INSTITUTO NACIONAL DE ESTADISTICA

Import Price Index of Industrial Products.

Base 2021

Methodology

Subdirectorate General for Short-term Statistics

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Index

1 Introduction

The Import Price Index of Industrial Products (IPRIM) is a statistic whose main objective is to measure the evolution of import prices of industrial products. To this end, the design used is based on the structures of the different industrial activities and the most imported products in each of them, based on the import value of the transactions declared to customs. These elements, along with others that make up the methodology of this indicator, need to be updated in more or less frequent periods of time in order to preserve the representativeness of the IPRIM.

The operation of the base change of the IPRIM consists, fundamentally, of reviewing and updating each of its components and determining the best options to achieve a representative and accurate indicator that adapts to the trends of industrial imports.

In addition, Regulation (EU) 2019/2152 of the European Parliament and of the Council, of 27 November 2019, on European business statistics, whose aim is to create a common framework for the production of community statistics, and Regulation (EU) Implementing Regulation 2020/1197, which establishes the technical specifications to comply with the mandate of the Framework Regulation, mark the periodicity of base changes. In this regard, the Regulation provides that:

The first base year is 2015, the second base year is 2021, and the third base year is 2025. Thereafter, every five years, Member States must reset the base of the indices, taking as base years those ending in 0 or 5. All indices must be adapted to the new base year within three years from the end of that new base year.

Therefore, the IPRIM base 2021, the main characteristics of which are detailed in this methodology, responds on the one hand to the need to adapt to the changes that have taken place in industrial imports in recent years and, on the other, meets the requirements established by European regulations in this regard.

Until the entry into effect of the base 2010, the IPRIM based its calculation on what is called a fixed-base system, whose main characteristic is that both the composition of the market basket and its weightings are unaltered for the entire time that the base is used. Therefore, the only way to be able to collect the changes in the behaviour of imports and for the IPRIM to adapt to these trends was to wait until the following base change. Obviously, in some cases this time frame was excessively long.

With the IPRIM base 2010, a new way of conceiving this indicator was initiated, based on an annual review of the weightings for the main levels of functional aggregation, and the possibility of including any significant change that occurs in industrial imports, whether it be the appearance of new products, changes in the productive activity or in the sample of establishments. In this way, the IPRIM is better adapted to the economic reality and is much more dynamic than its predecessors.

As a result of this operating scheme, in January 2024, the Import Price Index of Industrial Products in base 2021 came into effect, replacing the IPRIM which, with base 2015, was in effect until December 2023.

The IPRIM base 2021, maintains the main characteristics of the IPRIM base 2015, and, like the latter, will annually review the weightings for a certain level of functional disaggregation. To carry out this update, it uses the latest foreign trade data available from the *Intrastat* statistical declarations and the *Single Administrative Document (SAD)*.

Furthermore, the main changes introduced in the new System were approved in the Plenary Session of the Higher Council of Statistics, after their evaluation by the Permanent Commission of said Council.

The main characteristics of the Import Price Index of Industrial Products, base 2021, are included in this methodology.

2 Definition of the indicator

The Import Price Index of Industrial Products (IPRIM), which is published monthly, aims to measure the evolution of the prices of industrial products from the rest of the world. The prices considered for the calculation have the following characteristics:

– These are prices at the national border, excluding VAT, other indirect taxes or customs duties, but including all rebates or discounts.

– These are CIF prices (cost, insurance, freight), not including transport or insurance costs relating to the part of the itinerary located within Spain.

– These prices are expressed in euros. If the price is provided in another currency, it is converted into euros.

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

The degree of **representativeness** of the IPRIM is determined by the adaptation of this indicator to the current economic reality; thus, the variation rate calculated from the IPRIM will more closely approximate the evolution of the set of import prices, the more the elements selected for its measurement are adapted to the importers' behaviour patterns. To achieve this, the selected products that comprise the market basket of the IPRIM should be those with the highest import value within the corresponding branch, the establishments in the sample must have the highest purchase value on the foreign market, and the relative importance of each product in the market basket must respond to the import trends in the industry. The better the selection of these elements, the more representative the indicator will be.

Furthermore, the IPRIM is an indicator that only makes sense when comparisons are made over time; 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 of time). Therefore, the other quality that can be attributed to an IPRIM is the **comparability over time**, that is, the need for the elements that define the IPRIM to remain stable over time, except, logically, the prices collected every month. In this way, any variation in the IPRIM will be due only to changes in the prices of the selected products and not to any change in the methodological content of this indicator.

