

LABOUR COSTS WORKSHOP

Rome, 5-6 May 2015

Calendar and Seasonal adjustment of the LCI: direct versus indirect approach. The Italian experience

Anna Ciammola and Donatella Tuzi

Layout

Background

- The LCI system: EC Regulations on compilation and CA/SA
- The Italian LCI
 - ✓ Sources and compilation methods
 - ✓ CA and SA: from direct towards indirect approach

Our contribution

- Chain linking and CA/SA of aggregated indicators
 - ✓ The suggested approach by ESS Guidelines on SA
 - ✓ Our proposal

Final remarks

The LCI Regulation and Eurostat practice (1)

EC-R 450/2003

Quarterly comparable hourly indices on total labour cost (TOT), wages and salaries (WAG), other costs (OTH)

- ✓ **Elementary indices** at section level (B to S NACE Rev. 2)
- ✓ **Laspeyres indices, chain linked** annually, for the aggregates (B-E, B-F, G-J, K-N, O-S, G-N, B-N, B-S)

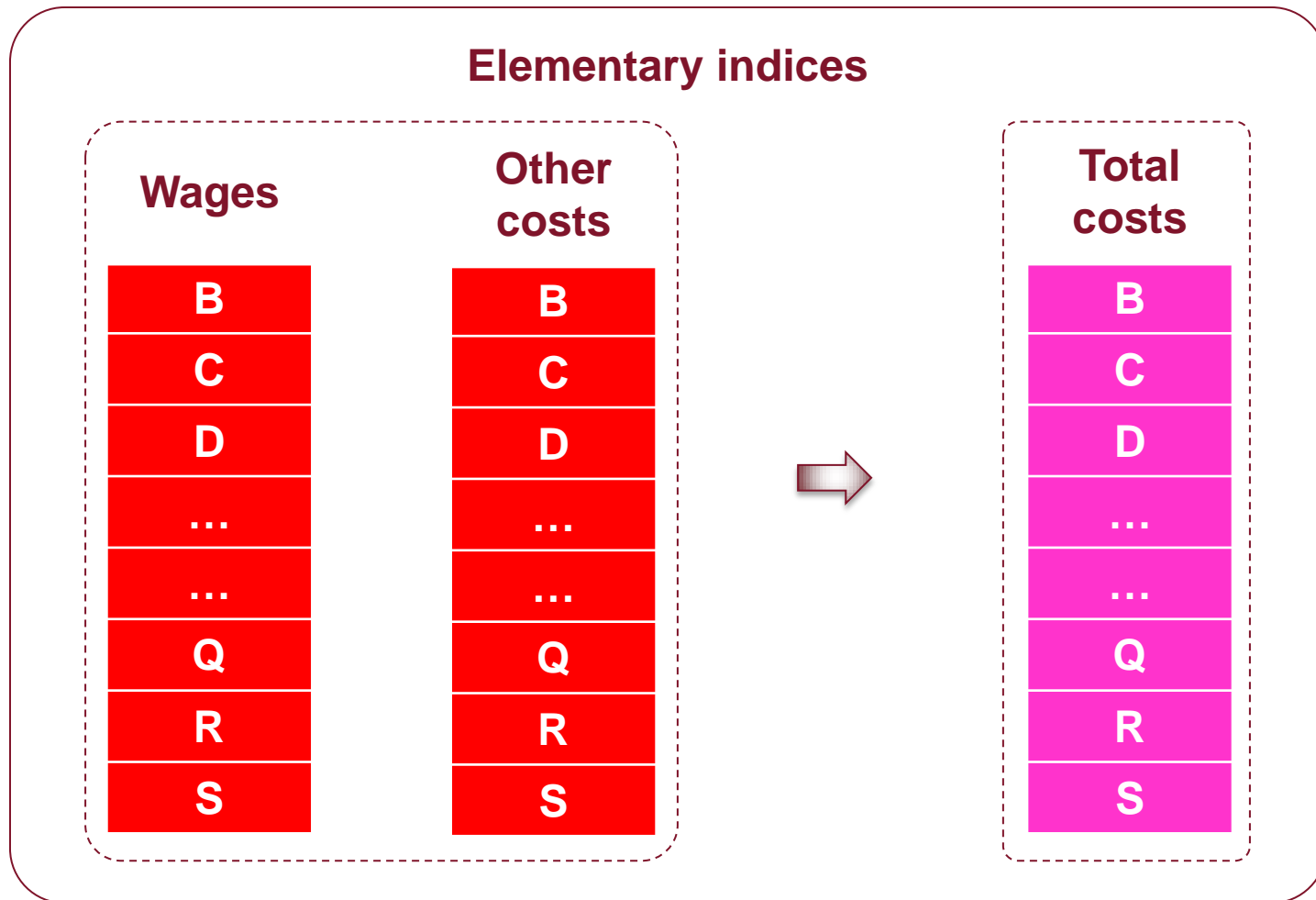
The LCI Regulation and Eurostat practice (2)

