

# Measuring the impact of inflation on specific sub-populations: some preliminary results

*La Misurazione dell'Impatto dell'Inflazione su Specifiche Sottopopolazioni: Alcuni Risultati Preliminari*

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**Riassunto:** la costruzione di indicatori dell'impatto dell'inflazione su particolari sottopopolazioni richiederebbe la conduzione di indagini specifiche sulle caratteristiche dei comportamenti di consumo delle famiglie (beni e servizi acquistati, spese sostenute, tipologie di esercizi commerciali frequentati). Al momento, in Italia, si è in grado di misurare adeguatamente solo la composizione della spesa per diverse tipologie familiari attraverso l'indagine Istat sui consumi delle famiglie. In questo lavoro sono esaminate le problematiche relative alla selezione di sottopopolazioni di interesse e alla determinazione delle strutture di ponderazione necessarie per il calcolo degli indicatori specifici; si presentano, infine, alcune evidenze empiriche sull'andamento, nel quinquennio 2001-2005, degli indici dei prezzi al consumo per varie tipologie familiari.

**Keywords:** Consumer Price Index, expenditure weights.

## 1. Introduction

Recently, the measurement of the price dynamics in Italy has been at the centre of a lively debate regarding its effects on various types of households.

Inflation, as commonly measured by a Laspeyres-type Consumer Price Index (CPI), might have a different impact on the households because of differences in: a) the goods and services consumed; b) the prices at which the very same specific products are bought, largely as a consequence of the different points of purchase.

Measuring the impact of inflation on a specific sub-population would require *ad hoc* surveys on the characteristics of the consumer behaviour (Biggeri and Leoni, 2003).

At present in Italy, the only possible exercise with the available data is to construct specific CPIs by using different weighting systems derived from the current Household Expenditure Survey (HES) conducted by Istat (Istat, 2005); differences in the level of these re-calculated indices for various sub-populations can be traced back only to the different consumption structures at a certain level of classification of the specific products (*i.e.* the elementary aggregates of the Italian CPI basket). As explained in Giraldo and Trivellato (2004), it is unclear *a priori* the effect of this simplifying assumption on the estimate of the “true” unobserved differential impact of inflation.

The aim of this paper is to discuss issues concerning the selection of reference sub-populations – *e.g.* tenant or low-consumption households – (section 2) and the estimation of specific weighting systems (section 3). Finally, some results related to experimental CPIs computed for different sub-populations over the period from January 2001 to December 2005 are presented (section 4).

## 2. Selecting sub-populations

In the CPI the weights are meant to reflect the relative importance of the elementary aggregates in the total consumption expenditure of the reference population; in Italy, the weights are mainly derived from the National Accounts (NAs) estimates for households' final consumption expenditures. The only available source for calculating weights specific to particular sub-sectors of the whole population is the HES, since the NAs do not enable to distinguish spending carried out by various types of households. In order to select reference sub-populations of interest, it is advisable to perform a preliminary analysis of the variability of the consumption expenditure structures. On the other hand, reference sub-populations can be defined *a priori* to meet specific users' requirements (e.g. monitoring the households of pensioners). A preliminary cluster analysis on the HES expenditure data reveals that most of the variability of the households' spending structures is accounted for by differences in the level of either consumption expenditure or equivalent consumption expenditure<sup>1</sup>; another important explaining factor is the housing tenure (further details can be found in Nuccitelli, 2004). Table 1 shows some household characteristics<sup>2</sup> for various selected overlapping sub-populations<sup>3</sup>.

