

Labour Cost Index

Methodology

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1 Introduction

The *Labour Cost Index* (hereafter, LCI) replaces, as of 2001, the *Wage Survey for Industry and Services* (hereafter, WS) which the INE has been carrying out quarterly from 1963 to 2000.

The LCI is part of the *euroindicators* that Eurostat (European Communities Statistical Office), at the request of the ECB (European Central Bank), demands of euro zone countries to analyse, once nominal convergence has been contrasted, if convergence in real terms is occurring between these countries and, especially, if there exists a tendency towards homogenisation of labour costs by work unit in Europe.

In 1998, Eurostat demanded that the member countries statistical offices provide retrospective quarterly estimates of labour costs indices by effective hour worked, from 1995 until the present time.

The large majority of Member States (MSs), among them Spain, only had situational wage indicators available and lacked non-wage cost indicators (such as obligatory corporate contributions, voluntary contributions, direct social benefits, ...).

As a consequence of this demand, the countries adopted different methods to estimate the indices since there was no time to implement an *ad hoc* survey, given the urgency of the demand, and since the indices were requested retrospectively back to 1995.

In the Spanish case, the quarterly aggregate of the *remuneration of employees* from the *Spanish Quarterly National Accounts* (QNA) has been used up until now as a good estimate of total labour expense. Using this aggregate as a base, series of indices corresponding to the total labour cost for wages and for other labour costs have been estimated and transmitted to EUROSTAT. These estimates are reviewed quarterly, when new accounting information is incorporated.

Faced with this need, the idea of carrying out a survey that will serve as a base for the construction of a new and improved LCI, and which will facilitate abandoning the current estimate system based on the QNA aggregate came into being. This is the first time that the provision of a statistical approximation for the cost of labour was attempted in Spanish continuous research.

The LCI replaces the Wage Survey, but offers more information than that obtained from the said survey. The index fieldwork started in 2000 with the object of being able to link the wage series (this coexisted with the survey during the said year).

The main difference between the two statistical operations is that the Index provides information not only on wage costs, such as the WS, but also on other costs companies incur through the use of the work factor. Other important differences are the population and sector scope, the definition of the worker object of the survey and the way of calculating effective work time.

The LCI, unlike the WS, **includes the contribution accounts with five employees or less.**

The index **considers all workers who have contributed at least one day during the reference month**, unlike the WS which only considered those who remained on the staff at the end of the month. In order to calculate average salaries per worker, the workers who have contributed less than 30 days are considered proportionally to the number of days contributed during the reference month.

The distinction between employees and workers has been suppressed, due to it being an administrative classification which does not correspond to the professional category of the worker, as well as the distinction by gender in the fourth quarter.

The scope of the sector was broadened with the inclusion of the National Classification of Economic Activities divisions included in the sections Education (M), Health (N) and other social activities and personal services (O), passing in this manner to include 54 branches of activity instead of the 48 which the former survey covered.

The calculation of effective work time is improved including entries for time not worked which were not in the WS (this survey only included holidays, temporary disability leave, for labour conflict and Employment Regulation Files). Moreover, the LCI entered into the accounts the holiday days taken each month in a real way, while the WS divided the agreed holiday days equally between the twelve months of the year.

In summary, the LCI is a much more complete and complex statistical operation than the Wage Survey.

2 Objectives

The LCI is a continuous quarterly statistical operation whose main objective is to ascertain the evolution of the average labour cost by employee and by effective hour worked.

The LCI tries to provide:

- Average labour cost by employee and month.
- Average labour cost per effective hour worked.
- Time worked and not worked.

National and Autonomous Community results are obtained.

The LCI facilitates:

- Wage information, as the Wage Survey has traditionally done, but of better quality due to the methodological improvements added to the project.

- It also provides information on non-wage expenses with the aim of complying with the European requirements on this subject.
- Better information on the time worked and not worked, of its structure, as well as of its short-term evolution.

3 Scope, coverage and reference period

3.1 POPULATION SCOPE

Comprises all of the *Contribution Accounts*, irrespective of their size, included in the General Social Security Regulations and in the Special Coal Mining Regulations.

3.2 POPULATION GROUP

Within each account, all employees who work for others, for whom a contribution was required for at least one day during the reference month independently of their contract type or working day, and who are associated with the account, are investigated in a grouped manner.

3.3 GEOGRAPHICAL SCOPE

The geographic scope covers the whole of national territory, with results broken down by Autonomous Communities. The information corresponding to Ceuta and Melilla is provided together with that of Andalucía.

The survey is not designed to provide reliable information within a provincial scope nor, therefore, in territorial scopes smaller than the province.

3.4 COVERAGE BY SECTORS

The contribution centres whose economic activity is within the three major economic sectors - Industry, Construction and Services - are investigated. Specifically, those centres whose economic activities are covered in the sections from the C to the K and from the M to the O of the NCEA-93:

NCEA-93	Economic Activity
C	Mining and quarrying
D	Manufacturing
E	Electricity, gas and water supply
F	Construction
G	Wholesale and retail trade; repair of motor vehicles, motorcycles and mopeds and personal and household goods
H	Hotels and restaurants
I	Transport, storage and communication
J	Financial intermediation
K	Real estate, renting and business activities
M	Education
N	Health and veterinary activities, social services
O	Other community, social and personal service activities

The maximum level of economic activity breakdown is the NCEA-93 divisions level. Specifically, 54 activity divisions are analysed.

These sections are excluded: Agriculture (A), Fishing (B), Public Administration, Defence and Social Security (L), Domestic service (P) and the Extra-territorial bodies (Q).

