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Re-engineering the ISAE manufacturing survey

by

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ABSTRACT

The Joint harmonized Manufacturing survey for Italy, carried out by the Institute of Studies and Economic Analysis (ISAE, formerly ISCO), has a long history: it began on a quarterly basis in 1959, becoming monthly in 1962. The survey was then broadly modified in several occasions; in particular, in 1986 it was re-designed in order to provide data also at the regional level, adopting a new stratified random sample, the strata represented by the sector, region and size of the firm. In 1998, the sample was upgraded further, using an optimal allocation of the reporting units to the sample strata (Cochran, 1977). These changes satisfied the demand for more detailed and, at the same time, better harmonized data. However, at this stage, the processing of the results was still based on a very detailed industry grid based on the old NACE1970 classification, re-codified to obtain harmonized data for the Main Industrial Groups and total manufacturing. Size weights were used in the processing of the results, but there were still some differences in the elaboration of the data at the national and regional level, resulting in a not fully-fledged comparability between local and national data.

For these reasons, in 2003 ISAE started a re-thinking of the manufacturing survey processing phase. The resulting re-engineering process recently implemented by ISAE is described in this paper. It has reached two main relevant goals: i. The underlying industrial structure for the aggregation of survey results is now based on the NACERev1.1 classification, at the 3-digit level, adapted to take into consideration the structure of Italian economy. ii. The weighting scheme is now based on a coherent system of size weights, based on a four-stage method in which, firstly, the balance $B_{a,j}$ for question a, firm j, is aggregated in each strata, using the j-firm employees as weights; in the following stages, the result for each strata is progressively aggregated to calculate the Industry total, using value added weights, provided by an external source (i.e., the National Institute for Statistics, ISTAT). The main consequence is that now results at the regional and dimensional level are fully comparable to the ones for the entire industry. Historical data up to 1991 have been re-calculated accordingly to the new aggregation scheme and are presented here as a conclusion of the paper.

Key Words: Survey methods, aggregation, weights

JEL Classification: C42, C82, E32

NON-TECHNICAL SUMMARY

The survey on the manufacturing sector in Italy, performed by ISAE (Institute for Studies and Economic Analysis), is part of the Joint harmonised Business and Consumers Survey (BCS) program of the European Commission. Business tendency surveys gather Information of a qualitative type, in the sense that respondents are not asked quantitative data about some variables (say, the amount of production in one month), but qualitative, multiple-choice assessments on the behaviour of that variable (say, if production has increased, decreased or remained the same in a given month with respect to the previous one). The qualitative information provided by the reporting units should be converted into a quantitative measure; this is usually done evaluating percentage of answers for each question and then synthesising the results into a single number. The elaboration of survey percentages is based on the aggregation of individual answers performed using some system of weights.

Processing the results implies firstly the classification of the Reporting Unit (RU) according to its main industrial activity, then the weighting of RU-level results to obtain data aggregated at the industry level and finally the calculation of time-series as a synthesis of the multiple-choice survey information. In 2003, ISAE has started a major project of survey updating, involving the whole phase of processing the results. The major issues at stake were a classification of response units based on an old classification of economic activity, an old system of weights and the inconsistency between regional/size data and the national ones. Therefore, the main goals of the projects were the updating of the industry classification of the survey Response Units, that of the industry/regional/size weights used in aggregating survey results and of the weighting scheme used in the aggregation, in order to allow full comparability of results at the national, regional and size level.

In fact, the weighting system previously adopted by ISAE was based on the classification of the reporting units according only to their industry specialisation. With the re-engeneering described in the paper, each reporting unit is now classified along 3 “axes”: industry specialisation, region, and size. As a consequence, survey percentages could be progressively calculated aggregating answers coming from the Reporting Units in 4 stages: In the first step, percentages of answers for each sector, in each region and size group are calculated using firm employees as weights; in the second, aggregated percentages for each sector (or region /size) in a given region (or sector/size) are calculated, summing with respect to size groups (or with respect to regions/sectors), using size specific (or region/sector specific) value added

weights. In the third step, “marginal” percentages are calculated for total sector (or for total region /total size), summing with respect to both regions and size groups (or, with respect to sectors and size/sectors and regions) using the region and size-specific value added weights (or, the sector and size specific weights/sector and region specific weights). In the final step, the overall percentage for all the firms of the manufacturing sector in Italy is calculated, aggregating all the industry, region and size specific percentages with their respective value added weights.

As a result, the series obtained at the regional/dimensional level are fully comparable to those elaborated at the national level; moreover, the aggregation is now based on the more up-to-date classification of industrial activity (i.e., the NACE Rev. 1.1.) and on an updated system of external weights, provided by the Italian National Institute of Statistics (ISTAT). All the series have been duly re-constructed starting from January 1991, in order to have long enough time series for cyclical analysis.

LA RISTRUTTURAZIONE DELL'INCHIESTA ISAE SULLE IMPRESE MANIFATTURIERE

SINTESI

L'inchiesta sulle imprese manifatturiere ed estrattive, realizzata in Italia dall'ISAE nel quadro del Programma Armonizzato della Comunità Europea, è iniziata, su base trimestrale, nel 1959, per diventare quindi mensile a partire dal 1962. Da allora, l'inchiesta è stata variamente modificata in molteplici occasioni: in particolare, nel 1986 l'inchiesta è stata profondamente ristrutturata, allo scopo di rendere possibile la produzione di informazioni anche a livello regionale, attraverso l'adozione di una nuova strategia di campionamento casuale stratificato, con gli strati identificati sulla base del settore, della regione e della classe dimensionale di appartenenza delle imprese intervistate. Nel 1998, poi, il campione è stato ulteriormente aggiornato, con l'adozione della tecnica dell'allocazione ottimale delle imprese rispondenti agli strati campionari (Cochran, 1977). Tali cambiamenti hanno risposto alla crescente domanda di informazioni allo stesso tempo più dettagliate a livello locale e meglio armonizzate sul piano comunitario. Va però considerato che, ancora dopo i cambiamenti introdotti nel 1998, la fase di aggregazione dei risultati elementari a livello d'impresa era basata su una "griglia" settoriale di informazioni particolarmente disaggregata e, soprattutto, basata sulla "vecchia" classificazione settoriale NACE 1970, riclassificata ex-post per ottenere dati armonizzati per i Raggruppamenti Principali d'Industria. Inoltre, le procedure di aggregazione seguite per ottenere i dati a livello nazionale differivano in parte da quelle utilizzate invece per i dati regionali: di conseguenza, questi ultimi potevano risultare non del tutto comparabili con il dato aggregato nazionale.

Per queste ragioni, nel 2003 l'ISAE ha lanciato un progetto di ristrutturazione dell'inchiesta, in particolare per quando riguarda la fase di elaborazione dei risultati. I risultati di tale progetto dell'inchiesta sono descritti nel dettaglio in questo lavoro. Il progetto ha consentito il raggiungimento di due rilevanti obiettivi: da un lato, si è rinnovata la struttura settoriale alla base delle procedura di aggregazione, con l'adozione della più recente NACERev1.1, ossia l'ATECO 2001 nella versione italiana, disaggregata alle tre cifre settoriali, adattata per tenere in considerazione la struttura del settore industriale italiano. D'altro lato, con la ristrutturazione della procedura di elaborazione dei risultati, lo schema di aggregazione è ora basato su un sistema di pesi coerente, imperniato su un processo a quattro stadi, che consente una totale coerenza tra i risultati elaborati a livello nazionale e quelli regionali e dimensionali. La procedura è stata applicata ai dati storici dell'inchiesta a partire dal 1991, presentati per la prima volta in appendice a questo lavoro, così da ottenere serie storiche sufficientemente lunghe e coerenti per l'analisi del ciclo economico del settore industriale italiano.

CONTENTS

1 INTRODUCTION AND OVERVIEW[1]

The survey on the manufacturing sector in Italy, performed by ISAE (Institute for Studies and Economic Analysis), is part of the Joint harmonised Business and Consumers Survey (BCS) program of the European Commission. Business tendency surveys ask entrepreneurs and managers opinions on current trends and expectations for the near future, regarding both their own business and the general situation of the economy. Information is of a qualitative type, in the sense that respondents are not asked quantitative data about some variables (say, the amount of production in one month), but qualitative, multiple-choice assessments on the behaviour of that variable (say, if production has increased, decreased or remained the same in a given month with respect to the previous one).

Implementation of BCS may be distinguished in 5 major steps, namely, the laying down of the questionnaire, the selection of the sample, the realisation of the interviews, the processing of the results and the dissemination of them to the public. The questionnaire is designed in a harmonised way at the European level, and it's not an object of the present study. In the sample selection stage, choices need to be made about the target universe, the required sample size, the sample units - i.e. the statistical unit used to select survey participants -, the reporting units – i.e. the part of the enterprise for which data are collected -, and the response units – i.e. the units to whom the questionnaire are sent[2]. The third step implies the actual realisation of the interviews, usually performed with the postal service or using the Computer Aided Telephone Interview (C.A.T.I.) methodology. The fourth step involves processing the results: the qualitative

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[1] The paper is the result of a joint effort of the authors; however, sections 1, 3 (with the exception of section 3.2) and 5 may be attributed to Marco Malgarini, sections 2 to Bianca Martelli, sections 3.2 and 4 to Patrizia Margani. The authors wish to thank: Raffaella Sonego, of the ISAE Computing Unit, that has been an invaluable support throughout the entire project; Luciana Crosilla, that studied carefully the seasonal characteristics of the new series and provided us with the final results presented in section 4; all the researchers, technologists and technicians working in the ISAE Survey Unit that have been involved in various stages of the project. In many cases, helpful comments and encouragement have come from our colleagues of the ISAE Macroeconomic Unit, especially from Giancarlo Bruno, Claudia Cicconi and Carmine Pappalardo. We also wish to thank SAS Institute Italy, for developing the new software used in the processing of the results; Massimo Culini and Serena Capuano, of ATESIA Spa, for helping in re-assigning response units from the old to the new classification; all the ISAE computing unit for providing excellent technical assistance. All the remaining errors are of exclusive responsibility of the authors.

[2] For these definitions, see OECD (2003), page 17; for more formal definitions, see OECD (2000).

information provided by the reporting units should be converted into a quantitative measure, firstly evaluating percentage of answers for each question and then synthesising the results into a single number. The elaboration of survey percentages is based on the aggregation of individual answers performed using some system of weights. This procedure may also be accompanied by the treatment of seasonality with some statistical method. Finally, survey results are disseminated to the public, perhaps together with information on survey methodology (metadata).

To begin with, this paper presents a brief historical overview of the methodologies used by ISAE in the sample selection stage and for processing the results (section 2). In section 3, new methods for processing survey results are described in detail, while section 4 presents the results obtained and provides a first assessment on the cyclical features of the new series as compared with Italian industrial production; some considerations on the effects of the re-engineering process on the quality of the data and on possible future research conclude the work.

2 A LITTLE BIT OF HISTORY

ISAE (formerly ISCO) started the survey on the manufacturing sector in 1959, on a quarterly basis; the survey became monthly in 1962 as part of the EU Joint harmonised project[3]. Methodologies used for the realisation of the survey went through numerous changes during the years, involving all the five major stages of survey implementation (see Table 1). The changes introduced in the second and third step of the survey (namely, those involving sample selection and results processing) will be discussed in detail below. The design of the questionnaire is harmonised at the European level. The version used by ISAE is an Italian translation of the European one, with some additional questions specific to the Italian case; in this paper, only the harmonised questions will be considered (see European Commission, 1997). As for the methodology used in the realisation of the interviews, at the beginning the survey was entirely conducted using the postal service. Since 1988, a part of the interviews started to be realised with C.A.T.I. methodology; starting from 2002 all the 4.100 monthly interviews are realised in this way, allowing a closer and more personal contact with the respondents and increasing survey response rates. In fact, each month non-answering enterprises are replaced by

[3] For a description of the origin of the Italian survey, see ISCO (1961); Pinca (1990).

new ones, randomly extracted from the target universe. It is also important to notice that all the ISAE surveys are part of the National System of Statistics (SISTAN) and as such participation to the ISAE survey is, in principle, compulsory. However, ISAE chooses not to stress this aspect, preferring, in full agreement with the OECD prescriptions (see on this OECD, 2003, page. 13), to make compliance as painless as possible and to convince the respondents about the usefulness for the economic system and the firm itself of survey information. In this respect, all ISAE respondents are returned every month with a copy of the monthly bulletin reporting the main survey results.

2.1 Sample selection

The procedure for sample selection implies the choice of:

1. Reporting and sampling unit;
2. Target universe and frame list;
3. Sample design;
4. Sample size.

1. In the case of the ISAE survey, the sample unit has always been coincident with the reporting unit. Originally the enterprise as a whole was chosen as the base statistical unit of the survey, taking into consideration availability and reliability of business registers. The first major revision of the survey, carried in 1986, had the main goal of gathering data to represent also the regional structure of the Italian manufacturing sector; as a consequence, the local unit was selected in place of the whole enterprise as the sampling and reporting unit[4]. However, it emerged soon after that the vast majority of local units were more and more often reporting to the enterprise headquarters for answering the questionnaires. For this reason, in 2000 ISAE chooses to come back to the whole enterprise as sampling and reporting unit. This choice has two major drawbacks, namely, it may provide a faulty regional distribution, because the answers are referred only to the region of the enterprise headquarters and not to that (those) of the various local units. On the other hand, it may also provide a somewhat misleading picture of the industrial structure, because answers may include activity in industries other than the main one. However, this seems to be a reasonable enough choice for ISAE, given the fact that, as mentioned before, local unit seemed, in the Italian historical experience, not to be able to give reliable answers at the

[4] For a more detailed description of the innovation introduced in 1986, see Martelli (1998).

local level. Furthermore, from 1986 onwards the choice of looking at the *kind-of-activity unit* (KAU), regardless of location of economic activities[5] (in order to reduce the industrial structure bias), was not a viable option for ISAE, given the goal of having relevant information also at the local level. However, it should be considered that Italian economy is characterised by a large presence of small and medium size firms: for SME's local unit, kind of activity and enterprise are often the same, and in this sense the bias of adopting the whole enterprise as the statistical unit of the survey is largely reduced in the Italian case.

