac{\sum p_t q_t}{\sum p_0 q_t}}$

Fisher-Quantity-Index FQI = $\sqrt[2]{\mathrm{LaQI} * \mathrm{PaQI}} = \sqrt[2]{\frac{\sum p_0 q_t}{\sum p_0 q_0} \frac{\sum p_t q_t}{\sum p_t q_0}}$

The total growth (1+μ) can be split into
a price-related change (1+π) and
a quantity-related change (1+ρ)

$$\frac{\sum p_t q_t}{\sum p_0 q_0} = (1+\mu) = (1+\pi)\ (1+\rho)$$

$$\frac{\sum p_t q_t}{\sum p_0 q_0} = (1+\mu) = (1+\pi)\ (1+\rho) = \sqrt[2]{\frac{\sum p_t q_0}{\sum p_0 q_0} \frac{\sum p_t q_t}{\sum p_0 q_t}}\ \sqrt[2]{\frac{\sum p_0 q_t}{\sum p_0 q_0} \frac{\sum p_t q_t}{\sum p_t q_0}}$$

2.3. Building IIP from the lowest level

The calculation starts with the measurement of indicators at the **product level**.
The products are assigned to product groups using the Central Product Classification (CPC) Ver.2

These product groups contain fairly homogeneous products, and via the use of weights, the sampled products are combined to produce data for the product groups.

Where **values of production** are collected, **deflation is needed** to obtain industrial production volumes. **Deflation** of the value data to produce volume measures should occur **at the most detailed level** of the index structure.

The recommendation of the Laspeyres-type index for the calculation of the IIP implies that in circumstances where price deflators are used to obtain volume indices from current period values, the deflator should be of the Paasche-type.

In the absence of Paasche price indices current price values can be deflated by using Laspeyres deflators.

The outcome is an approximation of the type Paasche - when the current and reference periods are close, the difference between the two deflator types, and hence the difference between the resulting deflated values will be acceptably small.

It is important to be aware of both the conceptual and the theoretical approach, i.e. the theoretical IIP as an index of value added (net output) on one hand and the practical outcome, i.e. the IIP mainly is a gross output index on the other hand.

Let us now look at the formula

Index formulas – not to avoid…

The First Stage of the Index Calculation – Value Indices for Products

Value Index $\frac{\sum p_t q_t}{\sum p_0 q_0} * 100$

P and p are slightly different (P stands for the purely inflationary price movement)

Price Index (Laspeyres) LaPI $\frac{\sum P_t q_0}{\sum P_0 q_0} * 100$ (quality changes taken into account)

Value Index/Price Index (Laspeyres) ≈ Volume Index (Paasche)

$$\frac{\sum p_t q_t}{\sum p_0 q_0} / \frac{\sum P_t q_0}{\sum P_0 q_0} * 100 = \frac{\sum p_t^* q_t}{\sum p_t^* q_0} * 100$$

The production values can be of two different types:

a) Production intended for sale

b) Value of output sold (sold production) ≈ turnover

End of Session 2

Break

3. Weighting and aggregation

3.1. Role of weights in index compilation

Weights measure ***the relative importance*** of each index component. In the IIP, weights reflect the relative importance of a product, product group or industry within the overall scope of industrial production.

Weighting data to construct an IIP are

(i) weights for products
(ii) (ii) weights for product groups
(iii) (iii) weights for industry branches

3.2. Weighting index data in IIP

(i**) Product weights**: The aggregation of the index starts with a sample of specific products. Product data are combined using weights that reflect their relative importance to form product groups.
Value of output should is generally obtained via the conduct of product surveys.

(ii) **Product group weights** in the base period are obtained by determining the share of *value of output* by product group within its ISIC class. These values of output reflect the relative importance of each product group considered within an ISIC class and are used to aggregate data for these product groups.
Each product group is assigned to just one ISIC 4-digit industry.

(iii) **Weights for industries** (i.e. weights at the 1-, 2-, 3- and 4-digit levels of ISIC) in the base period are obtained by determining the share of gross *value added at basic prices* by industry of all industries in-scope of industrial production. Such information is available as a result of annual national accounts compilation.