3.5 REFERENCE PERIOD

Given that the quarterly evolution of monthly labour costs by work unit is intended to be investigated, the following are distinguished:

- The **reference period for the results** is the calendar quarter.
- The **reference period for the information** requested on the questionnaire is the calendar month.

4 Definitions

4.1 WORKERS

All persons tied to the producing unit by means of a work contract, independently of the type of said contract, are defined as workers.

The *employees who are the object of the survey* are all those associated to the contribution account for whom there has been a contribution required for at least one day of the reference month.

For the purposes of the labour costs calculation by worker, those that have been registered in the contribution account during a period of less than a month are

accounted for in proportion to the time that they have been registered in said account.

Employees are classified according to the type of working day by:

Full Time Workers - Are those persons who work a normal company working day in the activity involved.

Part Time Workers: Are those persons who work a shorter than usual or normal working day for a full time worker in the activity involved.

4.2 TIME WORKED AND TIME NOT WORKED

4.2.1 Hours worked

Effective hours: Are the hours actually worked both in normal work as well as in overtime work periods, including those hours lost in the workplace, which are considered as effective time by virtue of the regulations in force.

They are obtained as the sum of the agreed hours plus the overtime and/or complementary hours minus the hours not worked, from which are excluded those hours lost in the workplace since they are considered as effective time. In summary, it involves the hours worked (in a normal or overtime working day) minus the hours not worked.

Agreed working day: Are the hours legally established by verbal agreement, individual contract or collective agreement between the employee and the company.

Overtime hours: Are all those that are carried out outside the agreed working day, be they by acts of god (*structural overtime hours*) or voluntary (*non-structural overtime hours*).

Complementary hours: Are the hours agreed in the part time contract as an addition to the normal or usual hours. They are paid and contribute the same as ordinary hours.

4.2.2 Hours not worked

Hours not worked and not remunerated.

Hours not worked are included by the following causes:

- *Vacations and holidays taken during the month.*
- *Days missed due to temporary disability.*
- *Maternity, adoption and personal leave days.*
- *Leave as compensation for overtime hours.*

Union representation hours, fulfillment of an unavoidable duty, attendance at exams and medical visits, among other concepts

Days or hours not worked for technical, organisational or for production reasons: they are temporary suspensions in the rendering of the service or in the production of goods by the employee (suspended days) or reductions of the work day (reduction hours) with the aim of overcoming crisis situations in the company.

Hours lost in the workplace: they are hours not worked due to reasons not attributable to the employee or the business person such as occasional lack of work, breakdown in machines, lack of raw materials, atmospheric accidents, power cuts or other causes of acts of god. The law allows the recovery of these non worked lost hours at a rate of one hour per day, with previous notification and if there is no agreement to the contrary. This component only covers the hours that have not been recovered and, therefore, can be considered as truly not worked.

Hours not worked and not remunerated.

Included are the following:

Labour conflicts: Is the total number of hours lost due to strikes independently of the local, sectorial, or corporate scope, or the total or partial intensity of the same. Time recovered later is not accounted for.

– *Absenteeism; legal custody; management lockout, ...*

In the case of *management lockout* the business person closes the work centre due to a collective conflict, with the danger of violence or damages, illegal occupation of the centre or the existence of irregularities that impede the normal production process.

Legal custody is a reduction of the work day for those employees that request it because they have under their direct care a child under 6, or a physically or psychologically challenged person who does not work.

4.3 LABOUR COSTS

Labour cost is defined as the total cost incurred by employer by using the work factor.

The labour cost is analysed from two perspectives:

– Labour cost by unit of work: ***Labour cost by worker and month.***

Measures the expense that a business person undertakes when employing an employee during one month.

– Labour cost by unit of time: ***Labour cost by effective hours of work.***

Measures the expense that a business person undertakes for one effective hour of work.

The cost must be measured in net terms for the employer, in other words, deducting the various subsidies received.

The labour cost comprises a wide range of entries that the survey covers in two main blocks: The cost of wages and other costs.

4.3.1 Wage Cost

Comprises all remunerations, both in cash and in kind, made to workers for the performance of their work services for others, whether it rewards effective work, whatever the method of remuneration, or the rest periods accounted for as work.

Wages include: *the Base Wages, Wage Complements, Overtime and/or Complementary Payments, Bonuses and Wage in Kind.*

The Overtime and/or Complementary wage payments: correspond to payments for overtime hours, both structural (by acts of god) as well as non-structural (voluntary) and to payments for complementary hours in the case of part time workers.

Bonuses: is remuneration that is received in periods which are greater than one month: bonuses, payments for participating in profits, premiums, objectives and any other exceptional payments.

Delayed Payments: are payments paid in the reference month but earned in previous periods.

4.3.2 Other Costs

The other costs include non-wage amounts and the obligatory contributions to social security.

4.3.2.1 Non-wage payments

Are remuneration received by the worker not for their work activity, but rather as compensation for expenses occasioned in the rendering of their work or to cover needs or situations of inactivity not attributable to the worker.

Amongst these, the survey differentiates between:

Direct corporate contributions.

Payments made by the company directly to the worker, the former worker or their family to assist them under certain circumstances as a complement of certain social services, without implicating Social Security or other insurance companies. Their main characteristic is that we are dealing with benefit payments for well-being.

Distinction is made between:

Temporary Disability Payments: Payments that the company makes directly to workers who are in a TD situation. Includes Delegated Payments¹ for TD, payments for TD undertaken exclusively by the company (the first fifteen days) and voluntary supplements or improvements to the TD benefit.

