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RETROPOLATING ITALIAN ANNUAL NATIONAL ACCOUNTS DATA ACCORDING TO ESA95

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Summary

The general revision of National Accounts according to ESA95 has involved the work of the Department of National Accounts and Economic Analysis of ISTAT during the years 1995-98. This paper summarises the main guidelines followed by ISTAT in the retrapolation of National Accounts data backwards to 1988. For the current revision, 1992 was assumed as the benchmark year. The key factors influencing the revision have been: a) the acquisition of the results from general census and from surveys on households and enterprises; b) the implementation of new and more accurate estimation methods; c) the application of the new ESA95 standards. The methodology adopted in estimating the new ESA95 accounts allows to distinguish the effects caused by the adoption of the new standards from those due to the revision of sources and estimation methods. The approach followed to reconstruct national accounts is different for the years after 1991 and before 1992. For the more recent years, the benchmark year methodology was used. For the previous years, reference indicators were widely used. These indicators result from the development of National Accounts series, constructed in accordance with ESA79, at the highest detailed level. Further remarkable information is provided by the level of 1982 (previous benchmark year) estimates.

1. Introduction¹

1. The previous general revision of National Accounts had been completed in 1987². A number of meaningful and remarkable quantitative changes were introduced at that time, mainly due to the inclusion of hidden economy estimates (Istat (1990,1993))³. Following the same approach of the 1987 revision, 1992 was assumed as the benchmark year for the 1998 revision. The current revision mainly aimed at the following goals⁴:

¹ The revision has been carried on by all the staff of the Department of National Accounts and Economic Analysis of Istat. This paper summarises the guidelines followed in the reconstruction of the series. Section 2 has been written by Stefano Pisani, section 3 by Federico Di Leo, section 4 by Ludovico Bracci. We gratefully acknowledge the collaboration of Paolo Dolfi for the elaboration on the revision process of GDP.

² See Rey (1988).

³ The 1987 revision was followed by later, less extensive revisions. See, e.g., Pisani, Savio (1994) and Istat (1997) for an analysis of these revisions.

⁴ A description of sources and methods used for the 1992 benchmark could be found in Picozzi (1998), Malizia (1998) and Calzaroni (1998).

- (1) the acquisition, for the benchmark year, of the results from general census and from surveys on households and enterprises;
 - (2) the implementation of estimation methods and the adoption in Italian National Accounts of the results carried out within the harmonisation process of GNP;
 - (3) the application of the new ESA95;
 - (4) the adoption of the 1995 base for figures at constant prices.
2. The methodology adopted in estimating the new ESA95 accounts has allowed to distinguish the effects caused by the adoption of the new standards (3rd item) from those due to the revision of sources and estimation methods (1st and 2nd item respectively)⁵. Therefore, it was possible to reconstruct a new GDP in accordance with ESA79 definitions, which could be compared with the previously disseminated series⁶.
 3. The limited revision due to items 1st and 2nd supports the correctness of the method followed to update to 1992 the 1982 national accounts figure. On the whole, it can be assumed that the dynamic of National Accounts series, constructed in accordance with ESA79, could be a reliable indicator to reconstruct the system of accounts for the years up to the benchmark year.
 4. Therefore, the different general approaches underlying methodologies adopted to construct national accounts after 1991 and before 1992 should be clear. In this paper we focus our attention on the backward calculation to 1998. For this period reference indicators were widely used. These indicators result from the rate of growth of National Accounts series, constructed in accordance with ESA79. Further remarkable information is provided by the level of 1982 estimates. In fact, 1982 estimates are highly reliable for many aggregates, since they include the whole information set used to implement the previous National Accounts benchmark (Istat (1990))⁷.
 5. Thus, the reconstruction of series can be divided into the following steps: a) reconstruction of a set of initial estimates of yearly National Accounts series at current prices, in accordance with ESA79; b) balancing the initial supply and demand estimates within an input – output table; c) estimate of ESA95 typical aggregates at current prices, and construction by addition of demand and supply side time series in accordance with ESA95; d) deflation of yearly aggregates at current prices using a 1995 based price system.
 6. Section 2 explains the procedure used to estimate supply aggregates and the balancing methodology. Section 3 deals with households consumption estimates. Sections 4 describes the procedures used to estimate the gross fixed capital formation. We conclude by reporting the main conclusions.

2. Supply side estimates and the balancing methodology

2.1. The preliminary supply side estimates

7. Reconstruction was based on the series defined in accordance with ESA79. Two aggregates were considered: output and value added. Firstly, the ESA79 – ESA95 differences were calculated for

⁵ This approach is compliant with European Union directives. See EU (1997).

⁶ See Dalgaard et al. (1997).

⁷ For a general point of view, the proposed method could be classified as “benchmark years and interpolation”. See Bakker and Rooijen (1997).

each economic branch of activity included in the National Accounts, for the year 1992⁸. Then subtracting these differences from the ESA95 national accounts figures we have obtained, for the year 1992, a set of national accounts figures that we can define as ESA79 exhaustive version. Later, the data relating to each branch of activity have been disaggregated into the following 5 types of producer: market enterprises; public market producer; public other non-market producer; market non-profit institutions serving households (NPISH); non-market NPISH⁹.