While it could therefore also be desirable to use a value added-type concept at all levels of the IIP aggregation, this is limited by theoretical and practical circumstances. The concept of **value added is applicable only to activities** (and therefore industries), but not to products.

The upper stages of the IIP are compiled similarly to the IIP at the lower stages. Volume relatives are calculated and then weights are used to produce IIP data for all levels of the ISIC structure.

Index numbers at the ISIC class (4-digit) level should be aggregated first to the ISIC group (3-digit) level, then index numbers at the ISIC group level are aggregated to the ISIC division (2-digit) level and so on.

The Second Stage of the Index calculation – IIP for Branches

value of each product in relation to the value of all products relating to the particular branch

$$g_i = W_0^i / \sum_{i=1}^{n} W_0^i$$

aggregating the individual volume indices to the branch index k (k=1,…,m).

$$I_t^k = \sum_{i=1}^{n} g_i * V_t^i$$

The deeper the breakdown for products (n) is the more the Paasche-effect can be avoided

ISIC Rev. 4	PRODCOM 4-digits	CPC Ver. 2	CPA	PRODCOM 8-digits
2812	28.12	43211	28.12.11	28.12.11.30
		43219	28.12.12	28.12.11.80
		43251	28.12.13	28.12.12.00
		88762	28.12.14	28.12.13.20
			28.12.15	28.12.13.50
			28.12.16	28.12.13.80
			28.12.20	28.12.14.20
			28.12.99	28.12.14.50
				28.12.14.80
				28.12.15.30
				28.12.15.80
				28.12.16.30
				28.12.16.80
				28.12.20.00

$$g_i = W_0^i / \sum_{i=1}^{1} W_0^i$$

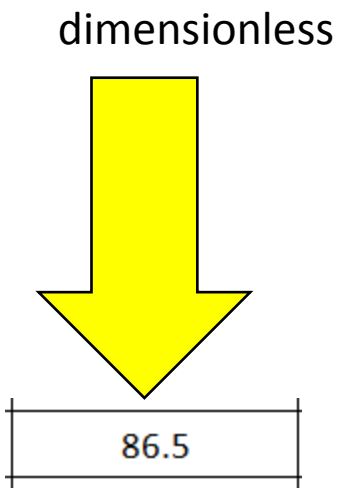
$$g_i = W_0^i / \sum_{i=1}^{4} W_0^i$$

$$g_i = W_0^i / \sum_{i=1}^{8} W_0^i$$

Pure Paasche

$$g_i = W_0^i / \sum_{i=1}^{14} W_0^i$$

IIP – from Output to Input…



Production Index 2010=100

Reporting period	Index (original)
December 2013	86.5

ISIC Rev.4 code 2812

Structure

Hierarchy

- Section: C - Manufacturing
- Division: 28 - Manufacture of machinery and equipment n.e.c.
- Group: 281 - Manufacture of general-purpose machinery
- **Class: 2812 - Manufacture of fluid power equipment**

Explanatory note

This class includes:
- manufacture of hydraulic and pneumatic components (including hydraulic pumps, hydraulic motors, hydraulic and pneumatic cylinders, hydraulic and pneumatic valves, hydraulic and pneumatic hose and fittings)
- manufacture of air preparation equipment for use in pneumatic systems
- manufacture of fluid power systems
- manufacture of hydraulic transmission equipment

This class excludes:
- *manufacture of compressors, see 2813*
- *manufacture of pumps and valves for non-fluid power applications, see 2813*
- *manufacture of mechanical transmission equipment, see 2814*

Click here for complete correspondences for this code.

