



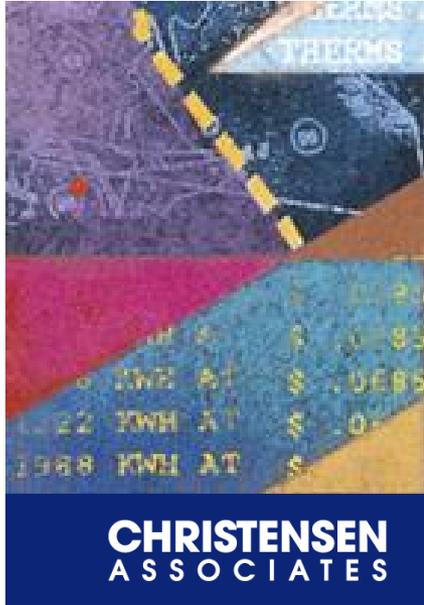
Ms. Marlene H. Dortch

August 16, 2016

Page 2

Attachment

cc: Eric Ralph  
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Christopher Koves  
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# Christensen Associates: *BDS X-factor Issues*

Mark Meitzen and Phil Schoech

Laurits R. Christensen Associates

*August 12, 2016*

# Key messages

*Because the productivity growth actually experienced over the 2005-14 period has matched almost exactly GDP-PI growth, there is no justification for any going-in price reset or increase in the X-factor*

- The X-factor since 2005 has not been zero – it has been set equal to GDP-PI inflation, or ~1.9%.
- This is not appreciably different from what we measure achieved productivity growth to have been over this time period.
- BLS KLEMS provides the best methodology for measuring actual productivity growth to determine a BDS X-factor.

# X-factor calculations must be based on the best available measures of productivity

## *The prospective X-factor should not exceed 2%*

- As we have explained, the BLS KLEMS productivity methodology using GDP-PI calibration computes an X-factor of **1.95%** based on 2005-2013 data.
- The FNPRM's calculations of an  $X = 1.85\%$  over this period were correct other than for a modest problem with the input price index.
- Just as the opening comments were being filed, the BLS made some adjustments to its KLEMS data and updated these data to include 2014. These 2005-2014 data show an X-factor of **1.99%** — practically unchanged from the prior estimate, which provides added confidence that the BLS data generate a stable estimate of the X-factor.

## *Grafting CACM-based parameters into KLEMS TFP calculations is inappropriate*

- CACM-based estimates of input proportions are for a forward-looking mass-market BIAS network, not the existing DSn BDS network that is composed of individually designed circuits, i.e., *special* access, which has a significantly different cost structure.
- Input price data for the CACM are dated, idiosyncratic, and do not measure input prices in the manner that the KLEMS TFP methodology requires. Estimates of price changes for new, forward-looking capital equipment do not equate to changes in the Jorgenson user/rental cost of capital equipment.
- Input price data from rural RoR ILEC TDS are undocumented, inapposite to largely urban BDS and unauditable. Further, they also do not measure input prices in a manner consistent with KLEMS TFP methodologies.

# Sprint's proposed methodology is inapt

*No CLEC other than Sprint provides any analysis to support its proposals for an X-factor or one-time price adjustment*

*Sprint urges the Commission to ignore the federal government's official total factor productivity data from the BLS/BEA – and instead rely on certain 1998-2010 KLEMS data from a European Union research consortium as the basis for a claimed X-factor of 4.4% and one-time price reduction of 25-47%*

*Sprint's proposals have no theoretical or empirical support*

- Sprint's argument for use of EU KLEMS data over BLS KLEMS data is based on its inaccurate belief that the EU KLEMS data are telecommunications-only, while BLS KLEMS combines telecommunications with broadcasting. EU KLEMS documentation clearly confirms that for the U.S., the industry that it captions "Telecommunications" includes broadcasting, too. Given that the BLS KLEMS data run through 2014, there is no coverage reason whatsoever to prefer the EU KLEMS data set.
- Sprint's contentions about broadcasting productivity are thus without any empirical support – and in all events, broadcasting is such a small portion of the combined industry (18% by revenue and 8% by PP&E) that it can have little effect on the overall estimates.
- Further, the EU KLEMS data are not appropriate for the Commission's price cap regime that caps total BDS prices because these data were developed to measure value-added productivity, not gross output productivity. Mathematically, value-added productivity will always exceed gross output productivity – in this case by a very substantial amount.
- Further, Sprint employs an input price adjustment that accounts only for changes in the prices of Energy, Materials and Services – and neglects any changes in the prices for Capital and Labor – the majority inputs for telecommunications.