The applications of the IPRIM are numerous and of great importance in the economic and legal fields. Among them it is worth noting its use as a measure of price inflation in the import of industrial products.

3 Indicator scope

3.1 Time scope

3.1.1 BASE PERIOD

The base period or reference period of the index is the one in which the index equals 100. This is normally an annual period. In the new system, the arithmetic mean of the twelve monthly indices of the year 2021 published in base 2015 is equal to 100. This means that the year 2021 is the period to which the successive indices that will be published in the new base refer, and that is why it is called IPRIM base 2021.

3.1.2 REFERENCE PERIOD

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

With the calculation formula used for the IPRIM base 2021 (chained Laspeyres), the price reference period is the month of December of the year immediately preceding the year under consideration. Therefore, at the beginning of each year the reference period changes.

3.1.3 REFERENCE PERIOD OF THE WEIGHTINGS

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

For 2024, the calculation of the weightings was carried out on the basis of foreign trade data from the *Intrastat* statistical declarations and the *Single Administrative Document (SAD)*, both for branches and for products, referring to 2022.

In addition, in order to correct the mismatch between the reference period of the foreign trade data and the price reference period (December 2023), the weightings have been updated using information on price developments from the IPRIM.

Thus, the reference period of the weightings is December 2023, during the year 2024. And in subsequent years it will be the month of December preceding each year, as the weightings will be updated annually, using annual information from customs, the IPRIM and other available sources.

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

In addition, in every base change the weightings will be updated for all functional and geographical breakdown levels.

3.2 Population scope

The population of the index or reference stratum is the population group whose income structure serves as the basis for the selection of representative products and the calculation of their weights.

In the IPRIM base 2021, the reference stratum of the index includes all establishments that import industrial products.

3.3 Geographical scope

The geographical scope of the research is the entire national territory, with the exception of Ceuta and Melilla.

3.4 Scope of application

This is the set of industrial products that companies in the reference stratum buy on the foreign market.

Each branch of activity of the CNAE is represented by one or more products in the IPRIM, so that the evolution in the prices of these products represents that of all the elements comprising that branch of activity. This is called a *market basket of products*.

3.4.1 MARKET BASE OF PRODUCTS

It is the set of products selected in the IPRIM whose price evolution represents that of all those that comprise the branch of the CNAE to which they belong.

The selection of the products that make up the IPRIM market basket has been made on the basis of the IPRIM base 2015 and the foreign trade data for 2022. The criterion for determining which activities should be considered as part of the indicator is to include all activities that exceed a minimum threshold of the import value of the branch. Once the activities represented in the index had been selected, the products making up the market basket in base 2015 were revised, increasing, decreasing or maintaining those included in each activity, depending on its weighting, the number of products that comprise it and the variability in the prices of said products.

Thus, the market basket of the IPRIM base 2021 is made up of 2,065 products.

3.5 Functional breakdown of the indices

The IPRIM base 2021 is completely adapted to the international classification of economic activities CNAE 2009. The products of the basket are added in classes (4 digits CNAE), these in groups (3 digits CNAE), then in divisions (2 digits CNAE), and finally, the divisions in sections (1 digit CNAE).

The functional structure of the new IPRIM compared to that of the IPRIM base 2021 is the same at all levels: it consists of 3 sections and 27 divisions.

In addition, indices are calculated distinguishing by economic destination of the goods.

3.6 Geographical breakdown of the indices

Both the IPRIM base 2021 and its predecessors do not calculate indices geographically disaggregated at the level of Autonomous Community or province; only indices for the national total are calculated.

However, in calculating this indicator, the destination market for the sale of the products is factored in, distinguishing between the Eurozone and the rest of the world. In addition, with the publication of the IPRIM, base 2021, the indices will begin to be published with this breakdown.

The following table shows the breakdown for which data will be published monthly.

INDEX	Domestic	Markets
General	X	X
Large Industrial Sectors	X	X
Divisions	X	X

4 Sample design

As in most countries of the European Union (EU), the sample design of the prices involved in the calculation of the IPRIM is based on a cut-off sampling, consisting of ordering the items to be sampled in a decreasing order according to their values (in this case, the import value, both for activities and for products) and selecting for the sample those that exceed a minimum threshold established. It is, therefore, a non-probabilistic design, given the characteristics of the population under study.