**Table 1:** Household characteristics by sub-population (HES data – year 2004)

| sub-population | households in the sample            | households in the universe | average monthly consumption expenditure per household (in euro) | average monthly equivalent consumption expenditure per household (in euro)            | average number of member per household | average number of income receivers per household |
|----------------|-------------------------------------|----------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------|
| 1              | 4,398                               | 4,240,870                  | 1,784.05                                                        | 1,045.28                                                                              | 2.39                                   | 1.37                                             |
| 2              | 8,097                               | 7,609,758                  | 1,190.82                                                        | 852.65                                                                                | 1.64                                   | 1.30                                             |
| 3              | 1,202                               | 1,166,387                  | 1,183.57                                                        | 892.22                                                                                | 1.58                                   | 1.19                                             |
| 4              | 5,648                               | 6,011,588                  | 1,084.06                                                        | 1,084.06                                                                              | 1.00                                   | 0.98                                             |
| 5              | 3,494                               | 3,676,403                  | 871.05                                                          | 871.05                                                                                | 1.00                                   | 0.98                                             |
| 6              | 5,147                               | 4,562,777                  | 687.11                                                          | 354.67                                                                                | 2.56                                   | 1.42                                             |
| 7              | 2,494                               | 2,260,841                  | 489.76                                                          | 342.38                                                                                | 1.67                                   | 1.28                                             |
| 8              | 2,451                               | 2,430,114                  | 822.85                                                          | 721.17                                                                                | 1.23                                   | 1.15                                             |
| 9              | 8,000                               | 7,630,454                  | 2,030.17                                                        | 1,027.75                                                                              | 2.91                                   | 1.56                                             |
| 10             | 11,395                              | 10,419,522                 | 2,089.98                                                        | 1,038.91                                                                              | 2.95                                   | 1.69                                             |
| all households | 24,853                              | 22,813,190                 | 1,825.97                                                        | 988.87                                                                                | 2.52                                   | 1.56                                             |
| 1              | tenant households                   |                            | 6                                                               | households with equivalent consumption expenditure $\leq 2^{nd}$ decile               |                                        |                                                  |
| 2              | households of pensioners            |                            | 7                                                               | households of pensioners with equivalent consumption expenditure $\leq 2^{nd}$ decile |                                        |                                                  |
| 3              | tenant households of pensioners     |                            | 8                                                               | households of pensioners aged 75 or older                                             |                                        |                                                  |
| 4              | one-member households               |                            | 9                                                               | households with a worker or a clerk as reference person <sup>4</sup>                  |                                        |                                                  |
| 5              | one-member households of pensioners |                            | 10                                                              | households of employees                                                               |                                        |                                                  |

## 3. Determining the weighting structure for a specific sub-population

To derive the weighting structure for a specific sub-population, the Consumer Price

1) The *equivalent consumption expenditure* is obtained by dividing the consumption expenditure of each household by a coefficient depending on the number of members in the household.

2) with reference to the coverage of the HICP - Harmonized Index of Consumer Prices - (Eurostat, 2001).

3) As the HES is a sample survey, the expenditure estimates are bound to be subject to sampling errors which may be relatively large for too small sub-populations; so, each grouping of households proposed in table 1 is selected in such a way as to include at least a thousand sampled households.

4) *i.e.* the person to whom the relationship of other people in the household is recorded.

Survey and the HES are exploited at the most detailed level of classification allowed by their combined utilization. Preliminary, some harmonization between the two data sets is required, as the HES includes payments that are outside the scope of the HICP (*e.g.* payments related to life insurance, games of chance, owner-occupier's imputed rents, holidays abroad, etc.). These expenditures are excluded from the total used to calculate the expenditure shares that serve as the basis for estimating the HICP weights. Next, since the HES uses a classification for types of expenditure not consistent with the COICOP<sup>5</sup>, it is necessary to establish a mapping between the 249 HES expenditure items (after harmonization) and the representative products of the used HICP baskets. Table 2 allows to compare, at the division level of the COICOP, the official HICP weights (based on the NAs estimates) with the weights derived from the HES data. Some observable discrepancies between weights can be traced back partly to differences in the reference population and in the method of measuring certain consumption expenditures<sup>6</sup>. Table 3 gives the weighting structures, at the division level, for the sub-populations proposed in table 1. Clearly, we cannot properly compare the household-specific weights with the official HICP weights, whereas sensible comparisons can be made with the weights reported in the last row of table 2. In comparison with the whole HES reference population, the sub-populations from *I* to *8* show lower weights for the divisions *III*, *VII*, *IX*, *X*, *XI*, *XII*, while the proportion of expenditure for necessities – largely included in the divisions *I* and *IV* – is higher (with the exception of the *tenant households* allocating a lower share of their budget to food). Expenditures for *Health* are relatively more important for the oldest segment of population.

