INSTITUTO NACIONAL DE ESTADISTICA

Services sector activity indicators. Base 2015

Methodological Note

January 2019

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1. Introduction

The main purpose of the statistical operation of the Services Sector Activity Indicators (SSAI) is to provide short-term performance indicators in nominal terms, that is, at current prices, of the economic activity of companies operating in the non-financial market services in Spain via two variables: turnover and employed personnel. The objective of this operation is to fulfil Regulation No. 1158/2005 of the European Parliament and Council, of 6 July 2005, modifying Regulation No. 1165/98 of the European Union Council dated 19 May 1998, on short-term statistics, although the latter remains in force.

These Regulations aim to create a common framework for the production of Community statistics on the short-term evolution of supply, demand, production factors and prices.

This entails an actual set of statistics with direct data collection. Results are presented as indices so as to measure variations as compared to the base year.

The Services Sector Activity Indicators study the population made up of companies whose main economic activity is described in sections G, (Trade), H (Transport and Storage), I (Accommodation), J (Information and Communications), M (Professional, Scientific and Technical Activities) and N (Administrative and Support Services Activities) of the National Classification of Economic Activities 2009 (CNAE-09).

This operation began to be carried out in the year 2002. In the year 2005, the sample was increased in order to disseminate regional data, and as of January 2009 SSAI provides information in CNAE-09. In January 2013, coinciding with the base change from 2005 to 2010, the formulation used is modified, from direct Laspeyres-type indices with fixed base year 2005, to chain-linked Laspeyres indices, with base year 2010 (monthly chain-linking during last December). In the reference month January 2018, the indices in the **new base 2015** begin to be published, following the mandate established by EUROSTAT.

2. Scope of application

The application scope is defined relating to the population researched, time and space.

On 13 April 2007, the Classification of Economic Activities 2009 was approved by Royal Decree 475/2007, which is the national version of the European Classification of Economic Activities approved by Regulation (EC) No. 1893/2006 of the European Parliament and of the Council of December 20, 2006.

As of the reference month of January 2009, indices are published in the new Classification CNAE-09 (and the retrospective series).

2.1 Population scope

The population under study is made up of companies whose main economic activity corresponds to the following CNAE-09 codes (detailed up to the lowest level for which national indices are provided):

TRADE (G)

Wholesale and retail trade and repair of motor vehicles and motorcycles (45)

45.1+45.3+45.4: Sale of motor vehicles, parts and accessories and sale, maintenance and repair of motorcycles and related parts and accessories,

45.2: maintenance and repair of motor vehicles,

Wholesale trade, except of motor vehicles and motorcycles (46)

46.1: wholesale on a fee or contract basis

46.2 wholesale of agricultural raw materials and live animals,

46.3 wholesale of food, beverages and tobacco,

46.4 wholesale of household goods,

46.5 wholesale of information and communication equipment,

46.6 wholesale of other machinery, equipment and supplies,

46.7: other specialised wholesale trade (of fuels, metals and others),

46.9: other non-specialised wholesale trade.

Retail trade, except of motor vehicles and motorcycles (47)

This division is obtained through the Retail Trade Index survey

TRANSPORT AND STORAGE (H)

Land transport (49)

49.1+49.2+49.5: rail transport and transport via pipeline

49.32: transport by taxi,

49.31+49.39: other passenger land transport (these two classes are obtained through the Passenger Transport Survey)

49.4: freight transport by road and removal services,

Water transport

50: water transport, both of passengers and goods,

Air transport

51: air transport,

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Warehousing and support activities for transportation

52: warehousing and storage, service activities incidental to land, sea and air transportation and cargo handling,

Postal and courier activities

53: postal activities under universal service obligation and other postal and courier activities.

ACCOMMODATION (I)

Accommodation services

55: accommodation,

Food and beverage service activities

56: food and beverage service activities.

INFORMATION AND COMMUNICATIONS (J)

Edition

58: publishing (of books, newspapers, magazines, directories; of video games and other software programs),

Motion picture, video and television programme activities and music publishing

59: Motion picture, video and television programme production, sound recording and music publishing activities,

Programming and broadcasting activities

60: programming and broadcasting activities,

Telecommunications

61: telecommunications (wired, wireless, satellite and other telecommunication activities),

Computer programming, consultancy and related activities

62: computer programming, consultancy and related activities,

Information service activities

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63: information services (data processing, hosting, websites and related activities; news agency activities and other information services).

PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES (M)

Legal, accounting and business and management consultancy activities

69+70.2: legal activities, accounting activities, bookkeeping, auditing and tax advisory, as well as management consultancy activities,

Architectural and engineering activities; technical testing and analysis

71 architectural and engineering activities; technical testing and analysis,

Advertising and market research

73: advertising agencies and media representation services. Market research and public opinion polling,

Other professional, scientific and technical activities

74: specialised design activities, photographic activities, translation and interpretation activities, technical consultancy and other professional, scientific and technical activities.

ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES (N)

Employment activities

78: recruitment company and temporary employment agency activities and other provision of human resources,

Travel agency and tour operators

79: travel agency, tour operator and other reservation services and related activities,

Security and investigation activities

80: private security and security systems service activities; investigation activities,

Cleaning activities

81.2: general cleaning of buildings and other cleaning activities

Office administrative activities

82: combined office administrative service activities, photocopying, document preparation and other specialised office support activities; call centre activities; organisation of conventions and trade shows; activities of collection agencies and credit bureaus; packaging activities on a fee or contract basis and other business support service activities,

2.2 Geographical scope

All statistical units located in the Spanish territory constitute the object of research, except Ceuta and Melilla, which are only collected in the activity of division 47 of CNAE-09, whose source is the Retail Trade Index survey.

2.3 Time scope

2.3.1 Base period

The base period or reference period of the index is the one in which the index equals 100. This is normally an annual period. In the new system the arithmetic mean of the twelve monthly indices of the year 2015 published in base 2015 equals 100; therefore, the reference period for the index is year 2015 (or in other words, the base is 2015). This means that all indices published will refer to this year.

2.3.2 Variable reference period

This is the period with whose values the variables are compared (turnover and employed personnel) for the reference month. In other words, the period chosen for calculating the elementary indices.

With the calculation formula used for SSAI base 2015 (chain-linked Laspeyres), the reference period of the variables changes every year and is the month of December of the year immediately preceding the year under consideration.

2.3.3 Weightings reference period

The reference period of the weightings is the period to which the weightings that serve as the structure of the system refer.

The reference period for weightings varies each year, and is the month of December of the year immediately prior to the one being considered.

The calculation of the weightings has been carried out on the basis of data from the Structural Business Statistics: Trade Sector and Services Sector of the year 2015, which provide structural information on the turnover and employment in each of the sectors. This survey investigates slightly more than 140,000 companies in the trade and services sectors and refers to the average for the year 2015, and in order to correct the gap that occurs between this period and that of the weightings (December of the year immediately prior to that considered), these are updated using information on the evolution of turnover and employment indicators from the short-term survey of the Service Sector Activity Indicators.

In addition, every five years there will be a base change, in which the weightings will be updated (with a new Annual Services and Trade Surveys) for all levels of functional and geographical disaggregation.

3. Statistical unit

The statistical unit used is the company that carries out, as its main economic activity, the rendering of any of the services included in the population scope. The company is also the informant unit, since it is perfectly defined and localised and has the accounting and employment data, which facilitates the response and obtaining homogeneous information.
The company is the smallest combination of legal units that constitute an organisational unit that produces goods or services, and which has a certain degree of decision-making autonomy, especially with regard to the allocation of their current resources. A company may carry out one or more activities in one or more local units.

4. Concepts and definitions

4.1 Economic activity

The economic activity carried out by a company is defined as the creation of value added through the production of goods and services.

Each one of the statistical units (companies) studied frequently carry out different activities that must be classified in separate classes of the National Classification of Economic Activities, but in this survey they are classified according to their main activity. In general, the activities carried out by an economic unit may be one of three types: main, secondary and auxiliary activities. The main activity is differentiated from the secondary as it is the activity which generates the greatest value added; in turn, auxiliary activities are those which generate services that are not sold on the market and which only serve the unit on which they depend (administration department, transport or storage services).

In view of the difficulty that the calculation of the value added represents for companies when they carry out several activities, the company is offered the possibility of considering as the main activity the one that generates the greatest turnover or, failing that, the one that employs the greatest number of people. However, this information is subsequently contrasted to determine the main activity of the company.

4.2 Company size

The size of companies is one of the most important variables when determining their behaviour. This size can be established in terms of the magnitude of the turnover or the production value or by considering the number of persons constituting the company's workforce. This survey chooses to consider this second option in order to determine the size of companies, although the first option is also taken into account, by comprehensively surveying smaller companies with significant turnover.

4.3 Definition of variables

4.3.1 Income or turnover

Revenue or turnover is the total invoicing of the company. Its definition is derived from the accounting definitions used by the companies. Includes the amounts invoiced by the company for the provision of services and the sale of goods carried out in the course of the company's business, including those carried out by subcontracting.

Expenses invoiced for packaging and transport are included; the sale of purchased goods for resale in the same conditions in which they were received, and sales of by-products. As well as hours worked invoiced to third parties solely for subcontracted work.

These amounts are considered, including the taxes that are levied on the goods and services, and excluding the VAT paid by the client.

