

# **Consumer Price Index. Base 2016**

## **Methodology**

Subdirectorato General for Industrial  
on Prices and Household Budgets

Madrid, April 2017

# Index

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# 1. Introduction

The operation of the change in the Consumer Price Index (CPI) System mainly consists of revising and updating each of its components and determining the best options for achieving a representative and precise indicator that adapts to economic trends.

Until the entry into force of base 2001, the CPI-based its calculation on what is called a fixed-base system, whose main characteristic is that both the composition of the shopping basket and its weightings are unaltered for the entire time that the base is used. The changes in the base were carried out every eight or nine years because such was the periodicity of the Basic Household Budget Survey (BHBS), the source used for the preparation of the weightings and of the shopping basket. Due to this, the only way to be able to collect the changes in consumer behaviour and for the CPI to adapt to these trends was to wait until the following change in base. Evidently, in some cases, the period was excessively long.

As of 1997, the two household budget surveys that had coexisted (one continuous and quarterly, and another, carried out every eight or nine years) were substituted by a single, quarterly one, which provided information that was closer to the basic survey, as per the breakdown level. This survey, called the Household Budget Continuous Survey (HBCS), provided the information necessary for the updating of the weightings, as well as the renewal of the composition of the shopping basket in the base change of CPI 2001. In addition, it made possible the permanent updating of said weightings and the revision of the shopping basket, which was an improvement on the changes of the CPI System.

Thus, with the CPI, base 2001, a new Calculation system began, whose most important characteristics are its dynamism and its contemporary nature. It is a more current CPI, given that it permanently revises its methodological system, for the purpose of improving it. To this end, direct contact is established with the different academic forums and national and international producing bodies.

It is also, however, a more dynamic CPI than its predecessors in that it annual revises the weightings for certain functional breakdown levels, and includes, in the shortest time possible, any change detected in the market components, be it the appearance of new products, changes in the consumption structure or the sample of municipalities or establishments. In additions, it establishes the base changes every five years, carrying out a complete revision of the methodology and the sample and the updating of weightings at all breakdown levels.

As a result of this new scheme of functioning, in January 2017, the Consumer Price Index System entered into force, with reference base in the year 2016. This System substitutes the CPI, which with base 2011, was in force until December 2016.

The CPI, base 2016, maintains the main characteristics of the CPI, base 2011, and the same as this, will annual review the weightings for a certain functional breakdown level. To carry out this updating, it will use the information provided by the Household Budget Survey (HBS) base 2006.

In 1999, the CPI Working Group was created, at the heart of the High Council on Statistics, comprised of representatives from the Ministry of Economy and Tax, Bank of Spain, consumer associations, universities, trade unions, OECD, Chambers of Commerce, among others. The Group meets periodically for the purpose of the INE

informing on the most relevant aspects of the preparation of the new price systems and the annual updates. The CPI, base 2016, counts with the assistance of the Working Group, which guarantees the ample support of the main economic agents.

In addition, the methodology of the new System was analysed by the High Council on Statistics and was the object of study by the Permanent Commission of said Council until it was approved in the Plenary of the High Council on Statistics.

On the other hand, since 1997, the INE also prepares the Harmonised Consumer Price Index (HCPI) following the consensual norms in the heart of the European Union (EU), with the purpose of obtaining inflation indices with a high degree of comparability among the member States.

The methodology applied in the national CPI is, for the most part, the same as that of the HCPI. It only differs in some respects where the methodology proposed by European regulation, with the objective of comparability between countries, was not adequate to meet the objective of the national CPI.

The main characteristics of the consumer price index, base 2016, as well as those aspects in which the HCPI differs from this one, are collected in this methodology.

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The INE would like to express its gratitude for the interest shown by all those bodies and professionals who have participated in the different working groups that were formed for the change in the CPI System, and likewise, thank the cooperation of all those respondents who provided the data necessary to compile the CPI within the established terms.

## 2. Indicator definition

The Consumer Price Index, published monthly, has the objective of measuring the evolution of the price levels of consumer goods and services acquired by the households resident in Spain.

System Base 2016 uses the definition of consumption expenditure of the FBS: "consumption expenditure is the monetary flow that the household and each of its members spend on the payment of certain goods and services, aimed at the household itself or to be transferred free of charge to other households or institutions".

It has, therefore, eliminated from the CPI consumption field the consumption categories defined in the HBS such as the value of the goods received in kind, within the concept of self-consumption, self-supply, salary in kind, free or subsidised food and rent of the dwelling in which the household resides, when the household is the owner of the same or has it granted free of charge or at a low price by other households or institutions. Some non-consumption taxes have also been abolished from the point of view of the FBS.

However, this conceptual framework does not always conform to the definition of expenditure on final consumption of households established in the European Account system (EAS-95), which governs the national accounts of all EU Member States. The objective of the FBS is to measure the level and the evolution of the expenditure carried out by households in goods and services intended for consumption, irrespective of the monetary benefits that may be perceived as subsequent, the result of that expenditure (via indemnities or subsidies) and the sector with which the transaction was made (households or companies)

In the CPI, base 2016, some of the estimates of expenditure from the FBS have been adjusted to adapt the CPI to the conceptual requirements of the EAS. These adjustments affect the CPI calculation as follows:

- **Gross spending vs. net spending.** The FBS includes the total expenditure made by households, irrespective of the possible monetary counterparts that it may have perceived (except for Health and Education, where expenditure refers to the actual effect, after subsidies). However, in accounting terms, the expenditure made must deduct the amounts received by the household, so that only the net expenditure of subsidies and counter benefits is considered.

This change affects **insurance** in the CPI (that include health insurance, housing insurance, and vehicle insurance). The expenditure used so far to estimate its weighting is the one that was really carried out by households, regardless of how they may have perceived any amount of compensation. According to the conceptual framework of the EAS, the amount of the benefits must be detracted from the gross expenditure.

- **Transactions** between agents belonging to the same economic sector. The FBS considers the expenses made in all transactions made by private consumers, regardless of the sector with whom the operation was carried out. The EAS affects in that the transactions considered in the definition must have occurred between the household sector and that of companies or other institutions. Transactions between households should not be taken into account in estimating expenditure.

The CPI parcel that must be adjusted due to this conceptual change is that of **used cars** since the expenditure from the FBS includes purchases made to companies and other households.

- **Expansion of the consumption field.** Gambling is a service that is likely to belong to the consumer field of the CPI. However, for fundamental methodological reasons, it has not yet been incorporated into the CPI (for the same reason, it is also excluded from the HCPI consumption field).

However, an important part of household spending is a payment to service providers, so their incorporation into the consumer field of the CPI is justified.

The precision with which this short-term indicator measures the evolution of price level depends on two qualities that every CPI must have: representativeness and time comparability.

The degree of CPI representativeness is determined by the adaptation of this indicator to the economic reality of that time; thus, the variation rate calculated from the CPI will more closely approximate the evolution of the whole of the prices of the economy, the more the elements selected for measurement adapt to the behavioural trends of consumers. To achieve this, the articles selected to form part of the shopping basket must be the most frequently consumed by most of the population, the establishments from the sample must be the most visited, and the relative importance of each article in the shopping basket must answer to household consumption trends. The better the selection of these elements, the more representative the indicator will be.

Furthermore, the CPI is an indicator that only makes sense when comparisons in time are established; in fact, an index number barely has any meaning if a comparison is not established with indices from other periods, to obtain the corresponding variation rates (this could be one month, one year, or any other period). To this end, the other quality that may be attributed to a CPI is time comparability, that is, the need for the elements that define the CPI to remain stable over time, except, logically, the prices collected monthly. This makes it possible for any variation in the CPI to be due only to changes in the prices of the selected articles, and not to any change in the methodological content of this indicator.

The applications of the CPI are numerous and of great importance in the economic, legal and social areas. Worth noting among these is its use as a measurement of inflation. It is also applied in the revision of real estate rental contracts, as a reference in wage negotiation, in the establishment of pensions, in the updating of insurance premiums and other types of contract, and as a deflator in the National Accounts.

## 3. Indicator scope

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### 3.1 Time scope

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#### 3.1.1 BASE PERIOD

The base period, or reference period, of the index, is that for which all indices are made equal to 100. This is normally an annual period. In the new system, the arithmetic average of the twelve published monthly indices of the year 2016, in base 2011, is equal to 100. The period to which the index refers, therefore, is the year 2016, and it is usually called CPI base 2016. This means that all indices published will refer to this year.

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#### 3.1.2 REFERENCE PERIOD OF THE PRICES

This is the period with whose prices the current prices are compared, that is to say, the period chosen for the calculation of the basic indices.

With the calculation formula used for CPI base 2016 - linked Laspeyres - the reference period of the prices varies each year, and it is the month of December of the year immediately before the year considered.

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#### 3.1.3 REFERENCE PERIOD OF THE WEIGHTINGS

The reference period of the weightings is that to which the weightings are serving as the structure of the System refer.

For the year 2017, the calculation of the weightings was carried out based on the data from the HBS, which provides the basic information on the expenditure of families on consumption goods and services corresponding to the year 2015.

For the adaptation of the expenditure to the concept of "net weights" in insurance, the elimination of the purchase-sales between individuals of new cars and the inclusion of gambling expenditure, the information provided by the National Accounting and the supply sources of these sectors has been used.

In addition, to correct the lag produced between this reference period of the weightings and the reference period of the prices (December of the year 2016), the weightings have been updated, using information on price and quantity evolution, from the CPI and other sources.

Thus, the reference period of the weightings is December 2016, during the year 2017. And in subsequent years it is the month of December prior to each year, given that the weightings will be updated annually, using the annual information of the HBS, and information from other sources, such as the evolution of private consumption from the National Accounts, the evolution of CPI prices and the information provided by sources on the supply of the different sectors.

This annual revision of weightings will be performed for certain geographical and functional breakdown levels, using the information available closest to the moment of the revision.

In addition, every five years, a base change will be carried out, in which the weightings will be updated for all functional and geographical breakdown levels.

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### **3.2 Population scope**

The population of the index or reference stratum is the population group whose consumption expenditure structure serves as the basis for the selection of representative articles and the calculation of their weightings.

In CPI base 2016, the reference stratum includes all the population that resides in family dwellings in Spain; excluding, therefore, the expenditure of the persons who reside in group dwellings or institutions (convents, nursing homes, prisons, etc.) and the expenditure of non-residents.

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### **3.3 Geographical scope**

The geographical scope of the research is comprised of the entire national territory.

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### **3.4 Consumption field**

It is the group of goods and services that the households of the reference stratum use for consumption; therefore, the expenditure on investment goods, imputed rentals and expenses subsidised by the public administrations are not considered. Nor are some taxes not considered consumption in the field of consumption from the point of view of the EAS-95.

The FBS, as well as the CPI, base 2016, have been adapted to the new International Classification of Consumption in the European Union (EU), called ECOICOP (European classification of assumption by purpose).

Each consumption division of the HBS is represented by one or more articles in the CPI, in such a way that the evolution of the prices of these articles represents the evolution of all of the elements comprising said division.

The adaptation to the ECOICOP from the COICOP used so far implies, in many cases, to disaggregate subclasses (maximum level of disaggregation at present) in two or more plots. In some cases, this change assumes that the new subclasses will contain fewer representative articles as a result of the distribution of articles that together previously represented a subclass, and in other cases, it would require the incorporation of new articles to represent hitherto non-existent subclasses.