EC-R 1216/2003

Transmission of LCI in unadjusted (**UNADJ**), calendar adjusted (**CA**) and seasonally adjusted (**SA**) form

- ✓ Approach/method for CA / SA → reference to the ESS Guidelines on SA
- ✓ CA European aggregates from national CA figures
- ✓ SA European aggregates from CA European aggregates (direct approach)
- ✓ Inconsistency check on CA / SA national series → components hidden if differ by more than 2 decimal points from the total

The LCI system (1)



The system of Italian LCI (2)

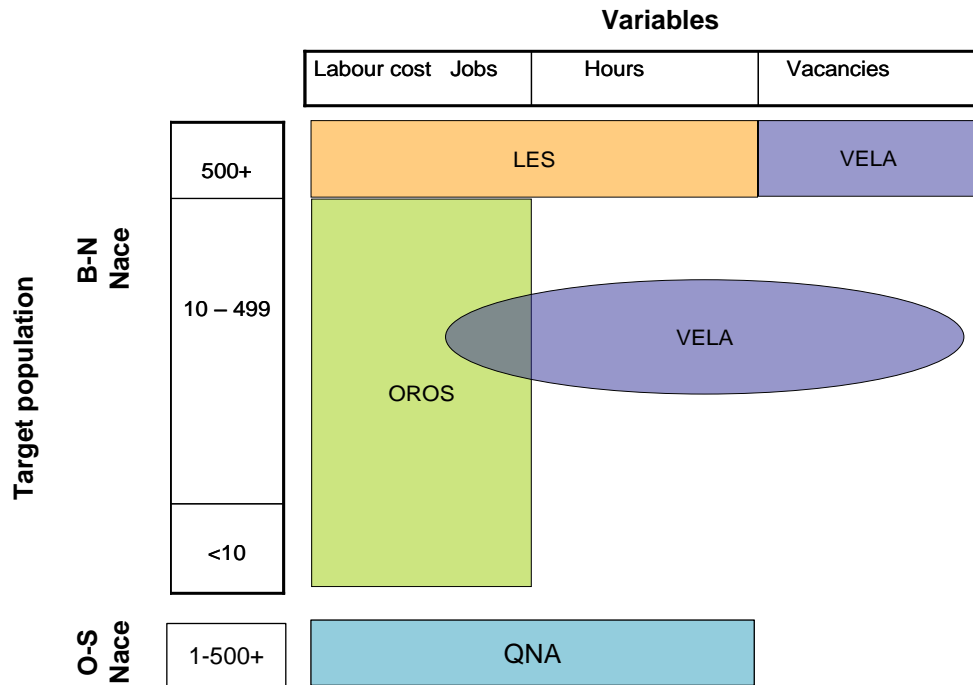
Elementary indices of wages, other costs and total cost



Chained Laspeyres indices of wages, other costs and total cost



The Italian LCI: sources and methods



LES: census monthly survey on large enterprises;

VELA: quarterly sample survey on job vacancies and hours worked;

OROS: survey on employment, wages and labour cost (based on Social Security data);