8. In the reconstruction 1988-1991 we have followed two different approaches. On the one hand the data relating to the public sector (production, value added, VAT, other taxes, etc.) has been estimated using a methodology analogous to that of the benchmark year. On the other hand, the previous national accounts series (PNAS) has been used as an indicator in order to reconstruct the output and the value added of the market sector. For this purpose, it was necessary to find an aggregation level which could reduce the problem owing to the change in the classification of economic activities¹⁰. An aggregation based on 31 sectors defined by 1 – 2 capital letters of the Nace Rev. 1 was selected¹¹.
9. In the first step we have estimated a new time series for the period 1982-92 (NESA79), applying to the 1992 ESA79 exhaustive data of the rate of growth 1982-92 of PNAS. For a significant sub-set of economic activity sectors, in 1982, PNAS estimates were as accurate as new benchmarks estimates (1992)¹², and then for these branches the 1982 PNAS data have been assumed as a benchmark for the reconstructed time series¹³. In order to realise this, we have calculated the difference between NESA79 and PNAS, in 1982. Then we have split this amount over the period 1983-91, obtaining a new time series (NESA791)¹⁴. For the other branches we do not assume any benchmark value and then NESA791 is equal to NESA79.
10. The construction sector is a remarkable example for the applied methodology. It was further divided into 5 sub-sectors as: new residential and non-residential constructions; new civil engineering works; ordinary and extraordinary maintenance of residential constructions; ordinary and extraordinary maintenance of non-residential constructions; other. We assume 1982 PNAS data as a benchmark for the sectors: new residential and non-residential constructions, ordinary and extraordinary maintenance of residential constructions. Because there are any methodological differences between the 1982 and the 1992 benchmark estimates. The other items are in a different

⁸ See EU (1997). In the Italian case, the differences consist mainly of the following: insurance, computer software and large data bases, government licences and fees, valuation of output for own final use and output from voluntary activity, market non-market criteria, entertainment, literary and artistic originals, services associated with the license to use entertainment, literary and artistic originals, minor repair activity by owner-occupiers, car registration taxes paid by households, wages and salary in kind.

⁹ See Eurostat (1996, par. 2.20).

¹⁰ Introducing ESA95 the Italian National Accounts has adopted the Nace Rev. 1 classification, and the previous ATECO81 was left.

¹¹ Whenever possible, a more detailed level of disaggregation was sought

¹² To identify this sub-set two problems were considered: quality of data (in terms of differences in data sources and calculation methodology between 1992 and 1982 estimates) and classification (branches for which previous – new classification matching does not result from aggregate sum).

¹³ Such branches are identified by the following codes: CB, DA, DB, DC, DE, DG, DH, DI, DJ, DM, P.

¹⁴ In formal term, given $NESA791_{82}=PNAS_{82}$, the NESA791 time series (1983-92) has been obtained using the following formula:

$$NESA791_t = NESA791_{t-1} \cdot (NESA79_t / NESA79_{t-1}) \cdot (NESA79_{92} / PNAS_{92})^{(1/10)}$$

condition, in fact the database was improved and estimate procedures were more accurate in 1992¹⁵, and so we have not assumed any benchmark value for NESA791 time series.

2.2. *The final results at current and constant prices*

11. The procedures showed in par. 2.1 and in chapters 3 and 4 enabled the reconstruction of aggregates which are the framework of an input-output table. In order to apply the balancing procedure, a preliminary estimate was required for intermediate cost flows among economic activity sectors. Owing to the complexity arising from innovations, namely the application of ESA95 and the change in classification, balancing was made only for one year (1988), and classification was limited to 10 economic activity sectors¹⁶: Using this reduced disaggregation remarkably simplifies the construction of the table of intermediate consumption and the creation of additional matrices required for balancing.
12. The values for each cell of the 1988 intermediate consumption table was estimated in the following way: 1) the 1992 table was aggregated from 101 to 10 branches; 2) the effect of ESA95 innovation was not considered in the result (re-investment, cheap tools, purchased software, social benefits, insurance additional premiums, etc.). Thus an intermediate 1992 table ESA79 version was obtained; 3) each cell of the 1992 intermediate table was retroplated to 1988 using a value index resulting from output + import - export¹⁷; 4) we corrected each cell of the 1988 intermediate consumption table on the basis of the total of intermediate consumption by branch calculated following the methodology showed in par. 2.1.
13. The input-output table was then balanced with the algorithm usually adopted by National Accounts¹⁸. In this way we modified both the demand and supply side preliminary estimates. In particular, for the supply side estimates we used NESA791 in order to explode the 10 branches figures resulting from the input-output table to 30 branches. Finally, given the two benchmarks 1988 and 1992, we have used the constrained dynamics of NESA791 to calculate the years 1989-91 (NESA792).
14. In the last step we have transformed NESA792 into the ESA95 version. In order to do this we have estimated each difference between ESA79 and ESA95 for the total economy¹⁹, and the obtained results was added both to the supply and demand side estimates. Then, using specific indicators, we have split these differences among the 30 branches of the time series.
15. Finally we have calculated the constant price time series by deflating current year values using two different set of prices for output and intermediate consumption, with 1995 fixed base year. Analogously to the current prices methodology, in order to obtain the input and the output prices we have used the previous deflators as indicators. Then the value added is obtained by the difference between output and intermediate consumption at constant price.

¹⁵ See Di Palma (1998), Nusperli (1998).

¹⁶ The sectors are: 1. agriculture, forestry and fishing; 2. energy; 3. manufacturing; 4. construction; 5. financial intermediation and services to enterprises; 6 banking and insurance; 7 trade and repair; 8 hotels; 9 transport and communication; 10 public administration, social services and other .

¹⁷ A different procedure was used for sector 1, concerning gross selling output and the other output. For sector 6, the imputed output of bank services was considered differently from the other bank output.

¹⁸ See Stone (1988).

¹⁹ See note to the par. 2.1.

2.3. *Main results*

16. The mean percentage error between ESA95 and ESA79 GDP at current prices, calculated on the period 1988-97, is equal to 0.9%. The upward revision of GDP is due to the adoption of the new concept and definition. In fact, if we reconstruct the new GDP in accordance with ESA79 definition (GDP exhaustive), we find that the new estimates are 0.6% lower than previously²⁰. In other words, GDP increased by 1.5% owing to the adoption of ESA95.
17. The overall difference between ESA95 and ESA79 estimates has been decomposed by sector of economic activities. Table 1 shows an increasing relevance in the industrial sector (the mean percentage error is greater than 0) and a downward revision for agriculture and service. These results are conditioned by the adoption of the new classification of economic activities (NACE Rev.1) that have caused a migration of activities among the different branches. Concerning the evolution of the time series at current prices, table 2 shows that the new series are more dynamic than the previous series. In this case the mean error is equal to 0.1, and as the mean absolute error is higher (0.2%) the profile also changes.
18. The analysis at constant prices reflects the results at current prices (tables 3, 4). The new GDP level is higher than the previous level (0.6%) and it is more dynamic than the period 1988-97 (0.1%). The revision of implicit prices has been particularly relevant in the Energy sector: the positive revision of the growth rate at current prices (0.5%) became negative at constant prices (-0.8%). The other industrial sector shows a higher dynamic, while the service sector does not show any systematic revision.