**Table 2:** *Weighting structure for the 2005 HICP at the division level of the COICOP by data source (percentage composition)*

| data       | division                                                          |           |            |           |          |           |            |             |             |                                  |           |            | total  |
|------------|-------------------------------------------------------------------|-----------|------------|-----------|----------|-----------|------------|-------------|-------------|----------------------------------|-----------|------------|--------|
|            | <i>I</i>                                                          | <i>II</i> | <i>III</i> | <i>IV</i> | <i>V</i> | <i>VI</i> | <i>VII</i> | <i>VIII</i> | <i>IX</i>   | <i>X</i>                         | <i>XI</i> | <i>XII</i> |        |
| NAs        | 16.55                                                             | 3.00      | 10.63      | 9.71      | 10.55    | 3.86      | 14.09      | 3.20        | 7.35        | 1.11                             | 11.30     | 8.66       | 100.00 |
| HES        | 23.55                                                             | 2.15      | 8.89       | 12.90     | 7.24     | 4.90      | 14.02      | 2.69        | 6.66        | 1.08                             | 5.68      | 10.23      | 100.00 |
| <i>I</i>   | Food and non-alcoholic beverages                                  |           |            |           |          |           |            |             | <i>VII</i>  | Transport                        |           |            |        |
| <i>II</i>  | Alcoholic beverages, tobacco                                      |           |            |           |          |           |            |             | <i>VIII</i> | Communication                    |           |            |        |
| <i>III</i> | Clothing and footwear                                             |           |            |           |          |           |            |             | <i>IX</i>   | Recreation and culture           |           |            |        |
| <i>IV</i>  | Housing, water, electricity, gas and other fuels                  |           |            |           |          |           |            |             | <i>X</i>    | Education                        |           |            |        |
| <i>V</i>   | Furnishing, household equipment, routine maintenance of the house |           |            |           |          |           |            |             | <i>XI</i>   | Restaurants and hotels           |           |            |        |
| <i>VI</i>  | Health                                                            |           |            |           |          |           |            |             | <i>XII</i>  | Miscellaneous goods and services |           |            |        |

**Table 3:** *Weighting structure derived from the HES data for the 2005 HICP at the division level of the COICOP by sub-population (percentage composition)*

| sub-population | division |           |            |           |          |           |            |             |           |          |           |            | total  |
|----------------|----------|-----------|------------|-----------|----------|-----------|------------|-------------|-----------|----------|-----------|------------|--------|
|                | <i>I</i> | <i>II</i> | <i>III</i> | <i>IV</i> | <i>V</i> | <i>VI</i> | <i>VII</i> | <i>VIII</i> | <i>IX</i> | <i>X</i> | <i>XI</i> | <i>XII</i> |        |
| <i>1</i>       | 22.02    | 2.53      | 7.01       | 25.02     | 5.50     | 3.74      | 12.39      | 2.46        | 5.21      | 0.73     | 4.94      | 8.47       | 100.00 |
| <i>2</i>       | 29.32    | 2.05      | 6.49       | 16.46     | 7.11     | 7.29      | 9.80       | 2.91        | 5.62      | 0.37     | 3.22      | 9.35       | 100.00 |
| <i>3</i>       | 26.97    | 2.45      | 4.80       | 31.49     | 4.96     | 5.78      | 7.43       | 2.69        | 4.16      | 0.22     | 2.23      | 6.82       | 100.00 |
| <i>4</i>       | 24.38    | 2.14      | 7.56       | 18.66     | 7.26     | 5.06      | 10.23      | 3.02        | 6.17      | 0.41     | 5.61      | 9.49       | 100.00 |
| <i>5</i>       | 30.24    | 1.63      | 6.18       | 20.28     | 7.64     | 7.44      | 5.95       | 3.26        | 5.42      | 0.04     | 2.72      | 9.20       | 100.00 |
| <i>6</i>       | 37.56    | 2.68      | 5.57       | 17.74     | 3.41     | 3.51      | 9.63       | 4.04        | 3.75      | 0.22     | 2.13      | 9.77       | 100.00 |
| <i>7</i>       | 42.40    | 2.21      | 3.85       | 20.52     | 3.71     | 5.40      | 5.60       | 4.49        | 3.22      | 0.07     | 1.25      | 7.28       | 100.00 |
| <i>8</i>       | 32.91    | 1.61      | 4.97       | 20.60     | 6.98     | 8.98      | 4.27       | 3.24        | 4.78      | 0.02     | 2.27      | 9.36       | 100.00 |
| <i>9</i>       | 22.47    | 2.24      | 9.36       | 12.15     | 7.09     | 4.09      | 15.70      | 2.58        | 6.93      | 1.19     | 6.15      | 10.04      | 100.00 |
| <i>10</i>      | 22.28    | 2.22      | 9.30       | 12.08     | 7.25     | 4.23      | 15.44      | 2.59        | 7.01      | 1.29     | 6.20      | 10.13      | 100.00 |