QNA: quarterly National Accounts data.

$$hTLC^t = \frac{TLC^t}{THW^t} = \frac{j TLC_{OROS+LES}^t \cdot j_{OROS+LES}^t}{j THW_{VELA+LES}^t \cdot j_{OROS+LES}^t}$$

CA / SA of the Italian LCI

- **CA** → Reg-ARIMA models (TRAMO)
 - ✓ One regression variable
 - ✓ Calendar effects more evident in the industrial sectors
- **SA** → ARIMA model based approach (SEATS)
 - ✓ Strong seasonality
 - ✓ WAG series more regular and stable than OTH series
- **Revision policy** → partial concurrent approach
 - ✓ (Re)-identification of reg-ARIMA models once a year through JDemetra+
 - ✓ Current processing through Tramo/Seats for Linux
 - ✓ Quarterly check for quality of SA through both JDemetra+ and Tramo/Seats



CA / SA of the Italian LCI: from direct towards indirect

Direct approach

- **Inconsistency** between WAG and OTH components and TOT aggregate (severe in case of few components)
- **Expediencies** to reduce incoherencies
 - ✓ Approximation of the ARIMA models for the sectorial aggregates to the models for the main NACE sections
 - ✓ Approximation of the ARIMA models for OTH series to the model for the corresponding WAG series



Large revisions



Indirect approach (June 2009)

Implementing the indirect approach (1)

ESS guidelines on SA

Unchaining → Aggregation → Chaining

➤ Pros

- ✓ Standard approach **easy** to implement
- ✓ Exploiting of **annual weights** used to aggregate **undjusted** indices

➤ Cons

- ✓ Inefficient
- ✓ Need of **CA annual weights** with significant calendar effects (see example 1)

Example 1

Year	Weights		Unadjusted indices							
			Unchained			Chain linked			GR%	
	C1	C2	C1	C2	A	C1	C2	A	A	
BY+1	7.00	3.00	101.0	101.0	101.0	101.0	101.0	101.0	101.0	1.0
BY+2	7.07	3.03	114.3	133.3	120.0	115.4	134.7	121.2	20.0	
BY+3	8.08	4.04	112.5	125.0	116.7	129.9	168.3	141.4	16.7	
BY+4	9.09	5.05	111.1	120.0	114.3	144.3	202.0	161.6	14.3	

Year	Weights		Calendar adjusted indices						
			Chain linked		Unchained			CL	GR%
	C1	C2	C1	C2	C1	C2	A	A	A
BY+1	7.00	3.00	101.0	105.0	101.0	105.0	102.2	102.2	?
BY+2	7.07	3.03	115.4	140.0	114.3	133.3	120.0	122.6	20.0
BY+3	8.08	4.04	129.9	175.0	112.5	125.0	116.7	143.1	16.7
BY+4	9.09	5.05	144.3	190.0	111.1	108.6	110.2	157.7	10.2

Implementing the indirect approach (2)

Our proposal

New annual weights → Aggregation

➤ Pros

- ✓ Efficient
- ✓ **Aggregation of chain linked** indices

➤ Cons

- ✓ Handling of **two weighting systems**
- ✓ New component weights (see example 2)
 - Dependency on the **aggregate**
 - **Not additive**

Example 2

Components $\Rightarrow C_1, C_2, C_3$

Aggregates $\Rightarrow A_1 = f(C_1, C_2)$
 $A_2 = g_1(C_1, C_2, C_3)$ or $A_2 = g_2(A_1, C_3)$

$$A_{1,t_y} = \sum_{c=1}^2 w_{c,y-1} C_{c,t_y} \quad \forall y = 1, \dots, Y$$

$$A_{2,t_y} = \sum_{c=1}^3 \omega_{c,y-1} C_{c,t_y}$$





$$w_{1,y} \neq \omega_{1,y}$$

$$w_{2,y} \neq \omega_{2,y}$$

$$A_{2,t_y} = \pi_{a_1,y-1} A_{1,t_y} + \pi_{c_3,y-1} C_{3,t_y} \Rightarrow \pi_{a_1,y} \neq \omega_{1,y} + \omega_{2,y}$$



