



ISTITUTO DI STUDI E ANALISI ECONOMICA

**The ISAE Market Services Survey:
Methodological Upgrading, Survey Reliability,
First Empirical Results**

by

Bianca Maria Martelli

ISAE, piazza dell'Indipendenza, 4, 00185 Roma

and

Gaia Rocchetti

ISAE, Piazza dell'Indipendenza, 4, 00185 Roma
Scuola Superiore di Studi Universitari e di Perfezionamento Sant'Anna, Pisa

Working paper n. 71
July 2006

The Series “*Documenti di Lavoro*” of the *Istituto di Studi e Analisi Economica* – Institute for Studies and Economic Analyses (ISAE) hosts the preliminary results of the research projects carried out within ISAE. The diffusion of the papers is subject to the favourable opinion of an anonymous referee, whom we would like to thank. The opinions expressed are merely the Authors’ own and in no way involve the ISAE responsibility.

The series is meant for experts and policy-makers with the aim of submitting proposals and raising suggestions and criticism.

La serie “Documenti di Lavoro” dell’Istituto di Studi e Analisi Economica ospita i risultati preliminari di ricerche predisposte all’interno dell’ISAE: La diffusione delle ricerche è autorizzata previo il parere favorevole di un anonimo esperto della materia che qui si ringrazia. Le opinioni espresse nei “Documenti di Lavoro” riflettono esclusivamente il pensiero degli autori e non impegnano la responsabilità dell’Ente.

La serie è destinata agli esperti e agli operatori di politica economica, al fine di formulare proposte e suscitare suggerimenti o critiche.

Stampato presso la sede dell’Istituto

ISAE - Piazza dell’Indipendenza, 4 - 00185 Roma.

Tel. +39-06444821; www.isae.it

ABSTRACT*

Within the E.U. Harmonised project, ISAE has been carrying out the quarterly services survey for Italy, since 1992, on a panel of about 1,000 business firms operating in the service sector. On E.U. suggestion, since the first quarter of 1998, the survey has been based on an updated sample, so as to enlarge the sectoral and information coverage. Starting from January 2003, the survey has been deeply revised and enlarged according to the Commission recommendations so as to cover the whole Market Service sector (Nace Rev.1.1 Sections H, I, J, K, part of O, with different degrees of detail). The survey is now based a sample of over 2,100 firms, stratified both by sector of activity (like already done since 1998) and geographic partitions; the units' allocation to strata is optimal in the Neyman sense, with some integrations to deal with the pre-existing panel and in order to include the most important Italian firms belonging to the target sectors.

The aim of this paper is discussing the quality of the survey in terms of transparency and reliability. The methodological upgrading of the sampling design is hereafter discussed as well as each step of the new procedure. To begin with, the analysis of the Italian service sector is presented, which enables to set the necessary assumption in determining the survey frame, the selection of sampling units and the weighting system.

The theoretical sampling design is thus explained with reference to sampling unit, stratification variables, units' allocation to strata, as well as the various step of the whole procedure in terms of statistical treatment of non responses, weighting, aggregation steps sampling and non-sampling errors. Furthermore, using the first year of information collected, the remarkable gain in precision of the new sample is analysed, together with its reliability in terms of accuracy of estimates. The analyses of the design effect shows that, also when dealing with qualitative series, the Neyman allocation to strata considerably improves the precision of estimates in comparison both to the stratified proportional design and to the simple random one.

Keywords: Services; business tendency surveys; sampling design; sampling techniques; design effect.

JEL Classification: C42, C82.

* The paper is the result of a joint effort of the authors; however sections 4, 5, 6, 7.3, 7.4, 9.2 may be attributed to Bianca Maria Martelli and sections 2, 3, 7.1, 7.2, 8, 9.1 to Gaia Rocchetti.

NON-TECHNICAL SUMMARY

Over the past decades, Market Services (MS) have been raising a prominent role in almost all the industrialised economies, in term of both weight on the total value added and of market shares growth. In Italy, the latest General Census, referring to 2001, points out the remarkable increase in the number of firms operating in the MS sector as well as in the weight of MS sectors workers on total workforce. Furthermore, an analysis on the National Accounts of the Italian National Institute of Statistics (ISTAT) shows that, in the period 1990-2003, the share of MS on the total value added increased by 3.7 percentage points beside a considerable reduction, or at least a substantial stability, in the other sectors. Moreover, the services sector structure has been recently deeply changing. Actually, an increasing externalisation (outsourcing) of many activities once performed inside the manufacturing firms - mainly related to organisation, management and ITC - is taking place. As a result, an increasing number of activities which used to be part of the manufacturing processes now belong to the service sector, thus making services – mainly the business related services - more sensitive to cyclical fluctuations. Furthermore, the huge process of privatisation involving many important services sectors (i.e. transport and telecommunication), carried out since early '90s, has probably altered some services cycle characteristics, particularly in those sectors involved in the privatisation process. For these reasons, it would be advisable to check for specific sectors of MS, whether a business cycle exists or not and what are its peculiarities.

Because of the growing importance of MS and of the recent change in their structure stated above, immediate statistics showing the evolution of the business cycle in this sector are needed. Nevertheless, the statistical information on these sectors is still relatively scarce, stemming from heterogeneous sources such, for example, surveys focused on specific sectors (i.e. survey on a particular sector such as engineering or telecommunications). Thus, given that increasing importance of MS data availability in the international context, the European Commission (EC) has recently focused its efforts on supporting the enlargement and upgrading of the Market Services surveys.

Consequently, ISAE has implemented a complete revision and enlargement of its traditional services survey. The survey design improvements have the aim of both correspond to EC requests and achieving thorough, timely and continuative short-term information for MS sector. For this reason, the new ISAE survey collects information on all the MS sectors, extending the previous survey, which was only focused on “Business Services” (BS) firms, to macro-

area sectors such as “Households” (HS) and “Financial Services” (FS). While the old survey - focused on BS sector – only monitored about 9% of the whole Italian GDP, the new one covers up to 35% of GDP, widely overcoming the coverage of the Manufacturing survey (24%). In addition, the aim of the new survey is to produce more timely information: for this reason ISAE adopt the monthly timing for data collection instead of quarterly one. Moreover, since 2003, the survey has been adopting a stratified sample design concerning both the sectors of activity (already adopted as stratification variable since 1998 survey) and the geographic partitions. Furthermore, the Neyman optimum allocation to strata method is applied for determining the strata size.

The present paper introduces the new ISAE Market Services survey, mainly from a statistical point of view. The focus is on the survey quality, both in terms of transparency and reliability. The methodological upgrading of the sampling design is hereafter discussed as well as each step of the new procedure. To begin with, the analysis of the Italian service sector is presented, which enables to set the necessary assumption in determining the survey frame, the selection of sampling units and the weighting system. The theoretical sampling design is thus explained with reference to sampling unit, stratification variables, units' allocation to strata, as well as the various step of the whole procedure in terms of statistical treatment of non responses, weighting and aggregation steps. Furthermore, using the first year of information collected, we measure the design effect, that is the gain in precision deriving from the use of a stratified sample design with optimal allocation to strata instead of a simple random sample and/or a stratified proportional sample of the same size. The computation of the design effect shows that, also when dealing with qualitative series, the Neyman allocation to strata considerably improves the precision of the estimates in comparison both to the stratified proportional design and the simple random one.

L'INCHIESTA ISAE SUI SERVIZI DI MERCATO: AGGIORNAMENTI METODOLOGICI, AFFIDABILITA' DEI RISULTATI DELLA SURVEY E PRIMI RISULTATI EMPIRICI

SINTESI*

L'indagine ISAE sui Servizi, condotta sin dal 1992 - nell'ambito del progetto armonizzato della Commissione Europea - su un panel di circa 1.000 imprese, ha subito negli ultimi anni alcune importanti revisioni. Già nel 1998 il campione era stato aggiornato con l'obiettivo di fornire indicazioni puntuali sul terziario avanzato ed estendendo quindi il numero di settori. A questa importante revisione ha fatto seguito nel gennaio 2003, anche sulla base delle indicazioni provenienti dalla Commissione Europea, un ulteriore ampliamento della popolazione target, estendendo l'indagine anche ai servizi alle famiglie e finanziari (Nace Rev. 1.1, Sezioni H, I, J, K e parte della O). L'indagine attualmente si basa su un campione di 2.100 unità, stratificato sia per settore (come già nel 1998), sia per ripartizione geografica. L'allocazione delle unità negli strati è ottimale secondo Neyman, sono stati, inoltre, introdotti alcuni importanti aggiustamenti, legati alla necessità di conservare il panel intervistato sin dal 1992 e di includere nel campione le imprese più importanti dei settori considerati.

Lo scopo del lavoro è presentare alcune caratteristiche dell'indagine, in particolare con riferimento alla trasparenza e all'affidabilità dei risultati. Vengono presentate tutte le fasi che hanno condotto alla revisione dell'inchiesta, accompagnate dalle principali considerazioni metodologiche.

Allo scopo di delineare le principali assunzioni che hanno guidato la costruzione del campione, si presenta inizialmente una breve descrizione del settore dei servizi di mercato. L'analisi preliminare delle caratteristiche del settore ha, infatti, guidato gli autori nell'identificazione delle principali caratteristiche della lista di campionamento (*survey frame*), nella definizione dei criteri di selezione delle unità del campione, del sistema di ponderazione dei risultati delle singole unità e nella formulazione del questionario. Vengono, quindi, presentate le fasi che hanno condotto alla costruzione del campione, illustrando l'intero disegno di campionamento con riferimento alle unità di selezione, alle variabili di stratificazione e all'allocazione delle unità negli strati. Inoltre, vengono presentate sinteticamente le procedure di trattamento delle mancate risposte, di ponderazione e di aggregazione. Conclude il lavoro

* Il lavoro è il risultato congiunto degli autori; tuttavia le sezioni 4, 5, 6, 7.3, 7.4, 9.2 possono essere attribuite a Bianca Maria Martelli e le sezioni 2, 3, 7.1, 7.2, 8, 9.1 a Gaia Rocchetti.

un'analisi per valutare l'affidabilità delle stime prodotte. Nel dettaglio, l'analisi del *design effect*, condotta sui dati relativi al primo anno dell'indagine, mostra che, anche quando oggetto di indagine è una variabile qualitativa, l'utilizzo del campionamento stratificato con allocazione delle unità negli strati ottimale secondo Neyman, consente di incrementare considerevolmente la precisione delle stime, sia se confrontato con il campionamento casuale semplice, sia rispetto al campionamento proporzionale.

Parole chiave: Servizi; indagini congiunturali presso le imprese; disegno campionario; tecniche di campionamento; design effect.

Classificazione JEL: C42, C82.

CONTENTS

1	INTRODUCTION	Pag.	11
2	ITALIAN MARKET SERVICES SECTOR	"	13
3	THE ISAE SERVICES SURVEY HISTORY	"	18
4	THE QUESTIONNAIRE AND SURVEY TIMING	"	20
5	THE DATA COLLECTING TECHNIQUE	"	22
6	THE UNIVERSE AND THE FRAME LIST	"	24
	6.1 Sampling unit and reporting unit	"	25
7.	THE ISAE MARKET SERVICES SAMPLING DESIGN	"	26
	7.1 The panel	"	26
	7.2 The sample size	"	27
	7.3 The stratified optimal random sample	"	29
	7.4 Sample definition	"	30
8.	PROCESSING TECHNIQUES	"	35
	8.1 Missing data processing	"	36
	8.2 Consistency Controls	"	37
	8.3 Aggregation and weighting	"	37
	8.4 Computing balances and the confidence climate	"	40
9.	SOME FIRST ANALYSES	"	41
	9.1 The Design Effect	"	41
	9.2 Quality indicators	"	44
10.	CONCLUDING REMARKS	"	46
	REFERENCES	"	49

1 INTRODUCTION¹

Over the past decades, Market Services (MS) have been raising a prominent role in almost all the industrialised economies, in term of both weight on the total value added and of market shares growth. In Italy, the latest General Census, referring to 2001, points out the remarkable increase in the number of firms operating in the MS sector as well as in the weight of MS sectors workers on total workforce. Furthermore, an analysis on the National Accounts of the Italian National Institute of Statistics (ISTAT) shows that, in the period 1990-2003, the share of MS on the total value added increased by 3.7 percentage points beside a considerable reduction, or at least a substantial stability, in the other sectors. Similar trends emerge also in all modern economies where, on average, services account for about 68% of world value added² and for 68.6% of employment³. In the European Monetary Union, in 2003 services contribute on average for about 70% of GDP as against about 28% of industry⁴.