It does not include subsidies received from public authorities or from the European Union, financial income or other operating income such as subsidies, sales of shares and fixed assets, interest income, dividends and patents, leases of company properties, production units and machines. Neither does it include income from staff amenities (canteens etc.) and supply of goods or services within the observation unit.

4.3.2 Employment

Employed personnel are classified according to remuneration:

- *Unpaid personnel (self-employed workers, partners and contributing family workers)*: comprising persons who direct or actively participate in company work without receiving fixed remuneration or wages. This includes owners who carry out an activity in the company and contributing family workers. This does not include exclusively capitalist partners or relatives of the owner who do not actively participate in the company or who are included in the payrolls of other companies as their main occupation.
- *Paid personnel*: this consists of those employees linked to the company by an employment contract and who are paid fixed or periodic amounts in the form of wage, salary, commission, piecework or payment in kind. A distinction is made between *fixed personnel* (with an indefinite/permanent contract or labour relationship) and *temporary personnel* (with a fixed-term contract).

5. Sample Design and Information Collection

5.1 Sampling Frame

The sample frame is the Central Business Register (CBR), a list of companies that is updated once a year with administrative sources, primarily of a tax and social security nature. It is also updated with information from the statistical operations of the INE.

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The CBR contains information on the main economic activity and number of employees, variables used in the sample design, and on identification and location data, necessary for the correct collection of the information.

5.2 Sample design

Stratified random sampling is used. In each stratum, a random sample is obtained, except the one formed by companies with 200 or more employees, in which all form part of the sample. In certain Autonomous Communities and activity groups, smaller strata are also comprehensive, due to having a very small population. For calculation of the sample size an optimal allocation is applied. The main stages of the design are then developed:

5.2.1 Stratification

The strata are formed by the crossing of Autonomous Community (17) x branch of main economic activity (36) x size group (6), measured by number of employees.

Activity branches are defined as follows:

Branch	CNAE-2009 Code	Branch	CNAE-2009 Code
1	451, 453, 454	19	53
2	452	20	55
3	461	21	56
4	462	22	58
5	463	23	59
6	464	24	60
7	465	25	61
8	466	26	62
9	467	27	63
10	469	28	69, 702
11	47*	29	71
12	491, 492, 495	30	73
13	4931, 4939**	31	74
14	4932	32	78
15	494	33	79
16	50	34	80
17	51	35	812
18	52	36	82

Note
* The index for branch 47 is obtained from the Retail Trade Indices survey
** The data for this branch are obtained from the Passenger Transport Statistics

The size groups are:

Size groups	Number of employees:
00	0

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11	From 1 to 2 employees
12	From 3 to 9
14	From 10 to 49
16	From 50 to 199
18	Of 200 and more

From 200 employees onwards, the strata are comprehensive, that is, all companies are investigated. Furthermore, there are also comprehensive smaller companies belonging to strata with smaller population, multi-location companies (with establishments in different Autonomous Communities) with 50 or more employees and companies with large invoiced amounts and few employees.

5.2.2 Sample Size

The size of the sample is calculated in order to provide indicators on the turnover and employment variables, with a permissible sampling error for the following populations:

- At national level for each branch of activity
- At Autonomous Community level by activity sector

The sectors of activities are aggregation of the branches and they are:

Sectors	**CNAE-2009 code**
Trade	45 to 47
Transport	49 to 53
Accommodation and food service activities	55 to 56
Information and communications	58 to 63
Professional, scientific and technical activities	69, 702, 71, 73, 74
Administrative and support services activities	78, 79, 80, 812, 82

Optimal allocation is applied in order to calculate the n_h sample sizes so that the overall sample size (n) is minimal, subject to:

- The relative error of the estimator of the total dummy variable by activity sectors does not exceed 5% at the national level.

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- The relative error of the estimator of the total dummy variable by economic sectors does not exceed 5% at the Autonomous Community level.

The resulting sample contains approximately 28,000 companies

5.2.3 Rotation of sampling units

The European Regulation requires changes of base every 5 years. At such times, the sample is renewed in order to reflect the new population distribution. However, in order to avoid weariness of the reporting units and ageing of the sample, without losing representation with respect to the current population, an annual rotation of between 20% and 25% of the sample in the sampling strata is carried out. Rotations are carried out during January each year.

The criteria used is to substitute the companies which have collaborated in the calculation of the index for approximately 4 or 5 years as well as those which have been delisted, unreachable, wrongly included and merged or taken over. Likewise, newly created companies with 200 or more employees enter the sample.

5.2.4 Estimators and sampling errors

To obtain a measure of the quality of the indices, an approximate relative sampling error is calculated for the year-on-year variation rates of the variables turnover and total employees. The general expression of the estimated relative error, assuming negligible bias, is given by:

$$C\hat{V}(\hat{R}) = 100 \times \frac{\sqrt{V(\hat{R})}}{\hat{R}}$$

$$siendo \quad \hat{R} = \frac{\hat{Y}_t}{\hat{Y}_{t-1}}$$

$\hat{R}$ is the estimator of the ratio, given by the quotient of the estimate of the total of variable Y (turnover or total number of employed persons) in month m of year t, $\hat{Y}_t$, and the estimate of Y obtained in the same month m of year t-1, $\hat{Y}_{t-1}$.