### 3.4.1 - SHOPPING BASKET

The group of goods and services selected in the CPI, whose price evolution represents that of all those that comprise the ECOICOP parcel to which they belong.

The selection of articles comprising the shopping basket has been performed based on CPI base 2011, and data from HBS 2015. The criterion for determining which parcel should be included is to take into account all those that exceed a minimum threshold of total spending. Once the parcels of expenditure that are represented in the index were determined, the articles that made up the basket of the purchase of the base 2011 were reviewed, increasing, decreasing or maintaining the articles of each plot, depending on the weighting of the parcel, the number of articles and prices representative of it and the variability of the prices of such items.

Thus, the total number of articles comprising the shopping basket of CPI base 2016 is 479.

For each of the articles, a description or specification is prepared, for the purpose of facilitating its identification on the part of the surveyor and permitting the correct collection of the prices. These specifications take into consideration the particularities of each region.

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## 3.5 Functional breakdown of the indices

The CPI base 2016 adapts completely to the ECOICOP international consumption classification. The articles in the shopping basket are aggregated into subclasses, these subclasses into classes, subsequently into subgroups, and finally, the subgroups into groups.

The functional structure of the CPI is extended to all levels (except the groups), with respect to the CPI, base 2011, due to the implantation of the ECOICOP. Since January 2017, this structure consists of 12 groups, 43 sub-groups, 101 classes and 219 subclasses.

In addition, the 57 headings and 29 special groups existing in CPI base 2016 are maintained.

CPI 2011 articles are distributed in the 12 groups as follows:

<b>Number of articles, CPI Base 2016</b>		
<b>Groups</b>		<b>Number of articles</b>
01	Food and non-alcoholic beverages	170
02	Alcoholic beverages and tobacco	12
03	Clothing and footwear	66
04	Housing	18
05	Furnishings, household equipment and routine maintenance of the house	57
06	Health	11
07	Transport	31
08	Communication	5
09	Leisure and culture	43
10	Education	7
11	Restaurants, cafes and hotels	22
12	Other goods and services	37
<b>TOTAL</b>		<b>479</b>

### 3.6 Geographical breakdown of the indices

CPI base 2016 publishes the indices for the different geographical and functional breakdown levels that were published in CPI base 2011.

The following table collects the breakdown for which data is published monthly.

<b>INDEX</b>	<b>National</b>	<b>Autonomous Community</b>	<b>Province</b>
General	X	X	X
Groups	X	X	X
Subgroups	X	X	X
Classes	X		
Subclasses	X		
Headings	X	X	
Special Groups	X	X	

## 4. Sample design

As is most European Union (EU) countries, the sample design of the prices that intervene in the calculation of the CPI is intentional, and therefore it is a non-probabilistic design, given the characteristics of the target population of the study.

To obtain significant indicators at all functional and geographical breakdown levels for which the CPI is published, a sample selection process has been structured in three large sections, each of which has the objective of selecting the different components of the same. These are as follows:

- Selection of municipalities.
- Selection of commercial areas and establishments.
- Selection of articles.

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### 4.1 Selection of municipalities

The selection of the municipalities that are a part of the new CPI System has been carried out, taking into consideration not only demographic criteria but also geographical representativeness. The official population data that has been used to make the selection of municipalities is that obtained from the revision of the Municipal Register of Inhabitants on 1 January 2015.

The geographical coverage criterion was mainly based on the population of the group of selected municipalities. In this way, the municipalities selected must cover 30% of the population of the province and 50% of the population of the Autonomous Community. With this criterion, the municipalities were selected by size, until the requirement was fulfilled, without considering the geographical distribution of the same within the province.

In addition, this departure criterion is completed as follows:

- **geographical representativeness:** it is important for the municipalities in the sample to be distributed throughout the entire province, avoiding a concentration in certain population centres.
- **population representativeness:** representativeness of small municipalities is emphasised; in previous bases, when the selection criterion was exclusively population, part of the population residing in smaller municipalities were excluded.
- **shopping basket representativeness:** all municipalities must have articles of all groups; for this reason, a reduced basket has been compiled from the total basket, in which basic consumption goods have been included. With this, the representativeness of the CPI has increased considerably.

Thus, the sample of municipalities obtained with the criteria above consists of 177 (the 52 provincial capitals and 125 non-capital municipalities).

In 97 of these 177 municipalities, prices were collected from the entire shopping basket of articles, in 44 of them, prices were collected in the Food shopping basket (groups 01

and 02), and part of the rest of the shopping basket, and in the 36 remaining municipalities prices were collected from a reduced part of the shopping basket (comprised of 48% of the articles).

It is important to highlight that, in practice, population percentages higher than those indicated are covered, granted that some establishments included in the sample, such as hypermarkets, shopping centres, repair workshops or furniture stores, are found outside of the municipalities or in bordering municipalities, due to which the real population represented in the index is larger than the theoretical population.

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## 4.2 Selection of commercial areas and establishments

For the selection of the number of establishments, CPI base 2016 has used as its starting point the sample from CPI base 2011 and has studied the existing network of establishments available in each province, paying special attention to the different types and characteristics of said establishments. In addition, the representation of commercial reality and the evolution of the prices in all areas have been taken into account.

In this selection process of commercial areas and establishments, the participation of the personnel of INE provincial delegations is essential, because they are the main experts in the commercial relations of their province.

As an overall criterion, the number of establishments that, on a monthly basis, inform on the prices of an article, was calculated depending on the weighting of the article in the index, and on the variability of its prices: the more weighting and/or variability of prices, the more number of establishments shall be selected.

Likewise, for the calculation of the number of establishments, a minimum number was established for each article in each province, depending on the type of article and the type of collection of said article.

For the selection of the types of establishment, the distribution of sales percentages by type of establishment (hypermarkets, supermarkets, markets and specialised stores) were taken into consideration, depending on each article. To this end, we counted on information from several sources, among these being the Annual Trade Survey (INE) and the Ministry of Agriculture, Food and the Environment.

Special attention is paid to shopping centres, hypermarkets and supermarkets, given their importance in terms of sales volume. In many cases, the situation in said centres, as well as the presence of markets, conditions the creation of "commercial areas", which are explicitly defined, in each municipality of the sample, for perishable food articles (meat, fish, fresh fruits and vegetables), and implicitly so for the rest of the articles.

In the definition of the commercial areas, we begin with the hypothesis that the population that purchases in said commercial area has homogeneous behaviour and habits as regards consumption. These commercial areas have been delimited with the aid of the provincial delegations.

For the perishable food articles, three types of commercial areas were defined, based on the size of the municipality and the number of establishments susceptible of being selected for the different types of articles considered.

In addition, these articles were classified into two large groups, considering the variability of the prices that they present and the weight that they have in the shopping basket.

This classification determines the number of establishments in which prices are collected, according to the type of commercial area and the type of article in question.

For the rest of articles, even though a strict delimitation has not been carried out in commercial areas, the selection of establishments is carried out complying with the representativeness objective: the establishment sample must represent, with the evolution of the prices of the articles sold in them, all the establishments of the town.

Based on the aforementioned premises, the personnel of the provincial delegations of the INE carry out the selection of the respondent establishments, so as to comply with the following basic norms:

- The sample must represent all of the commercial areas and the different types of existing establishments.
- The establishments must have the most frequent and massive flow of public in the town, and/or the greatest sales volume.
- The establishments must be representative of all types of articles for which information is collected.
- In each establishment, no more than one price may be collected for the same article on the same day.
- An establishment may not concentrate an important number of observations of prices of different articles. The objective of this price policy is to try to avoid one single establishment from conditioning the evolution of the index.
- Excluded from the sample are those establishments with access restricted to a sector of the population, such as cooperatives, company stores or similar establishments. Itinerant street vending and door-to-door sales are not considered either.
- The establishments selected must offer sufficient guarantees of continuity in the sale of articles for which prices are collected, given that this sample remains fixed over time, except in the case of closing, change of activity, loss of representativeness as regards consumption, or no longer selling the article for which prices were collected. In these cases, the establishment will be substituted by another that meets the necessary requirements to belong to the sample.

All of these criteria are dependent on other aspects, such as collection costs, the willingness of the respondent to cooperate and reliability of the data supplied. However,

Law 4/1990 establishes the obligation of providing the necessary data for the compilation of these Statistics.

In the CPI base 2016, prices are collected in approximately 33,000 establishments, distributed throughout the national territory.

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### 4.3 Selection of articles

To select the articles that are representative of the expenditure divisions of the HBS, different bodies, business associations, manufacturers, traders and establishments were consulted, which provided information on those articles that best represented the different divisions, in accordance with the following selection criteria:

- The evolution of the prices of the articles selected must be similar to that of the rest of the articles of the division that they represent.
- The articles must be habitually consumed by the population.
- They must have prices that are easily observable.
- They must offer reasonable guarantees of continuity on the market.

Thus, in CPI base 2016, the shopping basket is comprised of 479 articles.

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#### 4.3.1 SPECIFICATION OF ARTICLES

Once the articles are selected, it is necessary to determine the specifications that define them. The preparation of these specifications allows for comparison over time of equal or equivalent-quality articles, for the purpose of measuring real variations of prices and not those caused by a different quality of the articles. For this reason, the determining factors of the prices must be specified for each article, among which are: the unit of measure, type of packaging, size, composition, shape and dimensions.

In order to determine the characteristics of each item and determine the specifications, we also obtained information from numerous bodies, professional associations and companies; in this way, it was possible to compile some general specifications that subsequently were adapted, in each province, to the specific products selected in each establishment. Thus, when the information collection is carried out on the part of the agents, the articles are identified in a detailed manner.

The specifications of each article remain fixed over time, so long as they remain representative of the consumption of the area, and are therefore modified, when the article ceases to be sold or ceases to be representative of the consumption of a town.

The times in which it is necessary to change a product, the provincial delegations must include a detailed specification of the new product selected as the substitute of the prior; this will allow the calculation of a linking coefficient that assures variations in the

index exclusively caused by price variations and not but changes in the characteristics of the article.

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#### **4.4 Number of observations**

As previously stated, the number of observations used for the calculation of the index depends on the type of article in question, as well as on the establishments that have been selected in each of the provinces.

Sections 6 and 7 on "Types of articles" and "Price collection" indicate the frequency of price collection that ultimately determines the size of the sample of prices that are collected on a monthly basis.

The total number of prices processed each month amounts to approximately 220,000.

## 5. General calculation method

The formula used to calculate the indices of CPI base 2016, is the linked Laspeyres formula, which was first used in CPI base 2001.

The overall index corresponding to month  $m$  of year  $t$  is mathematically expressed as follows:

$${}_0 I_{LE}^t = \prod_{k=1}^t \frac{\sum_i p_i^k q_i^{k-1}}{\sum_i p_i^{k-1} q_i^{k-1}}$$

Similarly, it can be expressed as:

$${}_0 I_{LE}^t = \prod_{k=1}^t \frac{\sum_i \frac{p_i^k}{p_i^{k-1}} p_i^{k-1} q_i^{k-1}}{\sum_i p_i^{k-1} q_i^{k-1}} = \prod_{k=1}^t \sum_{k-1} I_i^k W_i^{k-1}$$

where:

$${}_{k-1} I_i^k = \frac{p_i^k}{p_i^{k-1}} \quad \text{and} \quad W_i^{k-1} = \frac{p_i^{k-1} q_i^{k-1}}{\sum_i p_i^{k-1} q_i^{k-1}}$$

As may be observed, a linked index establishes comparisons between the current period ( $t$ ) and the base period ( $0$ ) but considering the intermediate situations ( $k$ ).