Moreover, the services sector structure has been recently deeply changing. Actually, an increasing externalisation (outsourcing) of many activities once performed inside the manufacturing firms - mainly related to organisation, management and ITC - is taking place. As a result, an increasing number of activities which used to be part of the manufacturing processes now belong to the service sector, thus making services – mainly the business related services - more sensitive to cyclical fluctuations. Furthermore, the huge process of privatisation involving many important services sectors (i.e. transport and telecommunication), carried out since early '90s, has probably altered some services cycle characteristics, particularly in those sectors involved in the

¹ The authors are grateful to all the colleagues of the Survey Unit, particularly Germana Bottone, who carried out a preliminary analysis of services universe data, Claudio Scafetta and Franca Orsini for the continuous and careful controls on microdata and technical support in disseminations of the results. Raffaella Sonego, of ISAE EDP Unit, set up all the new original EDP procedures for elaborating the new series. Preliminary analyses were presented at seminars held in ISAE, at Tagliacarne Institute and at Bank of Italy and at the 27th CIRET Conference. The paper benefited from helpful comments and discussions with Marco Malgarini, Sandro Calabresi and Giancarlo Bruno of ISAE, Gian Paolo Oneto of ISTAT, H el ene Erkel-Rousse and Thierry Deperraz of INSEE and George van Gastel of NBB and take advantage of several surveys experts' meeting in Bruxelles. Any possible remaining errors are to be attributed to the authors.

² World Bank Indicator, 2003.

³ OECD: Annual Labour Force Statistics, 2004.

⁴ World Bank: World Development Indicators, 2003.

privatisation process. For these reasons, it would be advisable to check for specific sectors of MS, whether a business cycle exists or not and what are its peculiarities.

Strictly related to the previous points, is whether data stemming from business survey on MS sector are useful to predict business cycle turning points. In particular, as manufacturing and services sector are even more interrelated, confidences indexes built on both MS and Manufacturing survey data may be adopted to improve the short term forecasting of GDP (Bouton and Erkel-Rousse, 2004).

Because of the growing importance of MS and of the recent change in their structure stated above, immediate statistics showing the evolution of the business cycle in this sector are needed. Indeed, whatever is the approach followed by researcher (i.e. whether data are needed to prove if MS are cyclical or not, or whether they can be used to predict turning points), there is a growing request of cyclical data on MS. Nevertheless, the statistical information on these sectors is still relatively scarce, stemming from heterogeneous sources such, for example, surveys focused on specific sectors (i.e. survey on a particular sector such as engineering or telecommunications). Thus, given that increasing importance of MS data availability in the international context, the European Commission (EC) has recently focused its efforts on supporting the enlargement and upgrading of the Market Services surveys.

Consequently, ISAE has implemented a complete revision and enlargement of its traditional services survey. The survey design improvements had the aim of both correspond to EC requests and achieving thorough, timely and continuative short-term information for MS sector. For this reason, the new ISAE survey collects information on all the MS sectors, extending the previous survey, which was only focused on “Business Services” (BS) firms, to macro-area sectors such as “Households” (HS) and “Financial Services” (FS). While the old survey - focused on BS sector – only monitored about 9% of the whole Italian GDP, the new one covers up to 35% of GDP, widely overcoming the coverage of the Manufacturing survey (24%). In addition, the aim of the new survey is to produce more timely information: for this reason ISAE adopt the monthly timing for data collection instead of quarterly one. Moreover, since 2003, the survey has been adopting a stratified sample design concerning both the sectors of activity (already adopted as stratification variable since 1998 survey) and the geographic partitions. Furthermore, the Neyman optimum allocation to strata method is applied for determining the strata size.

In our view, the new MS survey is now able to monitor the deep changes driven by the introduction of new technologies (as e.g. in Telecommunications), to follow the rapid structural changes of financial sectors as well as to collect

information on more traditional ones, like Tourism related activities, which represent an important part of the Italian economy.

In this paper the various steps of setting up the new survey are presented, starting with the analysis of the role of the service sector in the Italian economy, with an overview of the changes which took place in the past decade (Section 2). Sections 3-8, report all the necessary steps to renew the survey (the initial situation, the questionnaire, the collecting technique, the sampling design, and the aggregation of results) by spelling out the theoretical basis and the operative choices adopted. Section 9 presents the design effect and applies it to the survey results, showing the remarkable gain in precision of the new sampling design, even for qualitative variables. Final remarks conclude the paper.

2 ITALIAN MARKET SERVICES SECTOR

The importance of timely data gathering on service sector is confirmed by the results of the latest Italian General Census for 2001, which points out the decisive role of services in the Italian economy⁵. The number of firms operating in the MS sector⁶ increases by 9.3 percentage points in the period 1991-2001 thus accounting for about one third (32.6%) of the overall Italian firms⁷. In the same period, the share of manufacturing firms drops by 3.4% thus reducing its incidence to 13.4% of the universe. Those trends are confirmed also

⁵ ISAE elaboration on ISTAT (2004), 8th General Census on Industry and Services.

⁶ The definition of Market Service adopted by ISAE is clearly identified as a whole in terms of Nace sectors and groups (namely H, I, J, K, 90). However, as market services comprise very heterogeneous branches, for the sake of analysis, they were grouped together in three macro-sectors; namely "Business", "Households" and "Financial" Services. Some uncertainties arise for the macro-sectors "Households" and "Business" (this latter already considered by ISAE since 1992 in his former survey), as several branches might belong to both groups (e.g. Telecommunications, Real estates, Sewage). However, to facilitate time series comparisons, ISAE preferred to maintain the branches of his historical survey as belonging to Business macro-sector and attributing the new ones to the Households. This problem does not arise for Financial sectors, as related activities are uniquely identified. See below, (sect. 3) for the ISAE exact attribution of the single NACE sectors and groups to each macro-sector. In following sections, while making comparisons between different sources, any possible discrepancy is thoroughly explained whenever it arises.

⁷ According to the Nace Rev.1 classification, as ISTAT has adopted the Nace Rev.1.1 only since late-2002. In this comparison the sub-sector 90 "Sewage and refusal disposal", which is comprised in the ISAE survey, is not included as it belongs to the Nace section O "Other services".

considering the number of employees. The percentage of employees working in the MS sector shows a marked increase by 6.4% in the ten years period, reaching a quota of the universe (31.0%) similar to that of mining and manufacturing (31.4%). However, in the same time span, this latter shows a 2.5% decreasing trend. At the same time, the weight of the trade sector decreases both in term of firms and employees, while the one of the institutional sectors (Nace Rev.1.1 M, N and O branches) grows.

From another point of view, in term of value added, also the National Accounts of the Italian National Institute of Statistics (ISTAT) confirm the trend toward tertiarization of the Italian economy. In 2003 the weight of the MS sector as a percentage of GDP equals 38.3%, while only 24.1% is stemming from industrial sector, 14.8% from non-market services sector⁸, 14.2% from trade⁹, 5.5% from construction and 3% from agriculture (see Table 1). In the period 1990-2003 the share of Market Services on the total value added increased by 3.7 percentage points beside a widespread reduction, or at least a substantial stability, in the other sectors.

This tendency towards tertiarisation emerges even better when considering the value added rate of growth (see Table 2). Indeed, the MS sector registered an yearly average rate of growth of 2.3% between 1992 and 2003 (with a peak between 1999 and 2000 of 5.6%), as compared to -0.2% for agriculture, 0.9% for manufacturing, 0.4% for construction, 1.5% for trade and 0.5% for non-market services¹⁰.

Within the whole MS sector, however, different trends emerge. On the one hand, the relevance of BS grows during the time; on the other hand, the production of high value added services and of high technological content increases both for HS and BS. In spite of the deep recession of the early nineties and the slowdown registered over the past three years, the value added of BS steadily grows between 1991 and 2003 with a yearly average rate of 4.4% (2.2% in FS and 1.5% in HS one). A marked growth has recently affected the BS, which accounts for 9.8% between 1999 and 2000, 6.4% between 2000 and 2001 and 6.2% between 2001 and 2002, even though it clearly decelerates in 2003 (1.9%). Particularly, between 1997 and 2001 a progressive increase emerges in the share of value added in the group comprising computing, research and related activities: the growth is remarkable (being 4.8% the 1992-2003 average) and with yearly averages higher than 10%

⁸ Non-market services comprise Nace sections M (education), N (health and social security) and O (other public, social and personal services).

⁹ Trade comprises both large distribution and retail trade.

¹⁰ Source: ISAE elaboration on ISTAT National Accounts, value added ex fabrica, 1995 constant price.

between 1997 and 2000 (with a peak of 12.2% in 1997/1998); nevertheless, the sector value added shows a slight slowdown between 2001 and 2002 (2.9%) presenting a negative sign between 2002 and 2003 (-0.9%) for the first time since 1993.

Tab. 1 **GDP Composition (%)**

Years	Agriculture	Manufacturing	Construction	Trade (Wholesale and Retail)	Market Services	Non Market Services
1990	3.4	25.9	6.1	13.9	34.6	16.2
1991	3.6	25.5	6.2	14.0	34.5	16.2
1992	3.6	25.4	6.2	14.0	34.4	16.4
1993	3.6	24.7	5.8	14.0	35.4	16.5
1994	3.6	25.6	5.4	14.2	35.3	15.9
1995	3.5	26.1	5.3	14.4	35.1	15.5
1996	3.6	25.5	5.5	14.2	35.6	15.5
1997	3.5	25.7	5.3	14.3	35.9	15.3
1998	3.5	25.7	5.2	14.5	36.0	15.0
1999	3.7	25.5	5.2	14.2	36.5	14.9
2000	3.4	25.1	5.2	14.4	37.2	14.6
2001	3.4	24.6	5.3	14.4	37.7	14.6
2002	3.2	24.4	5.4	14.2	38.1	14.8
2003	3.0	24.1	5.5	14.2	38.3	14.8
% points variation						
'90-2003	-0.3	-1.8	-0.6	0.3	3.7	-1.3

Source: ISAE elaborations on ISTAT NA data, value added ex fabrica at 1995 constant prices.

Note: the sum of the percentage values might differs from 100 due to rounding.

The FS value added shows a steady average growth, even though periods of marked expansions turned into deep slowdowns, particularly between 2001 and 2002 (-2,9%). However, dissimilar features emerge at sectoral level. Indeed, the limited slowdown of the overall FS sector observed between 2000 and 2001 (-0.8%) gets together with a marked increase in the value added of “Insurances and pensions’ funding” (+6.4%); further, the substantial stability of the whole FS between 2002 and 2003 (-0.2%) hides the moderate growth in the “Auxiliary Activities to Financial Intermediation” (+2.7%).

Finally, in the investigated time span, HS show a minor increase compared to BS and FS (the average yearly growth rate between 1992 and 2003 being 1.5%). The sectoral detail however, shows the strong impact on growth (the average yearly growth rate equalling 5.5%) of “Post and

Telecommunication”, the sector rate of growth being +3.3% in 2003 as against 0.6% in the overall HS and 0.8% for MS sector. Conversely, the Hotels and restaurants sector shows a moderate downturn since 2001 (-1.1% in 2002 and -0.7% in 2003).

Tab. 2 GDP growth in Market Services Sectors (1991-2001)
(Average yearly changes)

Economic Sectors	1992/ 1993	1993/ 1994	1994/ 1995	1995/ 1996	1996/ 1997	1997/ 1998	1998/ 1999	1999/ 2000	2000/ 2001	2001/ 2002	2002/ 2003	1992/ 2003
HOUSEHOLD SERVICES												
Hotels and restaurants	0.4	2.8	1.5	1.6	0.8	1.2	1.6	2.6	3.8	0.7	0.6	1.5
Transports, communications	-1.7	3.2	2.0	1.8	0.8	2.6	1.7	8.1	2.6	-1.1	-0.7	1.6
-Road transports	1.5	3.9	2.2	1.4	2.8	2.1	3.2	5.4	6.6	1.5	0.0	2.5
-Sea and air transp., aux. act.	2.1	5.0	0.0	0.8	0.1	1.6	-1.6	1.3	5.5	2.5	-2.9	1.2
-Posts and Telecommunications	0.1	4.7	3.0	-2.8	6.8	-0.3	-3.2	9.0	4.7	-2.3	0.6	1.6
Real estate activities, machinery, equipment hiring	1.9	1.0	5.9	7.1	3.8	5.6	17.5	8.5	9.6	2.9	3.3	5.5
FINANCIAL SERVICES												
Financial intermediation	0.4	1.9	0.9	1.6	-0.7	0.0	0.4	-1.5	1.9	0.8	1.6	0.6
Insurances, pension funding	11.0	5.2	-3.7	5.7	1.8	4.9	-2.6	9.6	-0.8	-2.9	-0.2	2.2
Activities aux. to fin. interm.	13.0	3.2	-4.4	9.8	3.4	6.5	-3.6	10.2	-1.4	-2.4	-0.3	2.7
BUSINESS SERVICES												
Research, computing and related activities	0.5	15.1	7.5	-10.5	-16.8	1.0	-0.4	8.9	6.4	-1.5	-3.5	0.2
Other professional activities	5.1	12.5	-6.2	-9.8	2.1	-6.3	5.4	4.7	-0.3	-8.0	2.7	0.0
MARKET SERVICES												
	1.5	-3.3	7.9	3.3	8.2	2.4	9.5	9.8	6.4	6.2	1.9	4.4
	5.6	-1.9	2.9	6.1	3.7	12.2	11.5	8.3	8.6	2.9	-0.9	4.8
	0.6	-3.6	9.2	2.6	9.3	0.1	8.9	10.3	5.9	7.1	2.6	4.3
	2.4	2.0	1.8	2.6	2.5	2.1	2.5	5.6	3.6	1.5	0.8	2.3

Source: ISAE elaboration on ISTAT National Accounts, value added ex fabrica, 1995 constant prices.

