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*Technological Innovation in the Service Sector:
An Analysis of the Italian and European Questionnaires*

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Abstract

This paper examines how Italian firms responded to the questionnaire circulated within the second round of the ‘Community Innovation Survey’ — specifically concerned with technological innovation in the service sector —, while pointing out some differences existing between the questionnaire circulated in Italy and the questionnaire circulated in other countries. Such an analysis gives rise to two main results: on the one hand one can understand some of the difficulties encountered by respondent firms, while on the other hand some hints on possible questionnaire improvements can be obtained.

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1. Introduction

The first ‘Community Innovation Survey’ was conceived of in the early 1990s in order to investigate the dynamics of innovation and innovative performance of the European economy. The first round was carried out in 1992, and was exclusively concerned with innovative performance in manufacturing industries. Five years later, also in acknowledgement of the importance of the tertiary sector – services account for two-thirds of total employment in the Oecd area – the survey ‘CIS-II’ was extended to the service sector. The survey was carried out by means of questionnaires, and the main focus was on *technological* innovation.

The fact that the aim was that of investigating *technological* innovation in the service sector deserves an explicit comment. The stress on the term ‘technological’ is important, for it excludes explicitly “organisational and managerial changes such as the implementation of advanced management techniques, the introduction of significantly changed organisational structures ... ” as well as “the implementation of a quality standard such as ISO 9000” (Eurostat Questionnaire). On the other hand, are considered as technological innovations the introduction of the use of “cellular phones to reroute drivers throughout the day” or “the introduction of smart cards and multipurpose plastic cards” (Eurostat Questionnaire).

In this paper we analyse, first of all, the Italian questionnaire and the way in which the Italian firms responded to the questionnaire itself. Italy carried out a pilot survey which considers the three-year period 1993-1995, instead of the 1994-1996 period as in the majority of the other European countries. As the Italian and the later questionnaires differ slightly, we also provide some comparisons between the two questionnaires’ structures. Secondly, we make explicit some of the theoretical ideas which constitute a sort of hidden agenda behind the questionnaires themselves. Put it another way, any questionnaire’s structure is characterised by a theoretical background which underlies the empirical investigation. Thirdly, we address the likely economic and policy implications coming from the analysis undertaken.

The analysis that we propose ought to be able to allow for some considerations on the appropriateness of such an approach; in particular the ‘manufacturing bias’ which affects the service questionnaire needs some attention.

The paper is organised as follows. In section two we briefly consider the main characteristics of the survey, that is we refer to the relevant statistical population, the sample structure as well as to the questionnaire both in terms of the questions asked and the rates of response; section three tries to address the overall quality of the survey, while the fourth and concluding section considers the question of what can be learnt from these surveys.

2. The Italian survey

In this section we briefly describe the characteristics of the sample selected by Istat, the features of the questionnaire circulated, and, finally, we will compare the Istat and Eurostat questionnaires.

2.1 The sample

The Italian survey was carried out by Istat, the Italian National Statistical Institute, in the period November 1996-September 1997. It thus anticipated by a few months the eurowide survey, and this also explains small differences which can be found in the definitions used in the questionnaire.

The survey addressed a set of 6,005 firms, 1,245 of which having more than 200 employees; the firms employing more than 200 employees were contacted on a censal basis, while the remaining 4,760 firms were selected through a stratified random sample. The overall sample is thus representative of a population of 19,301 firms employing 20 or more employees.

Of all the firms contacted by means of a postal questionnaire 3,331 firms replied – a response rate which amounts to 55.5% of the original overall sample. The sample was stratified according to the following variables: nineteen sub-sectors¹, six classes of employees² and four geographical areas, that is North-East, North-West, Central Italy and South (Perani and Del Santo, 1999)³.

We have to point out that the omission of the small firms, i.e. employing fewer than 20 employees, constitutes a weakness as these units account for a large part of the tertiary (and, incidentally, also manufacturing) sector in Italy. This can easily be seen in table 1, which shows the relative importance of firms belonging in the 1-19 size. Thus, for instance, if we look at sector 61⁴, we see that 980 out of 1,110 firms, which together make the sector, belong in the 1-19 size category, i.e. 88.29% of the sector's firms are actually excluded from the survey. Things, as a rule, are not as bad in terms of employees, so that the national 'exclusion rate' amounts to 66.17%.