In order to obtain significant indicators at all levels of functional disaggregation for which the IPRIM is published, the sample selection process has been structured into three main sections, each of which aims to select the different components of the sample. These are as follows:

– Selection of activities.

– Selection of products.

– Selection of establishments.

4.1 Selection of activities

The criteria used to define which activities will form part of the calculation of the IPRIM base 2021 are as follows: for the national total, it includes the classes (4 digits CNAE-09) that exceed 0.1% of total imports of the industry, and for the markets, the divisions (2 digits CNAE-09) that exceed 1.0% of total imports of the industry of each market (Euro-zone and rest of the world).

In total the IPRIM base 2021, covers 3 sections and 27 divisions.

4.2 Selection of products

The products that make up the IPRIM market basket, base 2021, are included according to their import value within the class to which they belong, until they cover 60% of it, for those that weigh more than 0.1%, and 40% for the rest.

The information to make the selection of products is obtained from foreign trade data (*Intrastat* and *SAD*), referring to the year 2022.

With these selection criteria in the IPRIM base 2021, the market basket is made up of 2,065 products.

4.3 Selection of establishments

For each of the products in the market basket, the establishments are selected in such a way as to guarantee that the estimation of the variation rates is significant at the maximum level of functional breakdown that is published.

The number of establishments surveyed for each product is determined on the basis of its weight, trying to cover at least 60% of the import value.

The information to make the selection of establishments is obtained from the foreign trade data.

4.4 Number of observations

The number of observations for each product is determined by the sub-variety reported by the establishments.

Each establishment is required to report information on the price of the sub-varieties (specific models of a product) they import most.

Thus, in the base 2015 there are approximately 18,000 prices of sub-varieties.

5 General calculation method

The formula used to calculate the IPRIX indices, base 2021, is the chained Laspeyres formula, which has already been used for the IPRIX, base 2010.

The general index corresponding to a moment in time *t* is mathematically expressed as follows:

$$ {}_0I^t_{LE} = \prod_{k=1}^{t} \frac{\sum_i p_i^k q_i^{k-1}}{\sum_i p_i^{k-1} q_i^{k-1}} $$

Where:

P_i^k and P_i^{k-1} is the price of product *i* at the time *k* and *k-1,* respectively

q_i^k is the quantity of the product *i* produced at the time *k-1.*

Similarly, it can be expressed as:

$$ {}_0I^t_{LE} = \prod_{k=1}^{t} \frac{\sum_i \frac{p_i^k}{p_i^{k-1}} p_i^{k-1} q_i^{k-1}}{\sum_i p_i^{k-1} q_i^{k-1}} = \prod_{k=1}^{t} \sum_i {}_{k-1}I_i^k W_i^{k-1} $$

where:

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

As can be seen, a chained index establishes the relationship between the current period (*t*) and the base period (*0*) on the basis of intermediate situations (*k*).

In the IPRIX, base 2021, the intermediate situations considered correspond to the months of December of each year. Thus, the index in base 2021 for the month *m* of the year *t*, is obtained as the product of indices in the following way:

$$ {}_{21}I_G^{mt} = {}_{21}I_G^{dic(t-1)} * \left(\frac{{}_{dic(t-1)}I_G^{mt}}{100} \right) = $$

$$ = {}_{21}I_G^{dic21} * \left(\frac{{}_{dic21}I_G^{dic22}}{100} \right) * \dots * \left(\frac{{}_{dic(t-2)}I_G^{dic(t-1)}}{100} \right) * \left(\frac{{}_{dic(t-1)}I_G^{mt}}{100} \right) $$

where:

${}_{21}I_G^{mt}$ is the general index, in base 2021, for the month *m* of the year *t*.

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

The main inconvenience of chained indices is the lack of additivity. For this reason, it is not possible to obtain the index of any aggregate in base 2021 as a weighted average of the indices in base 2021 of the aggregates that compose it. Thus, for example, the general index cannot be calculated as a weighted average of the indices of the four sections.

5.1 Elementary indices

An elementary aggregate is the component with the lowest level of aggregation for which indices are obtained, and in whose calculation no weightings are involved; the price indices of these aggregates are called elementary indices. In the IPRIX, an elementary index is calculated for each product in the market basket in each of the markets considered (Euro-zone and the rest of the world). Therefore, the elementary aggregate is the product-market.