As already noticed by ISTAT in its “2000 Annual Report”, the modernisation process featuring the tertiary sector since 1992 is thus confirmed, despite the fact that the two last years are characterised by smaller (and sometimes negative) rates of growth. This process is driven by the emerging of new consumption models and life habits for households and by new organisation models for firms: it considerably enlarges the share of “high-tech” services in BS (from 39% to 42%), and mainly in HS (from 5% to 12%).

Particularly, in BS, ISTAT records a strong increase in computing and telecommunication services, showing for the former an increase of 17.6% in 2000 (the yearly average growth rate between 1992 and 2000 being 8.3%). ISTAT attributes such a trend both to the role of new technologies in determining changes in consumption and production models (e.g. the role of mobile phones and of Internet), and to changes inside the firms themselves driven by the globalisation of markets and productive processes.

Focusing on the firms' size, the Italian MS sector universe¹¹ is characterised by the prevalence of small firms' (about 3.7 employees), compared to that of manufacturing and mining (equalling 9.0). The MS as a whole also shows, between 1991 and 2001, a downsizing of one percentage point, (4.7 on average in 1991), while manufacturing shows a smaller downsizing (9.5 in 1991).

Within the MS sector, however, the different branches and groups show different features, also among similar firms. The HS have a size (5.1 in terms of employees) slightly above the average, mainly due to the presence of large companies in Air Transports and Telecommunications, both being well over 100 employees. Hotels and Restaurants, however, accounting for more than a half of firms of the whole sector, have a smaller average size (3). FS also shows a larger than the average size (7.2), due to the large banking and insurance companies, having an average size of about 200 employees. Auxiliary activities, however, are characterised by a very small size (1.9). BS have a less than average size of 2.6, whereas only computing approaches the MS average showing 4.5 employees per firm.

From a geographical point of view nearly one third of MS (32.1% of firms and 36.6% of workforce) concentrates in the North-west, both considering firms and workforce and also showing an increasing trend in the decade. In North-west we find Hotels and Restaurants, Real estates, Financial services (mainly Insurances), computing, research and professional activities. North-east gathers most of tourism industry, proportionally (and for some aspects surprisingly) more than the South and the Centre and also shows an increasing percentage of MS firms on the Italian total. Large companies of post, telecommunication and air transports have their headquarters based in the Centre. The majority of sea transport are based in the South. Further, the Centre and the South signal a loss in their average quotas, both in terms of firms and of employees, a fact which points to the persistence of the Italian "dualism".

¹¹ See note 2.

3 THE ISAE SERVICES SURVEY HISTORY

Before applying the tool of BTS for investigating Italian MS sector (as described above), is worth remembering that the aim of tendency surveys generally does not lie in achieving reliable estimates of quantitative variables (like e.g. the industrial production value), but in monitoring the confidence of economic agents, that is the set of attitudes on which behaviours and economic decisions (on production, investment, consumption) are based.

To this purpose, the logic information is collected, that is, whether the contacted subjects express positive (favourable) or negative (unfavourable) evaluations, regarding the actual situation and short-term future evolution of some phenomena, quite apart from the quantitative values of them¹². Tendency surveys aim at collecting this logic information, additional and complementary to that (quantitative) available in official statistics. Dropping this assumption, or only trying to translate the results into a quantitative frame, could lead to a reduction of informative capacity of the surveys. The kind of desired information, while not influencing the sample structure, binds instead the sample size and the elaboration techniques (as shown in section 7 and 8), which partly differ from those applied for quantitative surveys.

Within the E.U. Joint harmonised project, ISAE has been carrying out the quarterly business survey for Italy since 1992, on a panel of about 1,000 business firms operating in the service sector. On E.U. suggestion, since the first quarter of 1998, the survey has been based on an updated sample so as to enlarge his sectoral and informative coverage. Thus, ISAE survey has taken up a more global feature of BS survey, including further services to firms and not only what is known as “high-tech tertiary” (notably the whole of the activities providing high-technology and high-content services) as it used to be. The sectors covered were: Machinery renting, Computer and related activities, Research and Development, all the most meaningful professional activities included in division 74 of Nace Rev. 1 classification, and Sewage and refusal disposal.

The Commission has recently decided to give priority to the enlargement and to the revision of the service survey, mainly acting on three points¹³. The first innovation is represented by the frequency increase from quarterly to

¹² E.g. an expected production growth of 5% can be regarded both as favourable and unfavourable depending both on the specific firm investigated and on the specific time period in which the question is posed.

¹³ These topics have been thoroughly discussed in the 2000 and 2001 annual expert meetings in Brussels.

monthly, as for the manufacturing survey. The second point regarded the sectors' coverage enlargement, as to comprise, (at two - digits level of detail of the Nace Rev.1.1 classification) the whole service sector. The third step concerned the revision of the questionnaire, aimed at collecting the same kind of information as for manufacturing while respecting the differences of the two sectors. Also the questions' reference time was equalled to that of manufacturing survey and an additional quarterly question (as for manufacturing), was added regarding obstacles to production.

In the light of all the above-listed considerations, ISAE has started a full revision and enlargement of its survey.

Since November 2001, ISAE has been testing the monthly timing on its panel of 1,000 firms belonging to BS sector, thus disseminating the results still on a quarterly base.

The sectoral coverage enlargement, carried out in the first half of 2002 implied the complete revision of the sample and led to the choice of including all the MS (but not the non-market services), with different degree of detail mainly in BS (Nace Rev.1.1 division 74). First results, also on a monthly timing, have been collected by ISAE - but not still disseminated - since August 2002. As for the questionnaire, the required changes have been introduced alongside with the sample enlargement.

As final results, since January 2003 ISAE survey is carried out on a monthly basis and addresses to a sample of about 2,100 firms operating in the overall MS, with the aim to enlarge information without losing the previous one nor to lower the results precision. The survey comprises a breakdown of eighteen economic branches belonging to sections H, I, J, K of the Nace Rev.1.1 and four geographic partitions (North-west, North-east, Centre, South). The branches were partly suggested by the European Commission and partly selected by ISAE for their importance in the Italian economy. The detailed classification adopted comprises¹⁴ in HS the following Nace Rev.1 divisions and groups: 55 (Hotels and Restaurants), 60+61+62 (Transports), 63.3 (Travel agency activities), 64 (Post and telecommunications), 70 (Real estate activities); in FS divisions 65 (Financial intermediation), 66 (Insurance and pension funding) and 67 (Activity auxiliary to financial intermediation); in BS all the sectors inquired in the previous survey, namely those classified in 71 (Machinery and equipment hiring), 72 (Computer and related activities), 73 (Research and development), groups 74.12 (Accounting: in particular business consultants, personnel managing), 74.13 (Marketing, market research), 74.14 (Administration and management consulting), 74.2 (Engineering and planning),

¹⁴ See also Tab. 4 col. 1.

74.4 (Advertising), 74.5, and 74.83.1 (Other services, mainly personnel selection and exhibition preparation) and 90 (Sewage and refusal disposal).

The ISAE survey excludes wholesale and retail trade (the latter being the subject of the specific harmonised survey) and, mainly, the “non market services”, that is Social security, Education, Health and Other services (public, social and professional with the only exception of Sewage and Refusal disposal). The survey refers then only to firms which offer Market Services and not to all organisations offering services. The choice of excluding from the frame all collective services, non-profit organisations, recreational and cultural activities and other personal services stems from the following considerations. The aim of the new survey was set, at a first instance, on enlarging the coverage of ISAE tendency surveys to services – so as to integrate the lacking supply of information on a growing sector of economy – and, at the same time, on offering an information comparable to those of manufacturing survey, so that both could contribute to the elaboration of a more comprehensive synthetic indicator of Italian economy. The survey therefore focused on productive agents which offer Market Services, thus operating with similar (as much as possible) modalities to those of manufacturing sector¹⁵.

In this frame is placed the new monthly ISAE survey, which, since January 2003, is disseminating assessments and expectations of MS sector operators, also offering a territorial breakdown.

4 THE QUESTIONNAIRE AND SURVEY TIMING

As already pointed out, the survey was originally conducted on a quarterly basis and has become monthly since January 2003. The firms are now requested to give information referring to the current month, the same timing as in the manufacturing survey.

The questionnaire mainly reflects the Commission’s suggestions, with only some enlargements on specific topics. It consists of two quantitative structural questions and ten qualitative monthly questions. Variables of interest are mainly

¹⁵ The decision of excluding the non-market services also raised after several discussions during the annual survey expert meetings in Bruxelles, also considering the need to maintain as much as possible a similar questionnaire to that of Manufacturing (see sect. 4). For non-market services it would have been very difficult to adapt standard questions (like those on demand and production) to organisations working with different aims. The EC, however, had not imposed any mandatory request on this point.

categorical: namely they deal with assessments, expectations and intentions, selected as the most suitable in pursuing the knowledge objectives of the survey.

The quantitative question are: the previous year's turnover (asked in brackets, as it is a sensitive question, to minimise the non-responses) and the number of employees, subdivided by permanent and temporary. The former is used in elaboration for size weighting¹⁶, the latter gives a first information on the workforce composition, as services are the sector where the most variable kind of employment concentrate. However, as already outlined, both questions do not aim at estimating the universe corresponding variables, but only at giving an approximation of firms' relevance¹⁷.

In 1992, the questionnaire originally comprised eight qualitative questions with three ordinal reply options, notably assessments on order books (with the domestic and foreign differentiation) and on turnover, expectations on total demand, turnover, employment, and selling prices. The detail between order and turnover (both as assessment and expectation) is an ISAE integration, as against the Commission recommendations. On an annual basis, ISAE also asks assessments and expectations on investments, state of the competition (domestic and foreign), perspectives of production growth, hiring intentions for new workers (either qualified or not) and possible difficulties met in finding skilled personnel. In 1998 the questionnaire was enlarged with two further questions, namely: assessments on employment and business climate. Since 2003, upon EC request and on a quarterly basis, ISAE has been posing specific questions on the existence and nature of obstacles to production growth such as limited demand, vacancies, insufficient room and/or plants, financial constraints or other obstacles. The latest revision of the ISAE questionnaire has therefore maintained the previous questions with the inclusion of the quarterly one, reaching ten monthly question, one quarterly and eight annual questions.

The questions are deliberately generic so as to fit different sectors (also according to Commission recommendation); they are as similar as possible to those of manufacturing sector so as to facilitate comparisons. However, it is worth noticing that important differences emerge in the two sectors and that was

¹⁶ See further, section 8.

¹⁷ In its Manufacturing survey, ISAE also asks other quantitative variables, like capacity utilisation, duration of ensured production (in months), labour costs variation. The former two questions collect information on quantitative variables not available elsewhere as far as they are perceived by economic agents. They thus do not estimate the "real" unknown datum. Labour cost might be the only properly quantitative variable for which a correspondence with quantitative statistics exists, but also in this case, the ISAE survey reports an average of what subjectively perceived by the firms and not the estimate of the effective variations.

taken into account while preparing the questionnaires and the sampling design, as it will be shown in section 7.

First of all, service sector is a complex entity gathering deeply different firms to which correspond different definitions of the variables investigated by the survey. For example, the opinions on order book and demand assume different features when they refer to a restaurant or to a transport firm; export orders for a telecommunication company might correspond to “roaming”, whereas for a hotel to the reservations from abroad.