¹ The service sectors which have been covered are the following: (1) trade, maintenance and repair of motor vehicles; (2) wholesale trade (excluding motor vehicles); (3) retail trade; (4) hotels and restaurants; (5) land transport; (6) sea and coastal water transport; (7) travel and transport services; (8) postal and telecommunication services; (9) financial services; (10) insurance and pension funds; (11) auxiliary activities for financial intermediation; (12) computer and informatics-related services; (13) research and development services; (14) legal, accounting, fiscal services; (15) architectural, engineering, technical services; (16) advertising; (17) security and cleaning services; (18) other business services; (19) waste disposal (see also appendix A).

² The classes of employees taken into account are the following: 20-49; 50-99; 100-249; 250-499; 500-999; 1000 and over.

³ Cf. also appendix A to the paper by Sirilli and Evangelista (1998).

⁴ See Appendix A at the end of the paper for the legend.

Table 1 – Weight of small (<20) service-sector firms on total

Sector	Firms 1-19	Firms (total)	Firms excluded %	Employees 1-19	Employees (total)	Employees Excluded %
50	157,787	159,190	99.12	391,528	442,016	88.58
51	362,461	366,816	98.81	749,432	967,537	77.46
52	698,915	701,675	99.61	1,312,375	1,570,084	83.59
55	209,419	211,573	98.98	578,950	724,311	79.83
60	131,913	133,772	98.61	243,863	555,932	43.87
61	980	1,110	88.29	3,025	24,799	12.48
62	88	142	61.97	840	22,772	3.69
63	18,269	19,741	92.54	64,428	195,032	33.03
64	1,324	1,383	95.73	3,246	291,749	1.11
65	7,542	8,516	88.56	20,742	405,704	5.11
66	94	250	37.60	645	45,330	1.42
67	54,101	54,237	99.75	101,815	107,780	94.47
70	104,837	104,967	99.88	162,374	167,682	96.83
71	7,830	7,885	99.30	13,475	17,405	77.42
72	45,257	46,349	97.64	120,275	204,102	58.93
73	5,994	6,065	98.83	8,458	17,417	48.56
74	498,514	502,730	99.16	823,759	1,150,445	71.60
90	3,247	3,631	89.42	11,865	58,530	20.27
Total	2,308.572	2,330.030	99.08	4,611.165	6,968.627	66.17

Source: Authors' elaborations on Istat (1999)

2.2 The questionnaire

In this section we provide a résumé of the contents of the questionnaire circulated in Italy, which was composed of 11 sections, some of which further articulated into two or more questions⁵.

The first section gathers information on both the total turnover and the export value of the firm for the three-years 1993-1995. Sections two and three of the questionnaire ask explicit questions on the innovativeness of the firm itself. In particular, in section two the firm classifies itself as either innovative or not according to the following definition of technological innovation:

“service and process innovation comprises new or significantly improved services. An innovation takes place when an innovation itself is introduced on the market (service innovation) or used in producing or delivering services ... A new or improved service is considered to be a technological innovation when its characteristics and ways of use are either completely new or significantly improved qualitatively or in terms of performance and technologies used ...” (Istat-Eurostat, Core Questionnaire).

In case of a negative answer, the firm was required to jump directly to section ten, while those answering ‘yes’ to section two, were required to continue into section three, which in turn classifies the typologies of the innovations introduced; in the latter section firms had the opportunity of briefly describing the innovations introduced.

Section four is devoted to the resources allocated to innovative activities in 1995. It is articulated into two basic questions: in the first the firm is requested to declare the cost borne in the innovative process distinguishing among R&D, planning and designing, know-how and software acquisition and elaboration, training, marketing,

⁵ See Appendix B at the end of the paper for a complete list of questionnaire's sections and questions.

and innovative investments (the latter meaning for instance buying the necessary new machinery run by new software included in the machinery itself). A further category is allowed for firms which have not been capable of providing figures; three possibilities are considered: the firm bore no cost; the firm was not able to estimate the costs; other. The second basic question concerns the personnel devoted to innovative activities.

Section five is concerned with the information sources on innovation distinguishing between internal and external ones. Both internal and external sources are further articulated: in fact, firms are required to rank the importance of the source according to a scale which ranges from 0 ('not relevant at all') to 5 ('crucial').

Section six deals with the objectives of the innovation distinguishing among the different aims such as improving and enlarging the range of services provided or reduce production costs. In this case also firms were required to rank the answers according to the scale indicated previously.

Sections seven, eight and nine provide questions which lead to an assessment of the impact of innovation on the firm's performance; in particular, section seven requires explicitly an evaluation of the likely impact of innovation on total turnover in 1995 (this question will deserve particular attention and we will concentrate on it in the next section); section eight concentrates on the impact of the innovation on total employment distinguishing by low-, medium-, and highly-skilled workers during the three years 1993-1995; section nine investigates the likely impact of innovation on the whole economic performance of the firm both in the period 1993-1995 and in the following three year period 1996-1998 (the immediate future three-year period when the questionnaire was circulated).