3. *Initial estimates of final consumption*

19. For the 1992 benchmark, the “commodity-flow” method (or balance of products, hereinafter MdD) were made on all the products. The results were later integrated with other available sources on the expenditure side. Basic methodology does not consistently differ from the previous benchmark year methodology, though there are meaningful differences in the use of sources and in their harmonisation²¹.
20. With reference to services supplied to households, new estimates were constructed for expenses in hotels, cafes and restaurants, for dwelling maintenance and for education. New statistical sources were used: the survey on tourism, on dwelling maintenance, as well as the multi-purpose survey²².

3.1. *The observation field for the reconstruction*

21. On the occasion of the 1992 ESA95 benchmark a Consumption Matrix was produced (hereinafter CM) which took into account both the purposes of expenditure and the economic branches from

²⁰ This is a particularity of Italian case in the EU. In all the other member states, the correction for exhaustiveness caused an increase in GDP, see G. Gueye (1999, p. 6). This difference can be explained, in particular, by the fact that Italy started from a different point with respect to exhaustiveness.

²¹ For a complete discussion of the Commodity Flow Method in the estimate of uses see Bracci, Di Leo, Mantegazza (1998). Istat Structural Statistics on industrial and service enterprise of the Head Office for Institutional and Business Statistics helped in processing data from the industrial production survey. As far as the revision of household consumption is concerned, it should be pointed out that rental for housing and motor-vehicle expenditure had already been revised in 1996 (for a description of methodology see Istat (1997)).

²² For a description of introduced innovations see Di Leo, Corea, Massari (1998).

which the product originated. The starting point of the estimates has been the CM of 1992 according to ESA95. CM was in (54×101) format and identified 229 cells, i.e., groups of products defined both by their purpose and their branch of origin. In particular, following the new Classification of Individual Consumption for Purpose (COICOP), 54 consumption purposes were defined. Reference to two-digit disaggregation was made, but for some specific items – i.e., food consumption - reference was made to three-digits. As far as the 101 branches of origin of products²³, the classification adopted by National Accounts to define the 1992 *input-output* matrix was considered.

22. “Correction items” were added to CM data, thus obtaining as a result the CM ESA79 benchmark. Passing from ESA95 to ESA79 the number of cells in the CM does not change²⁴: the differences between the two ESAs mainly regards social benefits, insurance, waste collection and some General Government services, i.e., certificates’ issues.
23. Then the CM 1992 ESA79 benchmark was aggregated by 39 purposes (two digits of the COICOP classification) and by 31 branches (two digits of the classification Nace Rev. 1), in accordance with the standard format of National Accounts. The result was a new CM with 159 cells. When the 1992 level had been computed, methodological and definition differences with previous CMs were analysed. In particular the 1982 figures were examined, since data included in this CM were initially assumed as fixed.

3.2. Comparison of new and old data

24. A reclassification was made on the basis of the 39 purposes and 30 branches. 1982 CM items were compared with corresponding 1992 items in terms of mean annual change rate. A number of problems were recorded, in particular the following typologies: a) improved methodology; b) different composition of items; c) non consistent estimates; d) new accurate data.
 - a) is referred to expenditure estimated in 1992, which were not matched in 1982. For example clothing repair was not included in 1982 CM. On the whole they are modest expenditures.
 - b) refers to a different classification of expenses, namely some clearly specified 1992 items were included in larger expenditure aggregates for 1982. This was the most difficult problem, as it was not possible to check whether 1982 estimates were consistent with new benchmark estimates. An example may help to understand this problem. The 1982 CM included only one item for body-care products. In 1992 CM this item refers to at least three different crossings: namely cotton-wool and sanitary napkins, plastic body-care articles and other body-care articles. It should be stressed that these two cases [a) e b)] could not be univocally identified. For example, if in the 1982 *input-output* table clothing repairs had been included in an industrial production branch, this would be an instance of b) thus contrasting with what has been previously stated. Current data do not provide for the solution of this type of ambiguity.
 - c) refers to expense items that seemed to be apparently matching in the two MPs, however their level of expenditure could not be compared. For furniture and art works repair and restore, the comparison of the two series showed that the mean annual change rate was 35.7%, which can be hardly explained taking into account the relevant market trend.

²³ It is a homogeneous aggregation of economic activities in accordance with the classification Nace Rev. 1.

²⁴ Some minor changes relate to the substitution of two items: expenses for the driving licence are excluded, while food and clothing provided to the households in case of disaster are included.

- d) includes items estimated in 1992 with the new method. Their whole historical series could be reconstructed with the analysed methodology. An example would help in this case as well: expenditure for hotels, restaurants and cafes, package holidays were estimated in accordance with new data. New historical series were produced also.

3.3. Reconstruction, by purpose or by branch?

25. Significant methodological problems arose from issues discussed above, especially in selecting the reconstruction method. The following method was used: 1982 CM was estimated, this estimate could be compared with 1992 CM from the standpoint of definitions. On the basis of the 1982 CM reclassified and the CM²⁵ 44*40 estimated in the framework of the National Accounts series 1982-1992 were computed indicators referred both to the purposes (39) and the branches (30). More in detail the indicators were estimated using the following approach. If the crossings from the two matrices perfectly matched (39*30 in accordance with classification of ESA 95 and 40*44 in accordance with ESA 79) a direct reclassification was enough. If a crossing of the CM 40*44 was matched by more than one crossing in the new CM, this was attributed splitting it according to fixed percentages²⁶.
26. These indicators were used only when complete reconstructed historical series were not available²⁷. The reconstruction by branch produced better results. Though 1982 estimates were not “fixed” (owing to problems discussed above) they were assumed as an important reference point, because they were based on a complete *input-output* matrix. The new 1982 estimates proved to be comparable with previous estimates, both as “total consumption expenditure” and with reference to data by branch of origin.
27. Fixed the new estimate for each branch²⁸ these were balanced with indicators per purpose previously constructed. Again particular data were taken into account, namely those specific estimates by branch and by purpose, such as imputed housing rents which in accordance with the new classification should be distinguished from actual rentals, or expenditure in hotels which should be distinguished from expenditure in restaurants and cafes.