In CPI base 2016, the intermediate situations considered corresponding to the months of December of every year. Thus, the index in base 2016 for month  $m$  of year  $t$ , is obtained as the product of the indices as follows:

$$\begin{aligned} {}_{16} I_G^{mt} &= {}_{16} I_G^{dic(t-1)} * \left( \frac{dic(t-1) I_G^{mt}}{100} \right) = \\ &= {}_{16} I_G^{dic16} * \left( \frac{dic16 I_G^{dic17}}{100} \right) * \dots * \left( \frac{dic(t-2) I_G^{dic(t-1)}}{100} \right) * \left( \frac{dic(t-1) I_G^{mt}}{100} \right) \end{aligned}$$

where:

${}_{16} I_G^{mt}$  is the overall index, in base 2016, of month  $m$  of year  $t$ .

$dic(t-1) I_G^{mt}$  is the overall index, referring to December of year ( $t-1$ ), of month  $m$  of year  $t$ .

The main inconvenience of linked indices is the lack of additivity. This makes it impossible to obtain the index of any aggregate as the weighted average of the indices of the aggregates that comprise it. Thus, for example, the overall index cannot be calculated as the weighted average of all of the indices of the twelve groups.

## 5.1 Basic indices

A basic aggregate is the consumption component with the lowest aggregation level for which indices are obtained, and in whose calculation weightings do not intervene; the indices of these aggregates are called basic indices. The Spanish CPI calculates a basic index for each article of the shopping basket in each of the provinces, and therefore, the basic aggregate is the article-province.

Basic aggregate index  $i$  is obtained as the quotient of the average price of said basic aggregate in the current period and the average price in the reference period of the prices, that is, December of the previous year:

$${}_{dic(t-1)}I_i^{mt} = \frac{\bar{P}_i^{mt}}{\bar{P}_i^{dic(t-1)}} \times 100$$

where:

${}_{dic(t-1)}I_i^{mt}$  is the index, referring to December of year (t-1), of basic aggregate  $i$ , in month  $m$  of year  $t$ .

$\bar{P}_i^{mt}$  is the average price of basic aggregate  $i$ , in month  $m$  of year  $t$ .

$\bar{P}_i^{dic(t-1)}$  is the average price of basic aggregate  $i$ , in December of year (t-1).

At the same time, the average price of aggregate  $i$ , in period (m,t),  $\bar{P}_i^{mt}$ , is the simple geometrical average of the prices collected in said period:

$$\bar{P}_i^{mt} = n_i^{mt} \sqrt[n_i^{mt}]{\prod_{j=1}^{n_i^{mt}} P_{i,j}^{mt}} \quad (1)$$

where:

$P_{i,j}^{mt}$  is the price of basic aggregate  $i$  collected in establishment  $j$ , in period (m,t).

$n_i^{mt}$  is the number of processed prices of basic aggregate  $i$ , in period (m,t).

The geometric average grants the same importance to the variations of all prices, regardless of their level.

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## 5.2 Weightings

The weightings that intervene in the calculation of the aggregate indices come from the HBS. This survey provides estimates of the expenditure on consumption products made by the households resident in family dwellings in Spain.

The consumption classification that the HBS (ECOICOP) uses consists of a series of expenditure divisions, most of which include goods and services included in the consumption field of the CPI.

For the calculation of the weightings of the articles comprising the shopping basket of CPI base 2016, the breakdown of these divisions has been necessary to obtain more detailed information. To this end, we have counted on the collaboration of different bodies, associations, manufacturers and traders.

The data used in the calculation of the weightings, used during the year 2017, are those corresponding to the year 2015.

In addition, to correct the lag produced between the reference period of the weightings and the reference period of the prices (December of the year 2016), the weightings have been updated, using information on price and quantity evolution, from the CPI and other sources. In this way, the reference period of the weightings, used during the year 2017, is December 2016.

The weightings for each article represent the relation between the expenditure on the divisions represented by said article and the total expenditure on all divisions covered by the index:

$$W_i = \frac{\text{gasto realizado en las parcelas representadas por el artículo } i}{\text{gasto total}}$$

These weightings are different in each of the geographical aggregations (provinces, Autonomous Communities, and the total national), and from them, the weightings of the different functional aggregations are obtained. Thus, the weighting of functional aggregate A is obtained as the sum of the weightings of the articles that comprise said aggregation:

$$W_A = \sum_{i \in A} W_i$$

The annual weightings updates, which will be carried out in CPI base 2016, will be done with the latest available information from the HBS.

### 5.3 Aggregate indices

As previously mentioned, the basic indices refer to December of the immediately previous year. In turn, the weightings used for the calculation of the aggregations also refer to December of the previous year, thereby maintaining coherence with the reference prices.

The calculation of the aggregate indices is described below.

#### Functional aggregations within a province

The index, referring to December of the previous year, of any functional aggregation A in a province  $p$ , is obtained as the aggregation of the basic indices of the articles belonging to said aggregation with the weightings applicable in year  $t$ .

Its mathematical expression is as follows:

$${}_{dic(t-1)}I_{A,p}^{mt} = \sum_{i \in A} {}_{dic(t-1)}I_{i,p}^{mt} \times {}_{dic(t-1)}W_{i,p}$$

where:

$${}_{dic(t-1)}I_{i,p}^{mt}$$

is the index, referring to December t-1, of article i in province p, in month m of year t,

$${}_{dic(t-1)}W_{i,p}$$

is the weighting (so much per one), referred to December of year (t-1), of article i in province p, within Aggregation A, that is:

$${}_{dic(t-1)}W_{i,p} = \frac{\text{gasto realizado en el artículo } i \text{ dentro de la provincia } p}{\text{gasto realizado en la agregación funcional } A \text{ dentro de la provincia } p}$$

Once the aggregate indices are calculated as detailed above, it is necessary to link them. These indices are those which are finally disseminated and provide continuity for the series published in base 2011.

For any functional aggregation A, the index in base 2016 in province  $p$  is calculated as follows:

$${}_{16}I_{A,p}^{mt} = {}_{16}I_{A,p}^{dic(t-1)} * \left( \frac{{}_{dic(t-1)}I_{A,p}^{mt}}{100} \right)$$

## Geographical aggregations of a functional aggregation

In the same way as the previous case, the calculation of the index of a geographical aggregation R greater than the province, for a specific functional grouping A is calculated as follows:

$${}^{dic(t-1)}I_{A,R}^{mt} = \sum_{p \in R} {}^{dic(t-1)}I_{A,p}^{mt} \times {}^{dic(t-1)}W_{A,p}$$

where:

${}^{dic(t-1)}I_{A,p}^{mt}$  is the index, referred to December of year (t-1), of the functional aggregation A in province p, in month m of year t.

${}^{dic(t-1)}W_{A,p}$  is the weighting (so much per one), referring to December of (t-1), of functional grouping A in province p, that is,

$${}^{dic(t-1)}W_{A,p} = \frac{\text{gasto realizado en la agregación funcional A dentro de la provincia } p}{\text{gasto realizado en la agregación funcional A dentro de la agregación geográfica } R}$$

As with the functional aggregations, once the aggregate indices are calculated, it is necessary to link them.

For any functional aggregation A, the linked index, in base 2016, in region R, in month m of year t, is:

$${}_{16}I_{A,R}^{mt} = {}_{16}I_{A,R}^{dic(t-1)} * \left( \frac{{}^{dic(t-1)}I_{A,R}^{mt}}{100} \right)$$

## 5.4 Calculation of variation rates

### 5.4.1 MONTHLY VARIATION RATE

The monthly variation rate of an index in period (m, t) is calculated as the quotient between the index from the current month m and the index from the previous month (m-1), according to the following formula:

$$V_{mt/(m-1)t} = \left( \frac{{}_{16}I_{A,R}^{mt}}{{}_{16}I_{A,R}^{(m-1)t}} - 1 \right) * 100 = \left( \frac{{}^{dic(t-1)}I_{A,R}^{mt}}{{}^{dic(t-1)}I_{A,R}^{(m-1)t}} - 1 \right) * 100$$

where:

$V^{mt/(m-1)t}$  is the monthly variation rate, in month m of year t.

${}_{16}I^{mt}$  is the index, in base 2016, in month m of year t.

$dic(t-1)I^{mt}$  is the index, referred to December of the previous year, in month m of year t.

In other words, the monthly changes can be calculated with the published indices, in base 2016, or with the unlinked indices (referred to December of the previous year).

#### 5.4.2 ACCUMULATED VARIATION RATES

The accumulated variation rate (year-to-date) is calculated as the quotient between the index from the current month and the index from December of the previous year:

$$\begin{aligned} V^{mt/dic(t-1)} &= \left( \frac{{}_{16}I^{mt}}{{}_{16}I^{dic(t-1)}} - 1 \right) * 100 = \left( \frac{dic(t-1)I^{mt}}{dic(t-1)I^{dic(t-1)}} - 1 \right) * 100 \\ &= \left( \frac{dic(t-1)I^{mt}}{100} - 1 \right) * 100 \end{aligned}$$

where:

$V^{mt/dic(t-1)}$  is the accumulated variation rate, in month m of year t.

${}_{16}I^{mt}$  is the index, in base 2016, in month m of year t.

$dic(t-1)I^{mt}$  is the index, referred to December of the previous year, in month m of year t.

That is to say, the accumulated variation rates can be calculated with the published indices, in base 2016, or with the unlinked indices (referring to December of the previous year).

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### 5.4.3 ANNUAL VARIATION RATE

The annual variation rate is calculated as the quotient between the indices published in the current month and from the same month of the previous year, both in base 2011:

$$V_{m(t-1)}^{mt} = \left( \frac{{}_{16}I^{mt}}{{}_{16}I^{m(t-1)}} - 1 \right) * 100$$

where:

$V_{m(t-1)}^{mt/m(t-1)}$  is the annual variation rate, in month  $m$  of year  $t$   
 ${}_{16}I^{mt}$  is the index, in base 2016, in month  $m$  of year  $t$ .

In the case of annual variations, these cannot be calculated with the indices referring to December of the previous year, as occurs with the monthly and accumulated variations.

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## 5.5 Calculation of effects

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### 5.5.1 MONTHLY EFFECTS

The effect of a monthly variation rate of an article or aggregate in the overall index is defined as the part of the monthly variation of the overall index that corresponds to said article or aggregate. Therefore, the sum of the monthly effects of all of the articles in the shopping basket is equal to the monthly variation rate of the overall index.

In other words, the effect that the monthly price variation of an article or aggregate has in the monthly variation of the overall index is the variation that this index would have experienced if all of the prices of the rest of the articles had remained stable that month.