Section ten focuses on the factors hampering or making unnecessary the innovation. A list of possible factors is indicated in the questionnaire, ranging from lack of financing to lack of sufficiently qualified workers. Each item has to be ranked between 0 and 5.

Finally, section eleven poses two questions concerning the future of innovative plans of the firm; in case of positive answer the firm is required to indicate the type of innovation foreseen.

2.3 The Eurostat and the Istat questionnaire: a comparison

Let us begin with pointing out that both the Eurostat and the Istat questionnaires are based on the Oecd-Eurostat 1997 edition of the *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data* generally referred to as the Oslo Manual. However, some differences can be highlighted as the Italian questionnaire was prepared and circulated before the final version of the Oslo Manual was made available (Perani and Del Santo, 1999). Furthermore, some other differences are actually due to an Istat choice.

First of all, the number of the different sections may differ because of small differences in the structure of the questionnaire: for instance, what constitutes section 1 of the Istat questionnaire is part of the 'general information about the enterprise' of the Eurostat one.

About the 'definitions' on whose basis the questionnaire has largely to be filled, the basic ones are exactly the same, even though Istat supplies more examples of what can be considered as a technological innovation; an example is the web pages. On the other hand, Istat did *not* point out explicitly — as Eurostat did — what is *not* to be

considered as a technological innovation in services (organisational and managerial changes, etc., as pointed out above).

Sections 2 and 3 of Istat's questionnaire overlap with section 1 of Eurostat's; however in the Eurostat questionnaire, section 1 contains the 'yes' or 'no' answer to the question of whether the firm has introduced any service innovation, while asking immediately afterwards who developed the innovation (distinguishing among 'mainly other enterprises or institutes', 'the enterprise together with other enterprises or institutes' 'mainly the enterprise'). On the other hand, the Istat questionnaire in its section 3 asks to classify the types of innovation ('service', 'process', and 'indistinguishable').

A missing question in Istat's questionnaire is Eurostat's section 2, which concerns the unsuccessful or not yet completed innovative processes. We believe that the inclusion of this question would have been quite important in order to understand the innovative process of which the timing has to be taken into account as well as the fact there also exists a probability of failure. An example that fits both points can be the one referring to the pharmaceutical R&D activity in which often long periods are required before getting the desired results and, at the same time, the likelihood of failure is fairly high.

Section four of Istat questionnaire is nearly the same as the Eurostat's section 3; however, Istat does not ask the question: 'did your enterprise engage in R&D between 1994 and 1996', but concentrates only on one year, namely 1995. Another important difference concerns the total expenditure in terms of personnel devoted to innovative activities. In fact, while Eurostat asks information only on personnel devoted to R&D, Istat asks for an estimate of the personnel involved in the whole body of innovative activities carried out by the firm. Thus, Istat's questionnaire leads to consider the personnel involved not only in R&D, but also in planning and designing, writing innovating software, and so on (see Appendix B). Thus when making comparisons among countries it is important to take into account this difference: should we 'forget' about it, Italy would see a great amount of human resources devoted to R&D in services which would rather depend on the different data requested.

Istat questionnaire is missing section 4 and 5 of the Eurostat questionnaire which include, respectively, a question on government support (subsidies, grants, loans) and a question on whether the firm had applied for at least one patent between 1994 and 1996 in any country. While the lack of the second question may be, in a sense, justified because patenting is not the typical form of innovative service protection, the lack of a specific question on government support must be stressed. In fact, some measures to facilitate the acquisition of innovative technologies in various forms exist at both the national and regional levels.

Sections 5 and 6 of Istat's questionnaire are fairly similar to Eurostat's sections 7 and 6. One difference consists of the different ladder according to which a particular topic is classified (from 'not relevant at all' to 'crucial'); in fact Istat offers six different options, while Eurostat only four. Moreover, the categories employed in section 6 do not match perfectly.

Istat's sections 7, 8 and 9 do not have an equivalent in Eurostat's questionnaire. The questions proposed by Istat are quite important; in fact the first asks to indicate the percentage of total 1995 turnover connected to the innovative services as defined in section 3, while the second and third ask, respectively, an evaluation of the impact of innovation on employment and on the overall economic performance. However, to

provide an answer to the three questions is quite a difficult task because — leaving apart extreme cases — it is difficult to identify and quantify the contribution of innovative activity to the either turnover, or employment, or economic performance. It is not a simple coincidence that the response rate to these questions was very low (cf. the next section).