Production Index 2010=100

ISIC Rev. 4 - 2812 Manufacture of fluid power equipment

Reporting period	Index (original)	Change to previous year	Change to previous month
December 2013	86.5	-0.3%	-26.8%
November 2013	118.1		
December 2012	86.8		

Reporting period	Working days	Change to previous year	Change to previous month	Change to the average 1991-2013
December 2013	18.0	5.9%	-11.3%	-6.7%
Average December 1991-2013	19.3			
November 2013	20.3			-1.9%
Average November 1991-2013	20.7			
December 2012	17.0			-11.9%

Production Index 2010=100

ISIC Rev. 4 - 2812 Manufacture of fluid power equipment

Reporting period	Index (working-day-adjusted)	Change to previous year	Change to previous month	Adjustment effect
Dezember 2013	89.1	-2.7%	-26.7%	3.0%
November 2013	121.5			2.9%
Dezember 2012	91.6			5.5%

Production Index 2010=100

ISIC Rev. 4 - 2812 Manufacture of fluid power equipment

Reporting period	Index (working-day- and seasonally adjusted)	Change to previous year	Change to previous month	Adjustment effect
Dezember 2013	107.3	-2.5%	-11.1%	24.0%
November 2013	120.7			2.2%
Dezember 2012	110.1			26.8%

Production Index 2010=100

ISIC Rev. 4 - 2812 Manufacture of fluid power equipment

Reporting period	Index (original)	Change to previous year	Change to previous month
December 2013	86.5	-0.3%	-26.8%
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November 2013	120.7			2.2%
Dezember 2012	110.1			26.8%

The Third Stage of the Index Calculation – IIP for the Whole Industry

Value-added shares (branch weights)

$$va_k = VA_0^k / \sum_{k=1}^{m} VA_0^k$$

Aggregating the individual branch indices I_t^k with the weights va_k

$$IIP_t = \sum_{k=1}^{m} va_i * I_t^k$$

3.3. Fixed weight versus chained index

• ***Fixed weight indices*** have their weight structure fixed at a particular point in time. These weights represent the relative worth of different products/industries at that point in time and are used to compute indices over an extended period. A fixed-weight volume or quantity index compares volume (or quantity) in period *t* relative to some fixed base period (which is why fixed-weight indices are also known as fixed-base indices). The weights are traditionally updated every 5 years and at this time the entire time series is re-calculated based on the new set of weights;

• The term ***chain linked indices*** refers to the updating of the weights and linking two index series together to produce a time series. Unlike the fixed weight approach, the chain approach does not re-calculate the entire historical series whenever the weights are updated, but rather links or splices together the two index series to produce a coherent time series. For example, a chained quantity index compares quantities between two periods taking into account information on weight changes in the intervening period or periods.

Using chain indices instead of fixed-weight indices reduces the spread between Laspeyres and Paasche types of indices. In fact, it can be shown that if individual prices and quantities tend to increase or decrease steadily over time, chaining will significantly reduce the index number spread, possibly almost eliminating it.

As a general recommendation, the chain-linking approach (the chained Laspeyres-type volume index), is the recommended one for the compilation of the IIP.

Industry level weights should be updated annually and product group weights should be updated frequently, at least every 5 years.

Chain Linking - Example

$$\frac{\sum p_0 q_1}{\sum p_0 q_0}, \frac{\sum p_1 q_2}{\sum p_1 q_1}, \ldots, \frac{\sum p_{t-1} q_t}{\sum p_{t-1} q_{t-1}}$$

Period	Individual Laspeyres-Indices (Example)												Chained Laspeyres-Index	
	2000		2001		2002		2003		2004		2005		Reference Year 2000=100	
	Index	Rate of change to previous year	Index	Rate of change to previous year	Index	Rate of change to previous year	Index	Rate of change to previous year	Index	Rate of change to previous year	Index	Rate of change to previous year	Index	Rate of change to previous year
2000	100.0												100.0	
2001	102.5	2.5%	100.0										102.5	2.5%
2002			103.4	3.4%	100.0								106.0	3.4%
2003					104.0	4.0%	100.0						110.2	4.0%
2004							100.7	0.7%	100.0				111.0	0.7%
2005									98.1	-1.9%	100.0		108.9	-1.9%
2006											103.0	3.0%	112.2	3.0%

End of Session 3

Break

4. Index compilation steps

4.1. Other compilation issues – introducing new products, reweighting and linking methods

4.1.1. Introducing new products

New products and the disappearance of old products is always observed in economies. When new products become significant, they should be included in IIP.

If weights are updated every five years, no information about the new products are available in the base period.