# The real issue associated with the X-factor is the national comparator

*The Commission's price cap formula and equations use GDP-PI to represent the difference between national input price growth and national TFP*

*Sprint and the Commission's May 1997 Price Cap Review Order suggest that the national comparator should be BLS statistics for the Private Non-Farm Business sector*

- This measure excludes the productivity and input price experience of the government, farm and not-for-profit sectors (about 27% of U.S. GDP) from the national comparator
- Using this sub-national measure reduces the calculated X-factor for 2005-2014 down from **1.99%** to **1.72%**.



## EU KLEMS Growth and Productivity Accounts

Jump To  
ISIC Rev. 3  
March 2011 Update  
72 industries up to 2007

Jump To  
ISIC Rev. 4  
34 industries

- The March 2011 release is an update of the November 2009 release. It provides data up to 2007, for a limited set of variables for 72 industries. The [March 2008 release](#) provides the most extended range of variables, but period coverage is limited to data up to 2005.
- The data in the ISIC Revision 4 classification is published on a rolling, country by country, basis. Data up to the most recent year available is included. Back-casts to the year 1970 are provided for most variables based on the March 2011 EU KLEMS data in ISIC Rev.3. More details can be found in the source documentation for each country.
- Additional EU KLEMS files for non-European countries can be found on the website of the [World KLEMS](#) initiative.



*The construction of this database is financially supported by the European Commission, Research Directorate General as part of the 6th Framework Programme, Priority 8, "Policy Support and Anticipating Scientific and Technological Needs" and as part of the 7th Framework Programme, Theme 8: Socio-Economic Sciences and Humanities, Grant agreement no: 225 281. Any errors or omissions are entirely the responsibility of the GGDC (Groningen Growth and Development Centre). For comments and suggestions please send an email to [euklems@rug.nl](mailto:euklems@rug.nl).*



Reactions to this page  
Last changed on: November 27 2009



- EU KLEMS Data
- EU KLEMS Project

## EU KLEMS Growth and Productivity Accounts: Data in the ISIC Rev. 4 industry classification

For a summary overview of the methodology and construction of the EU KLEMS database, see:

**O'Mahony, Mary and Marcel P. Timmer (2009),**  
**"Output, Input and Productivity Measures at the Industry Level: the EU KLEMS Database",**  
*Economic Journal*, 119(538), pp. F374-F403

*When using this data, please cite this source.*

For more details and analysis, see: **Timmer, Inklaar , O'Mahony and van Ark**, *Economic Growth in Europe*, Cambridge University Press, 2010

### Introduction

The 2012 EU KLEMS release follows up from the previous release in 2009 which showed detailed growth accounts up to 2007. This new release is similar in concepts and methodologies to calculate the various growth and productivity variables as its predecessors, but it also has a number of new features;

- It provides updates and data for additional years and revisions of longer time-series in case national statistical institutes (NSIs) provided these.
- For labour composition use has been made of the micro-data underlying the European Labour Force Survey (LFS) for recent years.
- New investment data has been provided by the EU KLEMS consortium partners.
- Most importantly, a new industrial classification is used based on the new international ISIC Revision 4 industry classification, which is consistent with the European NACE 2 industry classification. The National Accounts (NA) data in the new classification is typically provided for shorter time series than were previously available in the ISIC Rev. 3 (NACE 1) classification. We back-cast time series of output and labour data using growth rates from the earlier data in the ISIC Rev. 3 classification. These imputations are denoted in grey in the new release.

### Sources and methods

The EU KLEMS updates in the new ISIC Rev. 4 industry classification are being done on a country by country basis. New releases are dependent on the availability of data and resources. Documentation will be provided separately for each country and release.

### Content of the files:

- Basic File: Basic output, input and productivity data for 34 industries according to the ISIC Rev. 4 industry classification.
- Capital Input File: Contains additional information on investments and capital stocks for the same industry level as the basic file.
- Labour Input File: Contains additional information on several types of labour (labour composition) for more aggregate sectors.
- Sources and Notes: Contains notes with source descriptions and additional notes.
- Partner: Reference to the website of the research group or consortium partner that helped in constructing the data. Additional information can be found here.