Above all, in service sector, there is no unique definition of production (e.g. in banking could be a loan, in computing an EDP procedure) and there is often no clear distinction between orders and production, as most services are supplied at the same time they are demanded. ISAE therefore considers turnover as a rough proxy of production in services and keeps the distinction between turnover and orders by asking firms also to formulate assessment and forecasts on their turnover¹⁸. These information, however, are sensitive and firms often do not give reliable answers. Besides, it is difficult to point out reliable changes on a monthly basis, as firms often invoice with relevant delay as against the service provision.

5 THE DATA COLLECTING TECHNIQUE

Since the beginning, in 1992, the data collecting technique adopted has been the telephone one, with the aid of a CATI (Computer Aided Telephone Interviewing) system. This technique assures high qualitative standards¹⁹, even though its main drawback is represented by relatively high costs.

With respects to postal technique, telephone interviews allow to collect information faster, as the answers are readily available. Furthermore, as each firm establishes a personal direct contact with the same interviewer, month after month, also quality improves as against the postal approach, provided that always the same agent is responding. Practically, every time, at the end of the interview, firms are requested to fix a date, as they prefer, for the next contact, within the first half of following month. At the beginning of the month they also receive by fax a copy of the questionnaire, with the aim both to focus on the

¹⁸ In this topic ISAE survey slightly differs from the Commission recommendations as member countries are requested to formulate a unique question on order and/or turnover.

¹⁹ See, e.g., for Italy, CHIARO (1996), sect. 5.

accorded appointment and to give a general overview of the investigated topics. By the end of each month, they also receive the press bulletin containing the general results of the monthly survey. Besides, as interviews are carried out by experienced personnel, the risk of item non-responses is minimised (less than 3-4%).

Table 3 presents the structure of the monthly average outcome of the telephone interviews for MS, once the panel has been stabilised. Rows 1 and 2 show the phone calls to firms which have been responding to the survey for a long time (which we shall refer to as “loyal” firms), while in row 3 the new monthly entries are shown. The effort to maintain the desired sample size led to make an extra 50% phone calls with respect to the planned number of interviews’ desired size, mainly due to contacting new firms. Indeed, most additional phone calls are in row 5 and 10, indicating that no personal contact has so far been established.

Tab. 3 ISAE Telephone interviews structure

Outcome	Number of phone calls	% values
Panel		
Accepted interview (explanatory material received)	1911	61.8%
Accepted interview (explan. material non received)	37	1.2%
New entries		
Accepted first interview	72	2.3%
Refusal	67	2.2%
Unreachable	768	24.8%
Out of target	3	0.1%
No response	37	1.2%
Phone busy	14	0.5%
Automatic replier	2	0.1%
Wrong phone number	172	5.6%
Already contacted	5	0.2%
No more active	7	0.2%
TOTAL	3094	100.0%

Average March-May 2004

Another important point is the possibility to easily replace firms (that have ceased or are not any longer willing to participate) in exact the same strata were they are needed. This avoids most of the distortions arising from relevant gaps between the theoretical sample and effective replies.

Furthermore, CATI interviews allow to overcome the problem of late-coming questionnaires, so that, from this point of view, there is no need to revise the results²⁰.

A future development is represented by the CAWI (Computer Aided Web Interviewing) system. This technique is going to have an increasing diffusion in the future, mainly between medium and large firms. However, in the Italian MS sectors, which is characterised by a very small average firms size, this technique presumably will never completely substitute the telephone one²¹.

6 THE UNIVERSE AND THE FRAME LIST

The reference universe is represented by all the firms with 6 or more employees belonging to the MS sectors (Census survey updated by the information stemming from the Actives firms Integrated Statistical Archive - ASIA²²). The frame list used, the ASIA archive, comprises all the Italian firms with a less than 6 employees cut off. As also the Census survey is based on this archive, there are no difficulties and distortions arising from using as frame Census non-homogeneous or partial registers.

The selection of a minimum threshold reflects the need to base the survey on firms which presumably can assure their participation over time. A minimum size could be a satisfactory proxy of a stable (loyal) firm's organisation and therefore of the desired continuity in joining the survey. The choice of a

²⁰ The need to revise the results could arise whenever, in missing values handling, a longitudinal model is applied, but it is not the case for ISAE survey.

²¹ More properly, the future is likely to be featured by mixed-mode techniques, as firms should be allowed to freely choose the mode they prefer to ease the statistical burden and a relevant part of them still prefer the postal/fax mode (visual approach). In this frame, in Italy, ISAE already interviews some very large firms, which prefer a closer contact with the Survey Unit, via e-mail.

²² The ASIA archive is set up and yearly updated by the Italian National Statistical Institute by merging some major administrative archives, that is those of the Department of Economics, of the Chamber of Commerce, of the National Social Security Institute (INPS), of the National Insurance Institute against Work Accidents (INAIL), of the phone company (Telecom) and of the National Electricity Board (ENEL). The ASIA archive represents the most complete and updated source of the Italian firms universe. It supplies reliable and complete information for both building the sample and selecting the addresses, overcoming the usual problem to have a partial frame list in comparison to universe. It is disseminated with a delay of about 1 and a half year with respect to the information collected. The most latest version, released on October 2005, refers to 2003. The yearly update allows keeping updated information on the universe between the Census surveys, which are, as well know, carried out every 10 years.

minimum firms' size of 6 employees²³ matches the feature of the Italian service sector where the average size is particularly small (see sect. 2), even though few very large firms are present in some sectors (e.g. transports, communications, banking).

The chosen subset comprises about 66,000 firms representing only 5% of the complete MS sector universe in terms of firms and 43.5% in terms of employees. The average size of the selected firms raises to 32 employees (being 3.7 that of the whole universe) as the frame includes all the large industrial groups. In detail, HS included in the frame are about 9% of the whole universe and 56,2% in terms of employees, as they include the big companies of transports and of communications; FS frame represents 5.7% of firms and 77.8% of employees gathering all the large banking groups; finally, BS frame gathers 3.5% of the firms and 22.9% of employees, as this sector is characterised by the smallest average size in the universe (2.6 employees as against 5.1 for HS and 7.2 for FS).

The distribution by size of the firms selected for the frame shows that the majority of them are still very small: 48.1% have up to 9 employees; 32.6% up to 19 ; 13.3% up to 49 and only 6% are firms with 50 or more employees. Thus, any possible comparison by size with manufacturing vanishes.

6.1 Sampling unit and reporting unit

Being well aware of the limits of this choice, the selection of the firm, both as sampling unit and as reporting unit, was done on the basis of previous experiences and of statistical reasons. Indeed, the main limit implied in this choice is that sectoral and local information are only partially collected from firms, mainly of large size, whose activity is spread in many kinds of productions and/or many establishments located in different regions.

Past experience in Manufacturing survey, however, showed that, whenever ISAE tried to use the local unit as sampling unit, resistances emerged in answering as single unit, because all decision and plans are taken only by the firm's headquarters. Similarly, regarding the different activities featuring large firms (to build the "Kind of Activity Units" – KAU -, according to OECD, 2003), the interviewed are asked to answer only in a general way, comprising an average trend of all of them, so as to avoid a too big statistical burden. The small average size of the Italian services firms, however, implies, for the majority of them, to be single-unit firm. Therefore problems of geographical and

²³ The threshold in Manufacturing survey is 10 employees.

sectoral representativeness are limited to some few sectors (mainly transports, communication and banking), where big company units gather, widespread throughout the country and offering several kind of services.

Secondly, statistical quantitative sources, like frame list, universe turnover, value added, etc., are often firstly (and sometimes only) available for firms and only later for local units. This means that selecting firms as sampling units allows to use the most updated information to build the sample and to perform the related analyses and comparisons.

7 THE ISAE MARKET SERVICES SAMPLING DESIGN

The final sample adopted is a panel of about 2,100 firms based on a initial stratified simple random sample according to the Neyman optimum allocation to strata technique.

Apart from the decision to adopt a panel, all the following components mutually interact in establishing the sample design: the confidence limits, the desired precision of estimates, the features of variables we want to collect and the corresponding ones of the related universe, the frame, the sample size and the costs. As in our case the overall costs are fixed (i.e. a predetermined maximum budget is given, as in most real cases) and the costs for collecting data (due for ISAE to the CATI technique) are constant for each unit, the maximum allowable sample size n is consequently defined. The precision of estimates can thus be increased mainly selecting an appropriate sample design²⁴.

7.1 The panel

In BTS, where one of the main aim is to quickly pick up changes in economic agents' opinions, the choice of a panel allows to get more reliable results in comparison to other kind of surveys (e.g. cross-sectional surveys). A panel sample (whatever it is built) simply means that repeated interviews over time are carried out on the same subjects. Variations in responses in different times only depends on the changed perception of the economic phenomena

²⁴ Alternatively, should a lower precision be considered satisfactory, an appropriate stratified design would allow reducing the sample size.

from the same agents, excluding the variability due to dissimilar subjective perceptions of different respondents²⁵.

However, over time, a risk of loss in representativeness can arise, as major changes in the universe may be perceived by firms not comprised in the sample. To avoid this risk, a part of the sample should be periodically substituted (rotation of the sample) with new firms selected with the same rules used in building the original sample. This technique, however, appears difficult to apply “tout-court” in BTS for the following reasons:

- a. the high frequency (monthly) of the survey implies initial difficulties in selecting firms willing to join the survey. Also substitution therefore implies a notable additional burden with the risk of discharging some “loyal” firms and not being able to substitute them timely;
- b. rotation implies breaks in longitudinal individual answers reducing the size of the core panel, that is of the set of firms regularly responding over time.

In this respect, ISAE decided to merely substitute the few firms exiting the panel each month with new ones, randomly selected, belonging to the same stratum. In this way the sample size is preserved and, to some extents, also its representativeness and the need of introducing new firms.

7.2 The sample size

Unlike Census surveys, where we use all the information, in sample surveys the information for the whole population are inferred only on a fraction of it. Thus the estimates are subject to some uncertainty and can be obtained only with some margins of error.

According to the first 1992 EC suggestions, the services sample size should be about 1,000 units to assure – bounded to the predetermined precision level – satisfactory estimates, at country level, for evaluation of the “confidence climate”.

More precisely, when dealing with qualitative surveys, we accept a small risk equal α that the sampling 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 , within a confidence level $1-\alpha$ (with, for instance, $\alpha = 5\%$). That is:

²⁵ Apart from Business Tendency surveys, panel are widely used in longitudinal microeconomic analysis where the focus is the behaviour of the single economic agent over time.

$$prob\{|p - P| \geq d\} = \alpha \quad (7.1)$$

Assuming that p is normally distributed, it follows:

$$d = z_{\alpha/2} S_P \quad (7.2)$$

where $z_{\alpha/2}$ is the value of the normal deviate for a predetermined value of α

(e.g. for $\alpha=5\%$, $z_{\alpha/2}=1,96$) and $S_P = \left(\frac{P^*(1-P)}{n} \right)^{1/2}$ is the standard error of the

estimate p . Since the standard error S_P is affected by the sampling design, a proper design minimising S_P reduces the variability of estimates²⁶.

The sample size determination is therefore bound to the following factors: a) confidence interval; b) desired precision of estimates; c) sampling design; d) budget constrains. While points a) and b) could be decided *a priori* and an appropriate sampling design could significantly improve the results, survey costs - even constant in our case - may represent a further constrain.

In qualitative surveys dealing with percentages (or proportions), the proposed size of 1,000 units assures, in the most general case of a simple random sample and within a confidence interval of 95%, a maximum allowable error (precision) not exceeding 3 percentage points.

The CE bounds have been considered as a satisfactory starting point. This has been the initial size adopted for the former quarterly 1992 sample referring only to the BS sector.

In the new ISAE MS survey, with the aim to enlarge the information collected also to FS and HS²⁷, without loosing the previous one, nor to lower the results' precision (mainly at sectoral level), the sample size has been roughly doubled, setting at a first instance, $n=2,000$. This initial assumption is

²⁶ The same rules also apply to quantitative estimates, like the average quantitative value \bar{y} (e.g. average employees size) and the formulas 7.1 and 7.2 become respectively $prob\{|\bar{y} - \bar{Y}| \geq d\} = \alpha$

and $d = z_{\alpha/2} S_{\bar{y}}$, where $S_{\bar{y}} = \sqrt{\frac{\sum_1^N (y_i - \bar{Y})^2}{n(N-1)}}$ is the sampling error of \bar{y} .

In quantitative cases, however, being equal the size, the precision is much lower (that is the intervals are larger). As a rule of the thumb, to reach the same precision as for the qualitative ones, it is necessary to have samples of about a ten time size.