Comparison between direct and indirect approach

- **Plots of SA data and q-o-q growth rates** 
- **Residual seasonality**
- **Revisions history diagnostics** 
 - ✓ Concurrent target
 - ✓ % revisions of **SA data** and revisions on **q-o-q growth rates**
 - ✓ Revisions after **1, 2, 3, 4, 8, 12** step-ahead

Final remarks

➤ **Internal coherence**

Crucial criterion in the choice of the **indirect approach** to SA

➤ **Aggregation of chain linked indices**

Handling **non additivity** through a **new set of weights**

➤ **Outperformance of the indirect approach**

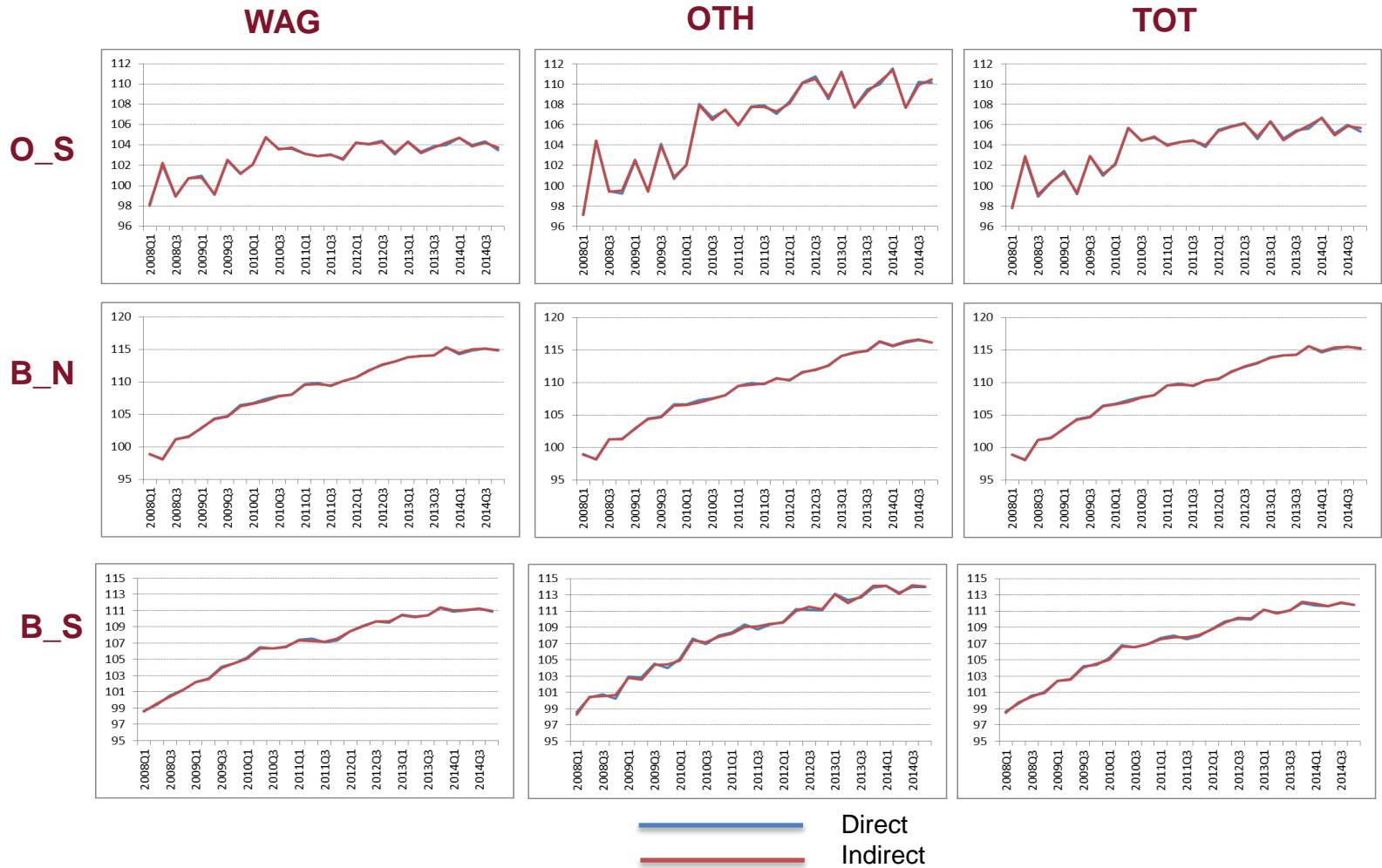
- ✓ From a **practical** point of view (ARIMA models, SA specifications, ...)
- ✓ In terms of **revisions** of SA data