Country	Basic File	Capital Input File	Labour Input File	Sources and Notes	Partner	Release Date
Sweden	<a href="#">SWE Basic 2013</a>	Not Available	Not Available	<a href="#">SWE Sources 2013</a>	<a href="#">STATSWE</a>	December 2013
Finland	<a href="#">FIN Basic 2013</a>	<a href="#">FIN Capital 2013</a>	<a href="#">FIN Labour 2013</a>	<a href="#">FIN Sources 2013</a>	<a href="#">STATFI</a>	December 2013



EU KLEMS Data  
 EU KLEMS Project

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Sweden	<a href="#">SWE Basic 2013</a>	Not Available	Not Available	<a href="#">SWE Sources 2013</a>	<a href="#">STATSWE</a>	December 2013
Finland	<a href="#">FIN Basic 2013</a>	<a href="#">FIN Capital 2013</a>	<a href="#">FIN Labour 2013</a>	<a href="#">FIN Sources 2013</a>	<a href="#">STATFI</a>	December 2013
Belgium	<a href="#">BEL Basic 2013</a>	Not Available	Not Available	<a href="#">BEL Sources 2013</a>	<a href="#">FPB</a>	December 2013
Japan	<a href="#">JPN Basic 2012</a>	<a href="#">JPN Capital 2012</a>	Not Available	<a href="#">JPN Sources 2012</a>	<a href="#">JIP</a>	May 2013
United States	<a href="#">USA Basic 2012</a>	Not Available	Not Available	<a href="#">USA Sources 2012</a>	<a href="#">BEA/BLS</a>	March 2013
Netherlands	<a href="#">NLD Basic 2012</a>	<a href="#">NLD Capital 2012</a>	<a href="#">NLD Labour 2012</a>	<a href="#">NLD Sources 2012</a>	<a href="#">CBS</a>	November 2012
United Kingdom	<a href="#">UK Basic 2012</a>	<a href="#">UK Capital 2012</a>	<a href="#">UK Labour 2012</a>	<a href="#">UK Sources 2012</a>	<a href="#">NIESR</a>	October 2012
Germany	<a href="#">GER Basic 2012</a>	<a href="#">GER Capital 2012</a>	<a href="#">GER Labour 2012</a>	<a href="#">GER Sources 2012</a>	<a href="#">DIW</a>	October 2012
Italy	<a href="#">ITA Basic 2012</a>	<a href="#">ITA Capital 2012</a>	<a href="#">ITA Labour 2012</a>	<a href="#">ITA Sources 2012</a>	<a href="#">ISTAT</a>	October 2012
Austria	<a href="#">AUT Basic 2012</a>	<a href="#">AUT Capital 2012</a>	<a href="#">AUT Labour 2012</a>	<a href="#">AUT Sources 2012</a>	<a href="#">WIFO</a>	July 2012
France	<a href="#">FRA Basic 2012</a>	Confidential	<a href="#">FRA Labour 2012</a>	<a href="#">FRA Sources 2012</a>	<a href="#">CEPII</a>	July 2012
Spain	<a href="#">ESP Basic 2012</a>	<a href="#">ESP Capital 2012</a>	<a href="#">ESP Labour 2012</a>	<a href="#">ESP Sources 2012</a>	<a href="#">IVIE</a>	July 2012

**Other EU KLEMS Releases in ISIC Rev. 3 (NACE 1):**

- [March 2007 Release](#)
- [November 2007 Intermediate Release](#)
- [March 2008 Release](#)
- [November 2009 Release](#)
- [March 2011 Update of the November 2009 Release](#)
- [Linked Database](#)



*This update of the EU KLEMS database is part of the **INDICSER** project. This project is funded by the European Commission, Research Directorate General as part of the 7th Framework Programme, Theme 8: Socio-Economic Sciences and Humanities. Grant Agreement no: 244 709 Any errors or omissions in this update of the EU KLEMS database are entirely the responsibility of the GGDC (Groningen Growth and Development Centre). For comments and suggestions please send an email to [euklems@rug.nl](mailto:euklems@rug.nl).*

# EU KLEMS mapping of U.S. BLS/BEA data to EU categories

## 1 Mapping NAICS and NACE 1 to NACE 2

In this section the main issues in mapping the NAICS industries to the new NACE 2 classification are briefly highlighted. The same is done for the industry mapping between NACE 1 and NACE 2 industries.