²⁷ Services to households and financial services represent almost 2/3 in terms of firms of the whole market services sector frame. See Table 4.

necessary for applying the Neyman allocation, as it allows the strata size determination presented in the following section.

Even the sample size definition could be logically seen as an initial step of the sample design, its exact determination could be established only as the final step of the whole process, as it is bound to the features of the investigated population and to the sampling design adopted. The final size estimation of 2,153 units, which is presented in section 7.4, stems in fact from the strata variance analysis and the strata allocation phase explained in the following section.

7.3 The stratified optimal random sample

In firms surveys, the stratified optimal random sample represents the most suitable architecture for obtaining the most reliable results²⁸.

The stratification technique implies to subdivide the total sample in several subsets each comprising firms similar to each other and different from stratum to stratum²⁹. The aim is to minimise the variance inside each stratum and to maximise that between strata. Each stratum represents a single sample on which different techniques (of unit selection, elaboration of results, etc.) can be applied.

The above mentioned remarks (on Universe, GDP composition, comparability with manufacturing sector, see sections 2 and 6) led to the adoption of a random sample stratified by two variables: economic activity sectors and geographical partitions, instead excluding a third variable commonly used in firms surveys, namely the size (approximated by the workforce)³⁰.

The choice of discharging this latter as stratification variable is due to the feature of the Italian services sector, characterised by a very small average size (see above section 6) and by a concentration of non-subordinate employment contracts (like seasonal, temporary, consulting) not always exactly reported by

²⁸ See, e.g., CEC (1977) pp 19-20. Some authors, however, state that the Neyman allocation is not explicitly advisable in dealing with qualitative survey, as the improvements in estimates are limited and do not offset the efforts requested for setting up a complex design.

²⁹ It is worth remembering that stratification variables should usually be correlated with (but are not themselves) the subject of investigation.

³⁰ In Manufacturing survey the strata are build sharing the frame, beside by economic sectors and geographical regions, also by firms' size, measured according to the workforce in three sub sectors (small firms up to 99 employees; medium-sized firms from 100 to 249 ; large firms with 250 or more employees). See Malgarini et alii (2005).

firms. Given these considerations, the identification criteria of the strata thresholds led to a strata definition of poor explicative value and not comparable with those of Manufacturing survey. A further variable – i.e. the turnover – which is definitely interesting in defining the relative importance of services firms, shows the same limits as workforce (overwhelming majority of very limited and few huge firms) and would not allow comparisons with the other surveys as well³¹. Also turnover was thus discharged.

The ISAE MS sample therefore has been subdivided in 72 strata (18 economic sectors multiplied by 4 geographic partitions).

Regarding the following step, i. e. how to define the exact strata size, the Neyman technique has been adopted.

The Neyman optimum allocation to strata criterion implies to define each stratum size not only taking into account the corresponding size of the universe (proportional criterion) but also the variance within the stratum. That is:

$$n_{hk} \propto N_{hk} S_{hk} \quad (7.3)$$

where for each stratum hk , being h the generic sector and k the geographical partition, n_{hk} is the stratum size, N_{hk} is the population size and S_{hk} is the corresponding universe variance.

7.4 Sample definition

The sample definition implied an iterative process involving several empirical applications of the Neyman techniques and some operative choices, due to the characteristics of the services sectors and to the decision to enlarge and not to change the pre-existing panel.

Using the individual firms data available from the frame, the necessary variables (sizes, variances, sampling fractions and weights) were calculated, for each stratum hk , as requested for applying the Neyman's allocation.

The variances S_{hk} were computed on the universe workforce as the ASIA frame provides this information, thus avoiding the need to use as proxy, the preliminary sample estimates s_{hk} . Besides the decision to use a quantitative variance also for a qualitative survey strengthen the representativeness of the sample estimates from a double point of view: a) it is impossible to know *a priori* which qualitative variable best fits the (several) subjects of investigation; b)

³¹ An estimation of turnover collected from the survey itself is however utilised in the aggregation process (see section 8.6).

make possible using the sample also for collecting more restrictive possible quantitative variables.

As the Neyman allocation is, in praxis, an iterative process, it is often necessary to apply it several times before reaching the final allocation³².

A preliminary analysis of the strata variances S_{hk} pointed out their overwhelming width in few strata, i.e. were the above mentioned large groups of transport, post and communication and financial services concentrate. Considering that those firms are to be included in the survey in any case (as they are essential for the survey) and not to polarise the allocation on them, creating disequilibria between all the remaining firms, they have been excluded from the analysis. The variance was then recalculated only on the subset of firms having up to 10,000 employees, that is excluding twelve firms only³³.

The Neyman's strata allocation has been performed in each stratum n_{hk} according to the formulas:

$$n_{hk} = n \frac{W_{hk} S_{hk}}{\sum_{hk} W_{hk} S_{hk}} = n \frac{N_{hk} S_{hk}}{\sum_{hk} N_{hk} S_{hk}} \quad (7.4)$$

being n the preliminary sample size, N the population size and, for each stratum hk , $W_{hk} = N_{hk}/N$ the stratum weight, N_{hk} the firms' population and S_{hk} the corresponding population variance.

The final sample size determination is bound to the strata variability and to the desiderate minimum variability of estimates, according to the following formula:

$$n = \frac{(\sum_{hk} W_{hk} S_{hk})^2}{V_0 + \sum_{hk} W_{hk} S_{hk}^2} \quad (7.5)$$

where the estimates desired minimum variance V_0 is obtained according to the Neyman allocation and is given by the formula:

³² The presence in a stratum of very large firms usually leads to very large (quantitative) variances. As the allocation is proportional to variance, it may happen, as extreme case, that the Neyman allocation leads to a sample stratum size larger than the of the corresponding universe. Furthermore, should the other strata variances be comparatively very small, the Neyman allocation technique could lead to an overwhelming weight of the stratum with larger variance.

³³ Over a total of 66,051.

$$V_0 = \frac{(\sum_{hk} W_{hk} S_{hk})^2}{n} - \frac{\sum_{hk} W_{hk} S_{hk}^2}{N} \quad (7.6)$$

The first version of the sample obtained showed, however, many drawbacks. Even though it was calculated on a reduced variance, the size of FS (Banking and Insurances) was nearly 50%, Hotels were 12%, Transport about 15%, and Sewage about 9%, all contributing to lower to a minimum the quotas of the remaining sectors (and related strata). Mainly for all those sectors characterised by very small firms size and consequently very low variances (like Travel agencies, Real estates, Auxiliary Activities to Financial Intermediation, Computing, Accounting, Consulting, Marketing) the size did not reach 0.1%, even though their incidence on the economic system is very high. The theoretical sub-sample size of BS sector alone, where small firms concentrate, is reduced to only 381 firms (about 18% of the total sample), 187 of which belonging to sewage.

Further, the size of the effective pre-existing panel involving about 800 firms of BS sector showed a strong presence of firms belonging to Computing and Engineering, each collecting more than 200 consolidated interviews. Simply summing up the exceeding consolidated interviews to the new sample would have led to a total sample size of over 2,700 units, out of the Institute budgetary availability and not resolving the other disequilibria. Finally, also with these additions, many strata resulted still empty and, even the sampling theory allows this occurrence, this was not the aim of the new sample, as strata are not so numerous and as also the geographical information has to be investigated.

So the following adjustments were operated:

- a. the variances of the “largest” sectors were reduced proportionally to their incidence in terms of value added on the Universe;
- b. a minimum quotas of 5 units per elementary stratum has been imposed as well as a minimum quotas of 50³⁴ units for each economic sector;
- c. for the “old” part of the sample, referring to BS, a stratum size not less than that of the pre-existing panel has been imposed, also accepting an over sampling of these strata;
- d. a sampling fraction not greater than 20% was fixed to avoid over sampling in strata were large firms concentrate;

³⁴ OECD (2003), p.22, states a practical experience of a minimum of 30 interviews per stratum, to obtain reliable results, being the sample a panel.

- e. a total sample size of roughly 2,000 units, after all these adjustments, has to be maintained.

After several empirical attempts, reducing gradually the initial size n to about 1,500 in calculating the first version of the theoretical sample and applying all the above-mentioned adjustments, the final resulting sample is shown in Table 4.

The sample reflects the adopted assumptions: HS³⁵ has in the sample a proportionally smaller sampling fraction with respect to universe, but nearly coincident with its VA weight. It is also characterised by small average size firms, even representing a very high quota in terms of firms number with respect to universe. Within this sector, however, Post, Telecommunications and Transport (being characterised by large and very large firms) maintain a sampling fraction higher with respect to the reference universe, according to the Neyman criterion.

Financial sector universe shows a high incidence of banks both regarding number and mainly size: this characteristic is maintained in the sample assuring a higher sampling fraction both within FS and the whole MS sample. Insurances, even limited as number, have similar features to those of banking, and are over represented in the sample, with respect to universe, whereas for division 67 (Auxiliary Activities to Financial Intermediation), being the average size (and the variance) very small, the sample fraction has been reduced.

BS sector represents the continuity with the pre-existing ISAE services survey and comprises the above mentioned groups (see Table 4), also of relatively small size in terms of number of firms, but of primary interest for economic analysis. Most of them have therefore a sample fraction larger with respect to that of universe.

From the territorial point of view, the sample reflects the most relevant features of Italian MS sector: Nearly half of firms are concentrated in North-west, mainly regarding Computing, Engineering, Banking, Transports, Accounting and Consulting. North-east gathers the majority of firms belonging to tourism sectors (Hotels and Restaurants), while a relevant proportion of Transports and that relatively larger of Sewage is set in Centre. Services, even the more “traditional” ones like tourism, do not seem to characterise the southern economy yet.

³⁵ Once again, it is worth mentioning that in this group ISAE collects several various services, mainly but not exclusively ascribing to households which do not coincide with National Account definitions.

Tab. 4

ISAE 2002 Market Services Sample

Nace Rev.1.1 Sectors			ASIA Frame 66,051 Firms %					ASIA Frame 2,116,484 Employees %					ISAE Theoretical Sample (2,154 Units; %)				
			Geographical partitions					Geographical partitions					Geographical partitions				
			NW	NE	CE	S	Italy	NW	NE	CE	S	Italy	NW	NE	CE	S	Italy
HOUSEHOLDS SERVICES	55	Hotels and restaurants	9.0	11.9	8.5	6.4	35.8	5.6	5.2	3.8	2.8	17.4	3.2	3.6	3.0	1.9	11.7
	60+61+62	Transports	4.8	4.5	3.1	4.5	16.9	4.3	3.0	9.4	3.9	20.5	3.6	1.3	3.2	2.5	10.5
	63.3	Travel agencies	0.7	0.5	0.5	0.4	2.1	0.4	0.3	0.2	0.2	1.1	0.7	0.7	0.4	0.4	2.3
	64	Post and telecommunications	0.1	0.1	0.1	0.1	0.4	4.2	0.0	9.4	0.1	13.7	1.0	0.3	0.7	0.3	2.3
	70	Real estate activities	1.4	1.1	0.7	0.2	3.4	7.6	3.4	5.0	2.2	18.2	0.9	0.5	0.5	0.5	2.3
FINANCIAL SERVICES	65	Financial intermediation ^a	1.0	0.6	0.5	0.4	2.6	1.2	0.5	0.4	0.0	2.1	4.2	2.7	2.3	1.8	10.9
	66	Insurance, pension funding	0.2	0.1	0.1	0.0	0.3	0.6	0.3	0.2	0.1	1.3	1.3	0.4	0.3	0.3	2.3
	67	Activities auxiliary to financial intermediation	1.8	1.1	0.8	0.5	4.1	0.6	0.5	0.3	0.1	1.5	0.9	0.5	0.5	0.5	2.3
BUSINESS SERVICES	71	Machinery and equipment hiring	0.3	0.2	0.2	0.2	0.9	0.2	0.1	0.2	0.1	0.5	0.8	0.5	0.5	0.5	2.3
	72	Computer and related activities	4.7	2.7	2.2	1.4	11.0	3.4	1.5	2.0	0.8	7.7	7.4	1.3	3.5	0.6	12.9
	73	Research and development	0.2	0.1	0.1	0.1	0.5	0.3	0.1	0.1	0.2	0.6	0.7	0.5	0.6	0.5	2.3
	74.12	Accounting	2.6	1.7	1.1	0.4	5.8	1.2	0.6	0.5	0.1	2.4	4.3	0.4	0.4	0.3	5.4
	74.13	Marketing, market research	0.2	0.1	0.1	0.1	0.5	0.2	0.0	0.1	0.0	0.3	1.5	0.6	0.6	0.6	3.3
	74.14	Administration and management consulting	1.6	0.9	0.6	0.3	3.4	1.1	0.3	0.3	0.1	1.8	3.3	1.4	1.4	0.7	6.9
	74.2	Engineering, planning, architecture	1.5	1.0	0.6	0.3	3.4	1.2	0.4	0.3	0.2	2.0	7.0	1.8	1.3	0.5	10.6
	74.4	Advertising	0.9	0.4	0.3	0.2	1.8	0.7	0.2	0.1	0.1	1.1	1.4	0.4	0.5	0.4	2.7
	74.5+74.8	Other services	2.2	1.2	1.0	0.8	5.2	2.9	0.6	0.7	0.6	4.8	1.7	0.7	0.6	0.3	3.3
90	Sewage and refusal disposal	0.5	0.4	0.4	0.6	1.9	0.9	0.4	0.8	0.8	2.9	1.8	0.6	2.1	1.0	5.4	
MARKET SERVICES			33.7	28.5	20.8	17.0	100	36.7	17.3	33.8	12.3	100	45.9	18.1	22.6	13.5	100
NW = North-west; NE=North-east; CE= Centre; S= South																	
a) Central Bank is not comprised (65.11)																	

8 PROCESSING TECHNIQUES

Since January 2003, the answers collected from the enlarged panel have been processed according to the standard techniques (see OECD, 2003), paying a particular attention to the weighting steps. In particular, the EDP procedure was completely revised in order to apply the new weighting system³⁶.