Old products disappear and direct comparisons to the base period are also no longer possible. This results in fewer and fewer actual product comparisons from which to compile the IIP.

By the annual updating of weights the new product can be added to the basket of products in the (new) base period and quantity comparisons between the current period and the base period are possible.

4.1.2. Re-weighting, linking and re-referencing the index

Re-weighting process means introducing new weights into the index structure

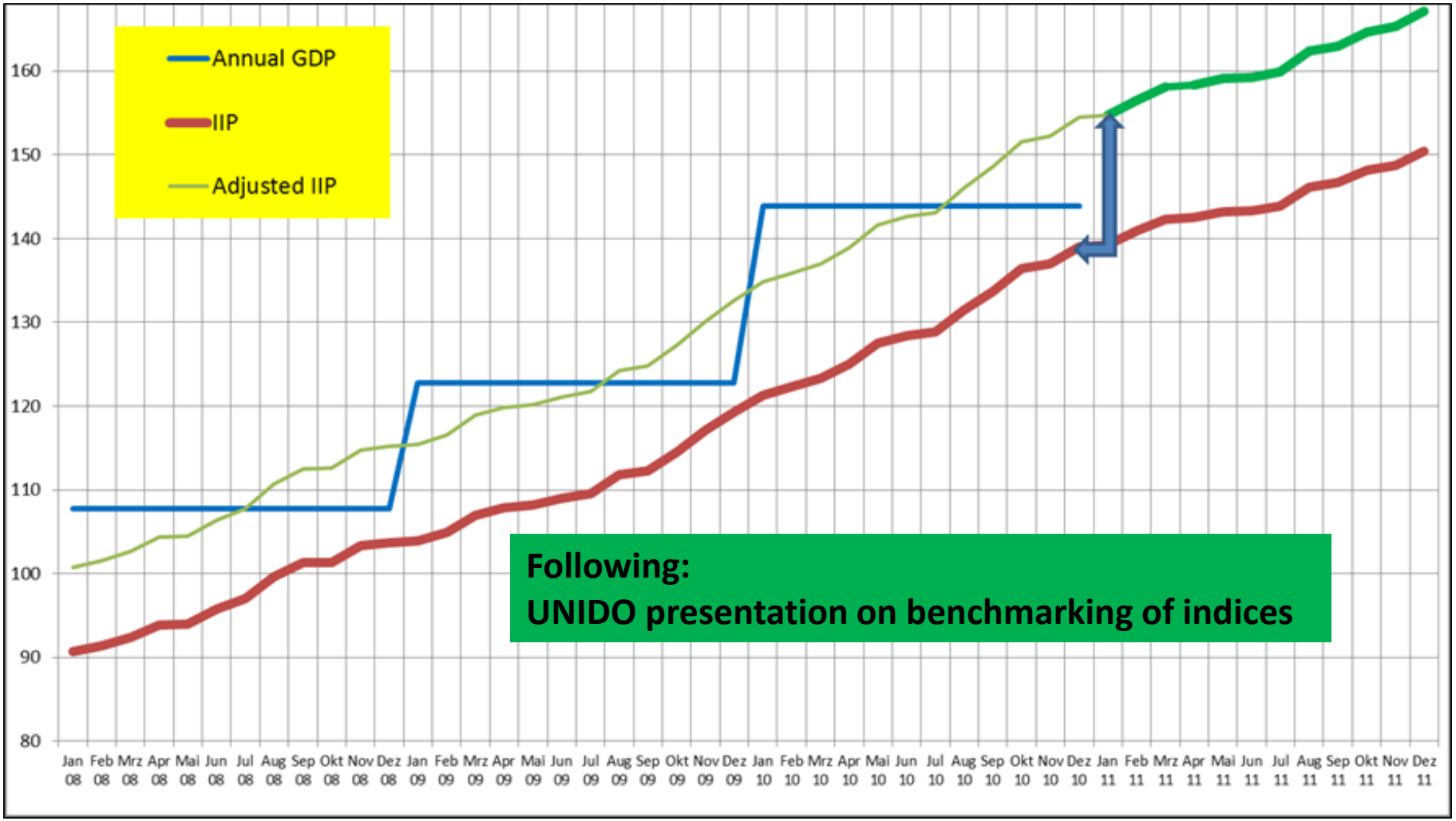
Linking is a numerical operation requiring data for an overlapping period of the index using both the old and new weights

There are **three** linking methods:
The one quarter overlap (a link factor is derived by dividing the index of the first quarter of year t by the index for the same quarter using the weights of year t-1),
The annual overlap technique (a link factor is derived by dividing the index for year t by the index for year t using the weights of year t-1) and
The over-the-year technique (a link factor is determined based on the same period in the previous year).