The index of the elementary aggregate *i* is obtained as the quotient of the average price of that elementary aggregate in the current period and the average price in the reference period of the prices, that is, December of the previous year:

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

where:

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

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

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

At the same time, the average price of the aggregate i, in the period (*m,t*), $\overline{P}_i^{mt}$, is the simple geometric mean of the prices collected in that period:

$$\overline{P}_i^{mt} = \sqrt[n_i^{mt}]{\prod_{j=1}^{n_i^{mt}} P_{i,j}^{mt}}$$

where:

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

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

The geometric mean gives the same importance to the variations of all prices, regardless of their level.

5.2 Weightings

The weighting structure of the IPRIM base 2021, has as a fundamental source of information the foreign trade data from the *Intrastat* statistical declarations and the *Single Administrative Document (SAD)*.

From it, the weighting of each of the branches represented in the IPRIM is obtained, as a quotient of the import value of the products imported in said branch and the total import value of the industry. Before calculating the weights, the import value of the branches not represented is distributed among the branches of the upper aggregate.

Secondly, the weighting of the products is obtained by distributing the weighting of the branch among the products that make up the IPRIM market basket, in proportion to their import value.

The data used in the calculation of the weightings, used during the year 2024, are those corresponding to the year 2022.

In addition, in order to correct the mismatch between the weighting reference period and the price reference period (December 2023), the weightings are updated using information on price developments from the IPRIM. In this way, the reference period of the weightings, used during the year 2024 is December 2023.

As mentioned above, the weight or importance of the aggregates that make up this indicator is updated annually, which allows the indicator to be adapted to changes occurring in industrial activities.

The weighting of each branch represents the ratio between the import value of that branch and the total import value:

$$W_i = \frac{import\ figure\ of\ branch\ i}{total\ import\ figure}$$

The weight of each class is distributed among the products included in that activity according to the relation between the import value of that product and the import value of all the products included in the branch to which they belong:

$$W_{ij} = W_i * \frac{import\ value\ of\ product\ j}{total\ import\ value\ in\ branch\ i}$$

These weightings are different in each of the markets (the Euro-zone and the rest of the world) and the weightings of the different functional aggregates are obtained from them.

Thus, the weighting of the functional aggregate *A* is obtained as the sum of the weightings of the products that make up said aggregate:

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

The annual weightings updates, which will be carried out in the IPRIM base 2015, will be performed with the latest available annual information from foreign trade data.

5.3 Aggregate indices

As already mentioned above, the elementary indices refer to December of the immediately preceding 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.

Aggregate indices are calculated using weighted sums of the elementary indices. Thus, different functional aggregations can be obtained for a given market, or an aggregation of different markets for a given functional aggregate, as detailed below.

Functional aggregations within a market

In order to calculate the index referenced to the month of December of the year prior to the current year of any functional aggregation A (class, group, division, MIG, section, etc.), in a market *p*, the elementary indices of the products belonging to said aggregation shall be aggregated using their weightings in the IPRIX market basket in the following manner:

$$dic(t-1)I^{mt}_{A,p} = \frac{\sum_{i \in A} dic(t-1)I^{mt}_{ip} * dic(t-1)W_{ip}}{\sum_{i \in A} dic(t-1)W_{ip}}$$

where:

$dic(t-1)W_{ip}$ is the weighting of the product *i* in the market *p*, referring to *December (t-1)*, which comes into effect in January of the year *t*.

$dic(t-1)I^{mt}_{ip}$ is the index referenced to December *(t-1)* of the product in the market *p* in the month *m* of the year *t*.

Once the aggregate indices are calculated as detailed above, it is necessary to chain them. These indices are those which are finally disseminated and give continuity to the series published.

For any functional aggregation *A*, the index in base 2021 in the market *p* is calculated as follows:

$$_{21}I_{A,p}^{mt} = {}_{21}I_{A,p}^{dic(t-1)} * \left(\frac{dic(t-1)I_{A,p}^{mt}}{100}\right) = \frac{{}_{21}I_{A,p}^{dic\,(t-1)}}{100} * {}_{dic(t-1)}I_{A,p}^{mt} = C_{A,p}^{t} * {}_{dic(t-1)}I_{A,p}^{mt}$$

That is, each index calculated with reference to December *t-1* is multiplied by a coefficient, obtained as a quotient between the index in base 2015 of December *t-1* and 100. This coefficient is called the **chaining coefficient**.