Referring to the response units, the overwhelming majority of them are represented by the firms' owner, mainly in the SME enterprises, while for larger ones by an administrative manager. The CATI technique allows to establish a direct contact and to assure that always the same person is interviewed each month, lowering the risk of non-sampling errors due to different respondents.

2. Originally, the target universe for the ISAE manufacturing survey was represented by all the local units with more than 20 employees of the Italian Manufacturing sector (as stemming from the General Census), while the frame list was built from commercial directories containing information about the enterprise (main) kind of activity, its institutional form, size and location[6]. In 1986, the survey frame was also updated, using information based on the more reliable Social Security (INPS) archive. Major innovations in the target universe were then introduced in 1998, by lowering the minimum size of firms considered for building the sample to 10 employees (in view of improving survey representativeness), and by adopting as register the official archive of active firms (ASIA), provided by the Italian National Institute of Statistics (ISTAT). ASIA provides very detailed information on kind of activity, location and size of all the active enterprises in Italy[7]; this archive is updated almost every year. The most recent version comprises 93,000 firms with 10 or more employees, being the whole universe of the Italian manufacturing sector build

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5 One way to partition an enterprise is by reference to activities. A unit resulting from such a partitioning is called a kind-of-activity unit (KAU), defined as an enterprise, or a part of an enterprise, which engages in only one kind of productive activity or in which the principal productive activity accounts for most of the value added. So, each enterprise must, by definition, consist of one or more kind-of-activity units, regardless of the location of the activity. For a definition of a KAU and its application as sample unit in business surveys, see OECD (2003).

6 The necessity of choosing a minimum size threshold is due to the consideration that very small firms are relatively less willing to join the survey and therefore not being able to assure a continuative participation to the panel.

7 As ASIA is a complete list of all the Italian firms, it also provides yearly updates on Universe, with respect to Census results (which have a 10 years frequency), thus allowing more frequently updating also of the sample.

by 543,000 firms. In terms of employees, however, the selected target universe (and frame) gather about 74% of the whole manufacturing.

3. An "ad hoc" panel was originally considered, stratified according to the Italian NACE1970 industry classification of economic activities. Starting from 1986, a Probably Proportional to Size (PPS) sample was instead used: the stratum size was defined proportionally to the size of the universe (i.e. the sampling fraction is constant in each stratum). The sample was stratified with respect to the kind of activity of the relevant statistical unit (the local unit up to 1999; the firm since 2000) and also in terms of location (region) and size[8]. The choice of the region as a stratification variable (see Pinca, 1990) allowed the elaboration of the data at the local level, responding to a growing demand in Italy for more disaggregated and up-to-date cyclical indicators[9]. In 1998, the sample was further upgraded and sample selection is from then based on the Optimal Allocation to Strata method (OAS, see Cochran, 1977). According to OAS, the number of firms selected in each stratum is chosen taking into account not only the corresponding universe size, but also the variability of the firms belonging to that stratum: a greater heterogeneity of the firms corresponds to a larger stratum size; on the other hand, in strata where firms are relatively similar, a minor number of firms is needed to get the desired precision of the results[10]. Once the sample is defined, the same set of firms is surveyed each month, being the sample a panel, substituting non answering firms with others extracted from the same stratum. The sample is then updated almost every year on the basis of the availability of new official releases of ASIA archives.

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[8] More specifically, the sample was built by merging regional sub-samples, stratified by economic activity and size.

[9] Indeed, linkages among cross-borders regions and the internazionalisation of local economies are growing fast in recent years, also implying growing differences in regional economic conditions within the same country; as a consequence, a growing number of studies has also recently been devoted to regional cyclical analysis, see for instance in the case of Italy the recent contribution of Chiades, Gallo and Venturini (2004).

[10] Since 1999, the variable selected for evaluating the variability inside each stratum is represented by the number of employees of each firms reported in ASIA archive. A previous version of the OAS sample (when ASIA was still not available) used the average number of employees declared by each enterprise in the period April 1996-March 1997. The choice of calculating the variance on a quantitative (and not on a qualitative one) variable stems out from the need to build a suitable sample also for investigating quantitative variables (e.g. investments, capacity). For a more careful description of the sampling method adopted by ISAE, see also Cicchitelli and others (1992). Further, in some cases, the stratum size may result greater than what is requested according to the theoretical allocation, because of a need to maintaining "loyal" firms within the sample.

Table 1 Major Historical updatings in the five major stages of survey implementation

Stage of the survey	*Original design (1959)*	*First major updating (various years)*	*Second major updating (various years)*
	1) Laying down of the questionnaire		
Type of questionnaire and its frequency	National specific questionnaire; quarterly	EU-harmonised questionnaire, monthly (1962)	EU-harmonised questionnaire
	2) Sample design		
Reporting and sampling unit	Enterprise	Local unit (1986)	Enterprise (2000)
Target Universe and Frame List	Units ≥ 20 employees, extracted from commercial directory of firms	Units ≥ 10 employees, extracted from INPS archives (1986)	Units ≥ 10 employees, extracted from Official ASIA Archive of active firms (1998)
Sample selection	Ad hoc panel	Panel based on Probability Proportional to Size (PPS) sample (1986)	Panel based on Optimal Allocation to Strata sample (1998)
Stratification variables	Industry structure	Industry, regional and size structure (1986)	Industry, regional and size structure
Allocation to strata	Non-random selection of representative firms	Non-random selection of larger units within strata	Random Units selection within strata
Sample size	4.000	4.000	4.100
	3) Realisation of the Interviews		
Methodology	Postal service	Postal service/CATI Interviews (1988)	CATI Interviews (2002)
	4) Results processing		
Weighting scheme	2-stage aggregating procedure	2-stage aggregating procedure for national results; 1-stage aggregation for local and size level data (1986)	4-stage aggregating procedures for national, local and size level data (2004)
	5) Dissemination of the results		
Internal dissemination	Postal dissemination	Intranet dissemination (1986)	Intranet dissemination (new interface, 2004)
Dissemination to external users	Postal dissemination	Postal and e-mail dissemination	Internet dissemination (future research)

4. The sample size for the survey, according to the EU prescription, has been predetermined equal to about 4,100 statistical units[11]. This size gives a sample coverage of about 4,4%. It should be noted that with the sample design adopted by ISAE the survey is based on a relatively high number of strata: in fact, the sample is stratified upon size (3 different sizes, small, medium and large firms), sectors (21 sectors of economic activity) and regions (19 administrative regions, aggregating Piemonte and Val d'Aosta), for a total of 3x21x19=1.197 strata. As a rule of thumb, OECD (2003) states that around 30 reporting units per strata are sufficient to obtain an acceptable level of precision for each strata for which data are to be published. Now, if this rule of thumb should literally be applied here, ISAE should interview up to 36.000 firms per month to have reliable results for each stratum. However, the choice of a very detailed "grid" does not imply that ISAE pretends to have reliable data for each strata: in particular, the very detailed three digit industry classification is used only at the national level, and, in some cases, for the geographical partitions, while at the regional level only a more aggregated industry classification is usually considered (on this, see also par. 3.2 and table 4 below). The choice of maintaining the very detailed sampling grid described above is based on the willingness to adopt a coherent sampling design that firstly may theoretically be disaggregated in a similar way at the industry, regional and size level and then may be appropriately processed to weight data at the aggregate level.
   On the basis of a fixed sample size (in this case, about 4.100) and of a desired level of confidence it is also possible to assess the measurement errors incurred in the survey, given the adopted sampling design. As well known, all the assumptions on estimates stemming from sample surveys can only be expressed within a predetermined confidence interval and with a certain degree of uncertainty. More precisely, the qualitative estimate of the percentage of answers *p* for a generic question *i* can differ (in absolute value) from the true value *P (*relative to the whole universe) for a quantity larger than *d*, with a confidence level 1-α (with α for instance equal 5%).

$$\Pr\left\{\left|p - P\right| \geq d\right\} = \alpha \qquad (1)$$

[11] More precisely, the Commission suggests a sample size of 4,000 units. The precise size of the ISAE theoretical sample (4140 units) stems from the "oversampling" in some strata, due to the aim of maintaining all the "loyal" firms responding over the years, even if in excess. This choice better guarantees the stability of the panel (see Martelli, 1998).

Assuming that p is normally distributed, it follows:

$$d = z_{\alpha/2} s_p$$

where $z_{\alpha/2}$ is the value of the normal deviate for a predetermined value of α (e.g. for α=5%, $z_{\alpha/2}$=1,96) and s_p is the standard error of the qualitative variable *p.* This latter, for a OAS sample and for qualitative variables, is given by:

$$s_p = \left(\frac{(\sum_k W_k \sqrt{p_k q_k})^2}{n} - \sum_{hk} W_k p_k q_k \right)^{1/2} \qquad (2)$$

being:

k the generic stratum;

N= the Universe size; N_k = the number of universe firms belonging to the generic stratum *k*

$W_k = N_k / N$ the weight of the stratum *k*

$p_k q_k$ the estimated qualitative variance of *p* in the stratum *k*

An important property of the OAS is to minimise (with respect to Simple Random and PPS samples) the variance of the estimates, increasing therefore the precision of estimates, with respect to other sampling designs, being the size *n* constant.
Setting α=5% and calculating the standard errors s_p on the effective sample for the main questions building the confidence indicator, we obtain an average sampling error of about ±0,48%[12]. In other terms, in the period considered, given the sample design and the sample size, the true parameter may have been about half a percentage point larger or smaller than the sample estimates.

12 More precisely the variables composing the confidence indicator are: order level, stocks of finished products and production expectations. The calculations have been carried for the months April, May and June 2004.

2.2 Processing the results

The answers to the multiple-choice questions of qualitative surveys are generally elaborated in the form of multiple percentages, according to the number of reply options. In particular, in the case of the manufacturing survey, Reporting Units (RU) are generally asked to choose between three options, i.e. a positive/neutral/negative answer to each of the questions. Processing the results implies the following steps:

1. Classification of the Reporting Unit (RU) according to its main industrial activity;
2. Weighting RU-level results to obtain data aggregated at the industry level;
3. Calculation of time-series as a synthesis of the multiple-choice survey information;
4. Seasonal adjustment of aggregated survey results;
5. Calculation of Sentiment Index by way of aggregation of some of the (seasonally adjusted) balances of the survey;

The methodology used by ISAE for steps 1 and 2 is revised below. Step 3 is usually performed calculating net balances for each question by subtracting the negative percentage from the positive one, excluding neutral answers[13]. The treatment of seasonality and the calculation of sentiment index are not object of this study. Seasonally adjustment methods adopted by ISAE are currently under careful revision; the Sentiment index is now calculated by ISAE according to Commission methodology, while different methods for calculating it are discussed in Bruno-Malgarini (2002) and Cicconi (2004).

1. The first step in the elaboration of survey results is to classify each Reporting Unit (RU) on the basis of its economic activity. Each RU is identified with a progressive number, and then an industry-specific code is assigned to it according to its main industrial specialisation. More specifically, until recently every RU was assigned to one of the 21 main manufacturing sectors (the so-called “ISAE Branches”), based on the NACE1970 classification; the code was then specified further taking into account 236 sub-sectors[14]. At the same stage, each RU was assigned also a specific code relative to its region and

[13] Alternative methods are proposed by Carlson and Parkin (1975) and, more recently, by Dahl and Xia (2004); a comparison between the “balance” method and alternative ways of quantifying qualitative data is in D’Elia (1991). The latter study reveals a high correlation between balances and alternative methods in the case of three-option replies, as is the case for the ISAE manufacturing survey.

[14] The ISAE branches included also the extractive firms (branch number 20), not considered in this paper. The total number of sub-sectors, including extractive firms, was equal to 240.

size. Table 2 provides a short description of the 21 main sectors, disaggregated further into the sub-sectors relevant for the construction of the Main Industrial Groupings (MIG).
It is possible to compare the ISCO-ISAE classification provided in Table 2 with that requested by the European Commission for the release of the Joint harmonised survey data; the latter is based on the official Eurostat classification NACE Rev. 1.1[15]. First of all, it should be stressed that, as emerges from table 2, the – very detailed – ISCO-ISAE classification is fully compatible with the Main Industrial Groupings requested by the Commission, i.e., starting from the ISAE industry classification is always possible to correctly evaluate survey data for MIG and total manufacturing alike. However, some differences do emerge[16]: in particular, for some industries (textiles, footwear and clothing, wood and wood products, non electrical machinery) the ISCO-ISAE classification was much more detailed than what is needed on the basis of the Commission requests. This originates from the will to monitor as close as possible the key industries of the Italian manufacturing specialisation, the so-called "made in Italy".

2. In the second step, the percentage of (-), (+) and (=) answers is calculated for each sample strata. Strata percentage is then progressively aggregated at the industry level.
In the case of the ISAE manufacturing survey, the calculation of percentages and the aggregation of the results were originally based on a two-step procedure. In the first stage, the percentage of (+), (-) and (=) answers for each sector *k* was calculated using as weights the number of employees of each firm, y_j. More specifically, given a generic set of firms $j_{1k}\ldots j_{ik}$ operating in sector *k*, the aggregated percentage of answers to a generic question *X* for sector *k*, X_k, is obtained as a weighted average of the firm answers, x_j, the weights being the number of the firm employees, y_j:

$$X_k = \sum_j \frac{y_j \cdot x_j}{\sum_j y_j} \qquad (3)$$

In the second stage, the X_k should be aggregated further to obtain the industry-level aggregated percentage of positive/negative/neutral answers for the generic *i*-question, *X*. In the aggregation, a weight is used to measure the relative importance of each industry in the Italian manufacturing sector; the weight variable *z* is the value added for each generic sector k of Italian

15 For the classification of the Joint Harmonised survey, see European Commission (2002); for a description of the official NACE Rev. 1 classification, see Schafer (2001).