Individual countries need to determine the most appropriate linking method for their own circumstances.

Re-referencing means updating the reference period to equal 100.0

Benchmarking



End of Session 4

5. Quality assurance of IIP

5.1. Comparison of monthly/quarterly indices with annual data

It is recommended to compare the sub-annual IIP be compared to other data sources.

These comparisons could improve the production of the index in future periods, for example by improving or changing IIP data sources.

The comparison of the IIP to, for example, the annual surveys that measure value added is suggested as annual data are available and are collected to obtain a measurement of both output and intermediate consumption – the difference being value added.

Methods used to measure value added at annual and sub-annual frequencies are likely to produce some discrepancy in the results due to conceptual and practical issues.
However, further examination of the data results (both sub-annual and annual) are required where the discrepancies cannot be explained by these conceptual or practical issues.

Some countries take this data confrontation process a step further and implement *benchmarking* of the monthly IIP to the annual national accounts (this was already presented by UNIDO).

5.2. Seasonal adjustment

Time series data on economic statistics often show seasonal fluctuations.
This distorts the view at the business cycle.

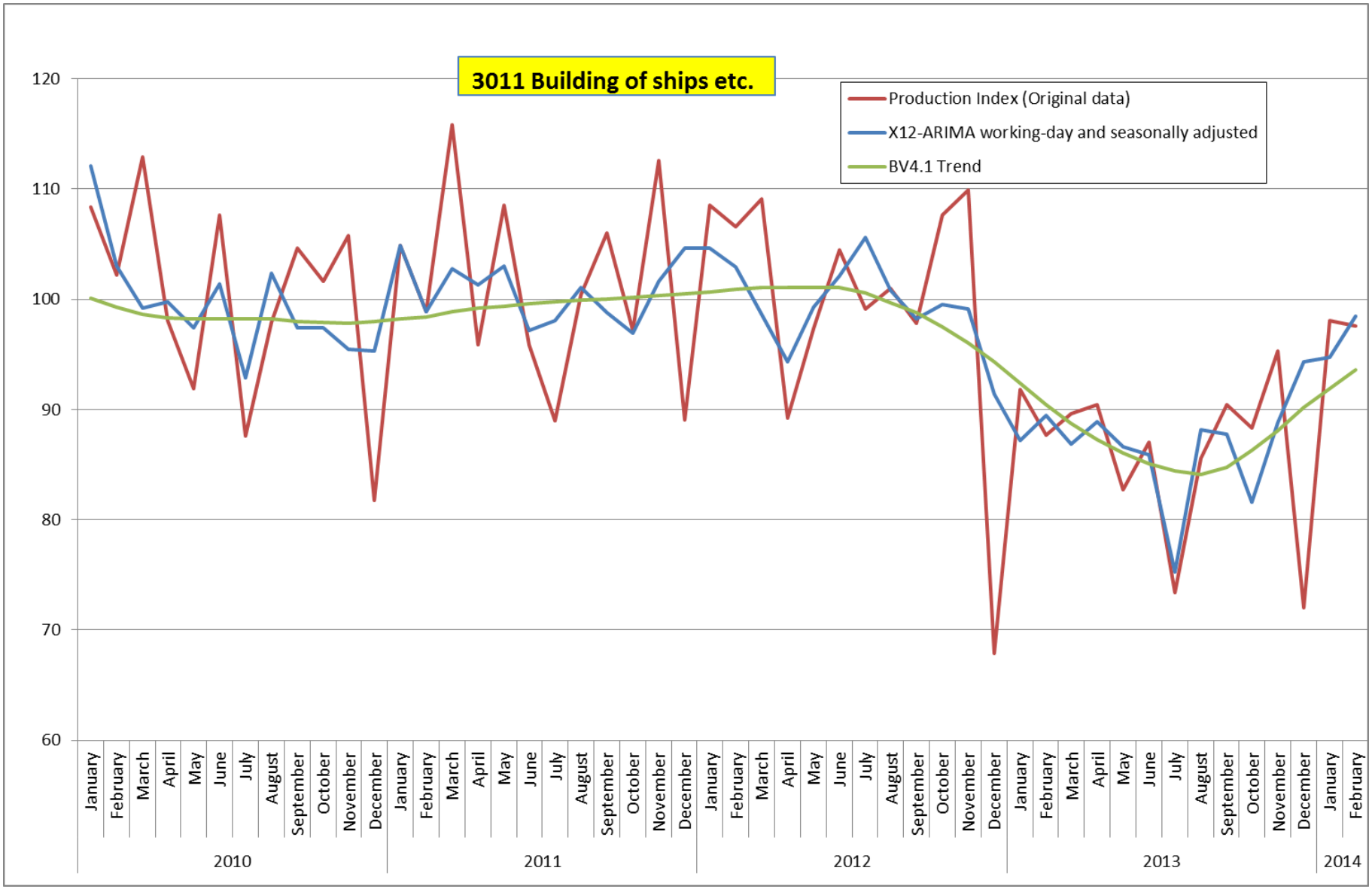
In seasonally adjusted data these effects are identified and removed.