3.4. From ESA79 to ESA95: procedures and main results

28. The new balanced estimates for the years 1988-91²⁹ according to ESA79 were transformed into estimates ESA95 using the balanced “Correction items”. As the time-series of these items is complete, the estimates of households final consumption according to the new standards required both from EU and Italy are available for the entire period.

²⁵ The 40 purposes refer to the COICOP classification adopted with ESA79, while the 44 branches were the “standard” of National Accounts to estimate aggregates.

²⁶ Attribution percentages were determined through a detailed comparison of the MC.

²⁷ This is the case of house rentals, hotels, etc.

²⁸ These results take in account also the results of the 1988 input-output table. See par 2.2.

²⁹ This paper examines the time-series 1988-1998, however, referring to households final consumption the time series was retrapolated up to the year 1982.

29. Together with the new figures at current prices a new methodology has been implemented to deflate the aggregates, which takes into accounts each cell of the CM rather than the total estimates by purpose or by activity branch³⁰.
30. It is interesting to investigate the impact on the time-series profiles of both the new standards and the new benchmark estimates. Considering the period 1988-1997 the Mean Percentage Error (MPE) of the new series (ESA95) when compared with the previous (ESA79) is -4,8% at current prices and 4,6% at constant prices (see tables 5, 7). As the Mean Percentage Absolute Error (MPAE) is the same (except for the sign), it is easy to conclude that the level of expenditure according to the new aggregate is permanently lower than the previous one. The MPE can be split into two parts which refers to the new standards of ESA95 and to the new benchmark figures.
31. In fact if we consider both series expressed in terms of ESA79 the MPE and the MPAE at current prices are -2,2% that is the error imputable to the new benchmark while the residual (total ME is -4,8%) has to be attributed to the new standards (see table 13).
32. Concerning the evolution of the series which can be measured with the Mean Error (ME) and by the Mean Absolute Error (MAE) it is possible to see how the new series is more dynamic then the previous considering both current and constant prices (ME=0,2% and 0,1%) and, as the MAE is higher (0,4% and 0,3% respectively), also the profile changes. Concerning the variability of the dynamic, measured by the standard deviation of the percentage changes, it is slightly higher (2,6% for the new series while was 2,5% previously) both by the new standards and the methodology for the estimates³¹ while the different dynamic is mainly connected with the standards (see tables 6, 8).

4. Gross fixed capital formation

4.1. Introduction

33. The reconstruction of the series of gross fixed capital formation for the years 1988-97 by product has been carried out, in accordance with the other National Account estimates, on the basis of benchmark levels estimated for 1992.
34. The key factors influencing 1992 benchmark estimates have been: a) the revision of statistical sources and estimation methodologies; b) the change from the economic activity classification adopted by ISTAT in 1981 (ATECO 81) based on NACE 70 to the classification ATECO 91 based on Nace Rev. 1;³² c) the transition from 1979 European System of Accounts (ESA79) to ESA95.
35. A complete description of the innovations introduced in the estimation methodologies of capital formation and in the statistical sources used is beyond the scope of this paragraph³³. For that which concerns the retrapolating techniques points b) and c) are relevant: first, capital formation for the benchmark year has been estimated under the ESA95 scheme, evaluating the ESA79-ESA95

³⁰ See Coreia C. (1999), The deflation of the annual households final consumption matrix, mimeo ISTAT

³¹ In fact the new definition of consumption does include social transfers to the households whose yearly percentage change is smooth. On the other hand the new methodology for the estimates, each year is considered like a benchmark year, clearly introduced an higher variability of the figures.

³² The economic activity classification (ATECO 91) follows the NACE Rev. 1 up to the fourth digit level, while the fifth level is a further disaggregation of the fourth.

³³ For references see notes 4, 15 and 21.

differences in order to get the amount of capital formation based on ESA79; second, investment is estimated at a five-digit level of the ATECO 91 economic classification; this high level of detail, much deeper of that adopted by National Accounts for balancing purposes³⁴, has been chosen for a correct identification of the intermediate flows in the construction of the investment matrix³⁵.

36. The same approach described above has been followed for the years 1993-97. Conversely, the 1988-91 investment series consistent with the new methodological approach has been obtained by a backward retrapolation starting from 1992, rather than being estimated year by year. The retrapolation concerns only the estimates based on ESA79. In fact, the ESA95 estimates have been obtained by adding to the previous ones the ESA79-ESA95 differences calculated for the years before the benchmark.
37. For backwards calculations the dynamics of the old ESA79 series of capital formation has been assumed as an indicator. Due to the change of economic activity classification, a preliminary step is the estimation of a conversion matrix between the old and the new classification. In fact, the retrapolation can be carried out only if the new estimates are consistent with the old classification (and vice versa). The methodology adopted for the estimation of the conversion matrix is described in Bracci et al. (1999a).
38. Investment series have been backward reconstructed up to the previous benchmark year (1982); as explained in section 2, a balance was made for 1988 with a disaggregation limited to 10 sectors; balanced figures have been consequently disaggregated by ATECO and the rates of change for the years 1988-91 have been adjusted to take into account the new 1988 estimates.