The method used to calculate the variance estimator is Taylor linearisation. The variance estimator is expressed as:

$$\hat{V}(\hat{R}) = \frac{1}{\hat{Y}_{t-1}^2}[\hat{V}(\hat{Y}_t) + \hat{R}^2\hat{V}(\hat{Y}_{t-1}) - 2\hat{R}Co\hat{v}(\hat{Y}_t, \hat{Y}_{t-1})]$$

Where $\hat{V}(\hat{Y}_t)$ indicates the variance estimator of $\hat{Y}_t$, $\hat{V}(\hat{Y}_{t-1})$ indica el estimador de varianza de $\hat{Y}_{t-1}$ y $Co\hat{v}(\hat{Y}_t, \hat{Y}_{t-1})$ indica el estimador de la covarianza entre $\hat{Y}_t$ y $\hat{Y}_{t-1}$.

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5.2.5 Regionalisation

The company is the statistical and information unit. This leads to the need for a regionalisation in order to adequately estimate the turnover or personnel employed in each region, in the case of companies with premises in different Autonomous Communities (the so-called multi-location companies). For this purpose, the Structural Business Statistics information has been used. .

As the samples of the short-term survey and the structural surveys are common to large companies (in both cases they are exhaustive), information is obtained from the latter on the regional location of the premises by means of the Autonomous Community distribution table, where a breakdown is requested in percentage of its turnover and number of employees of the company, corresponding to each Autonomous Community.

For any month, turnover or invoicing for an activity A, in a region R, may be broken down as (similarly to employment):

[a] turnover of non-multi-location companies (generally with less than 50 employees) with their registered office in R and main activity:

$$\sum_{h} \sum_{j=1}^{n_h} F_{h,j}^{A,R} \times w_h$$

where

$F_{h,j}^{A,R}$ is the turnover of company j (non-multi-location) belonging to stratum h with its registered office in R and main activity *A*.

w_h is the elevation coefficient for companies belonging to stratum h of the short-term survey.

n_h is the sample size of stratum h in the short-term survey.

[b] turnover of premises located in Autonomous Community *R* of multi-location companies having their registered office in that same Autonomous Community and whose principal activity is *A*:

$$\sum_{j=1}^{m} \sum_{l=1}^{L_j} F_{j,l}^{A,R}$$

where

$F_{j,l}^{A,R}$ includes only the turnover generated by the company in premises located in the Autonomous Community *R* with the presence of company *j* (which has 50 or more employees and is multi-location), which carries out the main activity *A* and

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whose registered office is located in the Autonomous Community *R*. Company *j* has L_j premises and there are *m* companies with these characteristics.

[c] turnover generated in premises located in the Autonomous Community *R* of multi-location companies having their registered office in an Autonomous Community other than *R* and whose principal activity is activity *A*:

$$\sum_{i=1}^{s} \sum_{l=1}^{T_i} F_{i,l}^{A,C \neq R,R}$$

where

$F_{i,l}^{A,C \neq R,R}$ includes the turnover generated by the company in the premises located in the Autonomous Community *R* owned by company *i* (which has 50 or more employees and is multi-location), which carries out the main activity *A* and whose registered office *C* is located outside the Autonomous Community *R*. The company *i* has T_i premises located in the Autonomous Community *R* and there are *s* companies with these characteristics.

Multi-location companies with 50 or more employees are studied comprehensively, as detailed in the sample design section, therefore the elevation coefficient for those companies is "one". The assumption is made that the main activity of all the premises of a company coincides with the main activity of that company.

As mentioned above, since the statistical and information unit is the company and not the establishment or premises, the information in the previous sections (b) and (c) (that is, the turnover of the premises) is estimated by means of the Autonomous Community distribution table of the Structural Business Statistics: Trade Sector and Services Sector, which collects information on the percentage of the turnover of the company corresponding to each Autonomous Community and on the number of employed persons in each of them.

Thus, the section (b) is approximated by:

$$\sum_{j=1}^{m} \sum_{l=1}^{L_j} F_{j,l}^{A,R} \cong \sum_{j=1}^{m} F_j^{A,R} \times p_j^R$$

where

p_j^R is the percentage of turnover of company *j* corresponding to Autonomous Community *R*.