In Istat's questionnaire we cannot find the equivalent of the Eurostat's section 8 which concerns innovation co-operation in the three-year period considered. The actual question is: 'did your enterprise have any co-operation arrangements on innovation activities with other enterprises or institutions in 1994-1996?'. This question is focused on the role of the co-operative relations in the process of innovation creation (and adoption). In particular, these relations may be quite important in those sectors in which the weight of the formal innovative activity is not particularly high. An example can be the co-operation between the suppliers of equipment, materials, components, or software which have to be adapted to specific requirements set by the final users. We have also to point out that a partial justification of this shortcoming may be due to Italian traditional weakness of the links between firms and institutions such as universities and research institutes.

Section 10 of Istat questionnaire is once more similar to Eurostat section 9, even though the two sections differ slightly — the questions being on the factors hampering innovation. Istat supplies more options (seventeen) than Eurostat (nine) in order to understand why innovation may have been slackened off.

Finally, Istat questionnaire considers the foreseen firm's future programmes on innovation during the following three-year period, a question not found in Eurostat's questionnaire.

By way of conclusions of this section, we have to stress that despite being fairly similar the two questionnaires are characterised by a few differences the most important of which are the lack in Istat's questionnaire of questions concerning government support and innovation co-operation.

3. The quality of the Italian survey

In this section we assess the quality of the Italian survey in two different ways. First of all, we analyse the rate of response to all of the questions included in the questionnaire; thus what is assessed is the rate of response, and not the absolute figures: for instance, in table 2a figure 18.93 at the cross between the column headed 'Answer 13' and row 'sector 52' means that 18.93% of the firms of belonging in sector 52 responded to question 13, so that we know that nearly 19% of firms exported part of their services. Secondly, we try to address this evidence in terms of the links existing between the way in which the question is asked, its economic content, and the difficulties that might have been encountered by the firms.

In order to evaluate the quality of the survey we go once more through the Istat questionnaire section by section and we consider in detail the answers supplied to each question (one can refer to appendices A and B at the end of the paper for the list of sectors and questions, respectively).

Table 2a - Sectoral distribution of response rates: Questions 7 - 14

Sector	Answer 7	Answer 8	Answer 9	Answer 10	Answer 11	Answer 12	Answer 13	Answer 14
50	100.00	95.29	95.81	96.34	37.70	42.41	42.41	100.00
51	100.00	95.43	96.17	97.05	46.98	50.81	51.40	100.00
52	100.00	93.49	95.27	95.86	17.16	19.53	18.93	100.00
55	100.00	92.35	92.97	93.88	2.45	3.06	2.75	100.00
60	100.00	92.31	93.91	95.51	12.82	14.42	16.03	100.00
61	100.00	94.12	94.12	97.06	47.06	50.00	50.00	100.00
62	100.00	76.47	82.35	88.24	52.94	52.94	47.06	100.00
63	100.00	95.50	95.95	96.85	17.57	18.47	18.92	100.00
64	100.00	77.27	77.27	95.45	4.55	4.55	9.09	100.00
65	100.00	93.43	94.81	96.89	4.15	5.19	4.84	100.00
66	100.00	96.88	98.44	98.44	9.38	9.38	10.94	100.00
67	100.00	84.85	84.85	90.91	6.06	6.06	6.06	100.00
70	100.00	100.00	100.00	100.00	14.29	14.29	14.29	100.00
71	100.00	90.48	95.24	90.48	4.76	4.76	0.00	100.00
72	100.00	95.10	95.10	95.80	14.69	13.99	15.38	100.00
73	100.00	92.31	92.31	100.00	38.46	38.46	38.46	100.00
74	100.00	94.11	95.03	96.50	10.13	10.87	11.60	100.00
90	100.00	94.64	94.64	94.64	0.00	0.00	0.00	100.00
Total	100.00	93.88	94.84	96.13	20.14	21.92	22.28	100.00

In table 2a we show the response rate for sections 1 and 2 of the questionnaire which contain questions 7-14 and concern the question on whether a firm belongs to a business group, total turnover for the years 1993, 1994, and 1995 (columns 2-5), the total value of exports (columns 6-7) as a part of total turnover, and the self-classification of the firms as either innovative or not (column 9 which answer question 14)⁶.