4.2. Backward calculation methodology

39. The starting point of the retrapolation of the series of gross fixed capital formation is the estimation of 1992 benchmark levels under ESA79. As stressed in the introduction, the levels of the benchmark year have been calculated for each of the 152 economic activities producing investment goods.
40. The estimates, calculated according to the ESA95 scheme, are then aggregated for balancing purposes. After the balancing procedure has been applied, the resulting figures have been attributed to the corresponding economic activities according to the relative reliability of the estimates by ATECO which in turn depends on the different sources and method used in the estimation.
41. The estimates according to the ESA79 scheme have been obtained by subtracting for each of the 152 economic activities the amount due to the differences between ESA95 and ESA79 from the ESA95 investment level.
42. The backwards reconstruction of the investment series has been carried out applying to the levels estimated for 1992 the yearly rates of change of the indicators. The indicators are a weighted average of the old series with weights given by the conversion matrix.
43. The values obtained for 1982 must be consistent with the old benchmark estimates. Differences may have two different causes. In the first place, structural modifications occurred between 1982 and

³⁴ The Italian National Accounts adopt a 101 branch classification obtained aggregating the NACE Rev. 1 at three-digits level.

³⁵ See Bracci et al. (1999b).

1992, thus it may happen that the 1982 reconstructed figures do not match the previous 1982 levels. Second, to methodological innovations in the estimate procedures.

44. If the estimation methodology is the same, then the 1982 reconstructed level should equal the 1982 benchmark level given an adequate aggregation level. It is important to stress that the 1982 benchmark resulted from the previous classification of economic activities. To compare by 31 branches the old level with the reconstructed one, the previous estimates were reclassified according to the new classification.
45. However, the 1982 reconstructed estimates may differ from the previous estimates because of methodological innovations or because new sources have been used. In this case the old benchmark levels are not binding for the reconstructed figures. Thus, for 1982, the share of investment resulting from new methodology has been calculated.
46. Series are reconstructed distinguishing, within each economic activity, the share of 1982 capital formation consistent with the previous benchmark from the share due to changes in methodology. In the first instance, series are forward reconstructed starting from the old benchmark levels, adjusting the estimated time series with the ratio between the average growth rate between the 1982 benchmark level and the 1992 level to the average growth rate between the reconstructed 1982 level and the 1992 level. In the second instance, since reconstructed figures for 1982 are not limited by any condition, the forward reconstruction of this share is not adjusted to consider the ratio between the average yearly growth rates. The same rates used for the retranspolation are applied. The series of capital formation by ATECO is obtained by adding the two estimated elements for every year.
47. The reconstructed time series are further modified as a consequence of the balancing made for 1988. The procedure is the same as before and consists in adjusting the growth rates for the period 1988-1992 to bind the reconstructed levels for 1988 to the balanced figures.
48. The series of gross fixed capital formation at constant prices has been calculated by deflating current year values by ATECO with the reconstructed implicit price indexes. The reconstruction of the deflators has been limited to the period 1988-91, using the old deflators as indicators.

4.3. Main results

49. The revision had a positive impact on capital formation. The new total investment level is higher than the old one over the entire period considered: the mean percentage error (MPE) is 7,74% at current prices and 6,78% at constant (1995) prices and the same values are found for the mean absolute percentage error (MPAE) (tables 9, 11).
50. However, the revision had a very differentiated impact on the various components of total capital formation. The production of machinery and equipment has increased by 21,78% at current prices, while the new estimates of transport equipment are 8,79% lower than previously; the construction sector has registered a more limited impact (+0,52%). The revision has caused an increase of implicit prices in all the sectors; particularly relevant is the case of the construction where the upward revision of the deflators has caused a decrease of the estimates at constant prices (-0,35%).
51. As explained in the introduction, the adopted methodology enabled us to quantify the impact of the overall revision due to the three effects that can be labelled as “benchmark”, “classification” and “ESA transition”. For the total gross capital formation the increase of 7,74% is attributable to the ESA transition effect for the 3,59% and to the benchmark effect for the 4,15% (see table 14). The classification effect is a key factor for the disaggregated analysis. The change of classification has caused the migration of activities towards the machinery and equipment sector (the more relevant

are the extraordinary maintenance of motor vehicles and the costs associated with the transfer of ownership for dwellings and other non-residential buildings). The downward revision in the estimates of the investment in transport equipment is almost entirely due the classification effect (-8,46%), even if the effect attributable to the new sources and methods is relevant as well (-1,25%).³⁶ The picture is similar for the construction sector: the upward revision due to the “benchmark effect” (+4,03%) is exactly matched by the reduction due to the “classification effect” (-4,10%). For both these two sectors the impact due to the transition to ESA95 is modest. Conversely, this effect is relevant for the investment in machinery and equipment (+8,27%) especially for the inclusion of intangible assets. The analysis conducted at constant prices gives qualitatively the same results (see table 15).

52. Finally, looking at the mean error and at the mean absolute error it is possible to conclude that the new series are more dynamic than before (ME is +0,29% at current prices and +0,37% at constant prices and only investment in transport equipment experienced negative values). Furthermore, the MAE is permanently higher than the ME in absolute values showing a change in the time-series profiles.

5. Concluding remarks

53. The methodology followed in reinterpolating the national accounts data has been based on benchmark year and interpolation. The adoption of this method and the limited revision due to ESA95 did not cause relevant revision on GDP. Thus, the new series will essentially confirm the macroeconomic analysis conducted in the past. The revision had a greater impact on the levels of Households Consumption and Gross Fixed Capital Formation, even if the new growth rates are substantially similar to the old ones.
54. The analysis conducted at more detailed level shows a slightly different picture. In this cases we note remarkable differences both in dynamic and in the level of the national accounts figures. The case of the component of GDP is emblematic: the new series show a reduction in the relevance of service sector and an increase for the industrial sector. This effect is due, on the one hand, to the change in the classification of economic activities and, on the other hand, to the introduction of ESA95.
55. This general presentation of the main results introduces a number of questions relating to the international comparability of data. The answer to these questions is very important for a better understanding the economic meaning of the new time-series:
- a) First of all, are the differences between the new and the old time series for the different aggregates the same along the whole period 1988-97 or not?
 - b) Are there important differences considering both the profile and the level when dealing with different sub-categories of the main aggregates?
 - c) Is it possible to quantify the impact of the revision due to the improvement in sources and methodologies and the revision due to the introduction of ESA95 definition?