### *Mapping NAICS to NACE 2*

In general the new NACE 2 industry classification provides a better fit with the NAICS industry classification for many industries and sectors. Particularly the new 'Information and Communication' sector (J) is an improvement in matching corresponding NAICS industries. However, there are a number of industries that do not map directly to NACE 1 industries and therefore compromises have been made. To a large extent these issues were already present when mapping the NAICS industries to the NACE 1 industry list. Some of these mapping difficulties are specific to the U.S. like the case of U.S. postal services which is mostly a state owned enterprise, therefore output and labour for this industry are in state and local government which is now allocated to the 'Public Administration and Defence, compulsory social security' (O). The NAICS-NACE 2 concordance used for the U.S. is based on an OECD (many to one) mapping to a target NACE 2 industry list at the A38 level. The EU KLEMS 34 industries list deviates slightly from the official A38 list; hence the mapping table has been adjusted for these differences. The source NAICS industry list from the BEA/BLS prototype Industry-Level Production Account consists of 63 industries. No attempt was made to split NAICS industries. The full mapping table is given in Appendix table 1. The list below gives a brief overview of the most important mapping issues.

Source: [http://www.euklems.net/data/nace2/USA\\_sources\\_12i.pdf](http://www.euklems.net/data/nace2/USA_sources_12i.pdf) at p. 2

# EU KLEMS mapping of U.S. BLS/BEA data to EU categories

Appendix Table 1

## U.S. NAICS-NACE2 many to one industry concordance

NAICS list	NACE 2	NAICS Description	Comments on NAICS industries
111, 112	A	Farms	
113, 114, 115	A	Forestry, fishing, and related activities	
211	B	Oil and gas extraction	
212	B	Mining, except oil and gas	
213	B	Support activities for mining	
22	D-E	Utilities	
23	F	Construction	
321	16-18	Wood products	
327	22-23	Nonmetallic mineral products	
331	24-25	Primary metals	
332	24-25	Fabricated metal products	
333	28	Machinery	
334	26-27	Computer and electronic products	
335	26-27	Electrical equipment, appliances, and components	
3361, 3362, 3363	29-30	Motor vehicles, bodies and trailers, and parts	
3364, 3365, 3366, 3369	29-30	Other transportation equipment	
337	31-33	Furniture and related products	
339	31-33	Miscellaneous manufacturing	
311, 312	10-12	Food and beverage and tobacco products	
313, 314	13-15	Textile mills and textile product mills	
315, 316	13-15	Apparel and leather and allied products	
322	16-18	Paper products	
323	16-18	Printing and related support activities	
324	19	Petroleum and coal products	
325	20-21	Chemical products	
326	22-23	Plastics and rubber products	
42	46	Wholesale trade	Includes Wholesale of motor vehicles
44, 45	47	Retail trade	Includes Retail of motor vehicles

Appendix Table 1

## U.S. NAICS-NACE2 many to one industry concordance

NAICS list	NACE 2	NAICS Description	Comments on NAICS industries
481	49-52	Air transportation	
482	49-52	Rail transportation	
483	49-52	Water transportation	
484	49-52	Truck transportation	
485	49-52	Transit and ground passenger transportation	
486	49-52	Pipeline transportation	
487, 488, 489	49-52	Other transportation and support activities	Includes parts of postal and courier services (NAICS 492; Couriers and messengers)
493	49-52	Warehousing and storage	
511, 516	58-60	Publishing industries (includes software)	
512	58-60	Motion picture and sound recording industries	
515, 517	61	Broadcasting and telecommunications	Includes broadcasting
518, 519	62-63	Information and data processing services	
521, 522	K	Federal Reserve banks, credit intermediation, and related activities	
523	K	Securities, commodity contracts, and investments	
524	K	Insurance carriers and related activities	
525	K	Funds, trusts, and other financial vehicles	
531	L	Real estate	
532, 533	L	Rental and leasing services and lessors of intangible assets	
5411	M-N	Legal services	
5415	62-63	Computer systems design and related services	
5412-5414, 5416-5419	M-N	Miscellaneous professional, scientific, and technical services	
55	M-N	Management of companies and enterprises	
561	M-N	Administrative and support services	

Source: [http://www.euklems.net/data/nace2/USA\\_sources\\_12i.pdf](http://www.euklems.net/data/nace2/USA_sources_12i.pdf) at p. 6