We simply remark that the response rates to questions 8-10 is generally high — with the partial exception of sectors 62 (air transport) and 64 (post and telecommunications) — and increases through time. On the other hand the rate of response to questions 11-13 must be taken carefully because a zero may mean that either the firm did not answer to this question(s) or that the value of total turnover ending up as exports was actually equal to zero. Sectoral differences, though, are quite high, ranging from 51.4% of sector 51 to 0 of sectors 71 (renting of machinery and equipment ...) and 90 (sewage and refuse disposal ...).

Also, all of the firms have been capable of classifying themselves as either innovative or not (*Answer 14*). The self-classification question marks a divide between the two fundamental categories of firms, i.e. innovative or not. Thus, comments of tables 2 to 13 are meant only for innovative firms, which amount to 1249 firms (or 37.49% of the total sample).

However, before we turn our attention to table 3 we want to devote an explicit comment to table 2b, which contains information (*Answer 7*) on whether a firm is part of a business group.

⁶ Questions 1 to 6 are not considered as they are concerned with general information on the firm.

Table 2b – Sectoral distribution of firms belonging to a business group

Sector	Firms	Group	Grup+Inn	% Group	% Innov. Firms bel. to group	%Grup+ Inn (total)
50	191	0	0	0.00	0	0.00
51	679	3	1	0.44	33.33	0.15
52	338	6	2	1.78	33.33	0.59
55	327	1	1	0.31	100	0.31
60	312	61	34	19.55	55.73	10.90
61	34	5	2	14.71	40	5.88
62	17	1	1	5.88	100	5.88
63	222	11	4	4.95	36.36	1.80
64	22	1	1	4.55	100	4.55
65	289	13	10	4.50	76.92	3.46
66	64	2	1	3.13	50	1.56
67	33	0	0	0.00	0	0.00
70	14	0	0	0.00	0	0.00
71	21	0	0	0.00	0	0.00
72	143	4	4	2.80	100	2.80
73	26	5	5	19.23	100	19.23
74	543	6	5	1.10	83.33	0.92
90	56	15	7	26.79	46.66	12.50
Total	3331	134	78	4.02	58.20	2.34

Looking at the totals, one observes that only 4.02% of the firms declared to belong to a business group. It is quite interesting to point out that when we consider only the subset of firms belonging to a group the percentage of innovators is 58.2%, to be compared with 37.49% of the whole sample. Thus, a hint can be that belonging to a business group leads to a higher innovation rate. The three sectors characterised by the highest rate of firms belonging to a business group are ‘sewage and refusal disposal, sanitation and similar activities’ (90), ‘land transport, transport via pipelines’ (60) and ‘research and development’ (73). A high percentage of the firms of these three sectors have realised innovative activities in the three-year period 1993-1995.

Table 3a shows the answers to questions of section 3 of the questionnaire, related to the kind of innovation introduced, namely: service innovation (*Answer 15*); process innovation (*Answer 16*); indistinguishable (*Answer 17*). Figures may add to more than 100% as a firm may have introduced more than one type of innovation. The variability of figures is quite high: in fact only 20% of firms of sector 71, to be compared with 83.3% of sector 64, have introduced service innovation during the three-year period in 1993-1995; on the other hand, we can compare the 100% figure of firms belonging in sector 71 which claim to have introduced process innovation, with the comparatively scanty 39.1% of firms of sector 55. Finally, it is worth stressing the fact that 50% of sector 67 have innovated, but cannot distinguish between the two basic forms of innovation.

Table 3a – Sectoral distribution of response rates: Questions 15 - 17

<i>Sector</i>	<i>Answer 15</i>	<i>Answer 16</i>	<i>Answer 17</i>
50	32.14	53.57	32.14
51	35.97	58.50	32.02
52	38.55	57.83	32.53
55	34.78	39.13	40.58
60	43.48	64.35	26.96
61	36.36	72.73	18.18
62	71.43	42.86	14.29
63	24.66	57.53	36.99
64	83.33	66.67	33.33
65	65.40	73.46	40.76
66	44.19	65.12	37.21
67	25.00	65.00	50.00
71	20.00	100.00	20.00
72	64.13	69.57	23.91
73	66.67	66.67	45.83
74	45.68	53.09	30.86
90	47.37	63.16	21.05
Total	45.48	61.09	33.39

Table 3b – Distribution of response rates according to firm size

<i>Classes</i>	<i>Answer 15</i>	<i>Answer 16</i>	<i>Answer 17</i>
20_99	40.51	52.11	34.19
100_249	42.63	62.11	32.11
250 and more	55.19	75.70	32.66
Total	45.48	61.09	33.39

In table 3b we observe that bigger firms have innovated more both in terms of service and process innovation, while smaller firms seem to be less capable of distinguishing between the two types of innovation — even though the differences in the latter case are not particularly high.