³⁶ Note that the downward adjustment due to the “benchmark effect” is sensibly higher at constant prices (-2,35%).

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STATISTICAL ANNEX

Summary statistics for the revision

We consider two types of error, namely: errors in the level and errors in the growth rates. Let ESA95 and ESA79 indicate respectively the new and the old series of national accounts.

For the levels we use the mean percentage error (MPE) and the mean absolute percentage error (MAPE), defined as:

$$MPE = \frac{\sum_{t=88}^{97} ESA95_t - ESA79_t}{\sum_{t=88}^{97} ESA79_t} \cdot 100$$

$$MAPE = \frac{\sum_{t=88}^{97} |ESA95_t - ESA79_t|}{\sum_{t=88}^{97} ESA79_t} \cdot 100$$

For the growth rates we use the mean error (ME) and the mean absolute error (MAE), defined as:

$$ME = \frac{\sum_{t=88}^{97} \dot{ESA95}_t - \dot{ESA79}_t}{N} \cdot 100$$

$$MAE = \frac{\sum_{t=88}^{97} |\dot{ESA95}_t - \dot{ESA79}_t|}{N} \cdot 100$$

Where $N=97-88+1$

Table 1. Mean percentage error between the ESA95 component of GDP and the previous series of national account
Levels at current prices - years 1988-1997

Components	Mean	Mean absolute
Agriculture	-0.61	0.96
Energy	4.38	4.38
Manufacturing	3.29	3.29
Construction	2.05	2.05
Services	-0.08	0.27
GDP	0.89	0.89

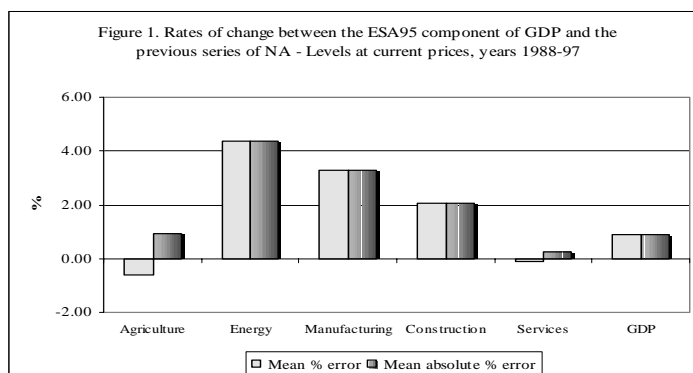


Table 2. Mean error between the ESA95 component of GDP and the previous series of national account
Current price growth rates - years 1989-1997

Components	Mean	Mean absolute
Agriculture	0.25	0.98
Energy	0.53	1.97
Manufacturing	0.21	0.35
Construction	0.14	1.07
Services	0.01	0.37
GDP	0.11	0.17

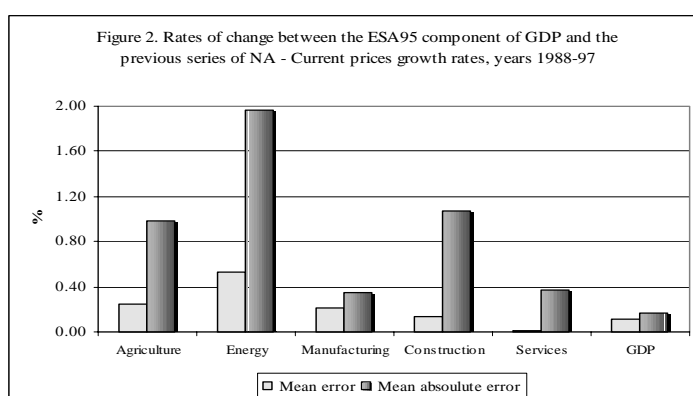


Table 3. Mean percentage error between the ESA95 component of GDP and the previous series of national account
Levels at constant prices - years 1988-1997

Components	Mean	Mean absolute
Agriculture	-1.17	1.44
Energy	6.69	6.70
Manufacturing	3.41	3.41
Construction	-0.56	1.31
Services	-0.54	0.54
GDP	0.63	0.63

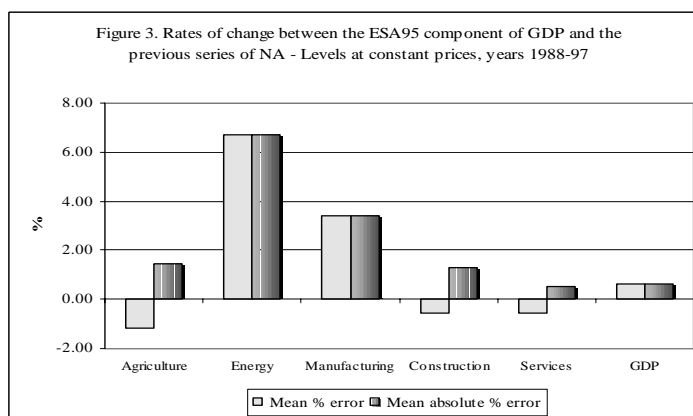


Table 4. Mean error between the ESA95 component of GDP and the previous series of national account
Constant price growth rates - year 1989-1997

Components	Mean	Mean absolute
Agriculture	0.43	0.85
Energy	-0.80	1.87
Manufacturing	0.27	0.52
Construction	0.62	0.91
Services	0.00	0.19
GDP	0.08	0.13