Unemployment Payments: Payments made by the company to workers affected by temporary suspension or work day reduction in the event of work regulation during the reference month. They include Delegated Payments* for partial unemployment, as well as voluntary improvements for partial unemployment paid for by the company with the object of complementing unemployment benefits.

Payments for Other Direct Services: Payments that the company makes directly to the active workers and/or former workers and/or their family members, as a complement to social security or private insurance subsidies or pensions. They include payments for retirement, payments for death and survival, payments for disability or handicap, payments for medical assistance and payments for family assistance.

Indemnities for Dismissal: Include the total payments made for dismissal and contract termination, as well as the wages not received during the transcourse of the dismissal proceedings that the employer must pay in this situation (dismissal proceedings wages). Both indemnities for individual dismissals as well as indemnities for group dismissals are considered here. That paid under pending obligations, such as wages owed, vacations not taken, ... (compensations) are excluded, since these amounts are considered delayed payments.

Other non salary payments

Encompass the rest of payments made to the worker: compensation for the expenses derived from the execution of their work and indemnities for contract termination.

They comprise: *Currency devaluation, wear and tear of tools, acquisition of work clothes, travel expenses, distance and urban transport allowance, relocation indemnities, contract termination indemnities, products in kind conceded voluntarily by the company whose delivery is not due by virtue of regulation, Group Agreement, or work contract, the delivery of products at reduced prices that are carried out in company canteens or dining rooms or corporate cooperative stores.*

4.3.2.2 Obligatory contributions to Social Security

These are the legally established contributions that the employer makes to the Social Security System in favour of their employees to cover the services the

¹ **Delegated payments:** Benefits given as Delegated Payments are those which, previously recognised by the competent managing unit, is paid by the business person and subsequently compensated upon liquidation of the Social Security quotas, which in this manner assumes responsibility for same.

system establishes, and which are those derived from illness, maternity, work accident, disability, retirement, family, survival, unemployment, professional training, wage guarantee, or any other contingency covered by the Social Security System.

The entries that comprise these obligatory contributions are:

General contributions

Common contingencies: Are contributions that cover services for common illness and non-work accident, maternity, disability, death, survival (if these last three contingencies have been the result of a common illness or non-work accident) and retirement.

Overtime hours contributions: Are contributions for this concept, both for structural overtime (or due to causes of acts of god) as for non-structural overtime (or voluntary) hours.

Common Service Contributions: Contributions of the companies that collaborate in the TD contingency management for work accident and professional illness.

Workers with Training / work experience contracts: These contributions cover the common contingencies for employees with training or work experience (if they exist) contracts, because to these workers the type of contribution applied for quota calculation is different to that of the remaining workers.

Other concepts: Refers to other contribution concepts different to those already indicated which, not having a specific form for effecting payment, its payment has been authorised in the TC-1.

Deductions for excluded contingencies: These deductions are solely used by the companies that have them granted.

Deductions for voluntary collaboration in common illnesses / non work accidents: Reductions applied to those companies that are authorised to voluntarily collaborate in the management of the Health Services and TD, derived from common illness or non work accident.

Temporary Disability (TD): Economic services, in delegated payment regime, for Temporary Disability (TD), derived from common illness or non-work accident.

Contributions for work accidents and professional diseases

TD Quotas: Quotas for Temporary Disability derived from work-related accidents and/or illnesses.

DDS Quotas: Quotas for Disability (permanent disability), death and/or survival derived from work accident and/or work-related illness.

Compensation for TD derived from work-related accidents and illnesses: economic services, in delegated payment regime, for Temporary Disability (TD), derived from work-related illness and/or accident .

Other contributions

Unemployment, Wage Guarantee Fund (WAGUFU) and Professional Training: Determine the contribution concepts whose object it is to cover this type of contingencies.

Compensation for partial unemployment: Are the amounts that the companies have given their workers under the concept of partial unemployment services, as a delegated payment.

4.4 SUBSIDIES

Reductions, bonuses and subsidies that employers apply in the liquidation of Social Security contributions, motivated by the contracting of determined groups of workers or by aid recognised by the unemployment office as part of its budget.

5 Indices and rates

The LCI is a simple index of labour cost variation.

In order to obtain it, the year 2000 is taken as the base period, so that the average cost for 2000 becomes 100.

A random *simple index* is calculated by means of the formula:

$$I_t = \frac{C_t}{C_0} \cdot 100$$

being:

$C_0 = \frac{\sum_{t=1}^{IV} C_t^{2000}}{4}$ cost in the base period (2000), is the average cost in the year 2000

C_t cost in the current quarter (t)

The *Inter-annual labour cost variation rates* are calculated in this form:

$$r_t = \frac{I_t - I_{t-4}}{I_{t-4}} \cdot 100$$

where,

I_{t-4} value of index for the same quarter of the previous year

6 Survey design

6.1 STATISTICAL UNIT AND POPULATION FRAMEWORK

The **statistical unit** of the LCI is the *Social Security Contribution Account*, a concept traditionally used in wage and labour cost surveys, both by the INE as well as by other organisms with competence in this matter.

The Social Security Contribution Account is made up of a set of workers who work for others, who carry out their work activity in one or various work centres of one same company, within the same province and generally, but not necessarily, under one same main activity and with homogeneous characteristics in that referring to contributions to Social Security.

The **population scope** used to extract the sample is the Social Security Contribution Accounts Directory, updated to 30 September of the year prior to the reference year.

6.2 SELECTION OF THE SAMPLE

The **sample type** used is a random stratified sample with optimum affixation, in which the sample units are the contribution accounts.