Table 4 – Sectoral distribution of response rates: Questions 18 – 33

<i>Sector</i>	<i>Answer 18</i>	<i>Answer 19</i>	<i>Answer 20</i>	<i>Answer 21</i>	<i>Answer 22</i>	<i>Answer 23</i>	<i>Answer 24</i>	<i>Answer 25</i>
50	1.79	1.79	7.14	7.14	3.57	3.57	53.57	53.57
51	11.46	11.46	16.21	16.21	9.09	9.09	54.15	54.15
52	9.64	9.64	14.46	14.46	13.25	13.25	49.40	49.40
55	5.80	5.80	7.25	7.25	7.25	7.25	40.58	40.58
60	7.83	7.83	14.78	14.78	13.04	13.04	46.96	46.96
61	27.27	27.27	27.27	27.27	18.18	18.18	54.55	54.55
62	14.29	14.29	14.29	14.29	14.29	14.29	71.43	71.43
63	16.44	16.44	16.44	16.44	12.33	12.33	58.90	58.90
64	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33
65	24.64	24.64	39.81	39.81	29.86	29.86	63.03	63.03
66	37.21	37.21	51.16	51.16	39.53	39.53	65.12	65.12
67	10.00	10.00	20.00	20.00	15.00	15.00	85.00	85.00
71	0.00	0.00	0.00	0.00	0.00	0.00	40.00	40.00
72	41.30	41.30	52.17	52.17	27.17	27.17	54.35	54.35
73	66.67	66.67	29.17	29.17	25.00	25.00	50.00	50.00
74	20.37	20.37	20.99	20.99	12.35	12.35	50.62	50.62
90	5.26	5.26	21.05	21.05	0.00	0.00	26.32	26.32
Total	18.17	18.17	24.18	24.18	16.33	16.33	54.04	54.04

Table 4 (continued)

<i>Sector</i>	<i>Answer 26</i>	<i>Answer 27</i>	<i>Answer 28</i>	<i>Answer 29</i>	<i>Answer 30</i>	<i>Answer 31</i>	<i>Answer 32</i>	<i>Answer 33</i>
50	21.43	21.43	7.14	7.14	48.21	48.21	76.79	76.79
51	27.67	27.67	10.28	10.28	58.10	58.10	76.68	76.68
52	25.30	25.30	6.02	6.02	51.81	51.81	71.08	71.08
55	13.04	13.04	13.04	13.04	43.48	43.48	65.22	65.22
60	27.83	27.83	8.70	8.70	61.74	61.74	76.52	76.52
61	27.27	27.27	9.09	9.09	72.73	72.73	81.82	81.82
62	42.86	42.86	0.00	0.00	42.86	42.86	85.71	85.71
63	26.03	26.03	12.33	12.33	56.16	56.16	82.19	82.19
64	16.67	16.67	50.00	50.00	50.00	50.00	83.33	83.33
65	48.34	48.34	24.64	24.64	52.13	52.13	71.09	71.09
66	55.81	55.81	20.93	20.93	55.81	55.81	76.74	76.74
67	45.00	45.00	10.00	10.00	35.00	35.00	90.00	90.00
71	40.00	40.00	20.00	20.00	40.00	40.00	40.00	40.00
72	51.09	51.09	21.74	21.74	54.35	54.35	80.43	80.43
73	50.00	50.00	16.67	16.67	41.67	41.67	79.17	79.17
74	30.86	30.86	11.11	11.11	55.56	55.56	78.40	78.40
90	15.79	15.79	10.53	10.53	57.89	57.89	68.42	68.42
Total	33.55	33.55	14.01	14.01	54.20	54.20	75.66	75.66

Table 4 shows the answers to questions of section 4 of the questionnaire, concerning resources devoted to technological innovation in 1995, from R&D activities (*Answer 18*) to marketing (*Answer 28*); furthermore, columns ‘*Answer 32*’ and ‘*Answer 33*’ contain the response rates to questions 32 and 33, and concern the total amount of resources devoted, in various forms, to technological innovation in 1995. Not necessarily, though, firms could be capable to disaggregate their expenditure. However, it is worthwhile to emphasise that 75.6% of the innovative firms have provided an answer.

As one can see, firms have supplied also specific items which contribute to make the total. For example questions 26 and 27 refer to training activities carried out by the firm. So if we consider sector 65 (financial intermediaries), we see that 48.3% of the firms have carried out this activity. It should be noted that the latter figure implies that the remaining 51.7% of the firms of this sector have provided as answer ‘zero’. Once more a 0 can have two different interpretations, i.e. the firm has not carried out the training activity or the firm has not been capable (or does not want) to provide an estimate of the cost borne.