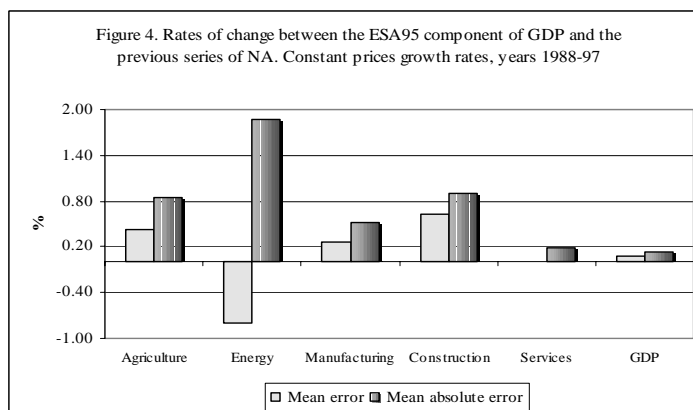


Table 5. Mean percentage error between the ESA95 component of HFC and the previous series of national account Levels at current prices - years 1988-1997

Components	Mean	Mean absolute
Non durables	-10.45%	10.45%
Durables	-7.14%	7.15%
Services	3.23%	3.23%
Total	-4.81%	4.81%

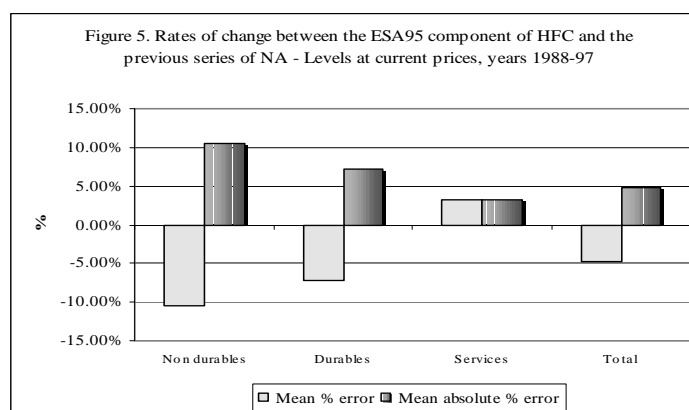


Table 6. Mean error between the ESA95 component of HFC and the previous series of national account Current price growth rates - years 1989-1997

Components	Mean	Mean absolute
Non durables	0.04%	0.23%
Durables	1.00%	1.79%
Services	0.05%	0.76%
Total	0.24%	0.40%

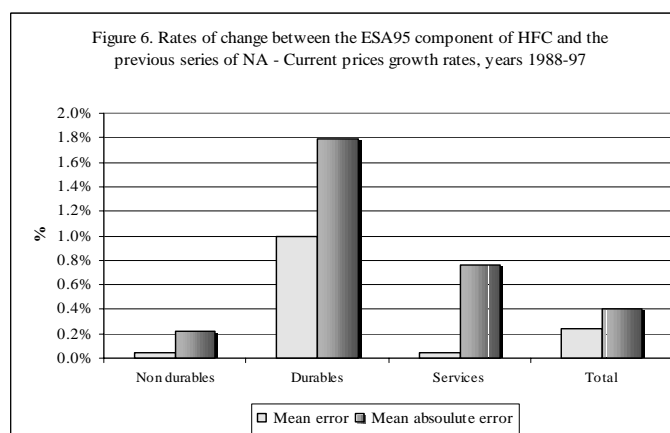


Table 7. Mean percentage error between the ESA95 component of HFC and the previous series of national account Levels at constant prices - years 1988-1997

Components	Mean	Mean absolute
Non durables	-10.14%	10.14%
Durables	-6.15%	6.39%
Services	2.98%	2.98%
Total	-4.61%	4.61%

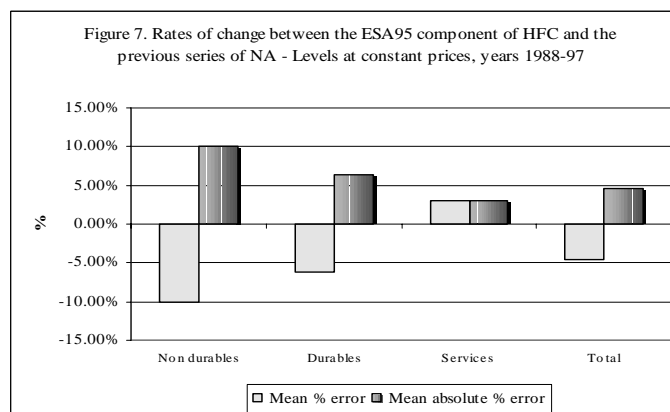


Table 8. Mean error between the ESA95 component of HFC and the previous series of national account Constant price growth rates - years 1989-1997

Components	Mean	Mean absolute
Non durables	-0.09%	0.25%
Durables	0.83%	2.15%
Services	0.06%	0.73%
Total	0.11%	0.32%

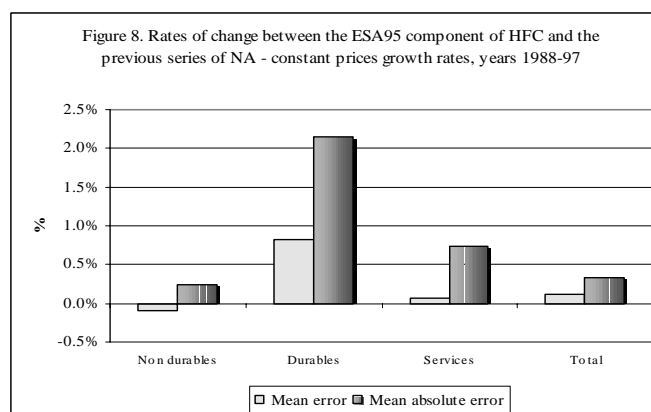


Table 9. Mean percentage error between the ESA95 component of GFCF and the previous series of national account Levels at current prices - years 1988-1997

Components	Mean	Mean absolute
Machinery and equipment	21.78%	21.78%
Transport equipment	-8.79%	8.79%
Construction	0.52%	0.78%
Total	7.74%	7.74%