Thank you
for your attention

ciammola@istat.it
tuzi@istat.it

PLOTS

SA series



PLOTS

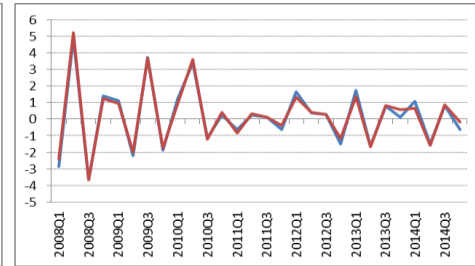
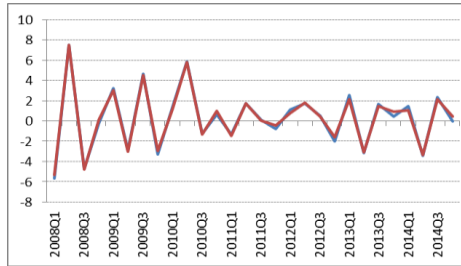
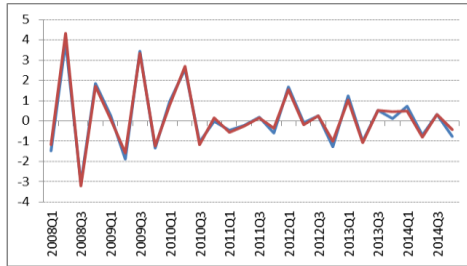
q-o-q growth rates of SA series (%)

WAG

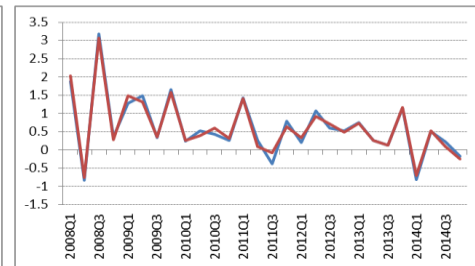
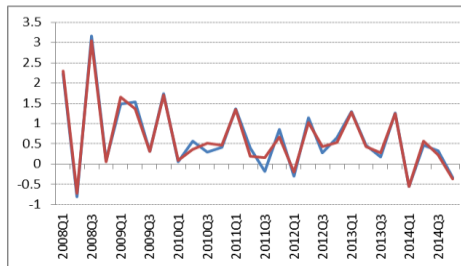
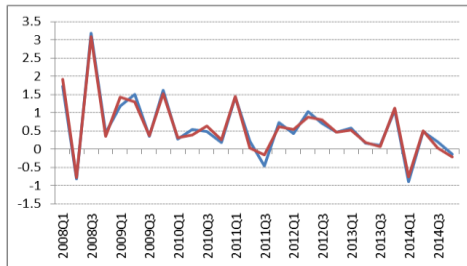
OTH