The stratification criteria is carried out attending to three variables: the Autonomous Community (17 in total, considering Ceuta and Melilla together with Andalucía), the economic activity (NCEA-93 division, 54 divisions in total) and the size of the units (8 strata or size groups).

The unit size is defined by the number of employees covered.

The following groups are considered for the stratification:

Stratum	Number of employees
1	1-4 employees
2	5-9 employees
3	10-19 employees
4	20-49 employees
5	50-99 employees
6	100-199 employees
7	200-499 employees
8	500 and over employees

The strata of 500 and more workers are exhaustively investigated.

Within each stratum, the units are selected via random systematic samples

6.3 SAMPLE SIZES AND ROTATION SHIFTS

The sample is made up of 19,500 units that are interviewed each quarter.

This sample is divided into three monthly sub-samples during the quarter, in such a way that the first sub-sample will be interviewed the first month of each quarter, the second sub-sample will be interviewed the second month of each quarter and the third sub-sample will be interviewed the last month of each quarter. In this way, each sub-sample is interviewed four times a year, and each month about 6,500 units are interviewed.

The sample distribution by Autonomous Communities and sizes is the following:

Autonomous Communities	Sizes								
	Total	1	2	3	4	5	6	7	8
TOTAL	19.531	5.054	2.431	2.254	2.387	1.721	1.409	2.917	1.358
Andalucía	1.637	464	170	161	182	135	114	275	136
Aragón	974	257	129	122	131	98	72	123	42
Asturias (Principado de)	886	242	125	121	127	85	58	93	35
Balears (Illes)	864	255	121	119	118	76	53	88	34
Canarias	1.026	283	142	128	131	97	71	112	62
Cantabria	704	200	110	113	103	67	40	54	17
Castilla-La Mancha	974	270	137	119	130	95	82	117	24
Castilla y León	1.113	308	145	127	132	106	92	138	65
Cataluña	2.294	508	201	195	200	163	140	591	296
Comunidad Valenciana	1.508	379	185	168	183	131	123	246	93
Extremadura	761	219	130	114	116	68	47	52	15
Galicia	1.182	328	151	140	150	107	102	150	54
Madrid (Comunidad de)	2.082	437	173	162	195	152	147	487	329
Murcia (Región de)	896	247	137	121	128	89	58	80	36
Navarra (Comunidad Foral de)	770	187	115	112	110	78	67	79	22
País Vasco	1.265	305	151	133	151	120	100	217	88
Rioja (La)	595	165	109	99	100	54	43	15	10

The sample distribution by divisions of the NCEA-93 and sizes is the following

Divisions NCEA-93	Sizes								
	Total	1	2	3	4	5	6	7	8
TOTAL	19.531	5.054	2.431	2.254	2.387	1.721	1.409	2.917	1.358
10	72	17	11	8	9	8	5	8	6
11-12	56	31	7	7	3	4	1	2	.
13	103	51	17	10	15	2	3	3	2
14	196	42	35	39	44	23	6	7	.
15	568	92	55	49	57	43	53	185	34
16	95	27	11	4	14	8	6	20	5
17	267	48	39	41	36	26	22	49	6
18	262	59	40	39	43	33	25	17	6
19	255	56	44	45	47	34	22	6	1
20	315	101	43	44	49	34	20	22	2
21	232	42	32	35	32	30	21	35	5
22	299	75	38	36	41	32	28	41	8
23	85	22	11	12	17	6	5	4	8
24	372	57	38	38	39	28	30	112	30
25	283	45	36	39	38	29	25	55	16
26	328	51	40	40	46	36	35	65	15
27	283	42	36	39	35	28	24	54	25
28	391	80	53	45	51	39	33	82	8
29	308	51	40	42	44	31	25	59	16
30	98	32	25	14	12	5	2	3	4
31	309	48	38	35	38	29	22	77	22
32	161	37	25	20	20	19	13	19	8
33	202	66	34	37	22	13	13	15	2
34	347	38	36	34	33	30	25	109	42
35	203	34	32	26	30	23	17	23	18
36	304	78	46	40	51	33	24	28	4
37	131	34	31	28	28	6	4	.	.
40	250	41	37	28	36	29	26	35	18
41	221	44	33	33	40	26	22	18	5
45	2.006	415	354	336	315	225	184	142	35
50	396	119	63	61	65	45	24	14	5
51	570	165	71	63	66	50	43	90	22
52	905	349	69	57	60	41	44	176	109
55	697	263	71	61	64	51	49	98	40
60	477	151	55	44	45	37	28	80	37
61	94	23	32	15	15	2	1	3	3
62	139	24	20	19	24	16	13	12	11
63	330	74	45	41	45	35	27	48	15
64	308	43	36	32	33	28	22	64	50
65	523	39	35	36	36	35	34	183	125
66	274	51	35	38	42	31	22	38	17
67	369	206	50	43	31	18	11	9	1
70	541	345	54	44	46	34	14	4	.
71	286	102	45	41	47	26	16	8	1
72	290	59	42	41	40	33	21	37	17
73	227	38	42	36	46	33	17	12	3
74	1015	168	66	63	69	64	84	316	185
80	495	80	50	43	70	45	38	93	76
85	802	105	39	43	48	44	55	225	243
90	257	41	34	34	40	31	30	32	15
91	508	253	48	52	56	36	25	30	8
92	463	155	53	57	64	43	31	39	21
93	563	345	59	47	50	31	18	10	3

The total sample is divided into five rotation groups in such a way that in the first quarter of each year the oldest group is replaced, which implies a renewal of 20% of the sample.