In other words, the turnover of the premises located in *R* of the multi-location companies with their registered office in that same Autonomous Community and whose main activity is *A* is obtained by multiplying the turnover of those companies by the percentage of their turnover corresponding to the Autonomous Community *R*.

and section (c) is approximated by:

$$\sum_{i=1}^{s} \sum_{l=1}^{T_i} F_{i,l}^{A,C \neq R,R} \cong \sum_{i=1}^{s} F_i^{A,C \neq R,R} \times p_i^R$$

where

p_i^R is the percentage of the turnover of company *i* (whose registered office is located in an Autonomous Community other than *R*) corresponding to the Autonomous Community *R*.

That is to say, the turnover generated in the premises of the Autonomous Community *R* of multi-location companies that carry out the main activity *A* and whose registered office is located in an Autonomous Community other than *R* is obtained by multiplying the turnover of each company by the percentage corresponding to the Autonomous Community *R*.

Thus, turnover for the activity A in the Autonomous Community R is estimated as:

$$\hat{F}^{A,R} \cong \sum_h \sum_{j=1}^{n_h} F_{h,j}^{A,R} w_h + \sum_{j=1}^{m} F_j^{A,R} * p_j^R + \sum_{i=1}^{s} F_i^{A,C\neq R,R} \times p_i^R$$

6. Base Year

Pursuant to Regulation No. 1165/98, the indices must change base every five years, in the years ending in 0 and 5. All indices must be adapted to the new base year within three years from the end of said new base year.

In order to comply with this Regulation, we must change the base from 2010 to 2015. In addition, the base changes are used to update the indices, so that they are adapted to the changes that have taken place in the services sector in recent years and their evolution is measured more precisely.

January 2018 is the first month that is published in the new base 2015; in this change the years 2016 and 2017 have been recalculated due to an update of the sample and using new weightings. In the series of retail trade and the aggregates in which it intervenes, the year 2015 has also been recalculated for consistency with the statistics of retail trade indices. The series have been linked to achieve comparable indices since their beginning.

Chained series

The series linking is carried out from December 2015 until the beginning, thus maintaining the variation rates published in base 2010 in all years, except for the recalculated years, that is, except in 2016 and 2017. In 2015, in the retail trade series and the aggregates in which it is involved, the rates of variation with respect to the rates published in base 2010 are not maintained either, since in these series the year 2015 has also been recalculated as indicated above.

The structural link is used which makes the average for 2015 to be 100. The values of each of the months until December 2015 of each of the series in base 2010 are divided by the average of the indices of the year 2015 in base 2010. In other words, they are multiplied by the structural link coefficient in order to pass them to base 2015:

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$$Coeficiente\ de\ enlace = \frac{1200}{\sum_{m=1}^{12} {}_{10}I^{m15}}$$

Being:

${}_{10}I^{m,15}$ the index of month m of the year 2015 in base 2010.

Thus, the linked index in base 2015 for month m in year t is:

$${}_{15}IE^{m,t} = {}_{10}I^{m,t} * \frac{1200}{\sum_{m=1}^{12} {}_{10}I^{m,15}}$$

7. General calculation method

The Services Sector Activity Indicators are calculated according to a chained Laspeyres index based on the year 2015. A chain-linked index measures accumulative movements of indices in the short term in different base periods. In other words, it establishes comparisons between the current period (t) and the base period (0) albeit taking into account intermediate situations (k). In the SSAI base 2015, the intermediate situations considered correspond to the months of December for all years.

A chain-linked index is used because, although this is a value index, where it is equivalent to use fixed base indices or chain-linked indices, the fact of carrying out an annual rotation of between 20% and 25% of the sample units means that these linked indices are considered to be methodologically more appropriate.

To get the indices that are chained and are the publishable indices, we must first calculate the indices that we call non-publishable.

Detailed below is the calculation method for the turnover variable, which is similar to the one used for calculating the employment indices.

7.1 Non-publishable indices (based on December t-1)

7.1 1 Elementary indices

Elementary indices (unpublishable) are constructed for each one of the 17 Autonomous Communities (R) and for each branch of activity (A) referenced to the month of December of the previous year:

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$$ {}_{dic\,(t-1)}I^{mt,NP}_{A,R} = \frac{\hat{F}^{mt}_{A,R}}{\hat{F}^{dic\,(t-1)}_{A,R}} $$

- where $\hat{F}^{mt}_{A,R}$ and $\hat{F}^{dic(t-1)}_{A,R}$ refer to the estimated turnover for one month of year t and December of year t-1, respectively, and have been calculated with the same set of companies (after having carried out the rotation).

Rotation

Each December a non-comprehensive 25% rotation of the sample is carried out. This implies having two sets of companies in the months of December.