TOT

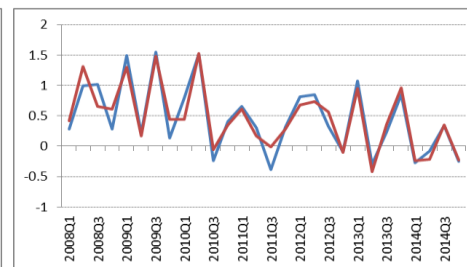
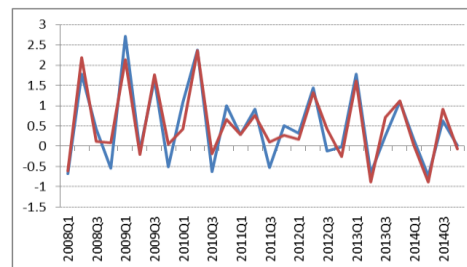
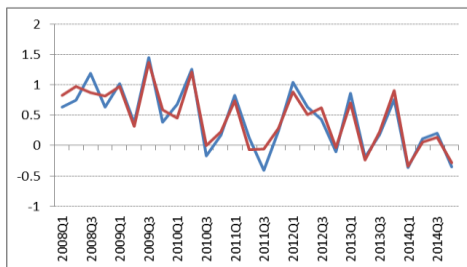
O_S



B_N



B_S



— Direct
— Indirect

Incoherencies between variables (TOT versus WAG and OTH) and sectors (aggregates versus NACE sect.)
Percentages on the total number of q-on-quarter changes

Aggregate	No. of compon.	3 dec.	1 dec.
Nace Rev. 2 sections and aggregates – Total labour cost vs wages and other costs			
B – Mining and Quarrying	2	30.0	26.7
C - Manufacturing	2	8.3	1.7
D - Electricity, Gas, Steam and Air Conditioning Supply	2	3.3	1.7
E - Water Supply; Sewerage, Waste Management, ...	2	6.7	1.7
F - Construction	2	15.0	5.0
G - Wholesale and retail trade	2	6.7	1.7
H - Transport	2	5.0	-
I - Accommodation and food service activities	2	1.7	-
J - Information and communication	2	15.0	8.3
K - Financial and insurance activities	2	3.3	-
L - Real estate activities	2	3.3	-
M - Scientific and technical activities	2	5.0	-
N - Administrative and support service activities	2	1.7	-
O - Public administration and defence; compulsory Social Security	2	23.3	20.0
P - Education	2	15.0	15.0
Q - Human health and social work activities	2	-	-
R – Arts, entertainment and recreation	2	3.3	1.7
S – Other service activities	2	6.7	1.7
B-S – Whole economy	2	6.7	1.7
B-N - Business economy	2	16.7	-
B-E – Industry (except construction)	2	6.7	-
B-F - Industry and construction	2	3.3	-
G-N - Services	2	6.7	1.7
G-J - Wholesale and ret. trade; transport; accomm. and food service activities; infor. and commu.	2	1.7	-
K-N - Financial and ins. activities; real estate activities; professional, scientific and technical.....	2	3.3	-

Incoherencies between sectors (aggregates versus sectorial components)
Percentages on the total number of q-on-quarter changes

Aggregate		No. of compon.	3 dec.	1 dec.
Labour cost components – NACE rev. 2 aggregates vs sections				
B-S – Whole economy	Wages	18	0.0	0.0
	Other costs	18	0.0	0.0
	Total costs	18	0.0	0.0
B-N - Business economy	Wages	13	0.0	0.0
	Other costs	13	0.0	0.0
	Total costs	13	0.0	0.0
B-E - Industry (except construction)	Wages	4	0.0	0.0
	Other costs	4	3.3	1.7
	Total costs	4	1.7	0
B-F – Industry and construction	Wages	5	0.0	0.0
	Other costs	5	1.7	1.7
	Total costs	5	1.7	1.7
G-N - Services	Wages	8	0.0	0.0
	Other costs	8	0.0	0.0
	Total costs	8	0.0	0.0
G-J - Wholesale and retail trade; transport; accommodation and food service activities; ...	Wages	4	3.3	3.3
	Other costs	4	6.7	3.3
	Total costs	4	1.7	1.7
K-N - Financial and insurance activities; real estate activities; professional, scientific and technical activities; ...	Wages	4	1.7	1.7
	Other costs	4	3.3	3.3
	Total costs	4	3.3	1.7
O-S – Mainly non-business economy	Wages	5	1.7	1.7
	Other costs	5	0.0	0.0
	Total costs	5	0.0	0.0