An exception should be made of the exhaustive units (units with more than 500 workers and those belonging to strata so small that their sample size necessarily coincides with the population), which due to their exhaustive character do not give rise to any renewal whatsoever and, except for termination, should continuously remain in the sample. These units make up 28% of the sample.

6.4 ESTIMATORS

6.4.1 Total estimates

Separate ratio estimators *are used, using the number of workers* in the Social Security Contribution Accounts Directory as an auxiliary variable.

Given:

h	stratum defined by the crossing of the branch of activity, Autonomous Community and size variables.
N_h	population size for the stratum h
n_h	sample size for stratum h
X_{hi}	value of variable X in unit i of stratum h
D_{hi}	n° of workers, according to the directory, in unit i of stratum h
$D_h = \sum_{i=1}^{N_h} D_{hi}$	total workers, according to the directory, in directory centres belonging to stratum h
$d_h = \sum_{i=1}^{n_h} D_{hi}$	total workers, according to the directory, in centres of the sample selected within stratum h

The ratio estimator for the whole of one variable X in one stratum h is given by the expression:

$$\hat{X}_{Rh} = \hat{R}_h \cdot D_h = \frac{\sum_{i=1}^{n_h} X_{hi}}{\sum_{i=1}^{n_h} D_{hi}} \cdot D_h = D_h \cdot \frac{\sum_{i=1}^{n_h} X_{hi}}{d_h}$$

Grouping the terms that accompany each value X_{hi} , observing in a stratum h , that the factor of elevation within each stratum h is:

$$F_h \equiv \frac{D_h}{d_h}$$

The **separate ratio estimator for the whole population** of the variable X will be given by the sum of the ratio estimators for the total of the strata that make up population:

$$\hat{X} = \sum_h \hat{X}_{Rh} = \sum_h \left(F_h \cdot \sum_{i \in R} X_{hi} \right)$$

6.4.2 Estimates of the cost per worker and month and of the cost per effective hour

To obtain an estimate of cost per worker and month ratio estimator quotients are used. Thus,

$$\hat{C} = \frac{\hat{X}}{\hat{Y}} = \frac{\sum_{h \in G} \left(F_h \cdot \sum_{i \in R} X_{ih} \right)}{\sum_{h \in G} \left(F_h \cdot \sum_{i \in R} Y_{ih} \right)}$$

where,

$\hat{C}$ estimate of the labour cost per worker and month in scope G (G being a determined cross of regions, branches and sizes)

$\hat{X}, \hat{Y}$ estimate of total cost and of total of workers, respectively

The estimation of the cost per hour is carried out by completely analogous means, substituting the total workers variable ($\hat{Y}$) by the variable total effective hours.

7 Collection and treatment of the information

The questionnaires are sent by post from the INE's provincial delegations and collected by them, where they are submitted to recording and a first filtering. In the Central Services a second filtering and treatment of the data is carried out. Once the consistency of the information is assured, the tables and series of results are obtained.

8 Calculation of cost per hour of overtime

Overtime hours can be remunerated with cash or with remunerated rest hours.

Paid hours are defined as, (making abstraction of full time and part time), the effective hours plus the non worked and remunerated hours, or as the agreed hours plus the overtime hours less the non worked and non remunerated hours:

$$PH = AH + OT - NWNHRH = AH - NWNHRH + OT$$

Where,

PH Paid hours

AH Agreed hours

OT Overtime

NWNRH Non-worked and non-remunerated hours

Rest hours as compensation for overtime hours are paid hours, which have a cost that we wish to discover.

Total (net) labour costs is defined by:

$$NTLC = W + OW + NWP - SUB = (W - OW) + OW + OC - OHCO + OHCO + NWP - SUB =$$

$$\begin{array}{ccccc} = W - OTW & + & OC - OHCO + NWP - SUB & + & OTW + OHCO \\ \downarrow & & \downarrow & & \downarrow \\ \text{Salary minus} & & \text{Other costs minus} & & \text{Direct cost per extra hour} \\ \text{overtime} & & \text{overtime} & & \end{array}$$

Where,

NTC net total labour cost

S Wages

OTW Overtime wage

OC Obligatory contributions

OHCO Overtime hour contribution

NWP Non-wage payments

SUB Subsidies

The total cost of hours paid except overtime hours is called the *ordinary* hours cost (TCOH):

$$TCOH = S - OW + OC - OHCO + NWP - SUB$$

If we define ordinary hours paid (OH) as $OH = AH - NNRH$

The cost of an ordinary hour would be $COH = TCOH / OH$

And thus , the cost of *compensated* hours will be $HO \times COH$

Where, HO hours off as compensation for overtime hours.

If one overtime hour can be paid with money or hours off or a mixture of the two, the cost for the business person will be:

$$COT = OW + OHCO + HO \times COH$$

and the cost by extra hour:

$$HCOT = (OTW + OHCO + HO \times COH) / OT$$

The total cost parting from these results will be equal to the cost of ordinary hours except the *compensated* hours plus the cost of overtime hours:

$$CNT = COH \times (AH - NNRH - HO) + COT$$

9 Links of wages series

The Wage Survey for Industry and Services (with the last base change occurring in 1996) has undergone certain methodological and coverage modifications, in order to give way to the LCI, with base in the year 2000.

Whenever there is a change of system there is always a variation in the structures, thus the indices and levels elaborated after the entry into force of the new system are not comparable with the former. That is why it is necessary to perform some operations that will allow for the comparison and that, in short, give continuity to the series and allows for the availability of historical series.

To perform this series link, in a determined period, it is necessary to overlap both structures, in other words, both methodologies must coexist during a common period of time T. In this manner, it is possible to calculate a link coefficient that will allow for an estimate of the data for previous years in accordance with the new methodological framework.