5) Classification Of Individual Consumption for Purpose.

6) For further details on inconsistencies between the HES and NAs estimates see Istat (2000).

#### 4. Some results related to the HICPs

Table 4 presents some results related to the experimental HICPs computed for the sub-populations in table 1 over the period from January 2001 to December 2005. At the end of the five-year period, the HICPs (column 2) ranged from a low of 111.97 (experienced by the *households of pensioners aged 75 or older*) to a high of 112.83 (experienced by the *tenant households*). The percentage variations in columns 4-7 indicate that the sub-populations that faced a higher price increase in one or two years did not experience a higher increase also in the other years. That is, there was not much household-specific persistence in price increase disparities.

**Table 4:** *HICP at December 2005 and percentage variations between annual average values of the HICP by sub-population (reference period: December 2000=100)*

| sub-population    | HICP<br>(December 2005) | percentage variations                         |                                               |                                               |                                               |                                               |
|-------------------|-------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
|                   |                         | 2005 average<br>HICP/<br>2001 average<br>HICP | 2002 average<br>HICP/<br>2001 average<br>HICP | 2003 average<br>HICP/<br>2002 average<br>HICP | 2004 average<br>HICP/<br>2003 average<br>HICP | 2005 average<br>HICP/<br>2004 average<br>HICP |
|                   |                         |                                               |                                               |                                               |                                               |                                               |
| 1                 | 112.83                  | 10.26                                         | 2.21                                          | 2.80                                          | 2.54                                          | 2.34                                          |
| 2                 | 112.50                  | 10.02                                         | 2.25                                          | 2.87                                          | 2.38                                          | 2.16                                          |
| 3                 | 112.52                  | 10.06                                         | 2.28                                          | 2.95                                          | 2.43                                          | 2.04                                          |
| 4                 | 112.72                  | 10.18                                         | 2.22                                          | 2.83                                          | 2.43                                          | 2.34                                          |
| 5                 | 112.32                  | 9.88                                          | 2.23                                          | 2.93                                          | 2.29                                          | 2.08                                          |
| 6                 | 112.67                  | 9.84                                          | 2.20                                          | 2.94                                          | 2.19                                          | 2.17                                          |
| 7                 | 112.00                  | 9.37                                          | 2.16                                          | 2.97                                          | 2.04                                          | 1.89                                          |
| 8                 | 111.97                  | 9.73                                          | 2.23                                          | 2.93                                          | 2.30                                          | 1.94                                          |
| 9                 | 112.76                  | 10.12                                         | 2.21                                          | 2.70                                          | 2.46                                          | 2.39                                          |
| 10                | 112.77                  | 10.11                                         | 2.21                                          | 2.71                                          | 2.44                                          | 2.39                                          |
| all<br>households | 112.78                  | 10.14                                         | 2.24                                          | 2.74                                          | 2.43                                          | 2.36                                          |

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