The formula of the monthly effect of a specific article (or aggregate)  $i$ , in month  $m$  of year  $t$ , is as follows:

$$R_i^{mt/(m-1)t} = \frac{dic(t-1) I_i^{mt} - dic(t-1) I_i^{(m-1)t}}{dic(t-1) I_G^{(m-1)t}} \times dic(t-1) W_i \times 100$$

where:

$dic(t-1) I_i^{mt}$  is the index, referring to December of year  $(t-1)$ , of article  $i$ , in month  $m$  of year  $t$

$dic(t-1) I_G^{(m-1)t}$  is the overall index, referring to December of year  $(t-1)$ , in month  $(m-1)$  of year  $t$ .

${}^{dic(t-1)}W_i$  is the weighting, referred to December of year (t-1), of article i, in so much per one.

Developing the previous formula, we obtain an alternative way of calculating the effects through the variation rates:

$$\begin{aligned}
 R_i^{mt/(m-1)t} &= \frac{{}^{dic(t-1)}I_i^{mt} - {}^{dic(t-1)}I_i^{(m-1)t}}{{}^{dic(t-1)}I_G^{(m-1)t}} \times {}^{dic(t-1)}W_i \times 100 = \\
 &= \frac{{}^{dic(t-1)}I_i^{mt} - {}^{dic(t-1)}I_i^{(m-1)t}}{{}^{dic(t-1)}I_G^{(m-1)t}} \times \frac{{}^{dic(t-1)}I_i^{(m-1)t}}{{}^{dic(t-1)}I_i^{(m-1)t}} \times {}^{dic(t-1)}W_i \times 100 = \\
 &= \frac{{}^{dic(t-1)}I_i^{mt} - {}^{dic(t-1)}I_i^{(m-1)t}}{{}^{dic(t-1)}I_i^{(m-1)t}} \times 100 \times {}^{dic(t-1)}W_i \times \frac{{}^{dic(t-1)}I_i^{(m-1)t}}{{}^{dic(t-1)}I_G^{(m-1)t}} \\
 &= V_i^{mt/(m-1)t} \times {}^{dic(t-1)}W_i \times \frac{{}^{dic(t-1)}I_i^{(m-1)t}}{{}^{dic(t-1)}I_G^{(m-1)t}}
 \end{aligned}$$

Therefore, the monthly effect of a specific article i, is the product of its monthly variation rate ( $V_i^{m,t/(m-1)t}$ ) by its weighting ( ${}^{dic(t-1)}W_i$ ) and by the quotient between the index of the article and the overall index of the previous month ( $\frac{{}^{dic(t-1)}I_i^{(m-1)t}}{{}^{dic(t-1)}I_G^{(m-1)t}}$ ).

As previously mentioned, the sum of the monthly effects of all of the articles that comprise the shopping basket of the CPI is equal to the monthly variation of the overall index. This is demonstrated as follows:

$$\begin{aligned}
\sum_i R_i^{mt/(m-1)t} &= \sum_i \frac{dic(t-1) I_i^{mt} - dic(t-1) I_i^{(m-1)t}}{dic(t-1) I_G^{(m-1)t}} \times_{dic(t-1)} W_i \times 100 = \\
&= \frac{\left( \sum_i dic(t-1) I_i^{mt} \times_{dic(t-1)} W_i - \sum_i dic(t-1) I_i^{(m-1)t} \times_{dic(t-1)} W_i \right)}{dic(t-1) I_G^{(m-1)t}} \times 100 = \\
&= \frac{dic(t-1) I_G^{mt} - dic(t-1) I_G^{(m-1)t}}{dic(t-1) I_G^{(m-1)t}} \times 100 = V_G^{mt/(m-1)t}
\end{aligned}$$

### 5.5.2 ACCUMULATED EFFECTS

The effect of the variation for the year-to-date (or accumulated variation) of an article or aggregate in the overall index, represents the accumulated variation that the overall index would experience if the rest of the articles were not to experience any price variation for the year-to-date. In other words, it is the part of the accumulated variation due to said article or aggregate.

The formula of the accumulated effect of a specific article (or aggregate)  $i$ , in month  $m$  of year  $t$ , is as follows:

$$\begin{aligned}
R_i^{mt/dic(t-1)} &= \frac{dic(t-1) I_i^{mt} - dic(t-1) I_i^{dic(t-1)}}{dic(t-1) I_G^{dic(t-1)}} \times_{dic(t-1)} W_i \times 100 = \\
&= \frac{dic(t-1) I_i^{mt} - 100}{100} \times_{dic(t-1)} W_i \times 100 = \left( dic(t-1) I_i^{mt} - 100 \right) \times_{dic(t-1)} W_i
\end{aligned}$$

where:

$dic(t-1) I_i^{mt}$  is the index, referred to December of year (t-1), of article  $i$ , in month  $m$  of year  $t$

$dic(t-1) W_i$  is the weighting, referring to December of year (t-1), of article  $i$ , so much per one.

Using the alternative formula for calculating effects that were developed in the previous section, we obtain that the accumulated effect is equal to the product of the accumulated variation by the weighting:

$$\begin{aligned}
R_i^{mt/dic(t-1)} &= \frac{dic(t-1) I_i^{mt} - dic(t-1) I_i^{dic(t-1)}}{dic(t-1) I_G^{dic(t-1)}} \times_{dic(t-1)} W_i \times 100 = \\
&= V_i^{mt/dic(t-1)} \times_{dic(t-1)} W_i \times \frac{dic(t-1) I_i^{dic(t-1)}}{dic(t-1) I_G^{dic(t-1)}} = \\
&= V_i^{mt/dic(t-1)} \times_{dic(t-1)} W_i \times \frac{100}{100} = V_i^{mt/dic(t-1)} \times_{dic(t-1)} W_i
\end{aligned}$$

In the case of the accumulated effects, we also verify that their sum is equal to the accumulated variation rate, developing the same steps as in the previous section.

## 6. Types of article

### 6.1 Criteria for the classification of articles

The operations included in the calculation process of the CPI, from the collection of prices to the calculation of the indices, are different, depending on the particularities of each article of the shopping basket.

Thus, the periodicity for price collection depends on the frequency with which they vary. The means of collecting them also differ, depending on the geographical homogeneity of the prices and on the availability of the same. Lastly, according to the characteristics of each article, the calculation method of the indices is different.

The following table shows the different types of article, according to the criteria used in their classification:

Criteria	Types of article
Periodicity for price collection monthly	groups 01 y 02 → monthly { perishable { seasonal not seasonal non-perishable
	groups 03 to 12 { monthly quarterly quarterly { quarterly for sales
Place of collection and recording of prices	{ provinces central services
Calculation method of basic indices	{ seasonal which are centrally collected of provincial collection with prepared price rental of housing without special treatment

#### Periodicity of price collection

According to the periodicity and frequency of the price collection, a first way of classifying the articles is established. Thus, two types of article are considered: monthly and quarterly articles.

### Monthly collected articles

The prices of the monthly articles are observed every month in all of the establishments of the sample, via personal visit, in most of the cases.

In general, each establishment is visited once a month, except those in which the prices of perishable articles are collected, which, due to the higher frequency with which their prices vary, the interviewer visits twice or three times a month, depending on the municipality. Unprocessed fresh food products are included in this category and suffer periodical fluctuations in their prices, as well as constant changes in quality. Included in these products are seasonal articles (some fresh fruits and vegetables), that are only sold specific months of the year; the prices for these articles are only collected in the months in which they are available.

Within the monthly collected articles, worth noting are the seasonal articles, which are those whose consumption takes place only some months of the year, since the rest of the year, they are not for sale. Moreover, these articles are characterised because, unlike fresh fruits and vegetables, all of those belonging to the same season have the same sale scheme in the market. In the CPI, clothing and footwear articles are considered to be seasonal, when they have two defined seasons (spring-summer and autumn-winter). Price collection for these articles is carried out once a month during the season in which they are sold; and the processing of the prices during the months in which the article ceases to be sold is the repetition of the last collected price, in such a way that there is no price variation when the article is not available.

### Quarterly collected articles

Quarterly articles are those whose prices have a rather stable behaviour, that is to say, they usually do not experience many price variations over time (household appliances, furniture, repair services, restoration, etc.). Quarterly collection allows for increasing the number of prices collected with the same cost.

The processing of these prices consists of dividing the sample of selected establishments into three sub-samples, in such a way that, each month, the establishments of only one of them are visited, and the last price collected in the establishments of the other two sub-samples is repeated. This achieves that, every month, there are establishments that inform on the prices of these articles. In addition, in the case that more than half of the prices collected in a month vary, the following month, information will be requested in the rest of the establishments.

With the inclusion of discounted prices, a new category of articles from within the quarterly articles was established: quarterly discounts. These are the articles that, despite fulfilling the requirement of price stability common to quarterly articles, show significant variations in typical sales periods (household appliances, furniture, bed linens, etc.). For this reason, the price collection during the sales months is carried out visiting all of the establishments in the sample, and not only those of the sub-sample corresponding to that month.

## **Place of price collection and recording**

Bearing in mind the place where the prices are collected and recorded, we can distinguish between provincially and centrally collected articles.

The prices of the former are collected in each province, via personal visit, by means of telephone, fax or the internet, through the official bulletins of the Autonomous Communities or provinces, and are recorded in the provincial delegations.

On the other hand, the monitoring of the prices of the centrally-collected articles is carried out by the Central Services of the INE. Included as part of this type of article are those goods and services that have one or several of the following characteristics:

- their prices are the same in a broad geographical area,
- their prices are subject to rates published in the BOE,
- there are few companies that sell the article,
- a perfectly defined directory of respondents is available,
- they are articles with regular changes in quality (such as technology articles), which involves difficulty in carrying out quality adjustments; as they are collected in a centralised way, the processing of these adjustments are homogenised.

## **Calculation method of basic indices**

Regarding the calculation method, there are certain groups of articles whose basic indices are obtained differently than the general formula described in section 5.1.

According to the general calculation formula, the basic index of any article of the shopping basket is obtained as the simple average of the prices collected, without considering any type of weighting. The exception to this general rule is constituted by the calculation formula of the centralised collected article and the articles with a prepared price; in both cases, the basic index is calculated taking into account a set of representative varieties or modalities of each article, weighted appropriately by the expenditure made on each one of them.

The weighting of each modality is obtained from the expenditure made by consumers. In this way, we maintain coherence with the general weighting structure of the shopping basket.

Another group of articles which, due to their characteristics, receive special treatment, are the seasonal articles. Because of the periodical oscillations in prices and quantities, the indices of fresh fruits and vegetables are calculated in a different manner, that considers the production and sales calendars of each one.

Finally, and due to the special characteristics of the market, housing rental also receives a different treatment from the general CPI formula.

The following sections describe these special calculation methods in detail:

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## 6.2 Seasonal articles

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### 6.2.1 DEFINITION

Seasonal articles are those that suffer periodical fluctuations, in both prices and quantities consumed over the year, even disappearing from the market during some period.

Seasonal articles are included in the index of most countries. However, there are notable differences in the processing methods, as well as in the cataloguing criteria of certain articles as seasonal. The products that present, in all countries, a higher seasonal profile, are fresh fruits and vegetables, although some also include fresh fish, certain meats, soft drinks, ice cream, clothing and footwear articles, plants, flowers and sporting goods.

In the CPI base 2016, only those fresh fruits and vegetables that are not available for sale at some point are considered season articles.