9.1 LINK COEFFICIENTS

9.1.1 Link coefficients for levels

Given:

$X_{95}(T)$ $\equiv$ level of variable X obtained in the common period T calculated with 95 methodology 95.

$X_{2000}(T)$ $\equiv$ level of variable X obtained in the common period T calculated with 95 methodology 2000.

K is a coefficient that transfers the levels calculated with the old methodology into the new one, in other words:

$$X_{2000}(T) = K \times X_{95}(T) \quad \Rightarrow \quad K = \frac{X_{2000}(T)}{X_{95}(T)}$$

For any period t prior to the common period T the new values with the new structure can be obtained simply by applying this coefficient:

$$\forall t < T \quad X_{2000}(t) = K \times X_{95}(t) = \frac{X_{2000}(T)}{X_{95}(T)} \times X_{95}(t)$$

Applying this coefficient to all available data until T, we will obtain the complete temporal series calculated with the 2000 methodology.

The time period during which both methodologies coexist remains to be seen, in other words T.

Due to the fact that the Wage Survey has a quarterly periodicity, it is possible to take any quarter of the year 2000 (for example the first quarter) as the common period. In this manner we obtain what we call a **Legal Link Coefficient**.

Another solution is to extend the overlap period to a complete year in the following manner:

- During the entire year of 2000 data is collected with both methodologies and the quarterly data are calculated for both:

$$X_{95}(2000R); \quad X_{2000}(2000R) \quad R \in \{ I, II, III, IV \}$$

$X_{2000}(2000R) \equiv$ level of variable X obtained for the quarter R of the year 2000 with the new methodology.

$X_{95}(2000R) \equiv$ level of variable X obtained for the quarter R of the year 2000 with the old methodology.

– The average quarterly values over the year 2000 are obtained:

$$\sum_{R=1}^{IV} X_{95}(2000R) / 4 \quad \sum_{R=1}^{IV} X_{2000}(2000R) / 4$$

– The link coefficient is calculated as the quotient between the average of the data with methodology 2000 and the average of the data with methodology 95:

$$K = \frac{\sum_{R=1}^{IV} X_{2000}(2000R) / 4}{\sum_{R=1}^{IV} X_{95}(2000R) / 4}$$

This coefficient, thus calculated, is called **Structural Link Coefficient** and is the one that is usually applied to link historical series.

To link wage series of the LCI with the WS it is necessary to take into account that the most important methodological changes that have been introduced (apart from the broadening of the coverage) are the following:

– The depth with which work time is requested, in particular the agreed working day, as well as the increase in the entries for time not worked that are included, allows for a greater approximation to the concept of effective working day. The WS only included as entries for time not worked holidays, temporary disability

leave, hours not worked as a result of an Employment Regulation File, and hours lost as a result of a labour conflict in the month of reference.

Likewise, it accounts in a real manner the holidays enjoyed each month, contrary to how it is done in the WS, which proportionally distributes the number of agreed holiday days a year between the twelve months of the year, thus the average wage by effective hour in the summer quarter, which in the WS did not vary much in proportion to the winter figures, increases in the LCI considerably.

– The increase in the non ordinary cost of wages entries included in the LCI with respects to the WS.

These methodological changes, tied to the marked seasonal component of this type of series, have meant that the inter-quarterly behaviour of the LCI series differ from the figures that were being provided by the WS. For these reasons, and with the objective of linking both the level as well as the profile of both series, the decision has been made to use a link coefficient for each quarter, in other words, the four series corresponding to each one of the quarters of each year have been taken into consideration individually and they have been linked by means of their legal link coefficient.

Given:

$X_{2000}(2000I) \equiv$ the level of the variable X obtained for the first quarter of the year 2000 with the new methodology.

$X_{95}(2000I) \equiv$ the level of variable X obtained for the first quarter of the year 2000 with the old methodology.

K_I is a coefficient that transfers the values of the first quarters to the new structure, in other words:

$$K_I = \frac{X_{2000}(2000I)}{X_{95}(2000I)}$$

For any first quarter of period t prior to the first quarter of the common period T it is possible to obtain the values of the first quarters with the new structure simply by applying this coefficient:

$$\forall tI < TI \quad X_{2000}(t) = K_I \times X_{95}(t) = \frac{X_{2000}(2000I)}{X_{95}(2000I)} \times X_{95}(t)$$

calculating the coefficients (where II, III, IV refer to the second, third and fourth quarter):

$$K_{II} = \frac{X_{2000}(2000II)}{X_{95}(2000II)}$$

$$K_{III} = \frac{X_{2000}(2000III)}{X_{95}(2000III)}$$

$$K_{IV} = \frac{X_{2000}(2000IV)}{X_{95}(2000IV)}$$

we have proceeded in the same manner with the second, third and fourth quarters:

$$\forall tII < TII \quad X_{2000}(tII) = K_{II} \times X_{95}(tII) = \frac{X_{2000}(2000II)}{X_{95}(2000II)} \times X_{95}(tII)$$

$$\forall tIII < TIII \quad X_{2000}(tIII) = K_{III} \times X_{95}(tIII) = \frac{X_{2000}(2000III)}{X_{95}(2000III)} \times X_{95}(tIII)$$

$$\forall tIV < TIV \quad X_{2000}(tIV) = K_{IV} \times X_{95}(tIV) = \frac{X_{2000}(2000IV)}{X_{95}(2000IV)} \times X_{95}(tIV)$$

9.1.2 Link coefficients for indices

In a completely analogous manner to the link outlined for levels, the link for indices is constructed.