Geographical aggregations of a functional aggregation

In the same way as in the previous case, the following calculation will be made to calculate the index for the national total of a given functional grouping *A*:

$$dic(t-1)I_{A}^{mt} = \frac{\sum_{\forall p} dic(t-1)I_{Ap}^{mt} * dic(t-1)W_{Ap}}{\sum_{\forall p} dic(t-1)W_{Ap}}$$

where:

$dic(t-1)W_{Ap}$ is the weighting of the functional grouping *A* in the market *p*, referring to *December (t-1)*, which comes into effect in January of the year *t*.

$dic(t-1)I_{Ap}^{mt}$ is the index of the functional aggregation *A* in the market *p* in the period *(m,t)*.

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

For any functional aggregation *A*, the chained index, in base 2021, in the month *m* of the year *t*, is:

$$_{21}I_{A}^{mt} = {}_{21}I_{A}^{dic(t-1)} * \left(\frac{dic(t-1)I_{A}^{mt}}{100}\right) = \frac{{}_{21}I_{A}^{dic(t-1)}}{100} * {}_{dic(t-1)}I_{A}^{mt} = C_{A}^{t} * {}_{dic(t-1)}I_{A}^{mt}$$

5.4 Calculation of variation rates

5.4.1 MONTHLY VARIATION RATES

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

$$V^{mt/(m-1)t} = \left(\frac{{}_{21}I^{mt}}{{}_{21}I^{(m-1)t}} - 1\right) * 100 = \left(\frac{{}_{dic(t-1)}I^{mt} * C^t}{{}_{dic(t-1)}I^{(m-1)t} * C^t} - 1\right) * 100 =$$
$$= \left(\frac{{}_{dic(t-1)}I^{mt}}{{}_{dic(t-1)}I^{(m-1)t}} - 1\right) * 100$$

where:

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

${}_{21}I^{mt}$ is the index, in base 2021, in the month *m* of the year *t*.

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

C^t is the chaining coefficient in year t.

In other words, the monthly variation rates can be calculated with the published indices, in base 2021, or with the unchained indices (referring to December of the previous year).

5.4.2ACCUMULATED VARIATION RATES

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

$$V^{mt/dic(t-1)} = \left(\frac{{}_{21}I^{mt}}{{}_{21}I^{dic(t-1)}} - 1\right) * 100 = \left(\frac{{}_{dic(t-1)}I^{mt} * C^t}{{}_{dic(t-1)}I^{dic(t-1)} * C^t} - 1\right) * 100 =$$
$$= \left(\frac{{}_{dic(t-1)}I^{mt}}{{}_{dic(t-1)}I^{dic(t-1)}} - 1\right) * 100 = \left(\frac{{}_{dic(t-1)}I^{mt}}{100} - 1\right) * 100$$

where:

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

${}_{21}I^{mt}$ is the index, in base 2021, in the month *m* of the year *t*.

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

C^t is the chaining coefficient in year t.

That is to say, the accumulated variation rates can be calculated with the published indices, in base 2021, or with the unchained indices (referring to December of the previous year). In the latter case, the index of December *t-1* referring to December *t-1* equal to 100, by definition.

5.4.3 ANNUAL VARIATION RATES

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 2021:

$$V^{\frac{mt}{m(t-1)}} = \left(\frac{{}_{21}I^{mt}}{{}_{21}I^{m(t-1)}} - 1 \right) * 100$$

where:

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

${}_{21}I^{mt}$ is the index, in base 2021, in the month *m* of the 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. The reason is that each of the two indices involved in the formula has been chained with different chaining coefficients (one referring to the year *t* and the other to *t-1*) so they are not reduced, as in the previous formulas:

$$V^{\frac{mt}{m(t-1)}} = \left(\frac{{}_{21}I^{mt}}{{}_{21}I^{m(t-1)}} - 1 \right) * 100 = \left(\frac{{}_{dic(t-1)}I^{mt} * C^{t}}{{}_{dic(t-2)}I^{m(t-1)} * C^{t-1}} - 1 \right) * 100$$

5.5 Calculation of contributions

5.5.1 MONTHLY CONTRIBUTIONS

The contribution of a monthly variation rate of a product or aggregate in the general index is defined as the part of the monthly variation of the general index that corresponds to said product or aggregate. Therefore, the sum of the monthly contributions of all the products in the IPRIX market basket is equal to the monthly variation rate of the general index.