The main aim of seasonal adjustment is to filter out seasonal fluctuations and typical calendar effects within the movements of the time series.

Seasonally adjusted data help to reveal the “news” contained in the time series, which is the ultimate goal of seasonal adjustment.

Usual seasonal fluctuations are movements which can under normal circumstances be expected to recur.

Calendar effects are those effects associated with the composition of the calendar.


3011 Building of ships etc.
Production Index (Original data)
X12-ARIMA working-day and seasonally adjusted
BV4.1 Trend
120
110
100
90
80
70
60
January
February
March
April
May
June
July
August
September
October
November
December
2010
2011
2012
2013
2014

The seasonally adjusted data and the estimated trend/trend-cycle complement the original data, but they cannot replace the original data for the following reasons:

i) unadjusted data are useful in their own right
ii) no unique solution exists on how to conduct seasonal adjustment
iii) seasonally adjusted data are subject to revisions

Advantages of seasonal adjustment
Seasonal adjustment supplies users and analysts with the necessary inputs for business cycle analysis, trend-cycle decomposition and turning points detection.
Disadvantages of seasonal adjustment
• Subjectivity: seasonal adjustment depends on hypotheses about the components of the time series and may vary from one software to another
• Burden: seasonal adjustment is consuming time and resources
• Risks: misleading results increase the probability of false signals
General recommendation
Countries should consider producing and disseminating seasonally adjusted series

Following:
UNIDO presentation on International experience of seasonal adjustment

End of Session 5

Break

5.3. Other quality issues

5.3.1. Quality Adjustment

The term ***quality*** refers to all those characteristics of a good or service that is sufficiently different to make them distinguishable from each other from an economic point of view.

In the **first** method, the **production value data** used to calculate an IIP are deflated using a **price index**. The extent and nature of methods used by price index compilers to take account of such quality changes if the price indices are to be used effectively as IIP deflators.

In the **second** method, when an IIP is compiled using **volume extrapolation**, including quality changes in the IIP calculation is more complex. The relationship between labor input and production output also changes as a result of changes in capital intensity and total factor **productivity**.

Other variables where quality adjustments are required include output variables like physical quantity and input variables like materials consumed.