Incoherencies between sectors (aggregates versus sectorial components)
Percentages on the total number of q-on-quarter changes

Aggregate		No. of components	3 decimals	1 decimal
Labour cost components – Nace Rev. 2 aggregates vs subaggregates				
B-S – Whole economy (B-N + O-S)	Wages	2	5.0	5.0
	Other costs	2	11.7	6.7
	Total costs	2	13.3	10
B-N - Business economy (B-F + G-N)	Wages	2	16.7	7.0
	Other costs	2	5.0	1.7
	Total costs	2	8.3	5.0
B-F – Industry and construction (B-E + F)	Wages	2	8.3	3.3
	Other costs	2	8.3	5.0
	Total costs	2	6.7	3.3
G-N - Services (G-J +K-N)	Wages	2	15.0	8.3
	Other costs	2	3.3	0.0
	Total costs	2	10.0	5.0

Revisions history on total labour cost

Revisions on q-o-q growth rates

Approach	Steps	O_S			B_N			B_S		
		MR	MAR	RMSR	MR	MAR	RMSR	MR	MAR	RMSR
Direct	1	-0.019	0.069	0.092	-0.028	0.053	0.067	0.000	0.038	0.054
	2	-0.081	0.124	0.18	-0.05	0.075	0.088	-0.034	0.056	0.078
	3	-0.285	0.313	0.394	-0.115	0.146	0.179	-0.067	0.103	0.126
	4	-0.025	0.439	0.532	-0.031	0.208	0.259	-0.010	0.167	0.202
	8	-0.091	0.763	0.904	-0.072	0.270	0.305	-0.051	0.247	0.301
	12	-0.097	0.847	1.050	-0.114	0.336	0.368	-0.068	0.287	0.350
Indirect	1	-0.011	0.049	0.06	-0.029	0.074	0.092	-0.023	0.051	0.066
	2	-0.060	0.088	0.135	-0.042	0.077	0.105	-0.048	0.072	0.104
	3	-0.283	0.301	0.378	-0.094	0.125	0.166	-0.16	0.164	0.194
	4	-0.025	0.417	0.534	-0.017	0.173	0.222	-0.018	0.169	0.189
	8	-0.090	0.739	0.914	-0.051	0.232	0.265	-0.062	0.240	0.270
	12	-0.088	0.853	1.098	-0.073	0.268	0.310	-0.075	0.290	0.330

Revisions history on total labour cost

% revisions of SA data

Approach	Steps	O_S			B_N			B_S		
		MR	MAR	RMSR	MR	MAR	RMSR	MR	MAR	RMSR
Direct	1	-0.093	0.134	0.171	-0.058	0.097	0.132	-0.027	0.061	0.085
	2	-0.175	0.195	0.233	-0.085	0.119	0.148	-0.054	0.072	0.117
	3	-0.199	0.228	0.259	-0.088	0.117	0.145	-0.053	0.075	0.118
	4	-0.03	0.283	0.316	-0.031	0.146	0.18	-0.023	0.114	0.153
	8	-0.1	0.459	0.512	-0.062	0.201	0.238	-0.073	0.19	0.245
	12	-0.134	0.58	0.642	-0.114	0.224	0.262	-0.112	0.251	0.295
Indirect	1	-0.087	0.129	0.168	-0.049	0.102	0.128	-0.063	0.081	0.098
	2	-0.169	0.184	0.227	-0.065	0.102	0.133	-0.102	0.11	0.142
	3	-0.209	0.219	0.256	-0.066	0.099	0.137	-0.116	0.118	0.152
	4	-0.028	0.271	0.321	-0.017	0.124	0.153	-0.021	0.106	0.138
	8	-0.099	0.466	0.531	-0.045	0.157	0.196	-0.065	0.161	0.202
	12	-0.128	0.622	0.678	-0.08	0.163	0.205	-0.099	0.23	0.256