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### 6.2.2 METHODOLOGY

In base 2011, the calculation of the indices for the sub-classes of seasonal articles was carried out in two stages. In each one of these stages, an index was obtained: basic indices for each seasonal article; direct and mobile indices for each seasonal sub-class.

With the entry into force of the new CPI base 2016, the calculation formula is changed to assimilate it to that of the rest of the articles of the basket, and the price of off-season products will be estimated with the average variation in the prices of the rest of the subclass products that are available, proceeding in the same way as with the other items in the shopping cart when there is a lack of price.

Thus, these items will have prices every month of the year, as well as annual fixed weights, and their elementary indexes can be calculated as well as those of the rest of the items in the shopping basket.

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### **6.3 Provincially collected articles with a prepared price**

The provincially collected articles with a prepared price are those whose prices are made up of different concepts (rates, quotas, consumption brackets, etc.), and likewise, information is available on both their prices and their weightings.

Provincially collected articles with a prepared price, among other are water, waste collection services, city transport and education.

#### **Calculation method**

The final price of these articles is obtained as the average of the different concepts weighted depending on the expenditure made on each one of them. The weightings that intervene in the calculation of the final price of these articles are updated each year.

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### **6.4 Housing rental**

Unlike the rest of the articles, most respondents on housing rental prices are not always establishments which market the service (which, in this case, would be the lessors of the dwelling), but actual consumers, in other words, the tenants.

The dwelling sample is distributed geographically taking into account, within each province, its population, the number of houses for rent and the expenditure of the families for rent; In addition, a minimum of provincial dwellings and uniprovincial Autonomous Communities have been set.

For the determination and tracing of the informers is used, among other sources, a module of the Active Population Survey (APS), which takes place in the fourth quarter of the year, and where households are asked if they are on a rental or property basis and, in the first case, some questions about housing characteristics.

In order to obtain the monthly information on rental prices, necessary for calculating the index, the selected sample is divided into three sub-samples, such that each dwelling provides information once per quarter, either by means of a personal visit or a telephone interview. In any case, the visit in person is made at least once per year, or when there has been a change of tenant in the dwelling.

The basic information which was collected in each interview is the net rent of each dwelling, including all community expenses when these are to be paid by the tenant.

#### **Calculation method**

The rental price for housing in each province has been calculated in the same way as any other quarterly collected item, as a geometric average of rental prices for the housing from the sub-sample corresponding to the current month and the sub-samples of the two previous months:

$$\bar{P}_p^{m,t} = \sqrt[N]{\prod_{i=1}^{N_{m-2,t}} P_{i,p}^{m-2,t} * \prod_{i=1}^{N_{m-1,t}} P_{i,p}^{m-1,t} * \prod_{i=1}^{N_{m,t}} P_{i,p}^{m,t}}$$

where:

$$\bar{P}_p^{m,t}$$

the average geometric price of rent in province p, corresponding to month m in year t;

$$P_{i,p}^{m,t}$$

the rental price for the i-th dwelling in province p o of the sub-sample corresponding with month m of year t ( $P_{i,p}^{m-1,t}$  and  $P_{i,p}^{m-2,t}$  are the prices collected in the previous months m-1 and m-2);

$$N_{m,t}$$

the number of dwellings in the sub-sample corresponding to month m of year t; and

$$N = N_{m-2,t} + N_{m-1,t} + N_{m,t}$$

the total number housing for rent of province p.

## 6.5 Centralised collection articles

Centralised collection articles not only have a special calculation method but in addition, as mentioned previously, the type of collection is different from that of the rest of the articles in the shopping basket.

### Information collection

The obtaining of information and monitoring of the centralised collection articles are carried out in the Central Services of the INE, unlike the rest of articles of the shopping basket which are collected in the provincial delegations.

For this type of articles, a provincial collection is not necessary because, in general, there are few companies that sell them and/or there is a perfectly defined directory of respondent companies, or the different rates are published in official gazettes.

In addition, for most of the articles, although the collection is centralised, if the prices differ between regions, they are collected in all of them. On the other hand, when the companies that sell the articles are the same, it is convenient to request the information from them once, from the Central Services of the INE.

For each article, a sample of the most representative varieties (brands, models, consumption brackets, etc.) and the respondent units is compiled.

The selection of the respondent units is made depending on their market quota, whereas the election of the representative varieties of the article is made depending on the expenditure on each one of them.

The information that is used for the calculation of the price of these articles is one of two types:

- Information regarding consumption: necessary for calculating the weightings of each company of the sample (market quota), as well as the weightings of each one of the modalities of the article. In order to keep the CPI updated, these weightings are revised once a year.
- Information regarding the prices or rates of each of the modalities and/or of each one of the concepts that are a part of the final price of the article. It is collected monthly.

Price variations are reflected in the month during which they have taken place, and in the case of rates that change from a specific day of the month, an average weighted price is calculated by the number of days during which the price has been in force.

Centralised collection articles are, among others, tobacco, electric energy, medications, vehicles, air and railway transport, fuels and lubricants, telephone services and package holidays.

### **Calculation method**

All those concepts and modalities determining the price of these articles intervene in the calculation of said price.

Thus, in articles such as tobacco, vehicles and medicinal products, the different brands are considered; In others as electric energy, we take into account the different sections of consumption, fixed quotas, etc. Moreover, in all of them, the final price is calculated as the average of the prices of each one of these concepts or varieties weighted by its degree of importance. These weightings are calculated from the expenditure made on each one of the varieties.

## 7. Price collection

The price collection of the articles is carried out both in provinces and in Central Services, via personal visit of INE agents to the establishments on the corresponding dates, with the exception of some of them for which, due to their special characteristics, the information collection is carried out by telephone, tax, electronic mail, catalogue or the internet.

The collection is carried out via a questionnaire generated automatically for each establishment, in which the interviewer notes down the prices and incidences regarding the articles that appear in the same. Each establishment is visited by a single interviewer, except for hypermarkets and department stores.

The prices collected are effective sales prices to the public with cash payment.

In the CPI base 2016 prices for defective goods, settlements or balance, are not collected. However, it does collect prices of discounted and clearance sales articles.

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### 7.1 Calendar and collection frequency

In general, the price collection period approximately covers from day 1 to day 22 of each month, both inclusive. However, for centralised collection articles, this period is extended, whenever possible, to the end of the corresponding month.

The price collection of one single article in the different respondent establishments has been distributed throughout this period in order to collect the largest number possible of price fluctuations. The selected establishments are visited every month approximately on the same day; this way, the variation reflected by the index corresponds to a monthly variation.

As perishable articles are subject to important price fluctuations, their prices are collected three times over the month in each of the establishments selected in all provincial capitals, maintaining a distance of at least seven days between the three visits to the establishment. In the rest of the municipalities, the prices of these articles are collected twice in each one of the establishments that belong to the sample.

For the rest of the articles, each establishment is visited only once a month, with the exception of the quarterly articles, for which the price collection in each establishment is carried out once every three months.

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### 7.2 Inclusion of discounted and sales prices

In the CPI base 2016, the prices that have suffered reductions due to reasons such as sales and promotions, as well as those whose discounts are due to official sales periods are collected. This affects most of the divisions that comprise the CPI, although discounts due to sales are produced more drastically in the divisions of Clothing and footwear and Furnishings, household equipment and routine maintenance of the house, where they are more habitual.

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### 7.2.1 CRITERIA AND TYPES OF DISCOUNTS CONSIDERED

The criteria followed in base 2016 for the collection of prices with a discount, are the following:

- that the discount is carried out on articles that are expected to be available again at their habitual prices, that is, not dealing with discounts due to liquidations or clearance sales;
- that the discount is made on items that can be purchased by all consumers, not only for a part of them (for example, discounts made for having loyalty cards of the establishment or for fulfilling certain conditions will not be taken into account, unless information is available on the part of the population susceptible to perceiving that discount);
- and that these discounts are effective at the time of purchase (for example, they do not consider refunds after purchase).

Therefore, they collect discounts due to:

- Seasonal sales (official sales periods regulated by the *Retail Trade Planning Law*).
- Sales of any type (so long as they are not liquidations or clearance sales).

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## 7.3 Organisation of fieldwork

Collection of most part of the information is carried out by the personnel assigned to the survey each month in each of the 52 provincial delegations of the INE: a team of interviewers-surveyors, interviewer inspectors, a survey inspector and, a provincial delegate who is in charge of the delegation, whose main responsibility is the collection of information in each province.

The technical responsibility corresponds to the survey inspector. S/he is in charge of organising and distributing the work, analysing the price series, planning the inspection visits and, in general, solving the problems that arise during the price collection. For this purpose, s/he has the help of the interviewer inspectors, who must accompany the new interviewers on their first visits, check the suitability and representativeness of the articles and establishments, advise them on the correct way of carrying out the price collection, and control and inspect the work done by the interviewers in their her/his charge.

Finally, the interviewer or surveyor has the objectives of collecting the prices, checking that they comply with the specifications of the articles selected, propose the substitution of the articles and establishments that are not considered suitable, and transmit to the interviewer inspector all the incidences that occur.

In order to control the quality of the information collected, there is a plan of inspection visits to respondent establishments.

In the delegations, the inspection works correspond to the interviewer inspector, and to the survey inspector. As a basic criterion, they should visit every establishment that is providing information for the first time, as well as those that the interviewer has found to be unwilling to cooperate.

In the visits to establishments, the suitability and representativeness of the same are determined, whether the articles from which the prices are collected comply with the specifications, and whether those prices are correct. They also check the degree of cooperation of the respondents, and whether the visits of the interviewer are made in an adequate manner and on the established dates.

Likewise, there is another systematic inspection established by the Central Services of the INE, which requires the monthly inspection of a certain percentage of the establishments. The survey inspector must send a report regarding said inspection in which s/he indicates the establishments, articles and interviewers inspected, as well as the discrepancies observed.

Visits, when deemed necessary, are also made to the delegations by the technicians of the Central Services, from the CPI Area, responsible for the control of the prices collected in the delegations, in which they check the suitability of the sample selected, the mechanism of the work carried out monthly. Likewise, during these visits, all of the issues raised by the working team of the delegation are resolved, and all of the changes considered pertinent for improving the quality of the survey are proposed.

Finally, worth noting is that repeated interviews are carried out continuously via moving agents from the Central Services, to check the quality of the data obtained.

## 8. Data processing

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### 8.1 Information reception

As previously mentioned, the direct collection of prices of the articles that comprise the shopping basket in the corresponding establishments is carried out via a questionnaire, in which the interviewer notes down the prices and incidences related to the articles that appear in the same.

Once the questionnaires are filtered by the interviewer, the data is recorded.

After each recording stage of questionnaires, computer applications are used to detect possible errors.

The interviewer inspector is responsible for checking the atypical prices before proceeding to the following stage of the process. This system allows for detecting any error in the data collection and solving the problem without much time elapsing from the moment of the information collection.

The last stage, prior to sending the information to the Central Services, is the analysis of the price series by the survey inspector.

Having completed the previous stages, the monthly information is sent to the Central Services on the foreseen dates, in such a way that the preparation of the index is carried out in the shortest period possible, to allow for publishing the indicator on the established date.

At the Central Services, the data sent by the provinces and the prices prepared by said services are processed together.