Thus, in December *t-1*:
The first set corresponds to the sample of companies that have been responding during the whole of year *t-1* and is used for calculating the index for December for *t-1*:
Non-publishable index in December *t-1*:

$$ {}_{dic\,(t-2)}I^{dic\,(t-1),NP}_{A,R} = \frac{\hat{F}^{dic\,(t-1)}_{A,R}(viejo\ \ conjunto\ \ empresas)}{\hat{F}^{dic\,(t-2)}_{A,R}(viejo\ \ conjunto\ \ empresas)} $$

With the second set of companies, where we have substituted part of them (approximately 25%) with new ones, the index is calculated for January in year t:

Non-publishable index in January of *t*:

$$ {}_{dic\,(t-1)}I^{enet,NP}_{A,R} = \frac{\hat{F}^{enet}_{A,R}(nuevo\ \ conjunto\ \ empresas)}{\hat{F}^{dic\,(t-1)}_{A,R}(nuevo\ \ conjunto\ \ empresas)} $$

7.1.2 Aggregate indices

Once the elementary indices are calculated, the aggregate indices are obtained as weighted sums of the elementary indices

7.1.2.1 Weightings

The weightings that intervene in the calculation of the aggregate indices come from the Structural Business Statistics: Trade Sector and Services Sector for 2015. These surveys provide estimates of the average values in the year 2015 of turnover and employed persons.

The weighting reference period (the one to which these refer) varies each year, and is the month of December the year immediately preceding the year under consideration.

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The weightings obtained from the Structural Business Statistics for 2015, as mentioned above, and in order to correct the time lag between this period and that of the weightings (December of the year immediately prior to the year considered), are updated using information on the evolution of the turnover and employment indicators from the short-term survey of the Services Sector Activity Indicators itself.

In addition, every five years there will be a base change, in which the weightings will be updated (with a new structural survey) for all levels of functional and geographical disaggregation.

Average turnover and Average number of employees in 2015

These are obtained directly from the Structural Business Statistics: Trade Sector and Services Sector for 2015.

Weightings in December 2015 and subsequent ones

We start from the 2015 average values of the turnover (and employed personnel) variables of the Structural Business Statistics for 2015 and take them to December 2015 with the variation of SSAI indices. Thus, calculation of weightings for functional aggregation of S activities in the Autonomous Community R is:

$$ {}_{dic\ 15}W_{A,R} = \frac{\hat{F}_{A,R}^{dic\ 15}}{\sum_{\forall A \in S} \hat{F}_{A,R}^{dic\ 15}} = \frac{\hat{F}_{A,R}^{dic\ 15}}{\hat{F}_{S,R}^{dic\ 15}} = \frac{\hat{\overline{F}}_{A,R}^{2015} \times (1 + tv)}{\hat{\overline{F}}_{S,R}^{2015} \times (1 + tv')} $$

where:

$\hat{F}_{A,R}^{dic15}$ y $\hat{\overline{F}}_{A,R}^{2015}$ correspond to the turnover estimate for activity A in December 2015, and for the 2015 average, respectively. The variation rate is given by:

$$ tv = \frac{{}_{15}IE_{A,R}^{dic15}}{{}_{15}\overline{IE}_{A,R}^{2015}} - 1 $$

where:

${}_{15}IE$ refers to the linked index in the new base 2015.

Similarly, $\hat{F}_{S,R}^{dic15}$ y $\hat{\overline{F}}_{S,R}^{2015}$ corresponds to the estimated turnover of the aggregation of S activities in December 2015 and the average for 2015, respectively. In this case the variation rate would be:

$$ tv' = \frac{{}_{15}IE_{S,R}^{dic15}}{{}_{15}\overline{IE}_{S,R}^{2015}} - 1 $$

Substituting these terms in the calculation of the weighting in December 2015:

$$_{dic\ 15}W_{A,R} = \frac{\hat{\overline{F}}^{2015}_{A,R} \times (1+tv)}{\hat{\overline{F}}^{2015}_{S,R} \times (1+tv')} = {}_{\overline{2015}}W_{A,R} \times \frac{{}_{15}IE^{dic\ 15}_{A,R}}{{}_{15}IE^{dic\ 15}_{S,R}}$$

Given that some terms are cancelled, and that the average for indices in the base year is equal to 100.

In general, weightings in December of year *t* are calculated:

$$_{dic\ t}W_{A,R} = {}_{\overline{2015}}W_{A,R} \times \frac{{}_{15}I^{dic\ t}_{A,R}}{{}_{15}I^{dic\ t}_{S,R}}$$

where,

$_{15}I^{dic\ t}_{A,R}$ is the publishable index, referring to year 2015, of activity A, in Autonomous Community *R* in the month of December of year *t*

$_{15}I^{dic\ t}_{S,R}$ is the publishable index, referring to year 2015, of the aggregation of activities *S*, in Autonomous Community *R* in the month of December of year *t*

Similarly for employed personnel.