16 For instance, furniture was included in the "Wood and wood products" industries instead than in the residual miscellaneous sector.

manufacturing, provided by ISTAT. This variable works both as size-weight, as it represents the relative difference between sectors, and as sample-weight, being calculated on universe data. Denoting w_k the generic weight for sector *k*, we have:

$$w_k = \frac{z_k}{\sum_k z_k} \tag{4}$$

being z_k the value added of sector *k*.
From (3) and (4), the industry level aggregate percentage of answers for question *i* is calculated as follows:

$$X = \sum_k (w_k \cdot X_k) \tag{5}$$

As stated above, in 1986 the sample was re-designed stratifying with respect not only to sectors, but also to region and size groups. However, in the processing of the results, expressions (4) and (5) were still applied only for the elaboration of national data, without taking into consideration the local and size dimension of the sample. At the regional (and size) level of aggregation, a simpler formula was instead used, based on a one-stage weighting scheme, in which the total regional/size groups percentages were calculated as a simple weighted average of the firm answers, the weights being the firm employees. In other words, denoting with l/m the generic region/size group, we had, for all the firms *j* operating in *l/m*:

$$X_{l/m} = \sum_{j=1}^{n} \frac{y_j \cdot x_j}{\sum_{j=1}^{n} y_j} \tag{6}$$

It should be noted that also at the regional/size level bigger weights were assigned to big-size firm and smaller weights to the small firms part of the sample. However, the relative importance of the various sectors considered in the disaggregation by kind of activity was not considered. As a consequence, a big weight was assigned to a firm that is indeed big in size, but that may be operating in a sector with minor relevance in the overall structure of the regional manufacturing sector. This may imply a high variance in the time series of the results: in fact, a modification in the answer of a big firm, operating in a small sector, may all the same result in a high variability of aggregate results. Moreover, the different methods used to calculate the results at the national and local level were to raise possible inconsistency between national and regional/size level data.

Table 2 The "old" ISCO-ISAE classification of industrial activity

ISAE branches (number of sub-sectors)		Sub-sectors (number)	Main Industrial Groups
01	Textiles (22)	Preparation of fibres, weaving, knitted and crocheted fabrics (13)	Intermediate
		Made-up textiles articles, fur, knitted and crocheted articles (9)	Non durables
02	Footwear, clothing (19)	Footwear, clothing (19)	Non durables
03	Wood, wood products -including furniture (11)	Wood, wood products (10)	Intermediate
		Furniture (1)	Non durables
04	Paper, paper products, publishing & printing (16)	Paper, paper products (14)	Intermediate
		Publishing & printing (2)	Non durables
05	Leather, leather products (3)	Leather, leather products (3)	Non durables
06	Plastic products (1)	Plastic products (1)	Intermediate
07	Refined petroleum products (1)	Refined petroleum products (1)	Intermediate
08	Basic metals (26)	Basic metals (26)	Intermediate
09	Non metallic minerals products (30)	Non metallic minerals products (30)	Intermediate
10	Chemicals (12)	Chemicals for industry & agriculture; other chemicals (8)	Intermediate
		Chemicals consumer products (4)	Non durables
11	Artificial fibres (1)	Artificiel fibres (1)	Intermediate
12	Other basic metals, metal products - except Machinery & Equipment -, machinery & equipment n.e.c. , other n.e.c. (15)	Other basic metals, metal products – except machinery & equipment (9)	Intermediate
		Machinery & equipment n.e.c. (5)	Investment
		Other n.e.c. (1)	Durables
13	Non electrical machinery (16)	Non electrical machinery (16)	Investment
14	Office equipment and computers (1)	Office equipment and computers (1)	Investment
15	Electrical machinery & apparatus, domestic machinery, radio, TV & communication equipment (11)	Electrical machinery & apparatus (6)	Intermediate
		Domestic machinery, radio & TV (4)	Durables
		Television & radio transmitter (1)	Investment
16	Motor vehicles (5)	Motor vehicles (5)	Investment
17	Other transports equipment (7)	Other transports equipment (6)	Investment
		Motorcycles and bicycles (1)	Durables
18	Rubber products (5)	Rubber products (3)	Intermediate
		Rubber products for footwear (2)	Non durables
19	Medical, precision and optical equipment (4)	Medical and precision equipment (2)	Investment
		Optical and photographical equipment (2)	Durables
21	Food, beverages, tobacco (25)	Starch products, prepared animal feeds (2)	Intermediate
		Food, beverages, tobacco (23)	Food & beverages
22	Manufacturing industries n.e.c. (5)	Jewellery, musical instruments (2)	Durables
		Sports goods, toys, miscellaneous (3)	Non durables

3 RE-ENGINEERING THE ISAE MANUFACTURING SURVEY

In 2003, ISAE has started a new major project of survey updating, involving the whole phase of processing the results. The major issues at stake were a classification of response units based on an old classification of economic activity, an old system of weights and the inconsistency between regional/size data and the national ones. Therefore, the main goals of the projects were:

1. Updating the industry classification of the survey Response Units;
2. Updating the industry/regional/size weights used in aggregating survey results;
3. Updating the weighting scheme used in the aggregation, in order to allow full comparability of results at the national, regional and size level.

3.1 Classification of Reporting Units on the basis of their industrial activity

The restructuring has as a first goal the updating of the ISAE classification, on the basis of the NACE Rev.1.1 adopted at the European level, trying to maintain as strong as possible a focus on the traditional sectors of Italian specialisation. The first step is to map each RU from the old ISCO-ISAE sectors into those of the NACE Rev.1.1; for a careful reconstruction of historical time series, this has to be done not only for the new data, but also for the historical past. In particular, ISAE chooses to re-build the survey time series starting from 1991, working directly on the survey micro-data, i.e. on the original answers provided by the Reporting Units. To proceed further, we need first to specify the level of aggregation of the new NACE Rev.1.1 on which to base the new classification of the RU.

The EC requests the Institute participating to the Joint Harmonised Program a two-digit level detail of the NACE Rev.1.1, going deeper at the 3-digit level when relevant for the construction of the MIG. The NACE sectors to be covered from the Joint Harmonised survey go from the NACE 15 to the NACE 36; considering the 3-digit sub-sectors, the total number of sectors amounts to 75 (excluding the 2-digit aggregation of the 3-digit sub-sectors). However, in the mapping process from the old to the new classification, ISAE chooses to slightly simplify the official Commission request, according to the peculiar characteristics of the Italian manufacturing sector. In fact, the industry disaggregation proposed by the Commission is common to all the European countries that participate to the Joint Harmonised survey program. Some of the

Table 3 The new ISAE classification of industrial activity

Code	Sector	Value added weight (%)	ISAE Branches	Number of ISAE Branches	MIG
15.1, 15.2	Processing of meat & fish	1.80	21	2	FOBE
15.3, 15.4	Processing of fruit, vegetables, oil, fat	1.17	21	7	FOBE
15.5	Dairy products	1.53	21	3	FOBE
15.6, 15.7	Grain mill products, prepared animal feed	0.59	21	2	INTM
15.8	Other food products	3.32	21	4	FOBE
15.9, 16	Beverages and tobacco	1.24	21	7	FOBE
17.1	Preparation of spinning of textile fibres	1.12	01	6	INTM
17.2	Textile weaving	1.43	01	5	INTM
17.3, 17.6	Finishing of textiles; knitted & crocheted fabrics	1.24	01	2	INTM
17.4, 17.5	Made-up textile articles, other textiles	0.97	02	2	CNDU
			01	6	
17.7	Knitted & crocheted articles	1,08	01	1	CNDU
18	Wearing apparel, dressing & dyeing of fur	3.74	01	1	CNDU
			02	15	
19	Tanning & dressing of leather; luggage, handbags, saddlers, harness & footwear	3.25	05	3	CNDU
			02	1	
			18	2	
20	Wood & wood products (except furniture); articles of straw and plaiting materials	2.32	03	10	INTM
21	Pulp, paper, and paper products	2.20	04	14	INTM
22	Publishing, printing, reproduction of recorded metal	3.80	04	2	CNDU
23.2	Refined petroleum products	1.07	07	1	
24.1, 24.2, 24.3	Chemicals products for industry & agriculture	3.01	10	5	INTM
24.4	Pharmaceuticals	2.70	10	1	CNDU
24.5	Soap & detergents, cleaning preparations and perfumes	0.97	10	2	CNDU
24.6, 24.7	Man-made fibres industries; other chemicals products	1.22	10	3	INTM
			11	1	
25.1	Rubber products	1.19	18	3	INTM
25.2	Plastic products	3.58	06	1	INTM
26	Other non metallic mineral products	5.71	09	30	INTM
27	Basic Metals	3.74	08	22	INTM
			12	2	

28.1	Structural metal products	2.78	12	2	INVE
28.2, 28.3	Metal containers; central heating & boilers; steam generators	0.62	na	na	INVE
28.4	Metallurgy	1.19	08	3	INVE
28.5	Treatment & coating of metal; general mechanic engineering	3.81	12	1	INVE
			08	1	
28.6	Cutlery, tools, general hardware	1.03	12	1	INVE
			13	1	
28.7	Other metal products	2.79	12	5	INVE
29.1	Engines, compressors, pump	2.45	13	3	INVE
29.3	Agricultural and forestry machinery	0.74	13	4	INVE
29.4	Machine tools	1.26	13	1	INVE
29.5	Machinery for textiles	3.91	12	1	INVE
			13	5	
			16	1	
29.2, 29.6	Other machinery & equipment n.e.c.	3.88	12	1	INVE
			13	2	
29.7	Electrical appliances	1.42	12	1	CDUR
			15	3	
30	Office machinery & computers	0.81	14	1	INVE
31.1	Electric motors, generators & transformers	0.79	na	na	INVE
31.2	Electricity distribution & control apparatus	0.92	15	1	INTM
31.3, 31.4, 31.5	Wire & cables; accumulators; lighting equipment	0.83	15	2	INTM
31.6	Electrical equipment n.e.c.	2.05	15	2	INTM
32.1	Electrical valves & tubes	0.65	15	1	INTM
32.2	Television & radio transmitters	1.10	15	1	INVE
32.3	Television & radio receivers	0.15	15	1	DUR
33.1	Medical & surgical equipment	0.57	19	1	INVE
33.2, 33.3	Instruments for measuring, checking, etc; industrial process control equipment	1.15	19	1	INVE
33.4, 33.5	Optical & photographic equipment; watches & clocks	0.63	19	2	DUR
34.1	Motor Vehicles	1.49	16	1	INVE
34.2	Bodies for motor vehicles	0.37	16	2	INVE
34.3	Parts for motor vehicles	2.01	16	1	INVE
35.1, 35.2	Ships, boats, railway, tramway	0.74	17	5	INVE
35.3	Aircraft & spacecraft	0.64	17	1	INVE
35.4, 35.5	Motorcycles, bicycles, other transports	0.69	17	1	DUR
36.1	Furniture	3.11	03	1	DUR
			12	1	
36.2, 36.3	Jewellery, musical instruments	0.73	22	2	DUR
36.4, 36.5, 36.6	Sports goods, toys, miscellaneous n.e.c.	0.67	22	3	CNDU

sectors needed on the basis of the “official” European classification may have a negligible weight in Italy, while other sectors that are not “officially” requested may have a role in the structure of the Italian manufacturing sector.

To evaluate the economic significance of the proposed industry classification, ISAE uses information on Italian industry value added (provided by the National Institute of Statistics, ISTAT, for the year 1999[17]). As a rule of thumb, we choose to aggregate further with respect to the Commission request all the 3-digit sectors with a national value added weight ≤ 0.5%: in other words, in case a 3-digit sector has a weight ≤ 0.5%, we aggregate it to the 2-digit level, or, in some cases, we construct an ad hoc aggregation of two (or more) 3-digit sectors. The resulting industry classification is presented in table 3.

The total number of ISAE sectors in which to map the old 236 ISCO-ISAE branches is equal to 56. Among the 3-digit sectors that have been aggregated to build up ad hoc ISAE Groupings, we have the industries comprised in the following branches: food products, beverages and tobacco (NACE 15 and 16), textiles (NACE 17), electrical machinery and apparatus n.e.c (NACE 31), medical, precision and optical instruments (NACE 33), other transports equipment (NACE 35), manufacturing industries n.e.c. (NACE 36). We also choose to exclude NACE 23.1 and 23.3 (Manufacture of coke and nuclear fuel) for their negligible (if any) relevance in the structure of the Italian manufacturing industry; Refined petroleum products (NACE 23.2) are considered, but are not included in any MIG according to the official definition. On the other hand, we add sectors 28.2 and 28.3 (Metal containers, central heating & boilers, steam generators) - that were not considered in the old ISCO-ISAE classification - and sectors 29.2, 29.6, 29.7 (Other machinery and equipment n.e.c) that are not requested by the Commission, but are officially considered as Investment goods. The resulting classification is much simpler than the one previously adopted by ISAE, maintaining however a sufficiently detailed description of the manufacturing sector in Italy. All the differences with respect to the official EC request were authorised by the Commission.

[17] For a more detailed description of the information used in the weighting of survey results, see below, par. 3.2.

3.2 The new weights and the structure of the Italian manufacturing sector

Once each RU has been re-classified according to the NACE Rev.1.1, the RU-level data should be appropriately weighted to provide aggregated survey results. As shown in par. 2.2, in the case of the ISAE survey, micro-level data were progressively aggregated using eq. (3)-(5) to obtain results for the whole manufacturing sector and the MIG at the national level. For regional and size level data, eq. (6) applied, resulting in possible data inconsistency. The new weighting procedure proposed in this paper is based on an updated system of weights: more specifically, 3-dimensional information on value added is needed, i.e. value added for a generic industry S_k, of size SS_m, operating in region R_l. Official information on market-price industry value added for each Italian region and for small (10–99 employees), medium (100-249) and large (>250) firms is currently available for the year 1999[18] at the 2-digit level; for the same year, official ISTAT regional and size-specific data at the 3-digit level are available only for employees. Therefore, as a first step, 3-digit industry, regional and size specific value added should be estimated on the basis of the information on industry employees: in practice, the 2-digit value added share is reported to the 3-digit level on the basis of the composition of the 2-digit industry in terms of employees.