Table 5 – Sectoral distribution of response rates according to firm size

<i>Classes</i>	<i>Answer 18</i>	<i>Answer 19</i>	<i>Answer 20</i>	<i>Answer 21</i>	<i>Answer 22</i>	<i>Answer 23</i>	<i>Answer 24</i>	<i>Answer 25</i>
20_99	11.60	11.60	14.76	14.76	10.54	10.54	51.66	51.66
100_249	18.42	18.42	24.21	24.21	15.26	15.26	52.11	52.11
250 and more	29.11	29.11	40.00	40.00	26.58	26.58	58.99	58.99
Total	18.17	18.17	24.18	24.18	16.33	16.33	54.04	54.04

Table 5 (continued)

<i>Classes</i>	<i>Answer 26</i>	<i>Answer 27</i>	<i>Answer 28</i>	<i>Answer 29</i>	<i>Answer 30</i>	<i>Answer 31</i>	<i>Answer 32</i>	<i>Answer 33</i>
20_99	25.45	25.45	10.09	10.09	53.16	53.16	75.15	75.15
100_249	34.21	34.21	15.26	15.26	51.05	51.05	73.16	73.16
250 and more	46.84	46.84	20.00	20.00	57.47	57.47	77.72	77.72
Total	33.55	33.55	14.01	14.01	54.20	54.20	75.66	75.66

Table 5 shows how the response rates vary according to the dimension of the firms. For instance if we consider question 22 (know-how acquisition) we see that the overall rate of response amounts to 16.3%; however, when we look at the answer distinguishing by dimension, one observes that the rate changes, and in particular it takes the highest value (26.58%) for the firms belonging to the biggest class.

Table 6a – Sectoral distribution of response rates: Question 34

<i>Sector</i>	<i>Firms</i>	<i>Answer 34 N.</i>	<i>Answer 34 %</i>	<i>Answer 34.1</i>	<i>Answer 34.2</i>	<i>Answer 34.3</i>
50	56	13	23.21	30.77	69.23	0.00
51	253	59	23.32	30.51	64.41	5.08
52	83	24	28.92	20.83	62.50	16.67
55	69	24	34.78	45.83	54.17	0.00
60	115	27	23.48	37.04	62.96	0.00
61	11	2	18.18	50.00	50.00	0.00
62	7	1	14.29	0.00	100.00	0.00
63	73	13	17.81	15.38	76.92	7.69
64	6	1	16.67	100.00	0.00	0.00
65	211	61	28.91	11.48	78.69	9.84
66	43	10	23.26	0.00	100.00	0.00
67	20	2	10.00	50.00	50.00	0.00
71	5	3	60.00	33.33	66.67	0.00
72	92	18	19.57	0.00	88.89	11.11
73	24	5	20.83	20.00	60.00	20.00
74	162	35	21.60	14.29	77.14	8.57
90	19	6	31.58	0.00	100.00	0.00
Total	1249	304	24.34	22.04	71.38	5.26

Table 6b – Distribution of response rates according to firm size

<i>Classes</i>	<i>Firms</i>	<i>Answer 34 N.</i>	<i>Answer 34 %</i>	<i>Answer 34.1</i>	<i>Answer 34.2</i>	<i>Answer 34.3</i>
20_99	664	165	24.85	27.27	66.06	6.67
100_249	190	51	26.84	13.73	78.43	7.84
250 and more	395	88	22.28	17.05	77.27	5.68
Total	1249	304	24.34	22.04	71.38	6.58

Table 6a considers the different reasons which may justify the fact that the firms have not provided any explicit figure concerning the resources devoted to technological innovation in 1995. It also provides the absolute number of responding innovative firms. The total percentage of firms which did not provide figures related to innovative efforts is 24.3%, and three possible justifications were considered: i.e. no cost was actually borne (*Answer 34.1*), no proper estimate was possible (*Answer 34.2*), and other reasons (*Answer 34.3*). Thus, if we look at sector 51, 23.32% of the 253 firms did not supply the requested figures; of those firms which did not provide the figures, 30.51% had actually not borne any cost, 64.41% could not provide a proper estimate, while the remaining 5.08% indicates ‘other’ reasons for not providing the figure. Put it another way, the sum by sector of the figures of *Answer 34.1*, *34.2* and *34.3* must add to 100, as they represent the percentages into which the figures of column *Answer 34* can be disaggregated.