# EU KLEMS data variables

## USA

### Basic Tables

Source: EUKLEMS database, March 2013 release

#### Variables

##### Values

<a href="#">GO</a>	Gross output at current basic prices (in millions of US Dollars)
<a href="#">II</a>	Intermediate inputs at current purchasers' prices (in millions of US Dollars)
<a href="#">IIE</a>	Intermediate energy inputs at current purchasers' prices (in millions of US Dollars)
<a href="#">IIM</a>	Intermediate material inputs at current purchasers' prices (in millions of US Dollars)
<a href="#">IIS</a>	Intermediate service inputs at current purchasers' prices (in millions of US Dollars)
<a href="#">VA</a>	Gross value added at current basic prices (in millions of US Dollars)

##### Prices

<a href="#">GO_P</a>	Gross output, price indices, 2005 = 100
<a href="#">II_P</a>	Intermediate inputs, price indices, 2005 = 100
<a href="#">IIE_P</a>	Intermediate energy inputs, price indices, 2005 = 100
<a href="#">IIM_P</a>	Intermediate material inputs, price indices, 2005 = 100
<a href="#">IIS_P</a>	Intermediate service inputs, price indices, 2005 = 100
<a href="#">VA_P</a>	Gross value added, price indices, 2005 = 100

##### Volumes

<a href="#">GO_QI</a>	Gross output, volume indices, 2005 = 100
<a href="#">II_QI</a>	Intermediate inputs, volume indices, 2005 = 100
<a href="#">IIE_QI</a>	Intermediate energy inputs, volume indices, 2005 = 100
<a href="#">IIM_QI</a>	Intermediate material inputs, volume indices, 2005 = 100
<a href="#">IIS_QI</a>	Intermediate service inputs, volume indices, 2005 = 100
<a href="#">VA_QI</a>	Gross value added, volume indices, 2005 = 100
<a href="#">H_EMP_QI</a>	Hours worked, volume indices, 2005 = 100
<a href="#">LP_I</a>	Gross value added per hour worked, volume indices, 2005 = 100

##### Growth accounting

<a href="#">LAB</a>	Labour compensation (in millions of US Dollars)
<a href="#">CAP</a>	Capital compensation (in millions of US Dollars)
<a href="#">LAB_QI</a>	Labour services, volume indices, 2005 = 100
<a href="#">CAP_QI</a>	Capital services, volume indices, 2005 = 100
<a href="#">VA_Q</a>	Growth rate of value added volume (% per year)
<a href="#">VAConH</a>	Contribution of hours worked to value added growth (percentage points)
<a href="#">VAConLC</a>	Contribution of labour composition change to value added growth (percentage points)
<a href="#">VAConK</a>	Contribution of capital services to value added growth (percentage points)
<a href="#">VAConTFP</a>	Contribution of TFP to value added growth (percentage points)
<a href="#">TFPva_I</a>	TFP (value added based) growth, 2005 = 100