A little digression from the main focus of this paragraph is needed here: in fact, given the desired level of detail of the adopted weighting system, the resulting weighting array has dimension 56 (industries) x 19 (regions) x 3 (size groups) = 3.192. In other words, the computation of 3.192 size-weights is needed in order to construct a system of weights to be used in the processing of the results. However, this very detailed weight grid is only needed to have a starting point from which to proceed to elaborate data at regional and size level consistent with national ones. From this starting point, a “modular” system of results is then constructed, in the sense that disaggregated results are provided at the industry/regional/size level, fixing alternatively the regional/size/industry dimension of the data. More specifically, the level of aggregation upon which actual data will be produced is described in table 4:

According to table 4, 3-digit industry level data (56 industries) are considered only at a national, size-aggregated level, as requested by the European Commission. A disaggregation by size groups (3 size groups) at the national level will be provided only at the 2-digit industry level (21 industries, for a total of 63 strata). Considering the main 4 Italian geographical partitions, data for 2-digit industries (21 industries) and the Main Industrial Groups (3 industries)

[18] The latest value added data available when ISAE started the restructuring of the survey was referred to the year 1999; more recent data have become available recently, and will be taken into consideration with the future revisions of the weights.

are provided at the size aggregated level (for a total of 84 strata) and for the size groups (3 size-groups, for a total of 36 strata) respectively. Ultimately, referring to a more detailed geographic disaggregation (namely, regions), data for the Main Industrial Groups and the total manufacturing are available at aggregated-size level and for size groups respectively (for a total, in both cases, of 57 strata). As a rule of thumb, OECD (2003) states that the availability of around 30 reporting units per strata is a sufficient condition to ensure an acceptable level of precision for each strata for which the data are published. A

Table 4 Data availability by level of aggregation

Geographical aggregation (number of geographical partition)	Size-level aggregation (number of size groups)	Industry aggregation (number of industries)
National (1)	Total (1)	3-digit industries (56)
National (1)	Size groups (3)	2-digit industries (21)
Geographical partitions (4) [19]	Total (1)	2-digit industries (21)
Geographical partitions (4)	Size groups (3)	Main Industrial Groups (3)
Regions (19)	Total (1)	Main Industrial Groups (3)
Regions (19)	Size groups (3)	Total Manufacturing (1)

maximum of 84 strata is considered in the "modular" disaggregation proposed in table 4, meaning that (on average) in the worst of the cases, with 4.100 interviews, a minimum of 4.100:84=49 interviews per strata are available, a number that should be considered sufficient for a statistically significant analysis according to international standards.

Coming back to the calculation of weights, table 5 shows the size weights for geographic partition, size and industry (from 15 to 36 in the 2-digit NACE Rev. 1 classification). A more detailed table with regional industry-specific value added is provided in the statistical appendix.

[19] The regional composition of the geographic partitions is the following: North West: *Piemonte, Val d'Aosta, Lombardia, Liguria;* North East*: Veneto, Trentino Alto Adige, Friuli Venezia Giulia, Emilia Romagna;* Centre*: Marche, Toscana, Lazio, Umbria;* South: *Abruzzi, Campania, Molise, Puglia, Basilicata, Calabria, Sicilia, Sardegna.*

Table 5 part 1 Industry size weights: NACE Rev.1.1 2-digit sectors, geographic partition and size (in percentage)

Sectors (NACE Rev. 1)/ Size	North West				North East			
	10-99	*100-249*	*>250*	*All*	*10-99*	*100-249*	*>250*	*All*
15. & 16. Food, beverages, tobacco	1,35	0,45	1,39	*3,19*	1,71	0,46	0,95	*3,13*
17. Textiles	1,84	0,61	0,81	*3,26*	0,64	0,17	0,39	*1,20*
18. Wearing apparel; furs	0,67	0,13	0,19	*0,98*	0,81	0,17	0,30	*1,29*
19. Leather products	0,21	0,05	0,02	*0,29*	0,65	0,17	0,07	*0,89*
20. Wood & wood products (exc. Furniture)	0,59	0,09	0,02	*0,69*	0,79	0,10	0,04	*0,93*
21. Pulp, paper & paper products	0,35	0,20	0,30	*0,85*	0,27	0,14	0,16	*0,56*
22. Publishing & printing	1,16	0,20	0,58	*1,95*	0,54	0,10	0,14	*0,79*
23. Coke, refined petroleum	0,04	0,05	0,40	*0,50*	0,03	0,01	0,07	*0,11*
24. Chemicals	1,11	0,83	2,61	*4,54*	0,46	0,19	0,64	*1,29*
25. Rubber & plastic products	1,46	0,42	0,71	*2,59*	0,78	0,24	0,17	*1,19*
26. Other non metallic products	0,67	0,18	0,44	*1,29*	1,03	0,42	0,97	*2,42*
27. Basic metals	0,74	0,36	1,02	*2,12*	0,27	0,20	0,24	*0,71*
28. Metal products	4,51	0,67	0,53	*5,71*	3,13	0,45	0,35	*3,94*
29 Machinery & equipment n.e.c.	3,46	1,13	1,63	*6,22*	2,38	1,03	1,73	*5,14*
30. Office machinery & computers	0,09	0,02	0,34	*0,45*	0,07	0,00	0,03	*0,11*
31. Electrical machinery	1,14	0,28	1,03	*2,46*	0,77	0,13	0,35	*1,24*
32. Radio, TV, communication	0,30	0,09	0,39	*0,78*	0,17	0,08	0,09	*0,34*
33. Medical, precision, optical apparel	0,64	0,18	0,19	*1,01*	0,43	0,10	0,34	*0,88*
34. Motor Vehicles	0,28	0,33	1,60	*2,21*	0,16	0,07	0,30	*0,53*
35. Other transport equipment	0,15	0,07	0,50	*0,73*	0,15	0,06	0,23	*0,43*
36. Manufacturing industries n.e.c.	0,96	0,17	0,17	*1,29*	1,37	0,26	0,16	*1,79*
Geographic total	***21,73***	***6,52***	***14,88***	***43,13***	***16,62***	***4,56***	***7,72***	***28,91***

Table 5 part 2 Industry size weights: NACE Rev.1.1 2-digit sectors, geographic partitions and size (in percentage)

Sectors	Centre				South				Italy			
	10-99	*100-249*	*≥250*	*All*	*10-99*	*100-249*	*≥250*	*All*	*10-99*	*100-249*	*≥250*	*All*
15. & 16	0,75	0,17	0,42	1,35	1,39	0,18	0,41	1,99	5,21	1,26	3,18	9,65
17.	0,98	0,10	0,05	1,13	0,18	0,04	0,03	0,25	3,65	0,92	1,27	5,84
18.	0,62	0,06	0,07	0,76	0,60	0,06	0,05	0,71	2,70	0,43	0,61	3,74
19.	1,11	0,16	0,14	1,41	0,40	0,03	0,24	0,67	2,37	0,41	0,47	3,25
20.	0,34	0,03	0,00	0,38	0,30	0,02	0,00	0,33	2,02	0,24	0,06	2,32
21.	0,26	0,05	0,20	0,51	0,12	0,04	0,11	0,27	0,99	0,43	0,77	2,20
22.	0,42	0,08	0,25	0,75	0,20	0,07	0,05	0,32	2,33	0,45	1,02	3,80
23.	0,06	0,01	0,27	0,34	0,06	0,01	0,05	0,12	0,19	0,08	0,80	1,07
24.	0,24	0,30	0,84	1,38	0,20	0,10	0,39	0,68	2,01	1,42	4,47	7,90
25.	0,39	0,09	0,10	0,57	0,25	0,09	0,08	0,42	2,88	0,84	1,06	4,77
26.	0,72	0,15	0,25	1,11	0,56	0,12	0,21	0,90	2,97	0,87	1,87	5,71
27.	0,12	0,03	0,27	0,42	0,11	0,06	0,33	0,49	1,24	0,64	1,86	3,74
28.	1,03	0,14	0,09	1,26	1,01	0,20	0,10	1,31	9,68	1,47	1,07	12,22
29	0,77	0,22	0,61	1,59	0,42	0,09	0,18	0,69	7,03	2,47	4,15	13,66
30.	0,06	0,00	0,11	0,17	0,06	0,00	0,03	0,09	0,28	0,03	0,50	0,81
31.	0,30	0,07	0,13	0,50	0,23	0,05	0,12	0,39	2,44	0,53	1,63	4,60
32.	0,10	0,05	0,29	0,44	0,08	0,05	0,21	0,34	0,65	0,28	0,98	1,90
33.	0,19	0,03	0,12	0,33	0,10	0,02	0,00	0,13	1,36	0,33	0,66	2,35
34.	0,06	0,04	0,17	0,27	0,08	0,09	0,68	0,85	0,59	0,54	2,74	3,87
35.	0,12	0,03	0,35	0,50	0,07	0,01	0,33	0,42	0,49	0,17	1,41	2,07
36.	0,76	0,09	0,09	0,94	0,30	0,05	0,15	0,49	3,39	0,56	0,56	4,51
Total	**9,39**	**1,91**	**4,80**	**16,10**	**6,73**	**1,39**	**3,75**	**11,87**	**54,47**	**14,37**	**31,16**	**100,00**

On the basis of table 5, it is possible to calculate total weights for industries/size groups/geographic partitions. Moreover, the table provides also “marginal” total for all the crossings between the three dimensions of the table: for instance, from a geographical point of view the chemical industry weight is equal to 4.5% in the North West, 1.3% in the North East, 1.4% in the Centre, 0.7% in the South. Looking at the size of the firms, the weight is equal to 2% for small firms, 1.4% for medium size firms and 4.5% for large firms. Overall, the weight of the chemical industry in the Italian manufacturing sector is equal to 4.5+1.3+1.4+0.7=2+1.4+4.5=7.9%. It is possible to compare the structure of the Italian manufacturing sector that is now adopted as a starting point for the elaboration of survey data with that previously used, that was based on the old NACE classification and on industry-specific weight relative to the year 1986 (table 6). On the basis of the information provided in the table, some relevant changes in the structure of the Italian manufacturing sector emerge. The main

differences concern the weight of the textile, leather & footwear sector, whose share declines from 17,8% in 1986 to 12,8% in 1999, while that of machinery & equipment rises in terms of weight from 17,3 to 23,3%, mainly because of an increasing specialisation in machinery & equipment n.e.c (+4,4%) and in electrical machinery (+2,4%). It is also possible to observe a decline in the shares of the transports equipment and other manufacturing n.e.c. sectors (-2,2% and -1,5% respectively) and an increase in those of the basic metals & metal products (+2,6%) and rubber & plastic products (+1,2%). Table 6 strongly confirms the need for an upgrading of the weights used for elaborating survey

Table 6 Old and new value added weights for the ISAE manufacturing survey

NACE	Sectors	*1986*	*1999*	*Difference*
15-16	Food, beverages, tobacco	9,94%	9,65%	-0,29%
17-19	Textiles, leather, footwear	17,82%	12,83%	-4,98%
17	Textiles	8,58%	5,84%	-2,74%
18	Wearing apparel, furs	5,38%	3,74%	-1,64%
19	Leather products	3,86%	3,25%	-0,61%
20	Wood & wood products (exc. Furniture)	2,97%	2,32%	-0,65%
21-22	Pulp, paper & paper products, publishing & printing	5,50%	6,00%	0,50%
21	Pulp, paper & paper products	2,47%	2,20%	-0,27%
22	Publishing & Printing	3,03%	3,80%	0,77%
23	Coke, refined petroleum	0,85%	1,07%	0,22%
24	Chemicals	7,68%	7,90%	0,22%
25	Rubber & plastic products	3,53%	4,77%	1,24%
26	Other non metallic products	6,81%	5,71%	-1,10%
27-28	Basic Metals & metal products	13,36%	15,96%	2,60%
29-33	Machinery & equipment	17,34%	23,33%	5,99%
29	Machinery & equipment n.e.c.	9,31%	13,66%	4,35%
30	Office machinery & computers	0,64%	0,81%	0,17%
31	Electrical machinery	2,19%	4,60%	2,41%
32	Radio, TV, communication	4,32%	1,90%	-2,41%
33	Medical, precision, optical apparel	0,88%	2,35%	1,47%
34-35	Transport equipment	8,15%	5,94%	-2,21%
34	Motor Vehicles	6,00%	3,87%	-2,13%
35	Other transport equipment	2,15%	2,07%	-0,08%
36	Manufacturing industries n.e.c, recycling	6,07%	4,51%	-1,55%

results, given the modification occurred in the structure of the Italian manufacturing sector. In this sense, it provides indeed an interesting picture of the structure of the Italian manufacturing sector in the year 1999: from a geographical point of view, the structure appears to be characterised by a large

dominance of northern firms which account for over 72% of total value added of the sector. From the point of view of size composition, more than half (54,5%) of total value added is produced by firms with less the 100 employees and only 14,4 and 31,2% respectively by medium and large-size firms. Looking at the industry composition, the structure of the Italian manufacturing sector is characterised also by a relevant role of "traditional" sector such as food, beverages and tobacco (9,65% of the total), metal products (12,22%), machinery and equipment (13,66%), and, on the other hand by a small or negligible contribution from sectors such as office machinery & computers (that accounts for only 0,81% of the total manufacturing value added), radio, TV & communication equipment (1,9%; among the others, industries of new electronics goods for consumers are included here), other transports equipment (such as naval industry and aviospace, 2,07% as a whole).

Table 6 is based on value added data evaluated at market price and in the local currency. For an international comparison of value added composition at the industry level, available data are measured at basic prices (see the OECD Stan database). However, differences between basic prices and market prices data are often negligible, allowing a direct comparison between the industry structure used for Italy by ISAE and that of some of the other main industrial countries, the EU and the OECD as a whole (table 7; for aggregated zones, data are converted to a common unit using the Purchasing Power Parities for total GDP)[20].