As it is well known, the qualitative variables of tendency surveys can be measured by associating a value to each class (reply option) in which they are scaled (ordered). Relative frequencies of those values are then calculated handling the qualitative reply options as quantitative variables. In particular, in the case of the MS survey, firms are usually asked to choose among three options, namely a favourable (*F*), neutral (*N*) and negative (*L*) answer³⁷. For each firm, these options are codified as dichotomous variables x_F , x_N and x_L , taking value 1 for firm selecting that item, 0 otherwise, in order to compute frequencies with the standard methods.

In details, processing the results implies the following steps:

1. Preliminary missing data treatment and consistency controls;
2. Classification of the respondents according to the belonging stratum, i.e. the sector of activity and the geographical partitions, and application of a weighting procedure accounting for the relative importance of the respondent;
3. Calculation of the multiple percentages at stratum level;
4. Weighted aggregation of frequencies by geographical partitions, by economic sectors, by macro-sectors (namely, HS, BS and FS), and for the overall Italian MS sector;
5. Computation of the balances (i.e. the difference between the percentages of positive and negative responses), and of the confidence climate for geographical partitions, macro-sectors and overall Italian MS sector.

³⁶ An important follow up of this experience, carried out in 2001/2002 on preliminary monthly data, has been to represent a “pilot” procedure allowing to acquire a precious experience also for the re-engineering of the Manufacturing survey. See Malgarini et al. (2005).

³⁷ Actually, ISAE also computes the non-response percentages (NR).

8.1 Missing data processing

The first phase of a survey processing generally consists of missing data (MD) handling. MD can refer to the whole questionnaire (unit non response) or only to some questions (item non response).

It is however worth noticing that MD processing is more properly related to the whole survey design. More precisely, an efficient survey design contributes to lower the presence of MD from the very beginning (e.g. reliable registers availability, proper questionnaire lay out and wording, training of interviewers, etc.). All these steps are therefore carefully planned also to this end.

Nonetheless, in the ISAE MS survey a small percentage of unit (total) non responses is still present. On average, each month about 2-3% of firms definitely exits the panel for various reasons or simply are materially unable to respond for the investigated month. Data collection by phone allows to act *a priori*, by replacing, within each stratum, the non-respondent with a firm, random selected, from the same frame stratum of the exiting one. The stratum size is therefore always guaranteed, thus to some extent overcoming the problems related to the unit non response.

As for the second kind of MD, i.e. the item non response, ISAE acts in two ways, according to the kind of lacking information.

With regard to the previous year turnover - which is a sensitive variable, essential for data processing - it is surveyed once a year, namely in March, when all firms should have prepared their budgets. A confirmation is asked in September, in case of possible variations. The information is requested in relatively wide brackets (seven) not to bound firms to give a detailed quantitative information, and under the guarantee that data will not disseminated other than aggregated (privacy guarantee). Interviewers ask this question every month to non-respondents, until they get information. For still lacking answers, it is then applied a deterministic method of attribution from similar (i.e. belonging to the same stratum) donor. Now, after one year of testing, the problem is very reduced as it regards only about the 2% of the sample³⁸.

Also item non responses in qualitative questions are very limited in size, being about 2-3%. They are mainly ascribed to new entrants who quickly become familiar with the survey and then completely fill up the questionnaire. ISAE tries to collect the missing information by telephone only in case of large firms. Should this second attempt fails too, ISAE attributes the previous (at the

³⁸ This percentage used to be relatively higher, about 10%.

time $t-1$) response. For the remaining cases, ISAE imputes a random distribution of MD within the stratum.

8.2 Consistency Controls

A further aspect of the initial step of data processing is represented by a set of consistency controls, aimed at avoiding inconsistent relations between answers to correlated variables (e.g. a firm can not say to have a “high” general order book level and a “low” both domestic and foreign order book). To this end the CATI software plays an important role already in the data collection phase, as it allows to perform the majority of those controls directly while gathering the information and immediately asking confirmation of possible inconsistent answers pointed out by the software.

Once completed the field work, further consistency controls are mainly performed in this phase at cross-sectional level, but also at longitudinal one, like e.g. on turnover and workforce, that cannot vary, month after month, outside predetermined acceptable ranges. All the information related to the participating firms (address, phone, fax, e-mail, etc.)³⁹ are also updated at this stage.

8.3 Aggregation and weighting

The second step consist of calculating, for each question Q , within each stratum hk , the relative frequency of each replay option (X_F, X_N, X_L, X_{NR}). In this step, we adopt an “internal” weight⁴⁰ using the central value of the declared turnover class⁴¹. When dealing with proportions, this weight could be seen as an indication of the relative importance of the respondent (“the answers from a large firm carry more weight than answers from a small one”⁴²); this indication, instead, is already comprised in the information collected when dealing with quantitative variables (e.g. amount of investments) and therefore “that size

³⁹ These controls are mainly performed with EDP procedures, but also directly by technicians.

⁴⁰ See OECD (2003), sect. 5, where these weight are called “size” weights. ISAE prefers to maintain the definition of “internal” weights as they are directly collected from the sample, with respect to the second step weights called “external”, as they stem from National Accounts data.

⁴¹ Compared to the Manufacturing survey where the number of employees is selected as internal weight, in the MS survey the turnover (even though it is a sensitive variable) seems to be a better proxy of the relative firm importance, as in the MS sector several kind of occupations – often not precisely reported by firms – are concentrated.

⁴² OECD (2003), p. 36.

weights are not generally requested in processing answers to quantitative questions because the answers already reflect the size of the reporting units"⁴³ .

More in details, let us consider a generic *i*-firm belonging to sector *h* and geographical partition *k* with an associated turnover t_{ihk} . Let *X* be one of the option allowed for the generic question *Q* (as described above, these options could be *F*, *N*, *L* or *NR*) and x_{ihk} the response of *i*-firm, taking the value 1 if firm has selected that option and 0 otherwise. Thus, the weighted response for the *i*-firm will be $t_{ihk} \cdot x_{ihk}$. The option X_{hk} percentage in each stratum *hk* is calculated as:

$$X_{hk} = \frac{\sum_i t_{ihk} \cdot x_{ihk}}{\sum_i t_{ihk}} \quad (8.1)$$

All in all, let *H* be the number of sectors considered and *K* the number of geographical partitions, an *HxK* matrix *Z* of frequencies X_{hk} for each possible choice to the generic question *Q* is obtained; that is, the X_F , X_N , X_L and X_{NR} matrixes carrying information at single stratum level.

The third phase of aggregation procedure allows to obtain, for each question *Q*, the vector of relative frequencies for sectors, macro-sectors, geographical partitions and whole Market Service sector, given the "internal" weighted replays of individual firms. This step is performed adopting a grid of "external" weights, the *HxK* matrix *W*, estimated as the percentage of value added in each stratum with respect to the total value added in the reference universe. These weights therefore reflect both the sample weights (i.e. the proportions to the universe) within the stratum and the relative importance in the Italian economy of the different sectors and geographical partitions (between strata).

In details, the weights matrix *W* was computed using heterogeneous data source provided by ISTAT. In particular, VA data for 1999, available at Nace three digit level and broken down by regions were used for computing weights concerning sectors 55, 60 to 64, 70 to 71. On the other hand, for Financial sectors we applied regional VA (also in this case for 1999) for sectors 65 and 67 and ISTAT 1996 National Accounting data for sector 66.

⁴³ OECD (2003), p. 37.

In particular, the following steps were performed:

1. First, regional data were aggregated to calculate the VA for the standard four geographical partitions in each two digit sector, thus obtaining a first distribution of the VA by the two dimension requested for our analysis;
2. Secondly, the VA for particular sectors of interest at three or four digit details (for example with reference to sector 63.3 - Travel agencies - and part of sector 74) was computed on the basis of the employees distribution in those sectors, extracted by the ASIA archive; in details, the value added of a single two digit sector was spread at 3 or 4 digit detail on the basis of the percentage of employees;
3. Further, the VA for financial sectors was inferred both by the regional VA data and by the overall distribution of VA displayed in 1996 National Accounting data; for sector 66 the percentage was spread among geographical partition on the basis of the distribution of employees stored in the ASIA archive;
4. Finally, the W matrix was computed by calculating the percentage of VA in each stratum with the respect to the VA estimated for the overall Market Services.

Turning to the aggregation procedure steps, the survey frequencies for the generic option X are computed as follows:

1. The aggregate frequency X_h . for the generic sector h , is computed summing up the X_{hk} with respect to geographical partition using the h -row of the weight matrix W :

$$X_h = \frac{\sum_k X_{hk} \cdot w_{hk}}{\sum_k w_{hk}} \quad (8.2)$$

2. The aggregate frequency for a specific macro-sector S (HS, BS and FS) X_S . is computed summing up the percentages both with respect to the set of sectors $H_S = \{h : h \in S\}$ and the geographical partitions, using the H_S -rows of the weight matrix W :

$$X_S = \frac{\sum_{H_S} X_{H_S k} w_{H_S k}}{\sum_{H_S} w_{H_S k}} \quad (8.3)$$

3. The aggregate frequency $X_{.k}$ for the geographical partition k , is computed summing up the percentages with respect to all economic sectors using the k -column of the weight matrix W :

$$X_{\cdot k} = \frac{\sum_h X_{hk} w_{hk}}{\sum_h w_{hk}} \quad (8.4)$$

4. The overall Italian MS frequency X is calculated aggregating all sectors and geographical partitions frequencies using the value added weights in W :

$$X = \frac{\sum_h \sum_k X_{hk} w_{hk}}{\sum_h \sum_k w_{hk}} \quad (8.5)$$

8.4 Computing balances and the confidence climate

By applying for each question Q the above described steps to all the options F , N , L and NR the aggregated percentages X_F , X_N , X_L and X_{NR} are obtained.

In details, we have the vector $X=(X_F, X_N, X_L, X_{NR})$ being:

- X_F the percentage of answers signalling an improvement of Q (or a *Favourable* level) ;
- X_N the percentage of answers signalling stability (or a *Normal* level);
- X_L , the percentage of answers signalling a worsening of Q (or a *Low* level);
- X_{NR} the percentage of *Non-responses* (that can also be considered as an indication of uncertainty).

with $X_F + X_N + X_L + X_{NR} = 100$.

Then, for each question Q , the balance is calculated as:

$$B = w_1 \cdot X_F + w_2 \cdot X_N + w_3 \cdot X_L \quad (8.6)$$

where, $w_1=1$, $w_2=0$ and $w_3=-1$.

Finally, the confidence climate is computed as the arithmetic average of the balances of assessments and forecasts on order books, and expectations on business climate.

9 SOME FIRST ANALYSES

Once consolidated the panel during end of 2002 and beginning of 2003, some preliminary statistical analyses has been carried out on an three month average (March-May 2004) of the effective responses both in terms of quantitative indicators (the employees average) and qualitative ones (the questions building the ISAE MS confidence indicator), with the aim of testing the quality of the data collected, focusing on the sample design adopted.

To this purpose the Design Effect (*Deff*) was applied⁴⁴. In the following section 9.1 the *Deff* theoretical basis are briefly recalled, while in section 9.2 experimental findings of the application of different formulation of *Deff* to Italian MS survey are presented.

9.1 The Design Effect

The Design Effect was introduced with the purpose to compare the efficiency of concurrent sample designs, given the sample size n .