Given:

$I_{95}(TR) \equiv$ the index for the quarter R of the common period T calculated with base 95

$I_{2000}(TR) \equiv$ the index for the quarter R of the common period T calculated with base 2000

$R \in \{I, II, III, IV\}$ and where:

$$I_B(TR) = \frac{S_B(TR)}{\bar{S}_B(T)} \text{ being:}$$

$S_B(TR)$ the salary in the quarter R of period T with methodology B

$\bar{S}_B(T)$ the average salary for year T with methodology B

C_R is a coefficient that transfers the indices from quarter R in the old base to the new base, in other words:

$$I_{2000}(TR) = C_R \times I_{95}(TR) \Rightarrow C_R = \frac{I_{2000}(TR)}{I_{95}(TR)}$$

For any period t prior to the common period T the indices with the new structure can be obtained simply by applying the corresponding coefficient to each quarter:

$$\forall t < T, R \in \{I, II, III, IV\}$$

$$\begin{aligned}
I_{2000}(tR) &= C_R \times I_{95}(tR) = \frac{I_{2000}(TR)}{I_{95}(TR)} \times I_{95}(tR) = \frac{\frac{S_{2000}(2000R)}{S_{2000}(2000)}}{\frac{S_{95}(2000R)}{S_{95}(95)}} \times \frac{S_{95}(tR)}{S_{95}(95)} = \\
&= \frac{S_{2000}(2000R)}{S_{95}(2000R)} \times \frac{S_{95}(tR)}{S_{2000}(2000)} = \frac{K_R \times S_{95}(tR)}{S_{2000}(2000)}
\end{aligned}$$

In other words, the step from the indices in the old structure to the new one is equivalent to the elaboration of the indices base 2000 of the levels series of the old transformed methodology.

9.2 VARIATIONS RATES

One of the most interesting aspects of the historical series is the calculation of the variation rates, which facilitate the analysis of the evolution in the variables studied between two different periods.

The actual Wage Survey offers, apart from the index and the level, the annual variation rate, in other words, the variation suffered by the value and the index in a given quarter between one year and the immediately previous year.

Given the two consecutive years, $A-1$ and A , the *Annual Variation Rate* of the index (obtained with base B) in quarter t is given by the expression:

$$TV = \frac{I_B(At) - I_B((A-1)t)}{I_B((A-1)t)}$$

Where:

$$I_B(At) = \frac{S_B(At)}{\bar{S}_B(A)}$$

$I_B(At) \equiv$ earnings index for quarter t of year A , calculated with base B

$S_B(At) \equiv$ Salary in quarter t of year A , calculated with base B

$$\bar{S}_B(A) = \sum_{t=1}^{IV} S_B(At) / 4 \equiv \text{Average salary in year } A \text{ calculated with base B}$$

The objective of elaborating a link is to avoid a break in the series of data and to continue the temporal series from the beginning. For this it is necessary to *recalculate* the series backwards applying the new methodology via a link coefficient.

The temporal evolution of the index must not vary when applying the link, given that the sole objective is to update the series, not alter it. The variation rates obtained in the past must remain invariable when introducing the link coefficient.

The following calculations prove that the application of the link does not affect the variation produced in the already existing data.

Being A any year prior to the year 2000. The annual variation rate (with respects to the previous year) obtained with the WS for the index in a quarter t (index according to the methodology and base 95) is:

$$TV_{95}At, (A-1)t = \frac{I_{95}(At) - I_{95}((A-1)t)}{I_{95}((A-1)t)} = \frac{\frac{S_{95}(At)}{S_{95}(95)} - \frac{S_{95}((A-1)t)}{S_{95}(95)}}{\frac{S_{95}((A-1)t)}{S_{95}(95)}} = \frac{S_{95}(At) - S_{95}((A-1)t)}{S_{95}((A-1)t)} \ln$$

other words, the variation rates are the same for both the indices as well as for the levels. Consequently, that stated for indices is applied in the same manner to levels.

If the methodological change is applied and the indices are calculated with the new structure, the following variation rate is obtained:

$$TV_{2000}At, (A-1)t = \frac{I_{2000}(At) - I_{2000}((A-1)t)}{I_{2000}((A-1)t)} = \frac{k_t \times I_{95}(At) - k_t \times I_{95}((A-1)t)}{k_t \times I_{95}((A-1)t)} =$$

$$= \frac{I_{95}(At) - I_{95}((A-1)t)}{I_{95}((A-1)t)} = TV_{95}At, (A-1)t$$

In view of all this, it is possible to conclude that the application of the link coefficients to the series does not affect the variation rates of same, in other words, it does not affect the temporal evolution of the indices, they are solely a tool that update the series and thus, their use is justified.

It is necessary to point out that with this manner of linking what do change are the inter-quarterly rates, but these are not significant in these types of series.

9.3 LINK COEFFICIENTS FOR THE DIFFERENT EXISTING SERIES

Evidently, only the series of wages that will be maintained with the LCI will be linked.

Variables that are studied in the WS are:

- Average number of hours worked and average number of hours agreed by employee and month
- Average earnings per hour
- Average earnings per worker and month

These variables are broken down according to the following criteria:

- Geographical level: national level and by Autonomous Communities
- Working day: full time and part time

- Payments: total and ordinary
- Hours: Standard working day and working day with overtime hours
- Sectors, sections and divisions of the NCEA-93
- Professional categories: employees and workers (this classification will disappear with the new methodology so that there will no longer be a need to link the series which include them)
- Size of the unit or contribution account

Not all these series may be linked, due mainly to the fact that there does not exist a clear connection with the series of the LCI, be it due to methodological changes, which makes them so different that there is no sense in linking them, or be it due to their lack of significance in the current survey.