Table 7 confirms the relative specialisation of Italian industry in the more "traditional" sectors of the so-called "made in Italy". In particular, the weight of industries 17-19 (Textiles, leather, footwear) is in Italy more than the double of the European average; also for industries 26 (Other non metallic products), 28 (Metal products) and 36-37 (Manufacturing n.e.c and recycling) the Italian weight is significantly higher than that of the other main industrial countries. On the other hand, the Italian manufacturing sector seems to be relatively de-specialised in high-technology industries such as those of sector 24 (Chemicals), 30 (Office Machinery & computers), 33 (Radio, TV, Communication equipment) and 34 (Motor Vehicles). It is therefore quite important to bear in mind these considerations in comparing survey results for Italy with those of the other countries participating to the Joint EU harmonised program.

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[20] Market price data in table 7 for Italy are slightly different from those provided in table 6 because on an international basis only figures for sectors 36 and 37 together are available, while sector 37 (recycling) is not considered in table 6 because the industry is not comprised in the Joint Harmonised manufacturing survey. In table 7, all the industry shares are therefore calculated with respect to the total from sector 15 to sector 37.

Table 7 Manufacturing value added shares in the main industrial countries, year 1999 (in percentage)

NACE	Sectors	*Italy (market prices)*	*Italy*	*Germany*	*France*	*EU11*	*US*	*Jap*	*OECD*
15-16	Food, beverages, tobacco	9,64	9,86	9,26	13,78	11,66	10,53	11,67	12,20
17-19	Textiles, leather, footwear	12,81	13,41	2,41	4,63	6,00	3,58	3,45	4,76
20	Wood & wood products (exc. Furniture)	2,32	2,73	2,01	1,61	2,29	2,98	1,07	2,47
21-22	Pulp, paper & paper products, publishing & printing	5,99	6,57	8,06	8,29	9,34	10,94	8,21	9,42
23-25	Chemicals, rubber, plastics & fuel	13,72	14,61	15,10	17,86	15,84	17,31	15,35	16,41
23	Coke, refined petroleum	1,07	1,62	0,61	2,27	1,43	2,05	5,47	2,83
24	Chemicals	7,88	8,57	9,46	10,86	9,76	11,29	8,69	9,83
25	Rubber & plastic products	4,77	4,42	5,03	4,73	4,65	3,96	1,19	3,75
26	Other non metallic products	5,70	6,47	4,08	4,76	4,93	2,80	3,38	3,95
27-28	Basic Metals & metal products	15,93	13,96	13,04	13,16	12,47	10,62	11,35	11,57
27	Basic metals	3,74	3,22	3,86	3,33	3,45	3,41	6,10	Na
28	Metal products	12,20	10,74	9,18	9,82	9,02	7,22	5,25	Na
29-33	Machinery & equipment	23,29	21,13	28,49	19,96	22,82	25,09	28,80	23,30
29	Machinery & equipment n.e.c.	13,64	11,87	14,38	7,91	10,54	7,77	9,21	8,51
30-33	Electrical & optical equipment	9,65	9,26	14,12	12,05	12,28	17,32	19,59	14,79
30	Office machinery & computers	0,81	0,33	0,91	1,07	1,10	2,46	2,61	Na
31	Electrical machinery	4,59	4,77	7,35	4,37	5,04	2,63	5,31	Na
32	Radio, TV, communication	1,90	1,99	2,40	3,26	3,23	8,31	10,10	Na
33	Medical, precision, optical apparel	2,35	2,16	3,45	3,35	2,91	3,93	1,57	Na
34-35	Transport equipment	5,93	6,43	14,61	12,22	10,80	12,46	10,84	11,87
34	Motor Vehicles	3,86	3,84	12,48	8,40	8,00	8,06	9,58	Na
35	Other transport equipment	2,07	2,59	2,12	3,81	2,79	4,39	1,25	Na
36-37	Manufacturing industries n.e.c, recycling	4,67	4,84	2,94	3,74	3,86	3,69	5,88	4,07

3.3 The new weighting system

In par. 3.2, a new grid of weights has been introduced, allowing the construction of a new procedure for processing results consistent at the national, local and size level. In fact, the weighting system previously adopted by ISAE was based on the classification of the reporting units according only to their industry specialisation (see par. 2.1). Now, each reporting unit is classified

along 3 “axes”: industry specialisation, Sk, region, Rl and size, SSm. Therefore, survey percentages could be progressively calculated aggregating answers coming from the Reporting Units in 4 stages:

1. In the first step, percentages of answers for each sector k, in region l, with size m, are calculated using firm employees as weights.
2. In the second, aggregated percentages for sector k (or region l/size m) in region l (or sector k/size m) are calculated, summing with respect to size groups (or with respect to regions/sectors), using size specific (or region/sector specific) value added weights.
3. In the third step, “marginal” percentages are calculated for total sector k (or for total region l/total size m), summing with respect to both regions and size groups (or, with respect to sectors and size/sectors and regions) using the region and size-specific value added weights (or, the sector and size specific weights/sector and region specific weights).
4. In the final step, the overall percentage for all the firms of the manufacturing sector in Italy is calculated, aggregating all the industry, region and size specific percentages with their respective value added weights.

Step 1. Let’s consider a specific sector, in a specific region, of a specific size group (k,l,m): say, textile, small size firms, operating in Tuscany. Consider the generic set of firms $j_{1k,lm} \ldots j_{i\ k,l,m}$ operating in k,l,m. In this case, in the first stage of the process the aggregated percentages of answers to question X for all the firms operating in the strata are obtained as a weighted average of the firm-specific answers, the weights being the number of the firm employees, y_j:

$$X_{k,l,m} = \sum_j \frac{y_j \cdot x_j}{\sum_j y_j} \qquad (7)$$

An example may be useful to clarify what is exactly $X_{k,l,m}$. Considering the question on the level of inventories, particularly the answer “Above Normal”, we have that:

$x_i = 1$, if inventories are considered above normal

$x_i = 0$, otherwise

Suppose that we are calculating survey percentages for small-size textile firms operating in Tuscany and suppose also that there are i=40 small-size firms in the strata. It is then possible to calculate the percentage of textile-small size-

Tuscanian firms that have answered “above normal” to the question about inventories using (7).

Step 2. Suppose now we want to calculate the “above normal” percentage for all the firms (not only the small ones) of the textile industry in Tuscany. This is the second stage of the procedure, in which value added weights are used to aggregate, in the case of the example above, through the different size groups. In particular, let’s denote $z_{k,l,m}$ the generic value added for sector k, in region l, of size m; in this case, the weights may be written as follows:

$$w_{k,l,m} = \frac{z_{k,l,m}}{\sum_{k}\sum_{l}\sum_{m} z_{k,l,m}} \qquad (8)$$

It is important to notice that in calculating (8) only industries answering in a particular survey are considered: this means that if for a generic strata identified by sector S_k, region R_l and size SS_m there is no firm answering in a particular month, the relative value added $Z_{k,\,l,\,m}$ is considered equal to zero; this also implies that the overall sum $\sum_{k}\sum_{l}\sum_{m} z_{k,l,m}$ may vary from one month to another, according to the actual answers received in a particular month. This implies also that the $w_{k,l,m}$ weights used in computing the survey results may vary in time, because of a change in the denominator in (8). This allows to maximise weights representativeness of the actual firms answering the survey each month, in the sense that a particular cell will give its contribution to the calculation of marginal and overall total if some firms are actually answering in that cell. On the other hand, it will be excluded from the calculation if no-one is answering to the survey in that particular cell (i.e., in a 3-digit sector of a region for firms of a peculiar size group). However, it should be considered that weight variability is expected to be relatively low, because of the above mentioned stability of the ISAE panel, implying that only a very small proportion of firms are being substituted from one month to another, and therefore the $\sum_{k}\sum_{x}\sum_{c} z_{k,z,c}$ sum is relatively stable in time[21].

Let’s now denote $X_{k,l,.}$ the total “above normal” percentage for all the textile firms operating in Tuscany. The $X_{k,l,.}$ percentage is calculated as a weighted

[21] Generally speaking, the new firms entering the panel each month amount to less than 2% of the sample.

sum of the percentages in (7), the weights being the relative importance of each size group for the textile industry in Tuscany:

$$X_{k,l,.} = \sum_{m} (w_{k,l,m} \cdot X_{k,l,m}) \tag{9}$$

Step 3. Suppose now we want to calculate the "above normal" percentage for all the firms of the textile industry for the Italian total: in this case, results need to be aggregated not only through size groups but also through regions. Let's denote $X_{k..}$ the marginal total percentage of "above normal" answers for S_k concerning the generic answer to a qualitative question X. The $X_{k..}$ is calculated as the weighted average of the industry specific percentages for each region and size groups, namely:

$$X_{k..} = \sum_{l} \sum_{m} (w_{k,l,m} \cdot X_{k,l,m}) \tag{10}$$

Step 4. From equations (8)-(10), it is straightforward to derive the fourth step of the aggregating process. In the example, in order to calculate the total percentage for the whole manufacturing sector and size groups for Italy as a whole, the $X_{k..}$ should be aggregated further with respect to sectors. Denoting X… the overall aggregated percentage of answers for a generic reply to question X, we have:

$$X_{...} = \sum_{k} \sum_{l} \sum_{m} (w_{k,l,m} \cdot X_{k,l,m}) \tag{11}$$

Obviously, expressions (9) and (10) above could be used also to calculate the "marginal" percentage of answers with respect to region or size; in these cases expression (11) still applies to calculate the overall total.

It should be noted that the new method used to process survey results is equivalent to the one recently proposed in OECD (2003). In fact, the OECD recommends the use of the inverse sample probability to weight the answers provided by the kind of activity units (KAUs) inside each stratum, in order to account for varying probability of extraction for the KAUs in the stratum. When, as in the case of the ISAE survey, the reporting unit is the enterprise itself (not the KAU), the inclusion probability is the same for each reporting units and therefore the sample probability is constant within the stratum. Moreover, as stated in section 3.2, the value added values used to weight the strata are

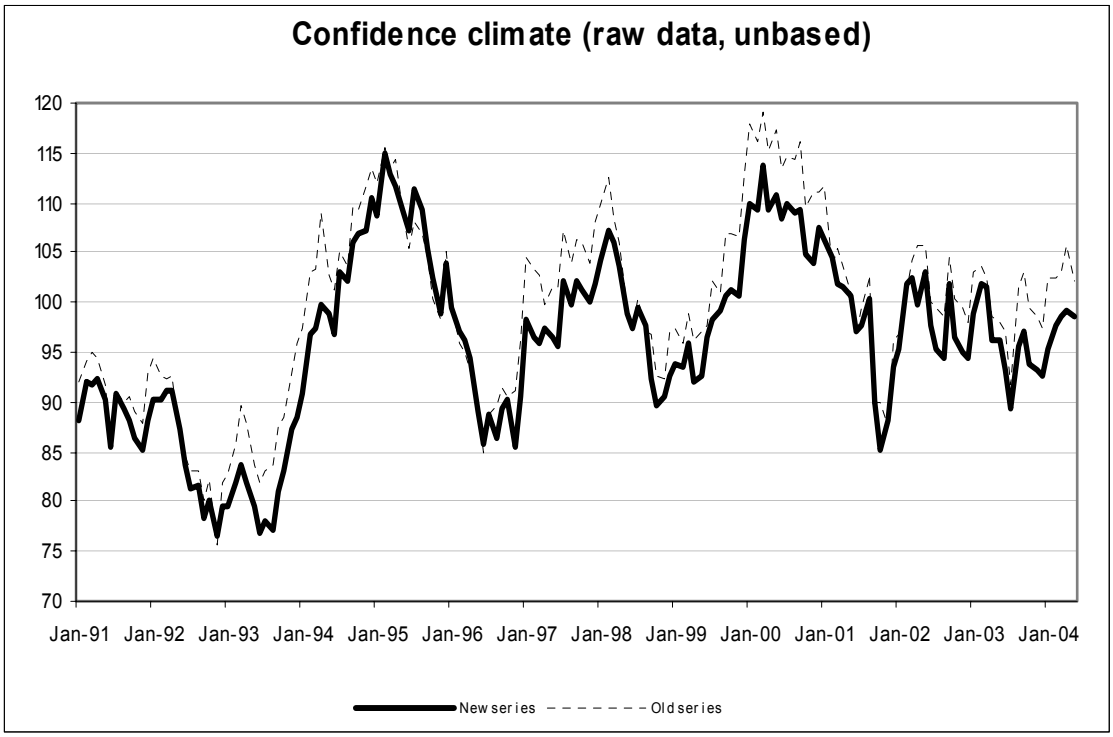
known from external sources and therefore there is no need to estimate them out of the sample.