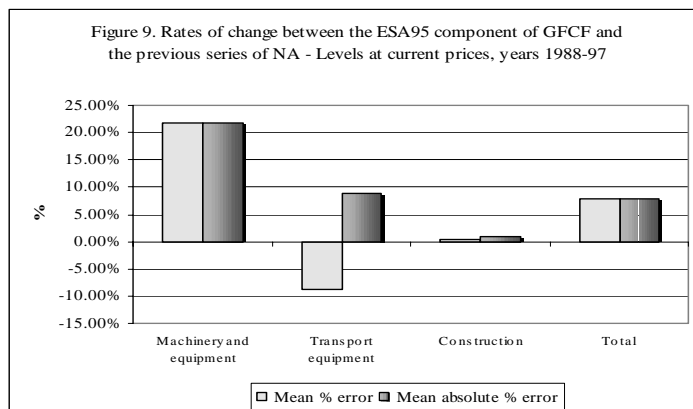


Table 10. Mean error between the ESA95 component of GFCF and the previous series of national account Current price growth rates - years 1989-1997

Components	Mean	Mean absolute
Machinery and equipment	0.45%	2.46%
Transport equipment	-0.05%	2.25%
Construction	0.20%	0.66%
Total	0.29%	0.97%

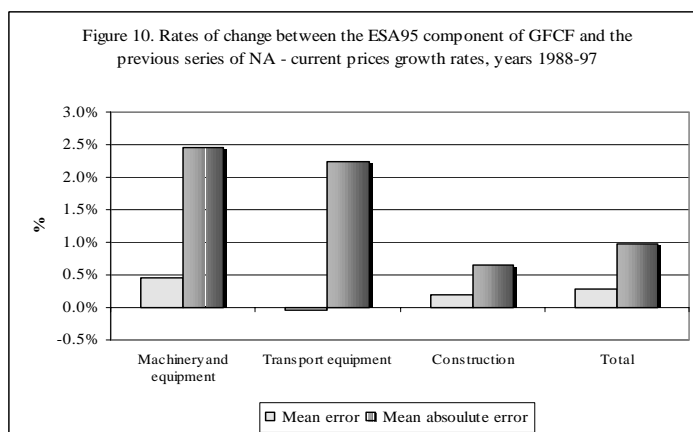


Table 11. Mean percentage error between the ESA95 component of GFCF and the previous series of national account Levels at constant prices - years 1988-1997

Components	Mean	Mean absolute
Machinery and equipment	21.05%	21.05%
Transport equipment	-9.73%	9.73%
Construction	-0.35%	0.66%
Total	6.78%	6.78%

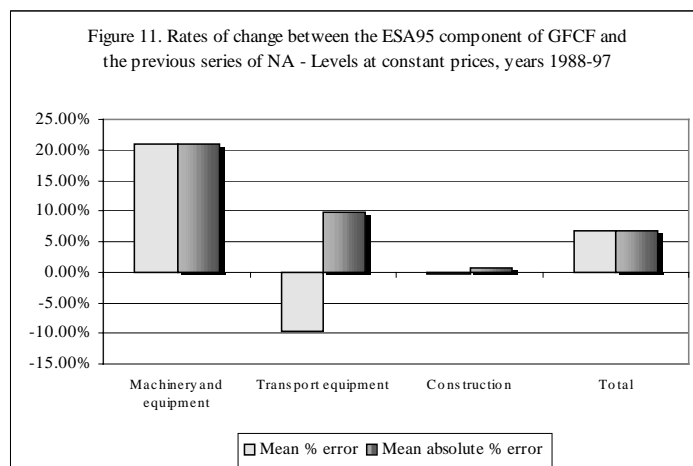


Table 12. Mean error between the ESA95 component of GFC and the previous series of national account Constant price growth rates - years 1989-1997

Components	Mean	Mean absolute
Machinery and equipment	0.38%	1.95%
Transport equipment	-0.04%	2.16%
Construction	0.27%	0.51%
Total	0.37%	0.74%

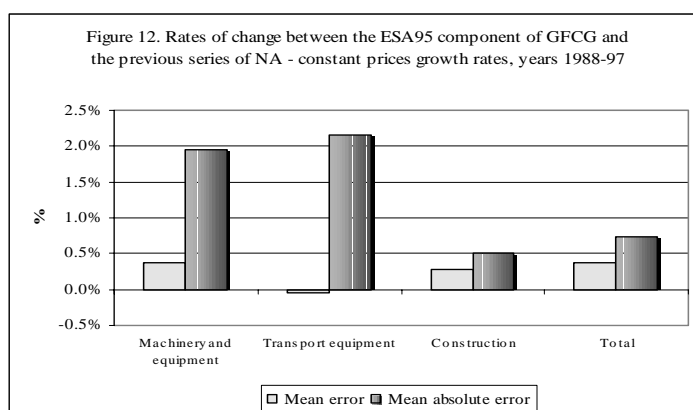


Table 13. The impact of the new ESA on the new time-series

	HFC ESA 95*	HFC ESA 79**
MPE - Level at current prices	-4.8%	-2.2%
MAPE - Level at current prices	4.8%	2.2%
MPE - Growth rate at current prices	0.2%	0.0%
MPAE - Growth rate at current prices	0.4%	0.2%

* The differences between time series incorporate both the impact

of new ESA standards and new benchmark estimates

** The differences between time series incorporate only the impact

of new benchmark estimates

Table 14. Breakdown of GFCF MPE by Effect Levels at Current Prices - Years 1988-97

	Benchmark effect	Classification effect	ESA transition effect	Mpe
Machinery and equipment	5.80%	7.71%	8.27%	21.78%
Transport equipment	-1.25%	-8.46%	0.91%	-8.79%
Construction	4.03%	-4.10%	0.58%	0.52%
Total	4.15%		3.59%	7.74%

Table 15. Breakdown of GFCF mpe by effect Levels at constant prices - years 1988-97

	Benchmark Effect	Classification Effect	ESA transition effect	Mpe
Machinery and equipment	4.88%	8.06%	8.12%	21.05%
Transport equipment	-2.35%	-8.25%	0.87%	-9.73%
Construction	3.31%	-4.25%	0.59%	-0.35%
Total	3.29%		3.49%	6.78%