In other words, the contribution that the monthly price variation of a product or aggregate has in the monthly variation of the general index is the variation that this index would have experienced if all the prices of the other products had remained stable that month.

The mathematical expression of the monthly contribution of a given product (or aggregate) *i*, in the 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 the year *(t-1)*, of the product *i*, in the month *m* of the year *t*.

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

$_{dic(t-1)}W_i$ is the weighting, referring to December of the year *(t-1)*, of the product *i*, as per unit.

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

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

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

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

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

Therefore, the monthly contribution of a given product *i*, is the multiplication of its monthly variation rate ($V_i^{m,t/(m-1)t}$) by its weight ($_{dic(t-1)}W_i$) and by the quotient between the product index and the general index of the previous month ($_{dic(t-1)}I_i^{(m-1)t} / {}_{dic(t-1)}I_G^{(m-1)t}$). Thus, a product in the sample will have a greater contribution to the variation rate of the general index the more its prices have changed, the higher its weight and the greater the value of its index in relation to the general index.

On the other hand, as previously mentioned, the sum of the monthly contributions of all the products comprising the IPRIX market basket is equal to the monthly variation of the general index. This is demonstrated as follows:

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

$$= \frac{\left(\sum_i {}_{dic(t-1)}I_i^{mt} \times {}_{dic(t-1)}W_i - \sum_i {}_{dic(t-1)}I_i^{(m-1)t} \times {}_{dic(t-1)}W_i\right)}{{}_{dic(t-1)}I_G^{(m-1)t}} \times 100 =$$

$$= \frac{{}_{dic(t-1)}I_G^{mt} - {}_{dic(t-1)}I_G^{(m-1)t}}{{}_{dic(t-1)}I_G^{(m-1)t}} \times 100 = V_G^{mt/(m-1)t}$$

5.5.2ACCUMULATED CONTRIBUTIONS

The contribution of the year-to-date variation (or accumulated variation) of a product or an aggregate to the general index represents the accumulated variation that the general index would have experienced if the rest of the products had not experienced any variation in prices so far this year. In other words, it is the part of the accumulated variation due to said product or aggregate.

The formula for the accumulated contribution of a given product (or aggregate) *i* in the month *m* of the year *t* is as follows:

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

$$= \frac{{}_{dic(t-1)}I_i^{mt} - 100}{100} \times {}_{dic(t-1)}W_i \times 100 = \left({}_{dic(t-1)}I_i^{mt} - 100\right) \times {}_{dic(t-1)}W_i$$

where:

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

${}_{dic(t-1)}W_i$ is the weighting, referring to December of the year *(t-1)*, of the product *i*, as per unit.

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

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

$$= V_i^{mt/dic(t-1)} \times {}_{dic(t-1)}W_i \times \frac{{}_{dic(t-1)}I_i^{dic(t-1)}}{{}_{dic(t-1)}I_G^{dic(t-1)}} =$$

$$= V_i^{mt/dic(t-1)} \times {}_{dic(t-1)}W_i \times \frac{100}{100} = V_i^{mt/dic(t-1)} \times {}_{dic(t-1)}W_i$$

In the case of accumulated contributions, it is also verified that their sum is equal to the accumulated variation rate, developing the same steps as in the previous section.

6 Collection of prices

The prices of the products included in the IPRIM market basket are collected from the different provincial delegations and the central services, through the completion of a monthly questionnaire by the establishment.

Since 2011, the INE has promoted the completion of questionnaires via the Internet, through the IRIA collection platform (Integration of Information Collection and Administration). The request of information is made, fundamentally, via the Internet and it is the respondents who choose the method of completion: either through the web or by using the traditional postal or e-mail channels.

For certain multi-located companies or companies that are part of corporations or groups, the INE manages the collection process from the central services. To this end, it has a special unit dedicated exclusively to the collection of questionnaires from this type of companies, which are informants in various surveys, including the IPRIM.

For sectors in which, in addition to the quantitative information required, it is necessary to establish a more personalised contact with companies in order to require certain qualitative information on their activity, which complements the information on prices; the collection is carried out from the unit promoting the survey itself.

The products whose prices are collected directly by the promoting unit are those in which there are few companies that market the product and this product has a significant weight in the index.

The collection of prices is done through a single questionnaire. The price reflected in the questionnaire, refers to the purchase price by the establishment on the 15th of the month. The same questionnaire is used to collect the prices of the Export Price Index (IPRIX), in case the reporting company also exports industrial products.