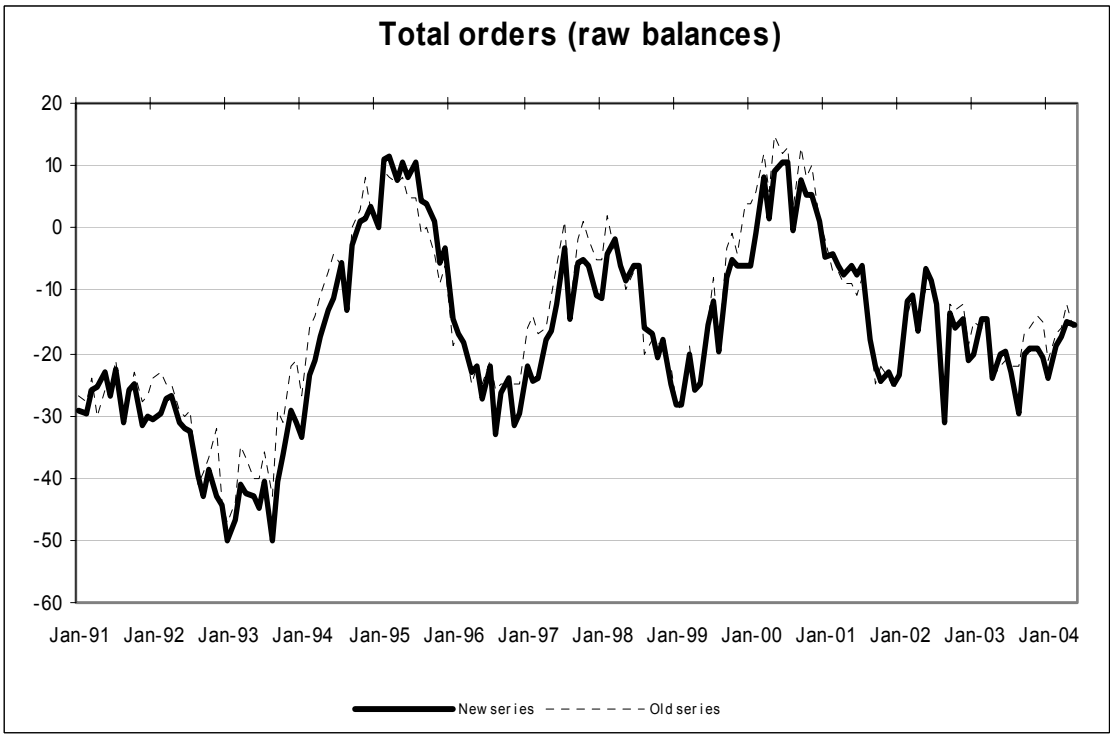
4 THE NEW DATA-SET

Before laying down some conclusions about the restructuring of the ISAE manufacturing survey, in this section we briefly present the new series and some first analysis of their main cyclical features. As stated above, the procedures described in section 3 have been applied to the survey data at the firm level, starting from January 1991. In practice, in a first step every responding firm in each month has been mapped from the old to the new industry classification, and then the new aggregated series for the survey have been calculated using equations 7-11. Confidence Indicators (CI) have then been calculated for the manufacturing sector as a whole, for the MIGs, the main geographical partitions and size groups. Accordingly with the EU methodology, CI is calculated as a simple arithmetic average of the balances of three questions, namely those on the current level of total orders, inventories and production expectations and then indexed to the year 2000. Figures 1-3 present, respectively, the CI and its components for the total manufacturing in Italy, together with those for the Main Industrial Groupings and the main geographic partitions, confronting the new series with the old ones (raw data).

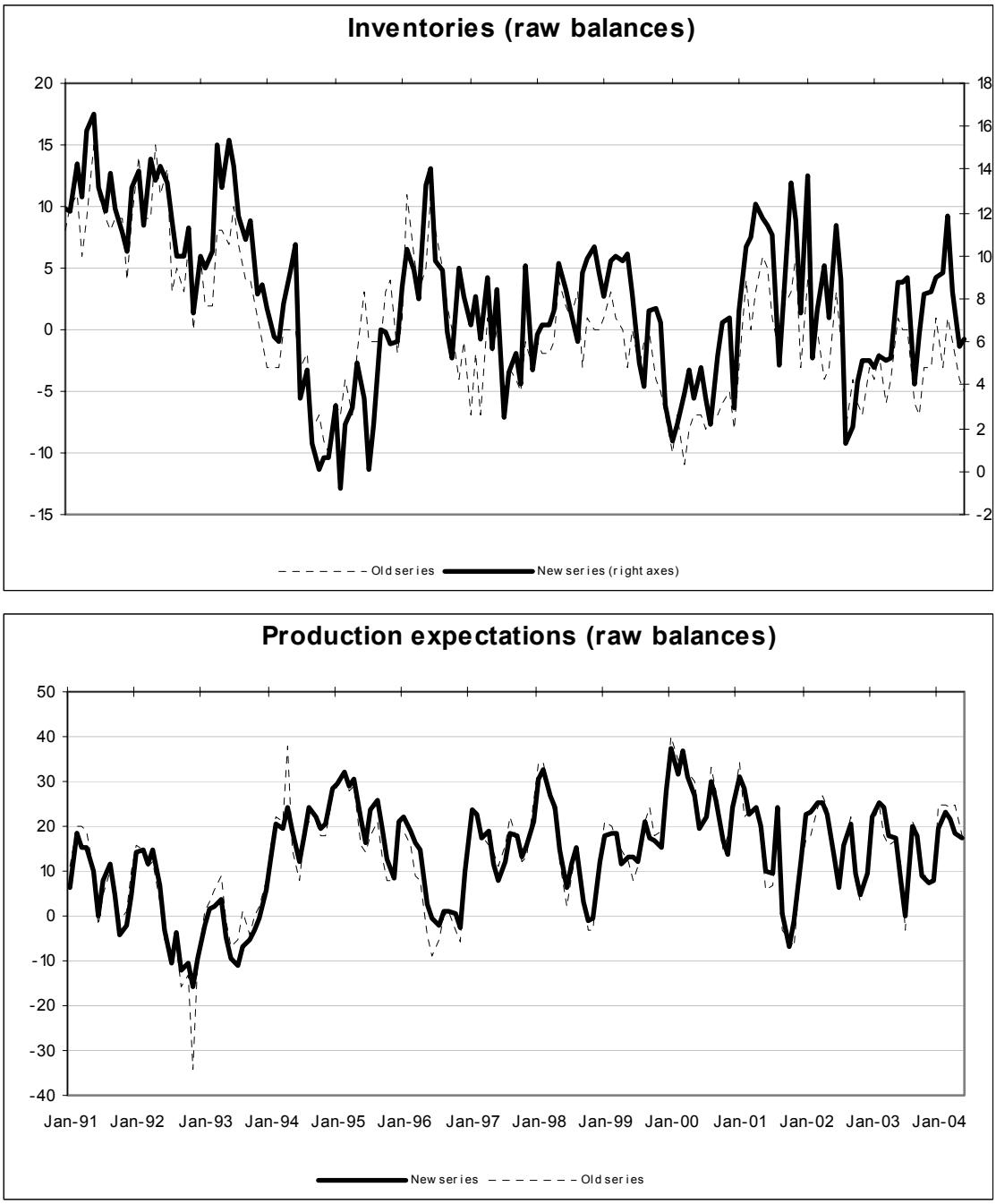
A brief digression is needed here about the way ISAE has historically calculated the balance for the question on the level of inventories. In the Italian version of the Commission questionnaire, the question on inventories has a 4-choice answer: in fact, beside the harmonised three possibilities (above normal, normal, below normal) ISAE adds the answer “no inventories”. In the old version of the series, the balance was calculated as the difference between “above normal” and the sum of “below normal” and “no inventories” answers. With the restructuring of the survey, ISAE explored the possibility of harmonising further the questionnaire and calculating the balance for this question in the harmonised way, as the difference of “above” and “below normal” answers. In practice, we added a question in the questionnaire for three consecutive months, asking if the “no inventories” answer was due to the peculiar production organisation of the firm or to an exceptional phase of the cycle; in all the three months, more than 90% of the firms that answered “no inventories” told us that that was due to the structure of the production process of the firm. Therefore, we decided to re-calculate the inventories balance in the harmonised way.

Figure 1 Raw unbased Confidence Climate and its components – Total manufacturing





continues **Figure 1** **Raw unbased Confidence Climate and its components – Total manufacturing**



Figures 1-3 present a comparison of the old and new series, referred to, respectively, the confidence climate and its components for the manufacturing sector in Italy as a whole (figure 1) and confidence climates for the Main industrial Groupings (figure 2) and the main geographical partitions (figure 3).

Figure 2 Raw unbased Confidence Climates for the Main Industrial Groupings

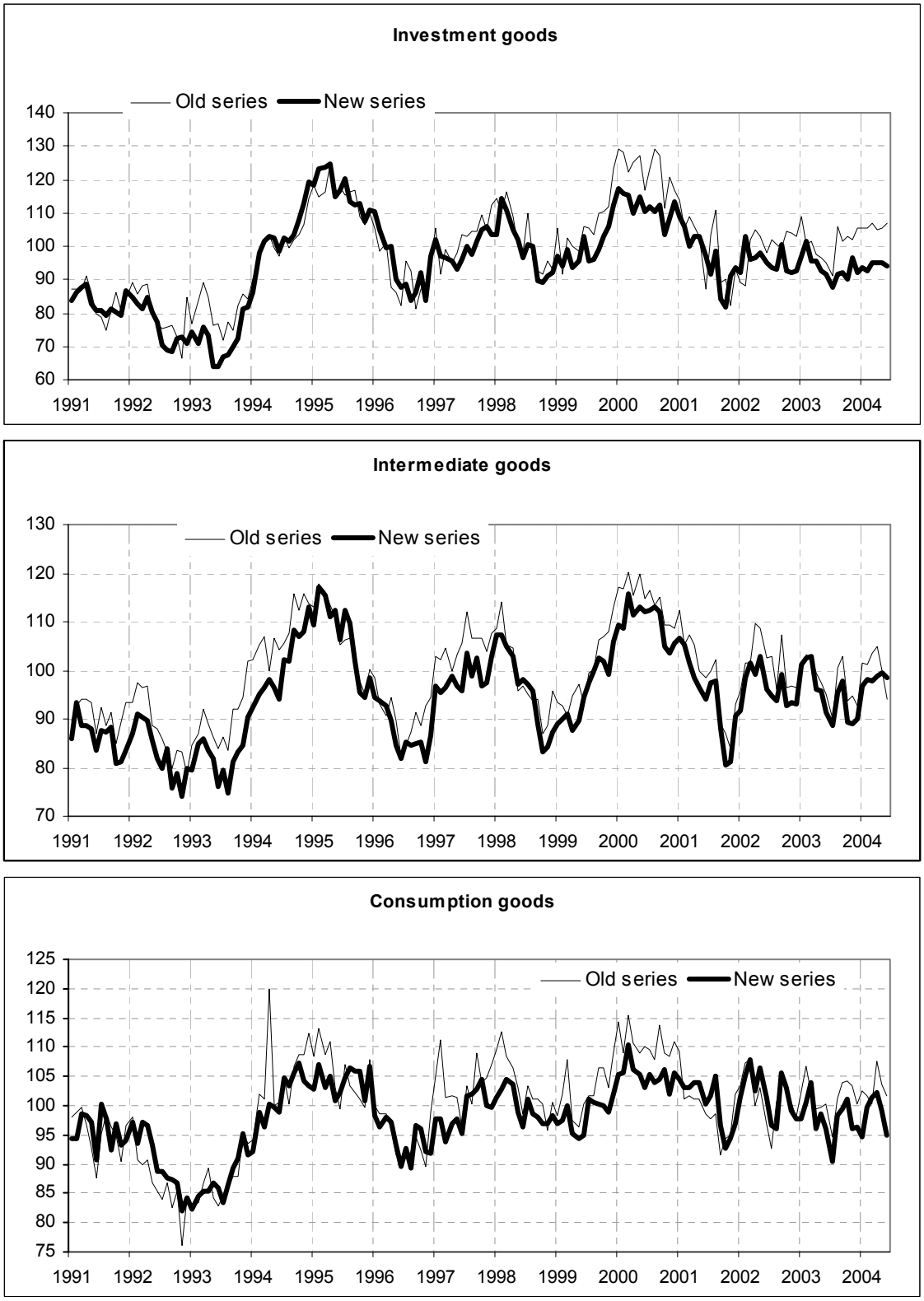
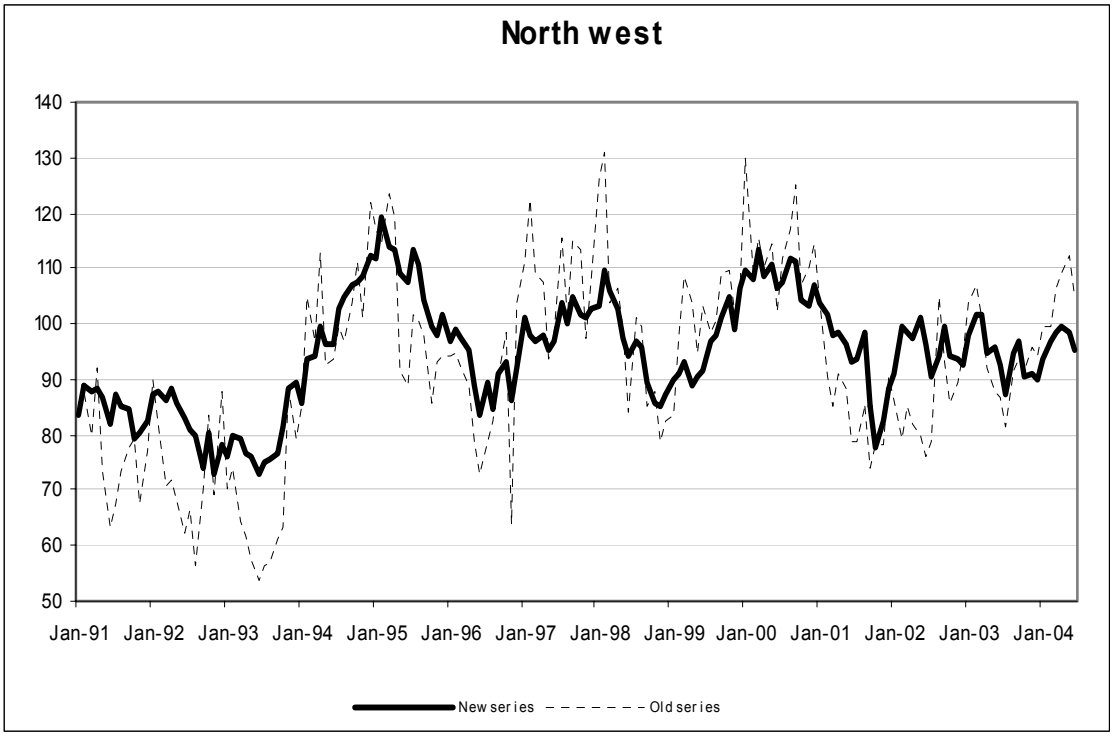
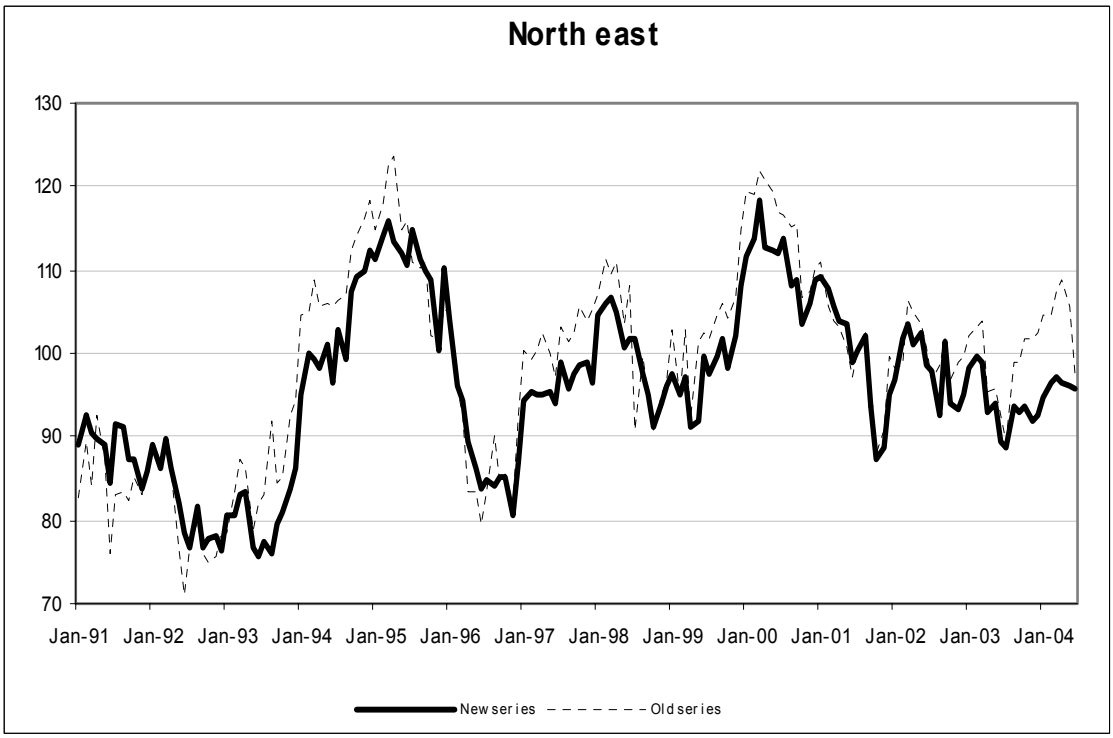
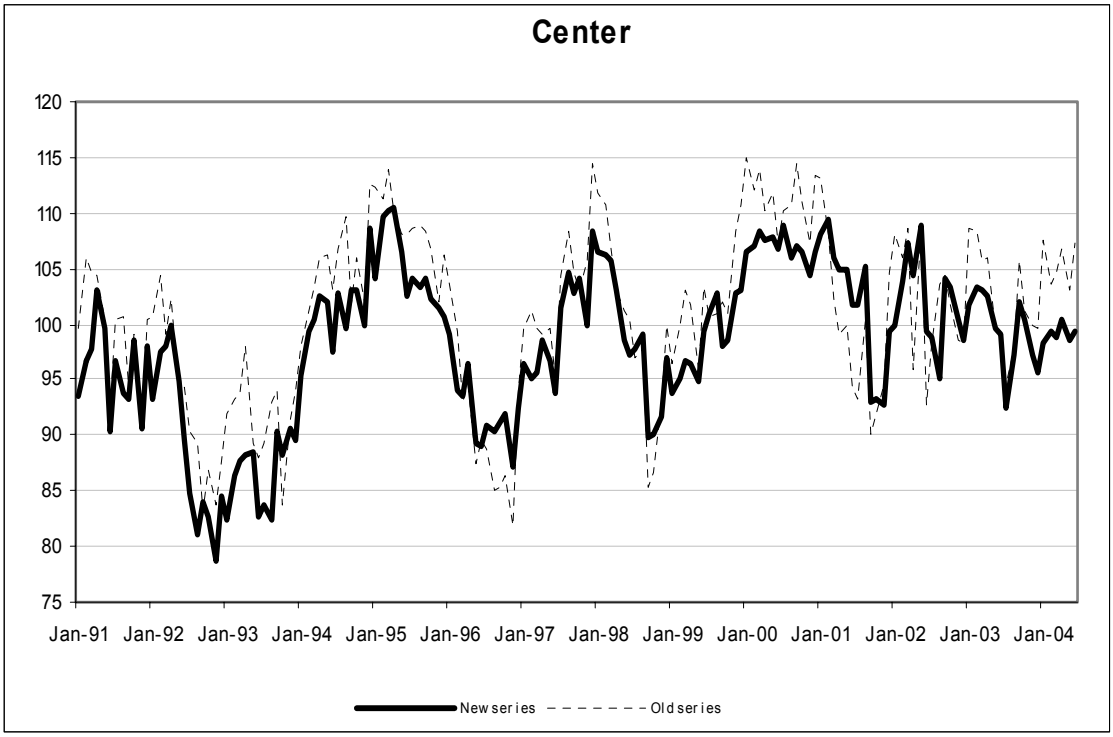