Consequently, the following variables of the WS will be linked:

- Average earnings per hour
- Average earnings per worker and month

That correspond with LCI variables:

- Wage cost by hour
- Labour cost by worker and month

These variables are broken down according to the following criteria:

- Geographical level: national level and by Autonomous Communities
- Working day: full time and part time
- Payments: total and ordinary
- Sectors, sections and divisions of the NCEA-93

It will be necessary to obtain link coefficients for each variable with all the series existing for same, depending on how they are broken down.

To simplify, suppose that a certain variable X (hours or profits) is analyzed by strata, in other words, by crossing the economic activity (a), the Autonomous Community (c) and the type of working day (l):

$X_{aci,2000}(T)$ $\equiv$ level of the variable X in working day l, of the Autonomous Community c and for economic activity a, obtained in the quarter T of the year 2000

Sufficient information will be available to calculate this level using both the current (95) as well as the future (2000) methodology:

$X_{aci,95}(T)$ and $X_{aci,2000}(T)$

Parting from these values the link coefficient is constructed to unite the series of new values of X with the series already existing:

$$C_{aci} = \frac{X_{aci,2000}(T)}{X_{aci,95}(T)}$$

If a lower level of breakdown for the variable X is desired, the values of said variable would be added until obtaining the desired level of breakdown.

For example, if we wish to ascertain the value of X in one quarter t, for a certain activity a, and for a certain region c, but globally for all the units (without differentiating their working day), the desired level of X would be:

$$X_{ac}(T) = \sum_i X_{aci}(T)$$

Although the desired variable is obtained adding levels, the link coefficient for X_{ac} cannot be calculated as the sum of the coefficients, because this coefficient is given by a quotient, and the quotient of a sum is not the sum of the quotients:

$$C_{ac} = \frac{X_{ac,2000}(T)}{X_{ac,95}(T)} = \frac{\sum_i X_{aci,2000}(T)}{\sum_i X_{aci,95}(T)} \neq \sum_i \frac{X_{aci,2000}(T)}{X_{aci,95}(T)} = \sum_i C_{aci}$$

$\downarrow$

$$\sum_i \frac{a_i}{b_i} = \frac{a_1}{b_1} + \frac{a_2}{b_2} + \dots + \frac{a_n}{b_n} \neq \frac{a_1 + a_2 + \dots + a_n}{b_1 + b_2 + \dots + b_n} = \frac{\sum_i a_i}{\sum_i b_i}$$

Thus, it is necessary to obtain the link coefficients independently for each one of the series (both of the levels as well as of the indices) that have continuity in the new system.

10 Description of published variables

Total cost:: includes the wages cost plus other costs.

Other costs: non-wage payments plus obligatory contributions minus social security subsidies and bonuses.

Total wage cost: this includes ordinary wage costs, extraordinary payments and delayed payments.

– **Ordinary wage cost:** are the monthly wage payments.

– **Extraordinary payments wage cost:** includes extraordinary payments and any other payment whose due date is more than a month (except delays).

– **Delayed payments wage cost:** these are payments made over the month and earned in previous periods.

Extraordinary wage cost: is the wage cost for extraordinary payments plus the wage cost for delayed payments.

Non-wage payments cost: includes cost for T.D. (temporary disability), for unemployment, other direct corporate benefits, compensation, dismissal and non-wage payments.

- **I.T. cost:** payments for I.T. at the employer's expense.

- **Unemployment cost:** payments for unemployment (reduction of working day and/or suspension of contract) at the cost of the employer.

- **Cost for other direct corporate benefits:** includes direct corporate benefits complementary to social security paid for by the employer.

- **Cost for other non-wage payments:** includes the rest of non-wage payments.

Cost for obligatory contributions: cost of obligatory social security paid for by the employer.

- **Cost for common contingencies:** contributions for common contingencies from obligatory social security paid for by the employer.

- **Cost for unemployment, Fogasa and professional training:** contributions paid for by the employer who covers these contingencies.

- **Cost for other obligatory corporate contributions:** this includes the rest of obligatory social security contributions

Social security subsidies and bonuses: reductions, bonuses and subsidies in social security liquidations.

Cost for dismissal: payments made as compensation for dismissal and extinction of contract.

Payments per day of T.D.: T.D. payments paid for by the employer per day when the employee comes off work for this contingency.

Cost of compensation for dismissed employee: this is the quotient of the total cost for dismissal among the total dismissed workers.

Cost per extra hour: overtime hours may be remunerated in cash or with remunerated rest hours. Cost per extra hour is the quotient between the sum of payments made for overtime hours plus the corresponding contributions for these hours plus the labour cost attributable to rest hours granted as compensation (see point 8 of the methodology) among the extra hours carried out.

Agreed hours: these are those legally established by employer/workers agreement (including that agreed for holidays and public holidays).

Paid hours: includes hours worked and not worked.

Effective hours: these are hours really worked including extraordinary hours. They are calculated as the hours agreed plus extraordinary hours minus hours not worked by different causes.

Hours not worked: this is the total of agreed hours not worked for some reason. Included are: not worked by holidays, not worked for public holidays (official and non-official), not worked by T.D. (temporary disability) not worked by maternity, adoption, paid leave (marriage, birth, death...), not worked for technical or economic reasons (with or without employment regulation file), other hours not worked and paid (union representation, medical visits...), not worked in the job post because of acts of god (power cuts, breakage of machines...), not worked due to labour conflict and finally not worked for other reasons (absenteeism, lockout, ...).