The total number of prices processed monthly, which is approximately 220,000, is analysed in the Central Services, requiring, when necessary, confirmation by the delegations on atypical variations. Once the prices are filtered and analysed, the indices are obtained and their corresponding variation rates, which are published during the first fortnight of the month following that to which said data refer.

Besides, applying macro depuration techniques and the estimation of those prices that are not available until the beginning of the next month, the publication of a leading Indicator of the CPI is carried out on the penultimate day of the reference month.

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### 8.2 Price filtering

As mentioned in the previous section, in the Central Services of the INE, all of the prices collected monthly are received, filtered and analysed.

In general, all variations greater than 25% or lower than -20% are reviewed, for Food articles, and those variations greater than 10% and lower than -10%, for the rest of the articles.

In addition, the processing of the lack of price is also carried out, that is, the price is estimated for those articles that were not available at the time of the visit to the establishment.

The estimation method of the lack of price consists of applying the average variation of the rest of the prices collected for the same article in the other establishments of the province.

This price estimation process is especially relevant in the case of perishable articles, in which the price of the article is collected, in the same establishment, several times throughout the month.

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### 8.3 Changes in quality

The accuracy with which the CPI measures price evolution, depends, among other factors, on the stability of the characteristics that define the selected products. The objective is to monitor the prices of a shopping basket whose products remain unalterable throughout time, in such a way that measuring price variations does not depend on the changes in the characteristics of those products.

Obviously, the suitability in the stability of the products is not always fulfilled, and it is, therefore, necessary to turn to adjustments that correct the changes produced in the product sample and that allow estimating price variation without it being distorted by it. These adjustments are known as adjustments due to a change in quality.

Changes in quality are a problem that all countries must deal with, and that, in recent years, have been accentuated by the rapid technical progress that some articles have experienced. For this reason, it is one of the issues that Eurostat takes care of, with the highest priority, in the area of the harmonisation of the CPI in the EU countries.

In the preparation of the Spanish CPI, in the different bases, there have been various procedures used for the estimation of the changes in quality. The choice of these methods has been determined by the availability of information at any given moment, and by the type of article in question.

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#### 8.3.1 DEFINITION

As it has been previously mentioned, an adjustment due to a change in quality is necessary when an article (product, variety or modality), whose price is a part of the calculation of the CPI, is substituted by another, and at that moment it is necessary to determine which part of the price difference between the substitute article and the substituted article is due to a different quality between them.

The substitutions of the articles may be due to several reasons:

- the article ceases to be representative, and another more representative article appears in the market;
- the article disappears from the market;

- the establishment where the price of the article is collected ceases to be representative, closes or changes its economic activity.

Whenever an establishment of the sample ceases to be representative, it must be substituted by another. A good selection of establishments, with an important sales volume and/or flow of clients, implies that the articles that the establishment has are the most representative and that on being demanded by the customers, when they disappear, they will be substituted by others of a similar quality.

Changes in quality are produced when the specifications of the representative articles change, and this leads to a difference in utility for the consumer.

The specifications of each of the articles that comprise the shopping basket remain fixed over time, as they define the most representative variety of consumption for the area, but should be substituted when said variety ceases to be sold or is no longer representative of the establishment.

In overall terms, the substitute product must be of a similar quality to that of the substituted product, but when, for some reason, the quality of the two articles is different (different variety, different brand, etc.), the persons responsible for collection so report to the Central Services, indicating all of the characteristics of the new variety and its price in the current period, and if possible, in the previous period, as well as an adjustment coefficient that guarantees variations in the index motivated exclusively by price variations.

However, there is not always an overlap period between the articles, nor is the identity given to one model and that which substitutes for it. It is, therefore, necessary to estimate which part of this price difference is due to technical improvements, changes in material, etc. and which part is a pure price change.

In order to carry out these estimations, we study the specifications of the substitute and substituted articles, analysing differences and analogies, and bearing in mind the opinions of the experts on the evolution of prices and costs, relating the changes in prices and qualities.

The ideal situation to estimate the changes in quality is that in which sufficient information is available on the characteristics that determine the price of an article on the market (brand, technical characteristics, place of purchase, etc.).

For many items, it is very difficult to acquire the necessary information, and even if said information is available, its use can be complicated.

### 8.3.2 QUALITY ADJUSTMENT METHODS

The quality adjustment methods that are the most habitually used in CPI base 2011, are the following:

a) Total quality adjustment.

Part of the assumption that the difference between the price of the substituted article and that of the substitute article is completely motivated by the difference in quality between the two, or that the articles are so different that they cannot be compared. It is believed, then, that the difference in price between both articles is solely due to their different quality, and therefore, the index will not reflect price changes. This adjustment assumes that in the case that the substituted article was to continue to be for sale, its price would not have changed.

b) Adjustment due to identical quality.

This is based on the idea that the substitute article has the same quality as the substituted article, that is, that the existing price difference between the two is due to a real change in price. This adjustment assumes that in the case that the substituted article was to continue to be for sale, its price would have been the same as that of the substitute article.

c) Other adjustments.

This section includes all those adjustments for which the value of the difference in quality between one article and its substitute is estimated. The most customary practices are:

- Prices of the options:

Discounted from the price of the substitute article is the sale price of the specific characteristics that the previous article did not have, but that could be acquired as an option.

- Production costs:

The producer supplies information regarding how much it costs to produce an extra characteristic, and this is discounted from the price of the substitute article that possesses that extra characteristic.

- Imputation prices:

The change of the average price of an aggregate higher than that to which the article belongs is imputed.

- Information provided by experts:

Experts or specialists on the article are asked which amount of the difference between the prices of the articles (substitute and substituted) is due to the difference in quality between them.

- Overlap prices:

The value of the difference in quality between the substituted and substitute articles is the difference in price between them during the overlap period, that is, in the period in which both articles are for sale.

- Hedonic regression methods:

This method is based on the hypothesis that the price of an article can be expressed depending on a group of characteristics, through a regression model (linear or non-linear).

In the case of a linear model, the price of an article  $j$ , would be:

$$P_j = a_0 + \sum_{i=1}^N a_i \times x_{ij} + u_j$$

where,

$i = 1, 2, \dots, N$	the number of explicative variables,
$a_0$	the independent term,
$x_i$	the explicative variables (characteristics of the article)
$a_i$	the regression coefficients,
$u_j$	the distortions $\approx N(0, \sigma^2)$ .

The estimation of the model provides the regression coefficients, and allows for determining which part of the change in the price of the article is due to the change in quality, and therefore, which part is a pure change in price.

There are several ways of calculating a hedonic price index according to the form of the function and the variables selected for the model.

In order to carry out the adjustment of the regression model, a large number of observations are necessary, including most of the specific characteristics of each observation. Likewise, a very specialised knowledge of the product is necessary.

From among all of the previously described methods, the Spanish CPI mainly uses the "price overlap" and "information provided by experts", "allocation prices" and

“adjustment for technical quality”. It is also worth noting, the application of hedonic regression methods in the adjustment of the quality of some electrical appliances.

The following indicates more specifically the processing that changes in quality receive, depending on the type of article in question.

### **Mass consumer goods (food, medicines and perfume)**

The changes in quality in perishable articles (meats, fish, fruits, vegetables and eggs), are difficult to measure, given that the quality normally has an important subjective component.

Very important for these articles are the annotations that accompany the prices that the agents collect to determine whether or not there is a change in quality, as well as the evolution of the rest of the prices of the same article in other establishments in the municipality.

In non-perishable articles, the most habitual changes in articles are caused by the change in brand (whether this occurs in the establishment itself or when changing the establishment) and the most habitual adjustment, in the absence of relevant information, is usually "imputation prices" or "adjustments for equal quality", if the substituting and substituted product belong to the same "quality range".

In thus type goods it is possible for a change in format. In this case, an adjustment coefficient must be calculated for a change in format, which will eliminate the change in price due to a change in format.

$$Coef = \left( \frac{\textit{previous format}}{\textit{current format}} \right)$$

### **Centralised collection articles**

Centralised collection articles present characteristics that are different from the rest of the CPI articles, which facilitates adjustments by changes in quality.

The prices of these articles are collected from the Central Services, and the final price is usually calculated via the design of representative samples by modalities, with overall information obtained from the different respondents. Therefore, normally, the necessary information is obtained directly from the companies that supply the service or the regulating body.

The problems with changes in quality of these articles are usually: the appearance of new modalities, new regulatory provisions, changes in prices due to slips in the hours of application of each price, etc.

The methods that are most used to solve the discontinuities in the evolution of the prices are based on the information provided by the experts, the overlap prices and the prices of the options.

The annual renewal of samples and internal modality weightings of these articles causes a reduction in the number of quality adjustments.

### **Rest of articles**

Among the rest of the articles that comprise the shopping basket, the following adjustments are worth noting:

- For most of the articles from the *Clothing and footwear* group, the changes in quality are carried out periodically, twice a year, coinciding with the changes in season. Two situations may occur:
  - The article disappears and is substituted by another that already existed in the previous season. In this case, the adjustment is made by the price overlap method.
  - The article disappears and is substituted by a new article that did not exist the previous season. In this case, several methods are used:
    - adjustment due to identical quality will be applied when the changing article belongs to the same “quality range” of the substituted one.
    - we seek the change of other articles of the same type that already existed the previous season;
    - we impute the average change, from that season, the aggregation to which it belongs;
    - experts are consulted;
- In the case of furniture, when the model for which the price is being collected disappears, it is substituted by another similar model. In this case, there is usually information available regarding the quality of the substitute and substituted articles; if they do not coincide it would be necessary to use the information provided by the experts.
- The substitution in articles such as household appliances or video and audio equipment is made when models appear in the market with new technological features that will substitute the former models, given that it is possible for these articles to begin to lower their prices. The moment at which the substitution is produced is of vital importance and should be paid special attention because otherwise, a delay in the substitution could lead to underestimating the evolution of the prices of these articles.
- For catering articles, most of the changes in quality are due to the change in the establishment. In this situation, it is possible to use the overlapping price method or the allocation prices.
- For some articles (household appliances and books), hedonic regression models are applied.

## 9. Series linking

Nonetheless, for new CPI base 2016, because it is a linked index, it has not been necessary to calculate any linking coefficient, since the calculation method of the linking allows for performing changes in weightings, sample and methodology every December, and linking the indices obtained with the new calculations, with the series that had been published, calculated with the old sample, weightings and methodology.

Thus, in CPI base 2016, the only change has been in the reference period of the indices or the base period, which went from the year 2011 to the year 2016. As a result, a re-scale coefficient has been calculated, which has converted the indices published in base 2011, from January 2002 to December 2016, into indices in base 2016.

This coefficient is that which makes the simple arithmetic average of indices published in the year 2016, in base 2011, equal to 100:

$$\left( \frac{1}{12} * \sum_{m=January}^{December} {}_{11}I^{m16} \right) * C_{re-scale} = 100 \rightarrow$$
$$\rightarrow C_{re-scale} = \frac{100}{\left( \frac{1}{12} * \sum_{m=January}^{December} {}_{11}I^{m16} \right)}$$

By multiplying the series published in base 2011 by this re-scale coefficient, we obtain a series of indices in base 2016, which preserves the variation rates published, and with which the new indices in base 2016 have been linked, calculated as of January 2017.