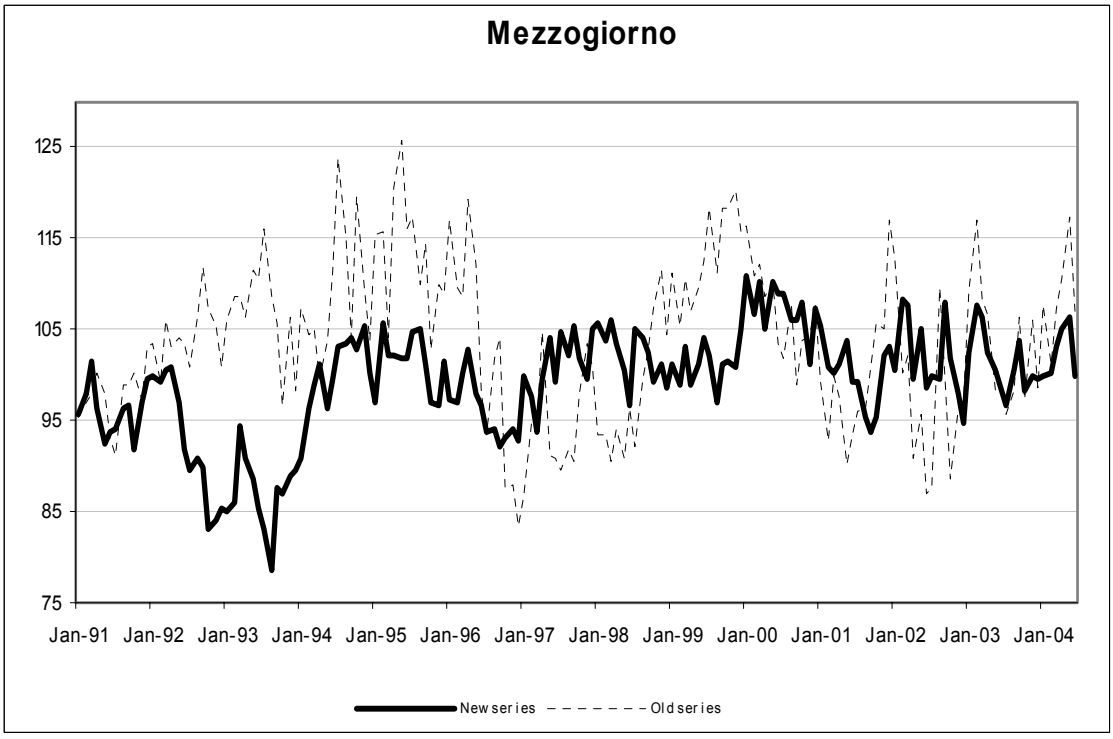
Figure 3 Raw unbased Confidence Climate for the geographical partitions





continues **Figure 3** **Raw unbased Confidence Climate for the geographical partitions**





Tables 8 and 9 then provide some first descriptive statistics relative to the balances of the main series of the survey, for the Italian manufacturing sector

Table 8 Descriptive statistics of the main balances of the survey – Italy

	Total orders	Inventories	Production expectations	Level of production	Production growth	Orders expectations	Price expectations	General economy expectations
				Old series				
Mean	-14,93	0,29	13,37	-9,71	4,07	16,43	10,59	-5,39
Median	-16,00	0,00	15,00	-12,00	7,00	17,50	8,50	-3,50
Std. Dev.	13,55	5,66	11,96	12,32	13,69	11,53	9,24	19,99
Min.	-47	-11	-34	-46	-34	-16	-7	-66
Max	15	15	40	22	34	46	44	32
Range	62	26	74	68	68	62	51	98
				New series				
Mean	-16,99	8.0	13,64	-10,68	3,22	14,67	9,93	-9,10
Median	-17,79	8.2	15,34	-11,23	5,53	16,53	8,40	-7,05
Std. Dev.	14,31	3.7	11,18	12,25	13,13	11,86	9,32	19,44
Min.	-50	-0.8	-16	-39	-34	-16	-6	-66
Max	12	16.6	37	17	33	38	40	23
Range	62	18	53	56	67	55	46	89

as a whole (table 8), the Main Industrial Groupings (table 9) and the main geographical partitions (table 10). Looking at both figures and tables relative to the total manufacturing sector in Italy, we notice that the restructuring of the survey does not seem to show a particularly significant impact on the mean and the variability of the series considered, as measured by their standard errors; however, the adoption of the harmonised definition for the balance of inventories does affect the mean of this series, also reducing its standard deviation and range. This may also explain the difference observed in the behaviour of the raw, unbased, confidence climate index calculated on the new

series with respect to that for the old ones[22]. Indeed figures relative to total orders and production expectations show that, at an aggregate level, old and new series have quite a similar behaviour in the period considered.

Table 9 Descriptive statistics of the main balances of the survey – Main industrial groupings

	New series			Old series		
	Total orders	Inventories	Production expectations	Total orders	Inventories	Production expectations
			Investment goods			
Mean	-17,9	9,2	13,2	-15,1	0,7	13,2
Median	-17,8	8,5	14,9	-16,0	0,0	14,5
Std. Dev.	21,3	6,9	15,6	20,0	8,7	17,6
Min.	-65,4	-5,9	-23,4	-65,0	-17,0	-34,0
Max	32,1	22,5	47,2	32,0	22,0	55,0
Range	97,5	28,4	70,6	97,0	39,0	89,0
			Consumption goods			
Mean	-15,2	5,9	15,8	-12,1	2,9	14,6
Median	-14,6	5,9	18,0	-12,0	2,5	16,0
Std. Dev.	10,1	3,6	9,3	10,9	7,1	12,4
Min.	-44,7	-2,7	-13,3	-45,0	-11,0	-51,0
Max	4,1	13,6	33,6	15,0	21,0	61,0
Range	48,8	16,2	46,8	60,0	32,0	112,0
			Intermediate goods			
Mean	-17,9	9,2	12,2	-16,9	-2,1	12,6
Median	-19,6	9,2	12,6	-18,5	-2,0	14,0
Std. Dev.	16,2	4,7	12,2	15,3	6,3	11,8
Min.	-54,8	-1,9	-17,0	-49,0	-18,0	-15,0
Max	18,5	20,5	38,5	19,0	12,0	37,0
Range	73,2	22,3	55,4	68,0	30,0	52,0

The picture is quite similar looking at the data disaggregated for the main industrial groupings; however, in this case the figures show that the restructuring seems to have some impact on the cyclical behaviour of the confidence climates, especially in the final part of the sample, that is probably more heavily affected by the change of the weights used for the aggregation. As expected, more striking cyclical differences emerge looking at the data disaggregated for geographical partitions: indeed, in this case the method of aggregation has completely changed with respect to the old elaborations. Taking into account industry, size and region specific weights, the behaviour of

[22] Unbased confidence climates are usually calculated by ISAE summing the value 100 to the average of the three balances entering the EU harmonised definition of confidence (total orders, inventories, production expectations), with the balance on inventories entering with negative sign.

confidence climate for the North West and the Mezzogiorno of Italy does indeed change. Also means, medians, standard deviations and ranges of the series are affected by the adoption of the new method.

Table 10 Descriptive statistics of the main balances of the survey – Main geographical partitions

	New series			Old series		
	Total orders	Inventories	Production expectations	Total orders	Inventories	Production expectations
			North West			
Mean	-17,95	8,22	10,47	-14,79	12,95	4,76
Median	-18,42	8,1	12,60	-13,50	5,00	6,50
Std. Dev.	15,81	5,5	12,45	21,94	18,41	26,93
Min.	-55	-3,7	-21	-74	-26	-54
Max	22	19,7	39	43	55	57
Range	77	23,4	60	117	81	111
			North east			
Mean	-15,90	9,7	13,88	-9,86	5,91	12,10
Median	-17,07	9,7	14,50	-10,00	5,50	14,00
Std. Dev.	16,68	4,2	12,52	17,68	7,58	14,47
Min.	-50	-1,59	-15	-51	-14	-26
Max	20	20,9	37	31	29	45
Range	70	22,49	52	82	43	71
			Centre			
Mean	-15,70	5,8	16,20	-12,46	0,91	15,69
Median	-16,29	5,8	17,48	-13,00	0,50	18,00
Std. Dev.	12,12	4,05	11,07	12,29	7,16	13,58
Min.	-44	-3,96	-17	-41	-21	-18
Max	10	16,64	40	17	22	43
Range	54	20,6	57	58	43	61
			South			
Mean	-18,40	5,7	22,09	-15,14	-5,14	21,37
Median	-16,77	5,8	23,20	-14,00	-7,00	21,00
Std. Dev.	11,03	4,85	9,50	13,42	11,11	13,93
Min.	-54	-6,5	-9	-47	-38	-14
Max	5	14,48	40	25	26	70
Range	59	21	49	72	64	84

Table 11 then provides a first assessment of the main cyclical features of the new Confidence Climate, seasonally adjusted with Tramo-Seats (Gomez and Maravall, 1996), comparing them with that of the old CI (seasonally adjusted with T-S) and of the Italian industrial production index. Considering the old and new Confidence Index (for the new series, also detailed by geographical partition), the table provides the cyclical chronology, extracted with the fairly standard Bry-Boschan (1971) procedure, and compares it with that of the cyclical component of the Industrial Production index (recently provided by

ISAE in a study on the industrial cycle in the EU)[23]. For the index of Industrial production, after a peak towards the beginning of the sample (January 1991), the ISAE study was able to identify three complete cycles in the period considered: the first is the 1993-1996 cycle, comprised between the trough in June 1993 and that in March 1996. The second one goes from this last trough to that in December 1998; the third from that minimum to the one in December 2001, after which it is possible to identify a peak in industrial activity in October 2002 and a quite long contraction phase thereafter, that is not over yet. The average duration of Industrial production cycles is equal to 34 months, with expansionary phases much longer, on average, than the ones of contraction (20 vs. 14 months).