Since when dealing with complex design the variance of estimates could be larger (or smaller) than that obtained from standard formulas, *Deff* is adopted to measure the gain (or loss) in precision deriving from the use of a complex sample design instead of a simple random sample of the same size⁴⁵. *Deff* values less than 1 indicate that estimates stemming from a complex design are more efficient (having less variability) than those of a random one, that is the complex design effectively introduces improvements in estimates. Quite the reverse in cases where *Deff* is greater than unity.

Deff depends on the population parameter that are going to be estimated; thus the notation $Deff(\theta)$ is adopted, where θ is a population parameter (mean, proportion, total, etc.)⁴⁶. The statistic useful for the purpose of this paper is the estimate of the population mean \bar{Y} and thus we refer to $Deff(\bar{y})$, where \bar{y} is an estimation of \bar{Y} . Since a proportion is a special case of mean, the analysis based on mean also covers proportions.

⁴⁴ See Kish, 1965, 1995; Lohr, 1999.

⁴⁵ Indeed, *Deff* has two primary uses: in sample size estimation and in appraising the efficiency of more complex plans (Cochran, 1977). In this paper we focus on the latter.

⁴⁶ *Deff* depends also on the estimator adopted (as for example Horvitz-Thompson vs. ratio mean); consequently *Deff* accounts not only for the efficiency of the design but also for that of the estimators (Park and Lee, 2004).

Following Kish (1965), for an estimate of the population mean \bar{y} , *Deff* is the ratio of the variance of \bar{y} under a generic complex sample design $V_{complex}(\bar{y})$, compared to the variance of the same statistic under a simple random design without replacement $V_{ran}(\bar{y})$, given the same sample size n . That is:

$$Deff(\bar{y}) = \frac{V_{complex}(\bar{y})}{V_{ran}(\bar{y})} = \frac{V_{complex}(\bar{y})}{\left[(1-f)S_y^2/n \right]} \quad (9.1)$$

being $f = \frac{n}{N}$ the sampling fraction and S_y^2 the population variance of the variable y ⁴⁷.

When the adopted sample design implies larger standard errors than simple random design – i.e. for clustered sample design⁴⁸ - *Deff* is larger than 1; in this case, *Deff* is generally adopted to measure the loss of precision of estimates⁴⁹. Conversely, as in the case of MS survey, when sample design is a stratified one and Neyman optimal allocation to strata is adopted (see section 7), the sample design is characterised by the lowest variances of estimates; consequently *Deff* is always smaller than 1.

Further, it is important to recall a fundamental property of the Neyman's allocation which arises when comparing the variances of estimated means obtained from different sampling designs, like simple random, stratified random sample with proportional and optimum allocation. In fact it is possible to show that:

$$V_{opt}(\bar{y}) \leq V_{prop}(\bar{y}) \leq V_{ran}(\bar{y}) \quad (9.2)$$

⁴⁷ Moreover, Kish (1992) introduced an alternative measure, *Deff**, that does not includes the finite population correction term $(1-f)$ thus using the variance of a simple random sample with replacement in the denominator. *Deff** is given by: $Deff^*(\bar{y}) = V_{complex}(\bar{y}) / (S_y^2 / n)$. For our purpose, since n is very small as compared to N , f is approximately zero and the two formulations are equivalent.

⁴⁸ Cochran (1977)) sect. 4.11. This problem can arise, e.g. , when households are easier available as sampling unit instead of persons.

⁴⁹ For example, if *Deff* is equal to 1.5, the variance of the estimates adopting the clustered design is 1.5 times greater that the variance that we could obtain using a simple random sample of the same size. Accordingly, the adoption of a clustered design implies a loss of precision of 50%. To recover this loss, in comparison with the random sample, it is therefore necessary to increase the size of the complex design sample by 1.5.

the optimum allocation estimates having the minimum variance⁵⁰. That is an optimal sampling design is expected to give the best (in terms of precision) estimates.

For our purposes, the ratios between these variances, that is the following *Deff*'s were considered:

$$Deff_{opt/ran} = \frac{V_{opt}}{V_{ran}} \quad Deff_{opt/prop} = \frac{V_{opt}}{V_{prop}} \quad Deff_{prop/ran} = \frac{V_{prop}}{V_{ran}} \quad (9.3)$$

which allow to quantify the improvements in the estimates due to the optimal sampling design adopted (*opt*) in comparison with a simple random sample of the same size (*ran*) and with a stratified proportional random sample (*prop*)⁵¹. According to (9.2), all the above considered *Deff*'s are all expected to have values smaller than 1. In these cases *Deff* measures the gain of a complex design over the simple random one instead of the loss⁵².

A complementary and alternative formulation of *Deff*, useful for obtaining an immediate perception of the improvement a proper sample design can offer with respect to another one, is represented by the *gain in precision*, precisely, according to our purposes:

$$(1 - Deff_{opt/ran}) * 100 \quad (1 - Deff_{opt/prop}) * 100 \quad (1 - Deff_{prop/ran}) * 100 \quad (9.4)$$

These formulas give the percentage amount of the improvement⁵³ in estimators efficiency when applying the optimal sampling design in comparison with the stratified proportional and simple random one, as well as between these two latter designs.

Formulas (9.3) and (9.4) are thus applied to different estimates of the new MS sample in following sections 9.2, where a quantification of the improvement of the sample design quality due to the Neyman allocation is presented.

⁵⁰ See Cochran (1977), sect. 5.6.

⁵¹ Actually, the ratio $V_{prop}(\bar{y})/V_{ran}(\bar{y})$ is more properly applied for measuring the effect of adopting a disproportionate allocation to strata, rather than a proportionate one, when adopting a stratified sample design.

⁵² Park and Lee, (2004).

⁵³ More generally, according to the corresponding *Deff*, also the gain in precision can assume negative values, when comparing a less efficient sample design as numerator with a more efficient one as denominator.

9.2 Quality indicators

In Table 5 some synthetic results are presented focusing on comparisons between the three main sampling designs considered (simple random, stratified proportional and stratified optimal).

Row 1 provides the quality indicators for three theoretical samples of the same size ($n = 2143$), calculated on the ASIA available employees' variances as simple random, stratified proportional and according to the Neyman allocation (see Table 5)

In rows 2 – 5 the same statistics are calculated on a three months average (March_May 2004) of the actual results stemming from the optimal sample, simulating also the results for the corresponding proportional and simple random samples of the same size.

In the first case (row 1) only the quality indicators for the well known average employees size $\bar{y}_{theor} = 32$, featuring the three different sampling designs considered, can be calculated. In the others, beside the estimate of \bar{y} (row 2), also the estimates of favourable percentages p of the three confidence building qualitative indicators (order-book assessments, order-book expectations and business climate expectations) for the whole MS sector are presented (rows 3-5).

Indicators are presented in columns: in columns 1-3 the precisions d (formula 7.2) are reported, respectively for a random, a proportional and an optimal design based samples of the same size. Columns 4-6 present the values of the considered *Deff's* according to formulas (9.3) and columns 7-9 provide the corresponding *gains* in precision (formulas 9.4).

All these indicators were calculated for the above-listed variables, namely for \bar{y}_{theor} , \bar{y} , favourable percentages p_{OA} of order-book assessments, p_{OE} of order-book expectations and p_{BS} of business climate.

The results of row 1 mainly represent a theoretical exercise, made possible by the availability of a complete frame (as it rarely happens in real cases) and are mainly presented for a better discussion of the empirical findings referring to the actual sample (rows 2-5).

However, also in estimating the average employees value \bar{y}_{theor} in the theoretical sample (that is using the frame's effective variances, but strata sizes equal n_h as defined for the sample), some interesting findings do emerge, as the true employees average value is known.

Even if the obtained values are still relatively high, as it deals of a quantitative variable, while the sampling design (and mainly its size) was set up for qualitative ones, passing from a random to an optimal design, the precision

not only remarkably improves, as the accepted interval diminishes from 8.21 for random allocation to 6.98 for proportional but also nearly halves to 4.54 for optimal one (row 1, col. 1, 2 and 3 respectively). That is only in the 5% of the cases there is an actual (small) risk that the Neyman sample estimate would be smaller (or greater) than about 4 and a half units with respect to the universe actual value. The estimated average obtained from the optimal sample is thus comprised in a range 28.5 — 36.5 that seems a good approximation also for the quantitative case.

Tab. 5 Design effect of the ISAE MS Sample (average March May 2004)

Variable	Precision			Design effect			Gain in precision (%)		
	d_{ran}	d_{prop}	d_{opt}	V_{prop}/V_{ran}	V_{opt}/V_{prop}	V_{opt}/V_{ran}	$prop/ran$	$opt/prop$	opt/ran
	(1)	(2)	(3)	(4) ^{b)}	(5)	(6)	(7)	(8)	(9)
Theoretical sample									
(1) $\bar{y}_{theor} = 32$	8.21	6.98	4.54	0.722	0.423	0.306	28	58	69
Actual sample ^{a)}									
(2) $\bar{y} = 30.1$	7.08 ^{b)}	5.62	2.81	0.495 ^{b)}	0.251	0.122 ^{b)}	51 ^{b)}	75	87 ^{b)}
(3) Order-book assessments ($p_{OA}=17.9$)	1.68	1.59	1.47	0.902	0.860	0.777	10	14	22
(4) Order-book expectations ($p_{OE}=27.4$)	2.08	1.93	1.86	0.859	0.926	0.793	14	7	21
(5) Business climate ($p_{BS}=15.11$)	1.58	1.52	1.39	0.944	0.816	0.770	6	18	23
a) It comprises on average about 1900 units, as most Banks and part of Insurances are still not surveyed									
b) As the actual sample stems from an optimal design for simulating the random sample variance the formula:									
$v_{ran} \cong \frac{(N-n)}{nN} \left(\frac{1}{N} \sum_{hk} \frac{N_{hk}}{n_{hk}} \sum^{n_{hk}} y_{hkj}^2 - \overline{y_{hk}^2} \right)$ has been applied (Cochran, p.137).									

Furthermore, considering the *Deff*'s or the corresponding gains, a 28% *gain in precision* emerges for the proportional allocation with respect to the random one (row 1, col. 7), thus confirming the theory which states that proportional allocation is usually more effective than the random one. But it is interesting to note that the optimal allocation improves the precision of results by a further 58% with respect to proportional one (row 1, col. 8), offering a total

gain of 69% (compared to the random allocation). In other words, the design effect shows that, in estimating \bar{y}_{theor} , the variability of the theoretical estimate stemming from the optimal design is not only nearly one third than that of the simple random one (row 1, col. 6) but also less than half of that of proportional sample (row 1, col. 5).

Similar statistics are reported for a three-months average of the actual sample, that is using the effective variances stemming from the sample and the effective strata sizes n_{hk} , which may slightly differ from the theoretical ones and vary from month to month.

In this case the optimal allocation offers even better results in estimating \bar{y} (row 2, col. 3). The precisions are generally higher (as intervals are smaller) than for the theoretical case. The optimal allocation confirms to have the higher precision 2.81% (row 2, col.3), being the interval nearly the half of that of the theoretical case. Within a confidence interval of 95% the true average size is thus comprised within a range of about 29—35, being the true value $\bar{y}_{theor} = 32$ and the sample estimate $\bar{y} = 30.1$. This finding validate the choices made while building the sample.

Looking at the *gains in precision*, the remarkable improvement of the optimal stratified vs. random allocation, equalling 87% (row 2, col. 9) is for a substantial part due to the Neyman technique, as the stratified proportional vs. random gain is only 51% (row 2, col. 7), signalling that the proportional allocation alone is only partly effective, as already pointed out by the width of the precision interval.

The comparison between the optimal and the proportional allocation (row 2, col.8) thus confirms that the *gain* improvement is nearly completely due to this latter. In other words, the adoption of an optimal allocation reduces the variability of estimates to about one fourth compared to proportional and to one tenth with respect to random sample (row 2, col. 4 and 5). A possible explanation of these results may be bound to the adaptations performed in the sample (see above 7.4), presumably as the actual sample captures the largest firms where variability concentrates, thus confirming the validity of the choices made.

In the following rows 3-5 the survey qualitative core variables are presented. For them the true universe percentages are unknown, as they are opinions, and only the sample estimates are available, namely for order-book assessments $p_{OA}=17.9$; for order-book expectations $p_{OE}=27.4$ and for business climate $p_{BS}=15.11$ respectively.