The weightings of each activity represent the relationship between turnover (or employment) for that activity, and total turnover (or employment) in the grouping of activities (*S*) covered by the index:

$$W_A = \frac{facturacion \ \ (o\ empleo)\ estimada\ de\ actividad \ \ A}{facturacion \ \ (o\ empleo)\ estimada\ de\ agregación\ S}$$

These weightings are different in each one of the aggregations (Autonomous Communities and national total).

7.1.2.2 Aggregation

The elementary indices and the weightings used for calculating aggregates refer to December of the previous year, whereby consistency is maintained with the reference variables.

The National General Index is calculated by aggregating the Branches of the different Autonomous Communities to obtain the national index by Branch; once it is obtained, all the Branches are aggregated to obtain the Division, then the Sector, these are aggregated to obtain the Trade and Other Services indices and with them, the National General index is obtained. Within each Autonomous Community, the same aggregation system is followed,

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7.1.2.2.1 Aggregations in an Autonomous Community

Once the non-publishable elementary indices have been obtained by activity and for each of the Autonomous Communities, the indices aggregated by activity within an Autonomous Community are constructed as weighted indices and are obtained using the weighting structure that reflects the importance of the different activities in each Autonomous Community.

The index, referring to December of the previous year, for any functional aggregate S in an Autonomous Community R, is obtained as an aggregate of the non-publishable elementary indices for activities belonging to said aggregate with the weightings of December of the previous year.

The mathematical expression of this aggregated index (non-publishable additive) is:

$$_{dic(t-1)}I^{mt,NP}_{S,R} = \sum_{\forall A \in S} {}_{dic(t-1)}I^{mt,NP}_{A,R} \times {}_{dic(t-1)}W_{A,R}$$

where,

$_{dic(t-1)}I^{mt,NP}_{A,R}$ is the non-publishable elementary index, referring to December *t-1*, of activity *A* in Autonomous Community *R*, in month *m* of year *t*,

$_{dic(t-1)}W_{A,R}$ is the weighting (so much per one), referring to December *t-1*, of activity *A* in Autonomous Community *R*, within aggregate *S*; in other words:

$$_{dic\ (t-1)}W_{A,R} = \frac{c\ \ negocios\quad (o\ \ empleo\ )\ \ de\ \ actividad\quad A\ \ en\ \ región\quad R}{c\ \ negocios\quad (o\ \ empleo\ )\ \ de\ \ agregación\quad S\ \ en\ \ región\quad R}$$

7.1.2.2.2 National aggregations

In the same way as in the previous case, the calculation of the index of national aggregation N to obtain the national index per Branch (S) is calculated as follows:

$$_{dic\ (t-1)}I^{mt\ ,NP}_{S\ ,N} = \sum_{\forall R \in N} {}_{dic\ (t-1)}I^{mt\ ,NP}_{S\ ,R} \times {}_{dic\ (t-1)}W_{S\ ,R}$$

where,

$_{dic(t-1)}I^{mt,NP}_{S,R}$ is the non-publishable index, referring to December of *t-1*, of branch *S* in Autonomous Community *R*, in month m of year *t*,

$_{dic(t-1)}W_{S,R}$ is the weighting (so much per one), referred to December of *t-1*, of branch *S* in Autonomous Community *R*, within geographical aggregation *N*; that is to say:

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$$_{dic\ (t-1)}W_{S,R} = \frac{c\ negocios\ \ (o\ \ empleo\ )\ estimada\ \ de\ \ rama\ \ S\ \ en\ \ la\ \ región\ \ R}{c\ \ negocios\ \ \ (o\ \ empleo\ )\ estimada\ \ de\ \ rama\ \ S\ \ en\ \ e\ l\ \ conjunto\ \ \ nacional}$$

Once the national index of Branch S has been calculated as the sum of Autonomous Communities, the rest of the national indices are obtained as an aggregation of national indices, and thus the national indices of Division, Sector, Trade and Other Services and the General Index are obtained.

Its general formula would be:

$$_{dic\ (t-1)}I^{mt,NP}_{D,N} = \sum_{\forall S \in D} {}_{dic\ (t-1)}I^{mt,NP}_{S,N} \times {}_{dic\ (t-1)}W_{S,N}$$

Where D is the national aggregate that is obtained as the sum of other national aggregates.

7.2 Publishable indices

Once the aggregated indices have been calculated, it is necessary to link them. These indices are those which are finally disseminated and give continuity to the series published in base 2015.

For any aggregation *S*, the **publishable index** in base 2015 in the Autonomous Community *R* or for the National total is calculated as follows:

$$_{15}I^{mt,P}_{S,R(N)} = {}_{15}I^{dic\ (t-1),P}_{S,R(N)} \times \left[\frac{_{dic\ (t-1)}I^{mt,NP}_{S,R(N)}}{100} \right]$$

where,

$_{15}I^{dic(t-1),P}_{S,R(N)}$ is the publishable index, referring to the year 2015, of the aggregation of activities *S*, in Autonomous Community *R* (or national group *N*) in the month of December of the year *t-1*

$_{dic(t-1)}I^{mt,NP}_{S,R(N)}$ is the non-publishable index, referring to December *t-1*, of the aggregation of activities *S*, in Autonomous Community *R* (or national group N) in month m of year *t*.