Table 11 Cyclical turning points of Confidence Indicators and Industrial production

	Industrial production	CI Total manufacturing (old)	CI Total manufacturing (new)	CI North West	CI North East	CI Centre	CI South
Number of cycles	3	3	3	3	3	3	3
Average duration: total	34	35	35	35	33	35	33
- expansions	20	20	21	21	19	22	17
- contractions	14	15	14	14	14	13	15
Turning points:							
Peak	1992:1	/	/	1992-4	/	/	/
Trough	1993:6	1992:11	1993-2	1993-2	1993-8	1993-1	1993-8
Peak	1995:7	1994: 11	1995-7	1995-7	1995-7	1995-3	1995-8
Trough	1996:3	1996:6	1996-8	1996-6	1996-8	1996-7	1996-9
Peak	1998:7	1998:2	1998-2	1998-2	1998-3	1998-1	1997-9
Trough	1998:12	1999:2	1999-2	1999-4	1999-2	1998-10	1999-2
Peak	2001:1	2000:5	2000-6	2000-5	2000-6	2000-7	2000-6
Trough	2001:12	2001:9	2001-10	2001-10	2001-11	2001-9	2001-10
Peak	2002:10	2002:5	2002-5	2002-5	2002-5	2002-5	/
Mean lead/lag at turning points:							
Total		-3.8	-2	-0.2	-1	-3.4	0.6
Peaks		-6.5	0.25	-0.6	-4	-5.25	-1.3
Trough		-1.25	-4.25	0.25	2	-1.5	2

For both the old and new CI, the Bry-Boschan procedure is also able to identify 3 complete cycles, with average duration quite similar to the one of industrial production; even at the local level, the average duration and number

23 See ISAE (2003).

of cycles calculated on the new indexes is similar to those of the production index. Looking at the mean lead/lag of old and new CI at turning points, it emerges that both show on average a lead at turning points with respect to industrial production. The leading is however stronger for the old than for the new index, because of longer leads at the beginning of the sample, especially at peaks. On the other hand, the new index is more capable of anticipating the production cycle at trough. However, the leading property of the new indicator is much stronger towards the end of the sample: in the last three turning points identified in the analysis (2 peaks and 1 trough), the lead of the CI with respect to the reference series has indeed been equal on average to almost 5 months. The better lead of the old index with respect to the new at the beginning of the sample may be due to the fact that in both cases the indexes are constructed using fixed weights, but the old weights were referred to the year 1986, the new ones to 1999. The adoption of 1999 weights may have caused a lesser leading capacity of the new indicator, the farther is the period from which the weights have been calculated. On the other hand, the adoption of more recent weights should ensure a better performance of the indicator towards the end of the sample, and this may be considered as a desirable property for such an indicator. These findings however support the need of further research, in order to adopt a variable system of weights, to be updated, for instance, every five years so as to take into consideration the variability of the structure of the Italian manufacturing sector. Finally, looking at the cyclical chronology of the indicator for the main geographical partitions, it emerges that the North West and the South of Italy show a cycle almost coincident with that of industrial production, whilst the North East and, especially, the Centre show good leading properties with respect to the reference series.

5 CONCLUSIONS

BCS data are widely used in business cycle analysis[24] and as a supporting tool for forecasting exercises[25]. It is therefore very important that Institutes conducing the surveys ensure a high quality of the data they release. More in particular, in its recent "Handbook" on BCS, OECD provides a detailed definition of "quality" referring to survey data: according to the OECD (2003), they should be reliable, timely released, comparable over time, transparent and accessible to the users.

With the project described in this paper, ISAE managed to increase the quality of the manufacturing survey data in the OECD sense, in particular with respect to reliability, comparability and transparency of the results:

- the upgrading of the industrial classification and of the weights used in the processing of the results increases the accuracy of the measures provided by the survey, making the results more reliable for the analysts;
- the reconstruction of the time series since 1991 ensures intertemporal comparability of the data. Moreover, the adoption of the NACE Rev. 1.1 classification increases the comparability of the Italian data with those released by the other European institutions, while the new system of weights increases the comparability at the regional and size level. The paper has also provided some information about the structure of the Italian manufacturing sector and its evolution in time, allowing comparisons with the industry structure of other industrial countries;
- the paper itself represents an important contribution to increase the transparency and interpretability of the results, helping researchers to draw meaningful analysis upon them. In this sense, it may be considered as a sophisticated system of meta-data, giving detailed information to the analysts about the survey frame, the statistical units used in the survey, the data collection methods, the sample, and the weighting system used in processing the results.

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[24] See for instance the OECD System of Composite Leading Indicators and the Conference Board Business Cycle Indicators Handbook (2001); both make a wide use of BCS series. For Italy, a similar indicator is proposed in Altissimo, Marchetti and Oneto (2000).

[25] Ciret Conferences have been historically devoted to the study of the role of BCS for cyclical analysis and forecasting; see for instance Oppenlander and Poser (1984; 1986; 1988; 1996; 2000), Oppenlander, Poser and Nerb (1995). In Italy, BCS data have also been widely used in short term macroeconomic analysis: see in particular various ISAE contributions, among which we have Bovi, Lupi and Pappalardo (2000), Bruno and Lupi (2001; 2003), Carnazza and Parigi (2003). Italian BCS data have also been used to investigate the strategic behaviour of manufacturing firms (Carnazza, 2001).

The paper has also stressed that the adoption of the CATI system for interviewing, started in 1988 and extended to the whole sample since 2002, has gradually improved the timeliness of data release: survey data are currently published in the fourth week of the month in which the interviews are carried and all the answers are referred to the same month in which the interviews are performed.

On the other hand, the paper has not deal with some other aspects inherent to the quality of the data, leaving the field open to further research. More in particular, concerning the reliability of survey results, more careful attention should be devoted in the future to the problems of the correct measure and the handling of non response that are currently treated simply substituting non answering firms within the sample frame. Possible future steps of research include also the development of easy-to-access interfaces, able to distribute survey data not only to ISAE researchers, but also to the general public, analysts and executives alike, with different levels of detail, depending on the user's needs and requests.

In this respect, at the moment ISAE is carefully checking the possibility of developing dynamic "front end" dissemination of the data, allowing public access to survey results through Internet. Possible future researches in this field also include the possibility of extending the methods and the software employed here to the other surveys currently performed by ISAE, in order to build an Intranet and Internet "portal" for all the ISAE surveys, accessible to analysts and executives accordingly to their need. On the other hand, in the future the cyclical characteristics of the new ISAE series should be more carefully checked, with a comprehensive comparison of business tendency survey results with appropriate reference quantitative statistics (industrial production, GDP, industry value added), in order to allow an easier interpretability of the results for researchers and analysts and also to the general public.

APPENDIX

Table A.1 Industry size weights at the regional level (in percentage)

Sectors (NACE Rev. 1.1)/Regions	PIE	LOM	LIG	TAA	VEN	FVG	ER	MAR	TUS	UMB
15. & 16. Food, beverages, tobacco	1,00	2,05	0,14	0,19	1,07	0,20	1,67	0,21	0,43	0,16
17. Textiles	0,94	2,32	0,01	0,04	0,74	0,09	0,33	0,07	0,94	0,07
18. Wearing apparel; furs	0,27	0,70	0,01	0,03	0,79	0,01	0,46	0,21	0,38	0,08
19. Leather products	0,06	0,23	0,00	0,01	0,69	0,02	0,17	0,67	0,71	0,01
20. Wood & wood products (exc. Furniture)	0,21	0,45	0,03	0,15	0,38	0,15	0,26	0,11	0,15	0,04
21. Pulp, paper & paper products	0,22	0,61	0,02	0,06	0,28	0,09	0,12	0,09	0,27	0,04
22. Publishing & printing	0,41	1,49	0,05	0,07	0,28	0,06	0,38	0,04	0,18	0,03
23. Coke, refined petroleum	0,07	0,36	0,07	0,00	0,06	0,01	0,04	0,05	0,08	0,00
24. Chemicals	0,58	3,84	0,13	0,07	0,61	0,06	0,55	0,10	0,45	0,05
25. Rubber & plastic products	0,82	1,71	0,06	0,09	0,54	0,12	0,44	0,21	0,22	0,03
26. Other non metallic products	0,33	0,88	0,08	0,10	0,77	0,16	1,38	0,10	0,54	0,18
27. Basic metals	0,43	1,57	0,12	0,06	0,34	0,15	0,16	0,04	0,23	0,12
28. Metal products	1,54	3,99	0,18	0,22	1,85	0,41	1,47	0,34	0,48	0,16
29 Machinery & equipment n.e.c.	1,88	4,24	0,11	0,19	1,95	0,46	2,54	0,55	0,69	0,16
30. Office machinery & computers	0,12	0,32	0,00	0,01	0,05	0,01	0,04	0,01	0,02	0,00
31. Electrical machinery	0,53	1,79	0,14	0,04	0,66	0,11	0,44	0,12	0,21	0,03
32. Radio, TV, communication	0,18	0,56	0,04	0,01	0,14	0,06	0,13	0,06	0,05	0,02
33. Medical, precision, optical apparel	0,22	0,71	0,08	0,03	0,51	0,07	0,28	0,03	0,12	0,02
34. Motor Vehicles	1,36	0,83	0,02	0,05	0,14	0,02	0,32	0,04	0,11	0,01
35. Other transport equipment	0,21	0,39	0,12	0,00	0,24	0,08	0,11	0,04	0,25	0,02
36. Manufacturing industries n.e.c.	0,34	0,91	0,05	0,05	1,02	0,42	0,30	0,30	0,46	0,06
Regional total	11,72	29,94	1,46	1,48	13,11	2,75	11,57	3,38	6,98	1,28

Source: ISAE elaboration on ISTAT data

Regions: PIE=Piemonte, Valle d'Aosta; LOM= Lombardia; LIG= Liguria; TAA= Trentino Alto Adige; FVG= Friuli-Venezia Giulia; ER= Emilia-Romagna; MAR=Marche; TUS=Toscana; UMB= Umbria

continues **Table A.1 Industry size weights at the regional level (in percenatge)**

Sectors(Nace Rev 1.1.)/Regions	**LAZ**	**CAM**	**ABR**	**MOL**	**PUG**	**BAS**	**CAL**	**SIC**	**SAR**	*Sec.Tot.*
15. & 16. Food, beverages, tobacco	0,54	0,72	0,23	0,07	0,31	0,09	0,09	0,29	0,19	9,65
17. Textiles	0,06	0,05	0,07	0,01	0,07	0,00	0,01	0,01	0,03	5,84
18. Wearing apparel; furs	0,09	0,20	0,14	0,03	0,28	0,01	0,02	0,03	0,01	3,74
19. Leather products	0,01	0,26	0,04	0,00	0,36	0,00	0,00	0,01	0,00	3,25
20. Wood & wood products (exc. Furniture)	0,07	0,09	0,04	0,01	0,06	0,01	0,04	0,03	0,05	2,32
21. Pulp, paper & paper products	0,11	0,09	0,12	0,00	0,03	0,00	0,01	0,01	0,01	2,20
22. Publishing & printing	0,50	0,08	0,03	0,00	0,07	0,01	0,02	0,07	0,04	3,80
23. Coke, refined petroleum	0,21	0,04	0,02	0,00	0,05	0,00	0,01	-0,02	0,02	1,07
24. Chemicals	0,78	0,15	0,09	0,01	0,08	0,03	0,02	0,23	0,07	7,90
25. Rubber & plastic products	0,12	0,15	0,09	0,01	0,08	0,03	0,01	0,02	0,02	4,77
26. Other non metallic products	0,29	0,19	0,20	0,02	0,14	0,03	0,05	0,17	0,09	5,71
27. Basic metals	0,03	0,07	0,06	0,01	0,29	0,00	0,00	0,03	0,03	3,74
28. Metal products	0,27	0,43	0,35	0,02	0,23	0,04	0,05	0,13	0,07	12,22
29 Machinery & equipment n.e.c.	0,19	0,17	0,11	0,00	0,19	0,02	0,04	0,11	0,05	13,66
30. Office machinery & computers	0,14	0,03	0,05	0,00	0,00	0,00	0,00	0,01	0,00	0,81
31. Electrical machinery	0,15	0,17	0,05	0,01	0,05	0,01	0,01	0,08	0,03	4,60
32. Radio, TV, communication	0,31	0,11	0,09	0,00	0,03	0,00	0,01	0,09	0,02	1,90
33. Medical, precision, optical apparel	0,17	0,05	0,02	0,00	0,03	0,00	0,01	0,02	0,01	2,35
34. Motor Vehicles	0,11	0,23	0,21	0,05	0,10	0,22	0,00	0,04	0,01	3,87
35. Other transport equipment	0,20	0,22	0,05	0,00	0,05	0,01	0,02	0,05	0,02	2,07
36. Manufacturing industries n.e.c.	0,12	0,08	0,07	0,01	0,17	0,06	0,02	0,06	0,01	4,51
Regional total	4,46	3,57	2,12	0,28	2,67	0,57	0,42	1,47	0,76	100,00

Source: ISAE elaboration on ISTAT data.
Regions: LAZ= Lazio; CAM = Campania; ABR=Abruzzi; MOL=Molise; PUG= Puglia; BAS= Basilicata; CAL=Calabria; SIC= Sicilia; SAR= Sardegna.

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