# Table A2.2: Information retrieved from the EU KLEMS database

Variable	desc	code	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
GO	Telecommunications	61	413,281	480,190	505,584	519,621	519,640	523,817	541,695	570,373	592,351	618,382	636,687	625,715	644,811
VA	Telecommunications	61	220,698	233,918	256,823	267,286	267,916	288,259	288,188	310,692	315,510	345,537	357,191	338,936	347,282
II	Telecommunications	61	192,584	226,272	248,742	252,334	251,724	255,557	253,507	259,682	278,841	272,844	279,497	286,779	297,528
GO_QI	Telecommunications	61	66.7	75.6	84.5	87.8	88.8	89.2	92.8	100.0	104.4	108.3	112.1	110.4	113.6
VA_QI	Telecommunications	61	59.1	64.6	73.4	78.0	79.6	80.0	87.6	100.0	104.6	113.8	121.0	115.4	119.3
II_QI	Telecommunications	61	76.3	89.9	98.7	100.3	100.4	100.8	99.3	100.0	104.3	101.9	102.0	104.5	107.1
GO_P	Telecommunications	61	108.7	106.7	104.9	103.8	102.7	103.0	102.3	100.0	99.5	100.1	99.6	99.4	99.5
VA_P	Telecommunications	61	120.2	118.5	112.6	110.3	108.3	107.9	105.9	100.0	97.1	97.7	95.0	94.5	93.7
II_P	Telecommunications	61	97.2	96.9	97.1	96.9	96.6	97.6	98.3	100.0	102.2	103.1	105.6	105.7	107.0
IIE	Telecommunications	61	1,948	3,132	4,838	5,996	4,537	5,538	6,074	6,765	6,417	5,431	6,420	5,196	5,217
IIM	Telecommunications	61	28,840	32,919	32,938	28,147	25,062	25,231	26,755	27,359	31,925	32,321	33,451	31,203	38,147
IIS	Telecommunications	61	163,796	190,221	210,966	218,191	222,125	224,788	220,678	225,558	238,499	235,092	239,626	250,380	254,164
IIE_QI	Telecommunications	61	59.0	90.0	114.6	134.0	110.1	110.5	108.5	100.0	87.7	70.9	71.7	75.5	66.9
IIM_QI	Telecommunications	61	79.7	102.7	108.9	97.1	88.5	92.1	98.7	100.0	114.8	117.6	121.2	115.6	141.9
IIS_QI	Telecommunications	61	78.0	87.9	97.1	99.9	101.6	101.7	99.1	100.0	103.5	101.0	100.6	104.1	104.3
IIE_P	Telecommunications	61	48.8	51.4	62.4	66.2	60.9	74.1	84.3	100.0	108.2	113.3	132.3	101.8	115.3
IIM_P	Telecommunications	61	123.0	117.2	112.6	106.0	103.5	100.2	99.1	100.0	101.6	100.4	100.8	98.7	98.3
IIS_P	Telecommunications	61	95.5	95.9	96.3	96.8	96.9	98.0	98.7	100.0	102.2	103.2	105.6	106.7	108.0
LP_I	Telecommunications	61	53.6	55.0	59.5	62.1	69.5	74.7	84.9	100.0	106.1	117.4	127.8	129.0	141.1
CAP	Telecommunications	61	133,988	135,843	149,450	159,965	163,789	162,799	180,309	204,252	208,778	226,888	238,878	225,560	237,667
LAB	Telecommunications	61	86,710	98,075	107,373	107,321	104,127	105,460	107,879	106,440	108,732	118,649	118,313	113,376	109,615
CAP_QI	Telecommunications	61	61.8	70.1	82.6	95.2	100.5	99.6	99.1	100.0	102.2	105.7	110.1	113.3	115.9
LAB_QI	Telecommunications	61	108.1	114.9	122.4	123.0	113.4	108.5	104.3	100.0	99.4	98.0	95.2	88.9	85.1
H_EMP_QI	Telecommunications	61	110.2	117.6	123.5	125.5	114.5	107.1	103.2	100.0	98.6	96.9	94.7	89.5	84.5
VA_Q	Telecommunications	61	0.26	8.94	12.82	5.98	2.08	0.52	9.04	13.25	4.46	8.51	6.13	-4.75	3.30
TFPva_I	Telecommunications	61	76.4	75.7	76.1	74.2	75.7	78.4	86.8	100.0	103.3	110.5	115.5	110.6	114.1
VAConTFP	Telecommunications	61		-0.97	0.63	-2.65	2.05	3.49	10.22	14.14	3.26	6.76	4.39	-4.33	3.13
VAConK	Telecommunications	61		7.44	9.52	8.43	3.23	-0.51	-0.36	0.61	1.40	2.23	2.73	1.87	1.56
VAConH	Telecommunications	61		2.64	2.06	0.66	-3.62	-2.61	-1.42	-1.13	-0.50	-0.57	-0.78	-1.91	-1.84
VAConLC	Telecommunications	61		-0.17	0.60	-0.47	0.43	0.16	0.60	-0.37	0.30	0.09	-0.22	-0.38	0.45

# Development of the X-factor

*The X-factor is intended to capture the difference in productivity performance of the communications sector (C) versus that in the national economy (N) generally:*

$$X = (IP^N - TFP^N) - (IP^C - TFP^C)$$

Where *IP* represents *input price* growth and *TFP* represents *total factor productivity* growth.

*BLS KLEMS provides the best measure of:  $IP^C - TFP^C$*

*The issue is what data to use to measure:  $IP^N - TFP^N$*

- *GDP-PI* represents the most comprehensive measure of this difference between national input price growth and national productivity growth because it shows the extent to which TFP is able to mitigate changes in input prices over the entire Gross Domestic Product (GDP).
- Using input price and TFP growth only as experienced in the *Private Non-Farm Business sector* is a less comprehensive measure of national performance.