6.1 Organisation of fieldwork

Most of the information is collected by the staff assigned to the survey in the 9 INE provincial delegations responsible for industrial surveys. Each team consists of a group of interviewers, inspectors of interviewers, a survey inspector and, at the head of each delegation, a provincial delegate who has ultimate responsibility for collecting the information in his or her collection unit.

The technical responsibility corresponds to the survey inspector. He or she is responsible for organising and distributing the work, analysing the price series, planning the sending of questionnaires and data collection and, in general, solving problems that arise during the collection of prices. To this end, they are supported by the inspectors of the interviewers, who must check the suitability and representativeness of the products and establishments, advise them on the correct way to collect prices and monitor and inspect the work carried out by the interviewers in their charge.

Finally, the interviewer is responsible for sending and receiving the price questionnaires, monitoring the products to confirm that they are always the same and, if they are not, verifying that the sub-varieties proposed as substitutes are correct, as well as claiming this substitution if the company does not propose substitutes. He or she will also inform the inspector of the interviewers of any incidents that may arise.

7 Processing of information

7.1 Information reception

As mentioned above, the collection is carried out by means of a questionnaire in which the respondent of the establishment records the prices of the products requested and their corresponding incidences, if any. Once completed, the respondent sends the questionnaire to the INE delegations or their central services.

After an initial cleaning of the questionnaires received by the interviewer, the data are recorded.

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

The inspector of interviewers is responsible for checking the atypical prices before moving on to the next stage of the process. This system allows to detect any error in the collection of data and resolve the incident without much time from the time of collection of the information.

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

Once the previous stages have been completed, the monthly information is sent to the central services on the planned dates, so that the index can be compiled as soon as possible so that the indicator can be published on the established date.

At the central services, the data sent by the delegations and the prices collected in these services are processed together.

The total number of prices processed monthly, which is approximately 19,000, is analysed in the central services, requiring, when necessary, confirmation by the delegations on atypical variations. Once the prices have been cleaned and analysed, the indices and their corresponding rates of variation are obtained and published on a provisional basis 30 days after the reference month of the data. Final data are published 3 months after the first publication.

7.2 Cleaning of prices

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

In general, all variations of more than 100% or less than -50% are reviewed for all products and those within the range (-50%, 100%) that have a significant impact on the index.

In addition to that, the processing of the lack of price is also carried out, that is, the price of those products that were not available at the time of completing the questionnaire is estimated.

The method for estimating the lack of prices consists of applying the average variation of the rest of the prices collected for the same product in the other establishments of the sample, within the activity to which it belongs.

7.3 Quality changes

The accuracy with which the IPRIM estimates price changes depends, to a large extent, on the stability over time of the conditions initially established. This implies that the product selected for the sample should not change its technical and commercial characteristics.

However, this requirement for homogeneity is not always possible, as the market itself is characterised by product differentiation and segmentation of the market, and by technological development. These problems are most pronounced in certain industrial sectors, such as clothing or printing, and in products that have a long manufacturing period. In such cases, adjustments are needed to correct changes in the sample of products and to estimate the price variation without being disturbed by the change. These adjustments are known as adjustments due to a change in quality.

This problem can be solved, to some extent, by an appropriate selection of sub-varieties and, sometimes, by using average tariffs or prices, even if these do not correspond to real transactions. As a general rule, when a price variation occurs as a result of a change in specifications in a sub-variety, it is assumed that the variation is not due solely to a price variation, and if no additional information is available to calculate what part of the variation is due to the price variation and what part to the quality change, the price variation is estimated with the average variation of the rest of the prices of that product.

7.3.1 DEFINITION

As already indicated, an adjustment for quality change is necessary when one sub-variety, the price of which is part of the IPRIM calculation, is substituted for another. When this happens, it is necessary to determine what part of the price difference between the new sub-variety chosen and the one that disappears is due to the fact that the quality is different between both.

Substitutions of sub-varieties may be due to several reasons:

– the establishment ceases to import the sub-variety;

– the sub-variety is no longer representative in the establishment;

– the establishment where the price of the sub-variety is recorded is no longer representative, closes or changes its economic activity.

The sub-varieties that comprise the market basket remain fixed over time as they define the most representative imported variety, but must be replaced when they are no longer imported or are no longer the most frequently imported in the establishment.