8. Indices of the variable EMPLOYMENT

In the base 2015 the calculation of the employment indices is simplified without this modification having very significant differences in the results. In this base, elementary indices for total employment are compiled instead of making this compilation for the

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lowest categories (unpaid, fixed and temporary employments) as was done in the previous base.

This change simplifies the calculation of indices, on the one hand reduces the number of elementary indices calculated and solves the problem of losing indices of those strata with little population, which could reach 0, and on the other hand adapts the calculation to the information available in the structural survey, information used in the calculation of the weightings.

Thus, there is an employment index by branch and Autonomous Community, and from the aggregation of these elementary indices we obtain grouping, Autonomous Community and national indices, as has been described in the previous sections.

The formulation is the same as that used in the variable turnover.

9. Indices adjusted for seasonal and calendar effects

National Services Sector Activity Indicators are published adjusted for seasonal and calendar effects in base 2015.

These indices are published from base 2005 adjusted for calendar effects and from base 2010, they are also published adjusted for seasonal effects.

The seasonal adjustment of these indicators is carried out in accordance with the *INE Standard for adjusting seasonal and calendar effects in short-term series*[1] that is available in INEbase. This standard follows the European Union recommendations contained in the *ESS guidelines on seasonal adjustment*.

The series adjusted for calendar effects and the series adjusted for seasonal and calendar effects are obtained with the JDemetra+ software (version 2.2.0)[2], from the publication of data in base 2015. JDemetra+ has been officially recommended by Eurostat since February 2015 for performing seasonal and calendar adjustments in the official statistics of the European Union[3].

The time series analysis methodology recommends a periodic review of models to incorporate the most current information. This means that the series adjusted for calendar effects and for seasonal and calendar effects are always provisional.

9.1 Indices adjusted for calendar effects

The European Regulation regarding short-term statistics, for the purpose of harmonising all of the indicators compiled by the different European Union countries and achieving the greatest comparability possible, requires the indices to be provided in net terms, that is, eliminating the calendar effect, among others.

[1] http://www.ine.es/clasifi/estandar_efectos_estacionales.pdf
[2] https://github.com/jdemetra/jdemetra-app/releases/tag/v2.2.0
[3] https://ec.europa.eu/eurostat/cros/system/files/Jdemetra_%20release.pdf

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The calendar effect is defined as the impact produced in the time series of a variable, due to the different structure that the months (or quarters) present in the different years (in both length and composition), even if the remaining factors influencing said variable remain constant.

The length of the month is not completely absorbed by the seasonal component, as the number of days in February is not the same each year. This non-seasonal portion of the duration component of the month must be eliminated in the series adjusted for calendar effect.

On the other hand, the composition of the month refers to variations in retail trade caused by the different number of public holidays in the same month in subsequent years.

The method used for the adjustment of calendar effects is based on INE standards and in accordance with Eurostat recommendations, on RegARIMA models (regression models with stationary ARIMA errors). For each branch, we have constructed four centred intervention variables that include the following three effects:

a) The working-day effect

b) The Holy Week effect

c) The leap-year effect

a) The working-day effect.

The adjustment of the effect of working days has been carried out with the design of a particularised intervention variable according to the characteristics of the branch or set of branches to which this effect is going to be eliminated.

This variable is created from the work schedules published in the BOE since 1991 and is constructed following the same structure that appears in the INE standard for the working days regressor JDemetra+. With the objective of including all public holidays, both national and those corresponding to the Autonomous Cities and Communities, the latter are weighted according to the weight that each Autonomous Community has in the index.

b) The Easter effect.

The intervention variables to cover the effect of the Easter holiday represent the public holidays and working days, respectively, of the Easter holiday.

It has been taken into account that the different Autonomous Communities celebrate either Holy Thursday, Easter Monday or both, weighting these days according to the weight that each Autonomous Community has in the index of the branch or set of branches of the services sector.

c) Leap year effect.

The intervention variable that covers the effect of the leap year distinguishes those months of February that have 29 days from the remaining months of February.

9.2 Indices adjusted for seasonal and calendar effects

Once the calendar effects have been removed, a further step is taken and the indices are adjusted for seasonal effects. Seasonal fluctuations are movements that occur with a similar intensity each month, each quarter or each season of the year, and which are expected to continue occurring.

Seasonally adjusted series, that is, those that are adjusted for seasonal and calendar effects, provide an estimate of what is "new" in a series (change in the trend, the cycle and the irregular component).