In relation to the change in classification, because of the enforcement of the European Classification of Individual Consumption according to Purpose (ECICOP), a series of new plots will be published beginning with the 2017 data, and during the first year of the series, there will not be an annual rate of the data.

On the other hand, the INE has given continuity to all the series that were published until now, except those in which the change of the content makes it impossible to do it.

# 10. Harmonised Consumer Price Index, base 2015

The Harmonised Consumer Price Index (HCPI) is a statistic indicator that has as its objective to provide a common measure of the inflation that will allow for comparisons between countries of the European Union (EU), and between these and other countries that do not belong to the EU. That is why it was used to examine the heading of what is stated in this matter in the Maastricht Treaty to enter the European Monetary Union.

The harmonisation process began to solidify in 1995 with a first objective: to define the phases that would lead towards the HCPI and to put it in a legal document that would make this an obligatory compliance process. Thus the Council Regulation 2494/95 of October 1995 in which the two phases of the process are clearly established.

The first phase was carried out during 1996, and it established the calculation of the Transitional Consumer Price Index (TCPI), based on the CPI of each of the countries member of the European Union.

The second includes the construction of the Harmonised Consumer Price Index (HCPI), as a result of the homogenisation of the most important methodological aspects of each of the Consumer Price Indexes, to make them comparable.

During the transitory implementation period, the necessary modifications and adjustments were done on the different national CPI until an index with the essential characteristics common to all the countries was reached. The first index of this phase is the one that corresponds to January 1997 and was published on 7 March.

Since then, numerous regulations have been approved, which contain the minimum norms for the treatment of diverse aspects of the calculation of the HCPI, and have increased the comparability of the indexes in the long run.

In June 2016 came into force, the new EU Regulation 2016/792 of the European Parliament and the Council, of 11 May 2016, on harmonized consumer price indexes and the housing price index, and by which the Council Regulation (EC) No 2494/95 is repealed, which embraces in a whole Regulation all the norms approved until then about harmonized consumer price indexes, and that were applied for the first time on the indexes for January 2017.

## **HCPI technical characteristics**

The HCPI is an indicator whose methodological design and production process is, in its main body, common to the CPI. For this reason, any detail about the contents of its methodology, as well as the aspects related to the characteristics of the statistical process (observation units, form and collection periodicity, etc.) and the plan and periodicity of the diffusion, can be found in this methodology.

Below are the relevant technical aspects in which this index that differs from the CPI:

- 1) **Coverage of goods and services.** Since the January 2017 index, the only difference between the HCPI and the Spanish national CPI in this regard refers to gambling, which is included in the IPC, while outside the field of consumption of the HCPI.
- 2) **Geographical and population coverage.** The HCPI covers the expenditure of the entire population, both rich and poor households, urban and rural, who live in private or collective homes.

It also includes the expense of foreign visitors and excludes the one carried out by the Spaniards outside our borders, except for the expense made because of business.

- 3) **Treatment of the seasonal articles.** Unlike the CPI, where the price of these items is repeated the months in which it is not available, in the HCPI the price is estimated from the evolution of the prices of those products in the same category that are available.
- 4) **Common reference period.** In the HCPI this is 2015=100 This period will be updated in the case of an important methodological change in the HCPI or every ten years.
- 5) **Rounding system.** While for CPI the indexes are published rounded to three decimal places and the rates of change are calculated using all the decimal points of the indexes, in the case of the HCPI, the indexes are published rounded to two or a decimal (if the national legislation does not allow to publish indices to two-tenths) and the rates of change are calculated from the published indexes.

In both the CPI and the HCPI, the rates of variation are published rounded to a decimal.

# Annexe I. Calculation of aggregated indices

With the calculation formula of CPI base 2016 (linked Laspeyres), the indices referring to December of year (t-1) start with a value equal to 100 in December of said year. In order to grant continuity to the published CPI series, the "publishable" or linked indices must be calculated.

The index published in the month m of the year t, in base 2016, is obtained by multiplying the index of December of (t-1), in base 2016, by the index of the month m of the year t referred to December of (t-1), divided by 100:

$${}_{16}I^{mt} = {}_{16}I^{dic(t-1)} * \left( \frac{dic(t-1)I^{mt}}{100} \right)$$

These indices are not additive, that is, using published indices, we cannot calculate the indices of the functional or geographical aggregations. These aggregations are calculated using the indices referring to December of the previous year (unpublished), which are additive.

The following describes the steps to follow in order to obtain the index in base 2016 of an aggregate A, from the published indices, in base 2016, of its components A1 and A2:

1. The indices referred to December of the previous year must be obtained for each A1 and A2 component. This is carried out by dividing the index published from month m of year t, by the index published from December of the previous year:

$$dic(t-1)I_i^{mt} = \left( \frac{{}_{16}I_i^{mt}}{{}_{16}I_i^{dic(t-1)}} \right) * 100 \quad i = A1 \text{ y } A2$$

2. The indices obtained in the previous step using the weightings in force during the reference period of the index (m,t). With this, we obtain the index of the aggregate A, referring to December of (t-1):

$$dic(t-1)I_A^{mt} = \frac{dic(t-1)I_1^{mt} \times dic(t-1)W_1 + dic(t-1)I_2^{mt} \times dic(t-1)W_2}{dic(t-1)W_1 + dic(t-1)W_2}$$

3. The index in base 2016 of aggregate A is calculated as the product of the index published in December of the previous year, by the quotient between the aggregate index obtained in step 2 and 100:

$${}_{11}I_A^{mt} = {}_{11}I_A^{dic(t-1)} \times \frac{dic(t-1)I_A^{mt}}{100}$$

$${}_{16}I_A^{mt} = {}_{16}I_A^{dic(t-1)} * \left( \frac{dic(t-1)I_A^{mt}}{100} \right)$$

## Annexe II: Historical Evolution

The INE established the first Cost of Living Indices System in the year 1939. Before the year 1936, some series of simple indices and average prices were published, which later served to establish this first System. Beginning in July 1938, the National Statistics Service began to compile cost of living indices for some provincial capitals. With the gradual extension to all provincial capitals, the grouping of simple indices into five consumption groups, and a readjustment of the weightings, the Cost of Living Indices System was implemented in 1939, with base July 1936.

Since then, there have been nine Consumer Price Indices systems, including the current system, known as Cost of Living Indices until the implementation of Base 1976, whose base periods have been: July 1936, 1958, 1968, 1976, 1983, 1992, 2001, 2006, 2011 and 2016.

The following briefly summarises the main characteristics of these Systems:

### Systems of Indices

Base	Time in force
1936 (July)	July 1939 – December 1960
1958	January 1961 – December 1968
1968	January 1969 – December 1976
1976	January 1977 – July 1985
1983	August 1985 – December 1992
1992	January 1993 – December 2001
2001	January 2002 – December 2006
2006	January 2007 – December 2011
2011	January 2012 – December 2016
2016	January 2017

### Reference stratum

Base	Reference stratum
1936 (July)	– Middle-class families consisting of four or five people with a monthly income of about 600 pesetas in 1939.
1958	- Households whose main breadwinner is economically active, with annual income less than 80,000 pesetas from March 1958.
1968	- Households with more than one member, whose main breadwinner is economically active, with annual income between 21,600 and 120,000 pesetas from 1968.
1976	- Households with more than one member, whose main breadwinner is economically active, with annual income between 81,000 and 720,000 pesetas from 1973-1974.
1983	- Households with more than one member (economically active and inactive), with income between 322,575 and 2,000,000 pesetas from 1980-1981.
1992	- All households resident in Spain.
2001	- All households resident in Spain.
2006	– All households resident in Spain.
2011	– All households resident in Spain.
2016	– All households resident in Spain.



## Survey used to obtain the weightings

Base	Survey
1936 (July)	- The weightings were established from some studies on household accounts carried out in 1940.
1958	- Household Account Survey, referring to March 1958, aimed at 4,192 families belonging to the reference stratum.
1968	- Household Budget Survey carried out from March 1964 to March 1965, interviewing 20,000 families. In order to study the evolution of the consumption structure until December 1968, the year taken as a base, a series of surveys were conducted with fewer than 4,800 households per year.
1976	- Household Budget Survey for the period from July 1973 and July 1974, aimed at 24,000 households.
1983	- Household Budget Survey for the period between 1 April 1980 and 31 March 1981, in which 24,000 households were interviewed.
1992	- Household Budget Survey, carried out from 1 April 1990 to 31 March 1991. Information was requested from 21,000 households.
2001	- Household Budget Continuous Survey, corresponding to the 8 quarters from the 2nd quarter of 1999 to the 1st quarter of 2001. 8,064 households were interviewed each quarter. For the annual updates, the latest data available from the survey was used each year.
2006	- Household Budget Continuous Survey, corresponding to the 8 quarters from the 1st quarter of 2004 to the 4th quarter of 2005. 8,064 households were interviewed each quarter. For the annual updates, the latest data available from the Household Budget Survey (in force since 2006) was used each year.
2011	- Household Budget Survey, base 2006, of year 2010. Approximately 24,000 households were interviewed each year. For the annual updates, the latest data available from this survey was used.
2016	- Household Budget Survey, base 2006, of year 2015. Approximately 24,000 households were interviewed each year. For the annual updates, the latest data available from this survey was used.

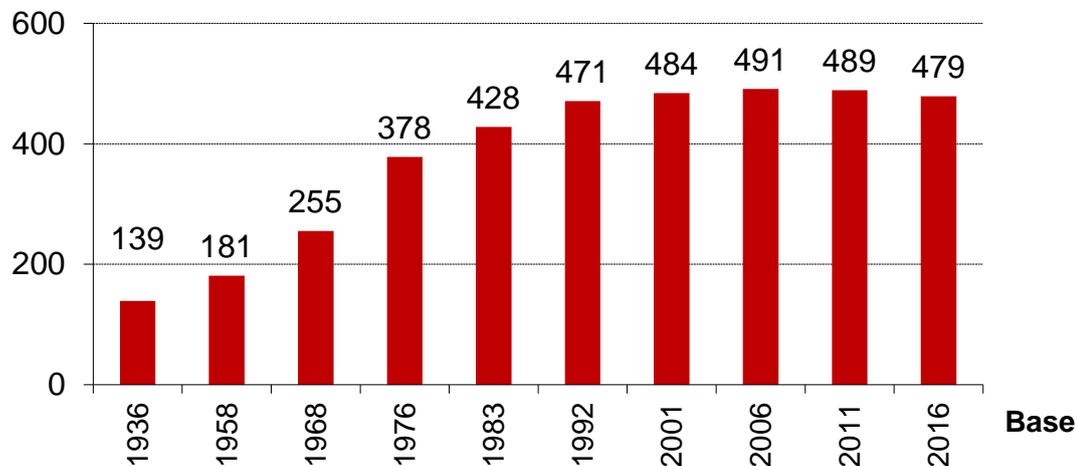
## Geographical breakdown

Base	Indices
1936 (July)	- Indices were calculated for each provincial capital, as well as an index for the group of capitals.
1958	- Indices were calculated for each provincial capital, Ceuta, Melilla, the total national, the group of capitals, and the group of non-capital municipalities.
1968	- Indices were established for the following groups: each one of the provincial capitals, Ceuta and Melilla; the urban total national, formed by all the components of the previous section and the municipalities not included in it and which had more than 50,000 inhabitants; non-urban total national, including the remaining municipalities, and the total national.
1976	- Indices were compiled for the total national, urban and non-urban, provincial capitals, Ceuta, Melilla and regional groupings (beginnings in 1978, said groupings were the equivalent to the current Autonomous Communities and the group comprised of Ceuta and Melilla).
1983	- Indices were obtained for the total national, urban and non-urban, provincial capitals, Ceuta, Melilla, Autonomous Communities groupings and that comprised of Ceuta and Melilla.
1992	- Indices were calculated for the total national, provinces, Autonomous Communities grouping and that comprised of Ceuta and Melilla.
2001	- In this base, the same indices were prepared as in Base 1992.
2006	- Indices are obtained for the total national, the 17 Autonomous Communities, the 50 provinces Ceuta and Melilla.
2011	- In this base, the same indices were prepared as in Base 2006.
2011	- In this base, the same indices were prepared as in Base 2011.