When the sub-variety that disappears and the new one coexist in time, it is possible to establish a relationship between both, and the quality adjustment is almost automatic. However, there is not always an overlap period between the products, nor is there an identity between a model and the one that replaces 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.

7.3.2 QUALITY ADJUSTMENT METHODS

The quality adjustment methods that are the most habitually used in the IPRIM base 2021 are the following:

a) Total quality adjustment.

   It starts from the assumption that the difference between the price of the substituted product and the substitute product is entirely due to the difference in quality between the two or that the products are so different that they cannot be compared. It is therefore considered that the difference in prices between the two products is due only to the different quality of the products, so that the index will not reflect price variations. With this adjustment it is assumed that if the substituted product continued to be imported, its price would not have changed.

b) Adjustment due to identical quality.

   It is assumed that the substitute product is of the same quality as the substituted product, i.e. that the price difference between the two is due to a real price change. With this adjustment, it is assumed that had the substituted product continued to be imported, its price would have been the same as that of the substitute product.

c) Other adjustments.

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

   - Imputation prices.

     It is imputed the variation of the average price of a larger aggregate to which the product belongs.

   - Information provided by experts:

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

   - Overlap prices:

     The value of the quality difference between the substituted and the substitute product is the price difference between them in the overlap period, i.e. in the period in which both products have been imported.

In most cases, the method used to make the quality adjustments in the IPRIM is that of imputation prices.

8 Chained series

For the new IPRIM base 2021, as it is a chained index, it has not been necessary to calculate any chain coefficient, since the chaining calculation method allows changes to be made in weightings, sample and methodology each December and to chain the indices obtained with the new calculations, with the series that had been published calculated with the old sample, weightings and methodology.

Thus, in the IPRIM base 2021, only the reference period of the indices or base period has been changed, which went from being the year 2015 to the year 2021. For this purpose, a re-scale coefficient has been calculated, which has converted the indices published in base 2015, from January 2006 to December 2023, into indices in base 2021.

This coefficient is the one which makes that the simple arithmetic mean of published indices in 2021, in base 2015, is equal to 100:

$$\left(\frac{1}{12} * \sum_{m=january}^{december} {}_{10}I^{m21}\right) * C_{re-scale} = 100 \rightarrow$$

$$\rightarrow C_{re-scale} = \frac{100}{\left(\frac{1}{12} * \sum_{m=january}^{december} {}_{10}I^{m21}\right)}$$

By multiplying the series published in base 2015 by this re-scale coefficient, we obtain a series of indices in base 2021, which preserves the variation rates published, and with which the new indices in base 2021 have been chained, calculated as of January 2024.

In this way, the INE has given continuity to all the series that have been published until now.

Annex I. Calculation of aggregated indices

With the calculation formula of the IPRIM base 2021 (chained Laspeyres), the indices referring to *December of the year (t-1)* start from a value equal to 100 in December of that year. As it is necessary to give continuity to the published IPRIM series, the indices referring to December must be chained to obtain other indices that give continuity to those already published in previous periods.

Thus, the chained index (the one to be published) in the month *m* of the year *t*, in base 2021, is obtained by multiplying the index of *December (t-1)*, in base 2021, by the index of the month *m* of the year *t* referred to *December (t-1)*, divided by 100:

$$_{21}I^{mt} = {}_{21}I^{dic(t-1)} * \left(\frac{{}_{dic(t-1)}I^{mt}}{100} \right)$$

Chained indices are not additives, that is, from published indices it is not possible to calculate the indices of functional aggregations or by market. These aggregations are calculated using the indices referring to December of the previous year (the unchained ones), which are additives.

The following describes the steps to follow to obtain the index in base 2021 of an aggregate *A*, from the indices published, in base 20p21, of its components *A1* and *A2*:

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

$$_{dic(t-1)}I_i^{mt} = \left(\frac{{}_{21}I_i^{mt}}{{}_{21}I_i^{dic(t-1)}} \right) * 100 \quad i = A1 \; y \; A2$$

2. The indices obtained in the previous step are aggregated using the weights in effect in the reference period of the index *(m,t)*. With this, the index of the aggregate *A*, is obtained, referred 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 2021 of aggregate *A* is calculated as the product of the index published in December of the previous year, by the quotient of the aggregate index obtained in step 2 and 100:

$$_{21}I_A^{mt} = {}_{21}I_A^{dic(t-1)} * \left(\frac{{}_{dic(t-1)}I_A^{mt}}{100} \right)$$