It is worth noticing that the theory generally states that, when dealing with percentages (or proportions), the gain in precision due to more complex sample

designs, mainly the Neyman allocation, is generally poor. In fact, variances calculated on percentages are much smaller than in the previous quantitative case, markedly reducing the intervals width and consequently assuring a high precision of estimates, also for random samples. Some utility in using more complex sample designs may arise only when the estimated proportion is very high/low (e.g. greater than 90% or less than 10%), as in these cases qualitative variances reach their maximum values.

The previous analyses, however, strengthen the validity of the sample estimates. Also in the qualitative cases, the analyses performed show some interesting findings.

As expected, the precisions are generally high (rows 3-5; col.1-3), ranging from about 2 for a random sample of order-book expectations to about 1.4 for an optimal sample of business climate. However, for all the three variables considered, even the investigated percentages range between about 15 and 27% (not extreme values), the precision gradually improves while going from random to proportional and to optimal design stemming estimates. Furthermore, the improvement due to optimal allocation is relatively high.

Looking at the gains' results, while the proportional design (rows 3-5; col. 7) improves the precision by about 10% only, the optimal one gives a further improvement ranging from 7 to 18% (rows 3-5; col. 8). Thus, the total gain of the optimal design with respect to the random one (rows 3-5; col. 9) has nearly doubled, ranging from 21 to 23%.

Indeed, Table 5 reporting the quantification of the improvement due to *Deff's* and their related *gains in precision*, calculated for the three most important sampling designs shows that, both for quantitative and qualitative variables, the stratification produces a significant improvement in the precision of estimates but, what is most important, this occurrence is mainly due to the optimal allocation, whereas the proportional allocation alone does not give a so remarkable contribution.

10 CONCLUDING REMARKS

The present paper introduces the new ISAE Market Services survey, mainly from a statistical point of view. The most important result is that, thanks to the survey, it is now possible to timely dispose of significant information on a large and increasing part of the Italian economy, thus filling an important informative gap. Due to the new weighting system, it is also possible to overcome the limits of the Nace classification, and correctly analyse for example the ITC sector (that mainly comprises both Computing and Telecommunication).

Another important finding is that the precision of estimates takes great advantage from the Neyman allocation, in spite of the fact that the survey collects qualitative variables. The *gain in precision* is mainly due to the use of the variances, in addition to pure proportional stratification.

Furthermore, the indicators presented show the reliability of estimates stemming from the adopted sampling design, which validates the obtained results.

Future methodological work should include a more detailed analysis of variances (mainly at sectoral level) and of interactions between variability of the old panel and that of the new one.

It could also be interesting to reconstruct longer series for the Business Services sector using the results of the old survey and to perform comparative cyclical analysis between services and manufacturing as the data are now harmonised.

REFERENCES

Bouton F. and H. Erkel-Rousse, "Sectoral Business Surveys as an Aid to Short-Term. Macroeconomic Forecasting: The Services Contribution", paper presented 27th CIRET Conference, Warsaw, September 2004.

EC (1990a), "L'estension des enquêtes de conjuncture dans la Communauté aux secteur des services ", Doc. II/121/90, Bruxelles.

EC (1990b), "NACE rev. 1", Official Journal of European Community L. 293 of 24.10. 1990 and L. 83 of 3.4.93, Bruxelles.

EC (1991), "Il sistema di inchieste congiunturali nella Comunità europea: Uno strumento efficiente ed apprezzato", in *Economia Europea supplement B*, special edition, Bruxelles.

EC (1996) "Contributo finanziario allo svolgimento del programma di inchieste congiunturali armonizzate della Comunità europea", Doc. II/08702, Bruxelles.

EC (1997), "The joint harmonised EU programme of business and consumer surveys" in *European Economy, Reports and Studies No. 6*, Bruxelles.

EC (2002), "NACE rev. 1.1", Official Journal of European Community L29/2002 of 10.1.2002 Bruxelles.

Cicchitelli, G. Herzel, A. Montanari, G. E. (1992), *Il campionamento statistico*, Il Mulino, Bologna.

Cipolletta, I., Freschi, R. (1983), "La diffusione dei principali servizi del terziario avanzato presso le imprese industriali", *ISCO, Rassegna di Lavori dell'ISTITUTO*, n. 26, Roma.

Chiaro M. (1996) "I sondaggi telefonici", *Monographic Studies of SIS (Italian Statistical Society) CISU*, Roma.

Coccia, G., Culini, M. (1990), "Problemi di campionamento nelle indagini telefoniche", in *FABBRIS, L., Rilevazioni per campione delle opinioni degli italiani*, SGE, Padova.

Cochran, W. G. (1977), *Sampling techniques*, John Wiley & Sons.

Corsi, M., De Cindio, G. (1997), "Il ciclo economico nel terziario avanzato" in *Rassegna di lavori dell'ISCO*, Anno XIV, n. 4.

Fabbris, L. (1989), *L'indagine campionaria: Metodi, disegni e tecniche di campionamento*, La Nuova Italia Scientifica, Roma.

Groves R.M., F.J. Fowler,Jr, M.P. Couper, J.M Lepkowski, E. Singer, and R. Tourangeau, (2004), *Survey Methodology*, John Wiley & Sons, New Jersey.

- INSEE (1997) "Spécification de dépouillement des enquêtes mensuelles et trimestrielles sur l'activité dans l'industrie", Direction des études et Synthèses économiques, Division "Enquêtes de Conjoncture" Section "Industrie", Paris.
- Italian National Institute of Statistics (ISTAT) (1989), Manuale di tecniche di indagine, Note e Relazioni n.1, Roma.
- Italian National Institute of Statistics (ISTAT) (1991), Classificazione delle attività economiche, Metodi e Norme, Serie C, n. 11, Roma.
- Italian National Institute of Statistics (ISTAT) (several years), Yearly Report.
- Italian National Institute of Statistics (ISTAT) (2004) 8th General Census on Industry and Services, <http://www.istat.it>
- Kish L. (1965), Survey Sampling, Wiley, NY.
- Kish L. (1992), "Weighting for Unequal Pi", Journal of Official Statistics, Vol. 8.
- Kish L. (1995), "Methods for Design Effect", Journal of Official Statistics, Vol. 11.
- Lohr S. L. (1999), Sampling: Design and Analysis, Duxbury Press, Pacific Grove, CA.
- Malgarini, M., Margani P., Martelli B.M. (2005), "Re-engineering the ISAE Manufacturing Survey" paper presented at the 27th CIRET Conference, Warsaw, September 2004 and Documenti di lavoro ISAE n.47/2005.
- Martelli B.M. (1998) "Le inchieste congiunturali dell'ISCO: aspetti metodologici" in "Le inchieste dell'ISCO come strumento di analisi della congiuntura economica", ISCO, Rassegna di lavori dell'ISCO Anno XV n.3, Roma, pp 13-65.
- National Bank of Belgium (1999), "Monthly Business Surveys in the Service Sector", Statistical Bulletin, <http://www.bnb.be>
- OECD (2003), Business Tendency Survey: A Handbook, Paris.
- Park I. and H. Lee (2004), "Design Effects for the Weighted Mean and Total Estimators Under Complex Survey Sampling", Survey Methodology, Vol. 30, No.2.
- Rocchetti G.(2003) "Weighting system of ISAE Market Services Survey", Technical Internal Note, ISAE Survey Unit, n.1.
- Spencer B. D. (2000), "An Approximate Design Effect for Unequal Weighting When Measurements May Correlate With Selection Probabilities", Survey Methodology, Vol. 26.
- World Bank (2003), World Development Indicators, www.worldbank.org

Working Papers available:

n. 31/03	S. DE NARDIS C. VICARELLI	The Impact of Euro on Trade: the (Early) Effect Is not So Large
n. 32/03	S. LEPROUX	L'inchiesta ISAE-UE presso le imprese del commercio al minuto tradizionale e della grande distribuzione: la revisione dell'impianto metodologico
n. 33/03	G. BRUNO C. LUPI	Forecasting Euro-area Industrial Production Using (Mostly)\ Business Surveys Data
n. 34/03	C. DE LUCIA	Wage Setters, Central Bank Conservatism and Economic Performance
n. 35/03	E. D'ELIA B. M. MARTELLI	Estimation of Households Income from Bracketed Income Survey Data
n. 36/03	G. PRINCIPE	Soglie dimensionali e regolazione del rapporto di lavoro in Italia
n. 37/03	M. BOVI	A Nonparametric Analysis of the International Business Cycles
n. 38/03	S. DE NARDIS M. MANCINI C. PAPPALARDO	Regolazione del mercato del lavoro e crescita dimensionale delle imprese: una verifica sull'effetto soglia dei 15 dipendenti
n. 39/03	C. MILANA ALESSANDRO ZELI	Productivity Slowdown and the Role of the Ict in Italy: a Firm-level Analysis
n. 40/04	R. BASILE S. DE NARDIS	Non linearità e dinamica della dimensione d'impresa in Italia
n. 41/04	G. BRUNO E. OTRANTO	Dating the Italian Business Cycle: a Comparison of Procedures
n. 42/04	C. PAPPALARDO G. PIRAS	Vector-auto-regression Approach to Forecast Italian Imports
n. 43/04	R. DE SANTIS	Has Trade Structure Any Importance in the Transmission of Currency Shocks? An Empirical Application for Central and Eastern European Acceding Countries to EU
n. 44/04	L. DE BENEDICTIS C. VICARELLI	Trade Potentials in Gravity Panel Data Models

Working Papers available:

n. 45/04	S. DE NARDIS C. PENSA	How Intense Is Competition in International Markets of Traditional Goods? The Case of Italian Exporters
n. 46/04	M. BOVI	The Dark, and Independent, Side of Italy
n. 47/05	M. MALGARINI P. MARGANI B.M. MARTELLI	Re-engineering the ISAE manufacturing survey
n. 48/05	R. BASILE A. GIUNTA	Things change. Foreign market penetration and firms' behaviour in industrial districts: an empirical analysis
n. 49/05	C. CICONI	Building smooth indicators nearly free of end-of-sample revisions
n. 50/05	T. CESARONI M. MALGARINI G. ROCCHETTI	L'inchiesta ISAE sugli investimenti delle imprese manifatturiere ed estrattive: aspetti metodologici e risultati
n. 51/05	G. ARBIA G. PIRAS	Convergence in per-capita GDP across European regions using panel data models extended to spatial autocorrelation effects
n. 52/05	L. DE BENEDICTIS R. DE SANTIS C. VICARELLI	Hub-and-Spoke or else? Free trade agreements in the "enlarged" European Union
n. 53/05	R. BASILE M. COSTANTINI S. DESTEFANIS	Unit root and cointegration tests for cross-sectionally correlated panels. Estimating regional production functions
n. 54/05	C. DE LUCIA M. MEACCI	Does job security matter for consumption? An analysis on Italian microdata
n. 55/05	G. ARBIA R. BASILE G. PIRAS	Using Spatial Panel Data in Modelling Regional Growth and Convergence
n. 56/05	E. D'ELIA	Using the results of qualitative surveys in quantitative analysis
n. 57/05	D. ANTONUCCI A. GIRARDI	Structural changes and deviations from the PPP within the Euro Area

Working Papers available:

n. 58/05	M. MALGARINI P. MARGANI	Psychology, consumer sentiment and household expenditures: a disaggregated analysis
n. 59/05	P. MARGANI R. RICCIUTI	Equivalenza Ricardiana in economia aperta: un'analisi dinamica su dati panel
n. 60/05	M. BOSCHI A. GIRARDI	Euro Area inflation: long-run determinants and short-run dynamics
n. 61/05	M. BOVI	Book-Tax Gap. An Income Horse Race
n. 62/06	M. BOVI	The Cyclical Behavior of Shadow and Regular Employment
n. 63/06	G. BRUNO C. LUPI C. PAPPALARDO G. PIRAS	The cross-country effects of EU holidays on domestic GDP's
n. 64/06	M. COZZOLINO F. DI NICOLA M. RAITANO	Il futuro dei fondi pensione: opportunità e scelte sulla destinazione del TFR
n. 65/06	S. LEPROUX M. MALGARINI	Clima di fiducia e spesa delle famiglie in Italia: un'analisi disaggregata secondo il reddito degli intervistati
n. 66/06	M. BOVI	Consumers Sentiment and Cognitive Macroeconometrics Paradoxes and Explanations
n. 67/06	G. ROCCHETTI	Modelli di business nel mercato del software e partecipazione delle imprese italiane al fenomeno open source
n. 68/06	L. CROSILLA	La stagionalità delle inchieste ISAE su imprese e consumatori: aspetti metodologici ed evidenza empirica
n. 69/06	C. OLDANI	Money demand & futures
n. 70/06	R. BASILE S. DE NARDIS A. GIRARDI	Pricing to market of italian exporting firms