Missing Values – Increasing the Quality of the Preliminary IIP

	Total production value		Value taken over from previous month		Reported value in the reporting month	
t	150 000		15 000		135 000	
	100%	Δ=	10%	1-Δ=	90%	
	IIP		**IIP**		**IIP**	
t-1	103.4		103.4		103.4	
t	123.0	1.190	103.4	1.000	**X**	
t	**125.2**	1.211	125.2	1.211	125.2	1.211
	adjusted preliminary IIP	X=	(IndexTotal(t)-IndexTotal(t-1)*Δ)/(1-Δ)			
		X=	125.2			
	rate of change reported data=		1.211			

5.3.2. Dimensions of quality

The quality of a statistical product is assessed via the following **seven dimensions**:

- **Relevance**: Statistics are compiled to meet the strong demands of analysts and policy makers.
- **Accuracy**: Accuracy refers to the closeness between the values provided and the (unknown) true values.
- **Credibility**: The credibility of data products refers to the confidence that users place in those products based simply on their image of the data producer, i.e., the brand image.
- **Timeliness**: Data should be made available quickly after the reference period.
- **Accessibility**: The accessibility of data products is described as how readily the data can be located, the suitability of the form in which the data are available, the media of dissemination, and the availability of metadata and user support services.
- **Interpretability**: The interpretability of data is closely related to the users' understanding of the data for their use.
- **Coherence**: The coherence of data products reflects the degree to which they are logically connected and mutually consistent.

Four important **subdimensions for coherence** can be distinguished:

- Coherence **within a dataset**
- Coherence **across datasets**
- Coherence **over time**
- Coherence **across countries**

Cost efficiency can be described as a measure of the costs and provider burden relative to the output.

A difficult element of any quality framework is its implementation. Some scoring systems include quantitative measures for comparison purposes, while others rely heavily on qualitative statements to highlight priority areas for data improvement.

It is recommended that **a quality review of the IIP** using a quality assessment framework be undertaken **every four or five years**, or more frequently if significant new data sources become available.

5.3.3. Evaluating the suitability of data variables and methods

The *preferred approach* presents the variables and methods that are considered to be most appropriate as a short-term indicator in an IIP context. Second-best are the *alternative variables,* and the *other variables* typically produce a less precise measure.

The **six issues** relevant to an assessment of the suitability of data variables

- **Relevance**: The indicator should measure changes in output (value added) rather than some other variable or concept;
- **Accuracy**: The level of accuracy of the indicator itself should be acceptable.
- **Timeliness**: As the purpose is to estimate short-term change in value added, a short-term indicator is required to be made available quickly;
- **Periodicity** / frequency: That is, in order to reflect monthly (or quarterly) value added, an indicator should ideally consist of independent monthly (or quarterly) observations;
- **Interpretability**: An indicator that estimates short-term change in value-added should cover, in some representative fashion, the full range of businesses or other types of organizations that are included within the industry or sector category in question; and
- **Coherence**: The same indicator should be used throughout the entire time series.

End of Session 6

Break

6. Methods of compilation of IIP for various industrial sectors

6.1. Special consideration for IIP compilation for mining and quarrying, manufacturing and utility sectors

According to the international classification NACE rev.2, the following activities are **not used** for generating industrial statistical indicators **in Germany**:

1) 35.3 Steam and air conditioning supply;
2) 36 Water collection, treatment and supply;
3) 37 Sewerage;
4) 38.1 Waste collection;
5) 38.2 Waste treatment and disposal;
6) 38.3 Materials recovery;
7) 39 Remediation activities and other waste management services.

According to Eurostat directive No1503/2006, EU countries may voluntarily exclude the above activities in generating industrial statistical indicators.

Included in the German IIP:

35.1 Electric power generation, transmission and distribution
35.2 Manufacture of gas; distribution of gaseous fuels through mains

It should be mentioned that not only the production but also the distribution of electricity and gas is included.

Distribution is part of the output.

Thank you for your attention!

For additional questions

don’t hesitate to contact me via mail

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ANNEX
Recommended PowerPoint-Presentations

International Recommendations for the Index of Industrial Production (IIP)

Two main approaches to calculate the IIP

Re-weighting, linking and re-referencing the IIP

Dissemination of IIP data

Presentations from Ralf Becker - United Nations Statistics Division/DESA

These presentations can also be ordered via my mail account
cnherbel@arcor.de

International Workshop on Industrial Statistics

Dalian, China

June 2010

Statistical units and data items for monthly/quarterly survey

Benchmarking of monthly/quarterly IIP

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