## Shopping basket

Base	Number of articles
1936 (July)	Different in each provincial capital, varying between 95 and 139 articles.
1958	181 articles.
1968	255 articles.
1976	378 articles.
1983	428 articles.
1992	471 articles.
2001	484 articles.
2006	491 articles.
2011	489 articles.
2016	479 articles.

## Nº articles



## Calculation formula

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In base July 1936, the Lowe formula was used for the calculation of the provincial capitals indices; the index of the group of capitals was obtained as the arithmetic average of the weighted indices by the population of each capital

In all of the following bases, the Laspeyres formula was used, with a fixed base, for the calculation of the indices.

Beginning with base 2001, the linked Laspeyres formula was introduced for the calculation of the indices.

## Consumption groups and weightings by group

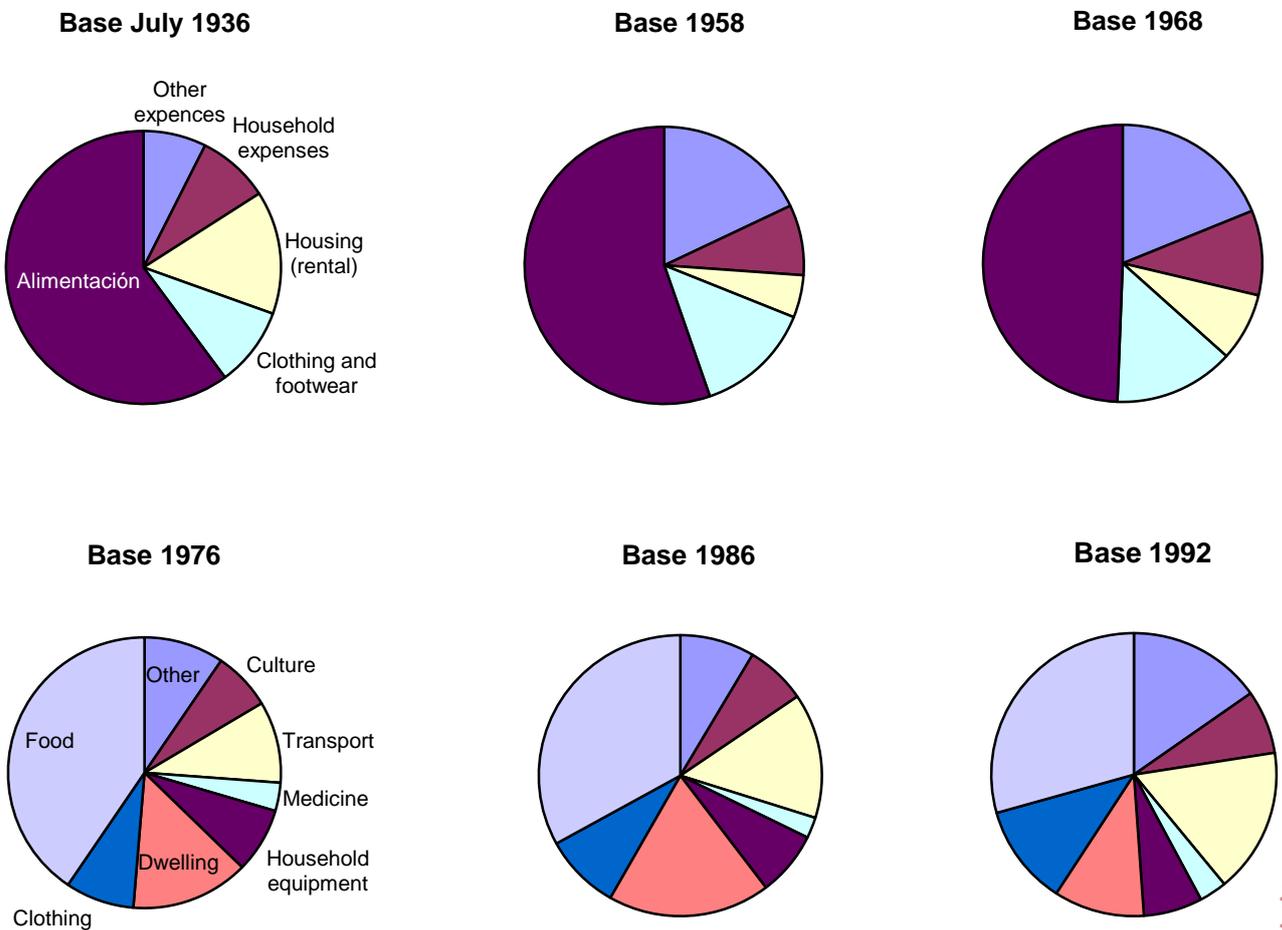
Group	Weighting	Group	Weighting
<b>Base July 1936</b>		<b>Base 1958</b>	
Food products	601.0	Food products	553.0
Clothing and footwear	94.0	Clothing and footwear	136.0
Housing (rental)	146.0	Housing (rental)	49.6
Household expenses	85.0	Household expenses	82.1
Other expenses	74.0	Other expenses	179.3
<b>TOTAL</b>	<b>1,000.0</b>	<b>TOTAL</b>	<b>1,000.0</b>
<b>Base 1968</b>		<b>Base 1976</b>	
Food products	493.9	Food products	405.20
Clothing and footwear	139.4	Clothing	81.71
Housing (rental)	79.5	Housing	140.01
Household expenses	98.9	Furnishings, household equipment	77.51
Other expenses	188.3	Health	33.74
<b>TOTAL</b>	<b>1,000.0</b>	Transport	97.44
		Culture	69.44
		Other	94.95
		<b>TOTAL</b>	<b>1,000.00</b>
<b>Base 1983</b>		<b>Base 1992</b>	
Food products	330.27	Food products	293.61
Clothing	87.39	Clothing	114.79
Housing	185.65	Housing	102.80
Furnishings, household equipment	74.15	Furnishings, household equipment	66.84
Health	23.93	Health	31.26
Transport	143.81	Transport	165.42
Culture	69.60	Culture	72.67
Other	85.20	Other	152.61
<b>TOTAL</b>	<b>1,000.00</b>	<b>TOTAL</b>	<b>1,000.00</b>
<b>Base 2001</b>		<b>Base 2006</b>	
	<b>Year 2002</b>		<b>Year 2007</b>
Food and non-alcoholic beverages	218.630	Food and non-alcoholic beverages	220.556
Alcoholic beverages and tobacco	32.170	Alcoholic beverages and tobacco	28.229
Clothing and footwear	99.280	Clothing and footwear	90.280
Housing	110.260	Housing	103.607
Furnishings, household equipment	63.571	Furnishings, household equipment	61.520
Health	28.062	Health	28.259
Transport	155.760	Transport	148.879
Communication	25.729	Communication	35.845
Leisure and culture	67.263	Leisure and culture	71.089
Education	17.444	Education	16.027
Restaurants, cafes and hotels	112.708	Restaurants, cafes and hotels	115.477
Other goods and services	69.124	Other goods and services	80.230
<b>TOTAL</b>	<b>1,000.000</b>	<b>TOTAL</b>	<b>1,000.000</b>
<b>Base 2011</b>		<b>Base 2016</b>	
	<b>Year 2012</b>		<b>Year 2017</b>
Food and non-alcoholic beverages	182.642	Food and non-alcoholic beverages	197.711
Alcoholic beverages and tobacco	28.872	Alcoholic beverages and tobacco	30.190
Clothing and footwear	83.437	Clothing and footwear	67.342
Housing	120.006	Housing	133.033
Furnishings, household equipment	66.750	Furnishings, household equipment	58.765
Health	31.398	Health	39.612
Transport	151.630	Transport	146.693
Communication	38.498	Communication	35.960
Leisure and culture	75.420	Leisure and culture	85.209
Education	14.175	Education	16.793
Restaurants, cafes and hotels	114.608	Restaurants, cafes and hotels	121.193
Other goods and services	92.563	Other goods and services	67.499
<b>TOTAL</b>	<b>1,000.000</b>	<b>TOTAL</b>	<b>1000.000</b>

As may be observed, until the system with base 1976, five groups were considered, which increased to eight beginning with said system.

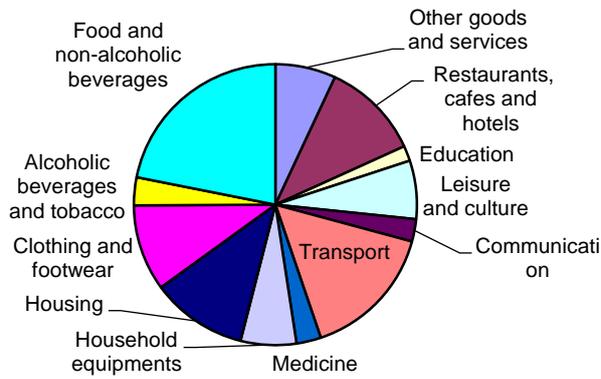
Although the number and denomination of the groups may be equal between two systems, the inclusion of certain articles in the different groups has varied over the different bases, which prevents us from making exact comparisons between the weightings structures corresponding to each one of them.

Nonetheless, the following graphs show the evolution of the weightings:

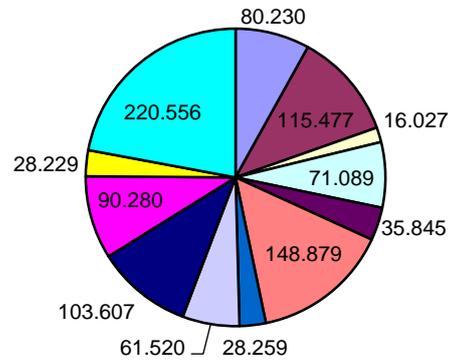
Other expense



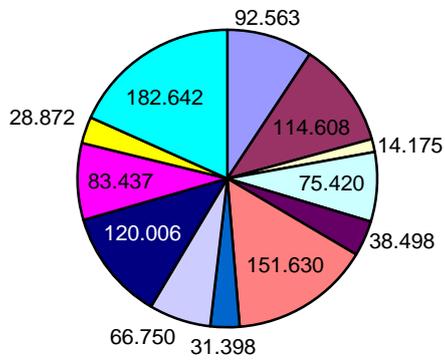
**Base 2001. Year 2002**



**Base 2006. Year 2007**



**Base 2011. Year 2012**



**Base 2016. Year 2017**