The sector that was most capable of supplying information was 67 (‘activities auxiliary to financial intermediation’), with only 10% of firms filling Q. 34, while the worst was sector 71 (‘renting of machinery and equipment without operator’), with 60%.

Table 6b shows the analysis of responses by size. As one can see smaller firms have the highest rate of the category *34.1*, i.e. did not bear any cost related to innovation in 1995. Medium-sized firms, instead, have the highest response rate of category *34.2*, that is they could not estimate the costs borne. Finally, option *34.3* was little used (in eleven sectors out of eighteen we find a blank space).

Table 7a – Sectoral distribution of response rates: Question 35

<i>Sector</i>	<i>Firms</i>	<i>Answer 35 N.</i>	<i>Answer 35 %</i>
50	56	45	80.36
51	253	198	78.26
52	83	66	79.52
55	69	43	62.32
60	115	81	70.43
61	11	9	81.82
62	7	6	85.71
63	73	61	83.56
64	6	4	66.67
65	211	179	84.83
66	43	38	88.37
67	20	16	80.00
71	5	4	80.00
72	92	84	91.30
73	24	22	91.67
74	162	132	81.48
90	20	17	85.00
Total	1249	1004	80.38

Table 7b – Distribution of response rates according to firm size

<i>Classes</i>	<i>Firms</i>	<i>Answer 35 N.</i>	<i>Answer 35 %</i>
20_99	664	514	77.41
100_249	190	155	81.58
250 and more	395	335	84.81
Total	1249	1004	80.38

In table 7a we present the rates of response concerning question 35 related to the personnel employed in innovative activities. The rates, generally high, range from 62.3% to 91.6%. From table 6a there also emerges that for the firms it has been easier to provide an estimate of the number of personnel employed in innovative activities rather than supplying an estimate of the costs. When we look at these rates disaggregated according to the dimension of the firms (table 7b) we find confirmation of the high rate of response with the bigger firms showing a higher value (from 77.4 of category 22-99 to 84.8% of the category 250 or more).

The next two tables, 8a and 8b, concern the response rates to questions 36-50, which are related to the source of information on innovation.

Table 8a – Sectoral distribution of response rates: Questions 36 - 50

<i>Sector</i>	<i>Answer 36</i>	<i>Answer 37</i>	<i>Answer 38</i>	<i>Answer 39</i>	<i>Answer 40</i>	<i>Answer 41</i>	<i>Answer 42</i>	<i>Answer 43</i>
50	89.29	87.50	82.14	85.71	89.29	87.50	96.43	92.86
51	87.75	86.17	81.82	79.45	87.35	87.75	90.51	88.54
52	93.98	83.13	83.13	81.93	83.13	84.34	92.77	89.16
55	86.96	89.86	82.61	82.61	85.51	82.61	89.86	84.06
60	91.30	80.87	79.13	76.52	85.22	83.48	93.91	86.96
61	100.00	100.00	90.91	72.73	90.91	100.00	90.91	90.91
62	100.00	100.00	71.43	71.43	71.43	71.43	71.43	85.71
63	91.78	86.30	80.82	82.19	90.41	87.67	90.41	90.41
64	83.33	83.33	83.33	66.67	83.33	83.33	83.33	83.33
65	97.63	96.68	93.36	93.36	95.73	96.21	97.16	97.63
66	97.67	88.37	90.70	79.07	88.37	88.37	90.70	95.35
67	75.00	85.00	75.00	80.00	85.00	75.00	90.00	85.00
71	100.00	100.00	80.00	80.00	100.00	100.00	100.00	100.00
72	90.22	86.96	85.87	79.35	90.22	90.22	91.30	94.57
73	87.50	83.33	87.50	83.33	87.50	87.50	95.83	87.50
74	90.12	87.65	85.19	83.33	89.51	88.89	93.21	91.98
90	84.21	73.68	78.95	68.42	73.68	73.68	89.47	78.95
Total	91.19	87.83	84.63	82.55	88.71	88.23	92.71	90.95

Table 8a (continued)

<i>Sector</i>	<i>Answer 44</i>	<i>Answer 45</i>	<i>Answer 46</i>	<i>Answer 47</i>	<i>Answer 48</i>	<i>Answer 49</i>	<i>Answer 50</i>
50	78.57	87.50	83.93	83.93	82.14	82.14	39.29
51	81.42	86.17	82.21	81.03	80.63	80.24	40.32
52	83.13	86.75	83.13	85.54	85.54	84.34	49.40
55	79.71	85.51	85.51	78.26	81.16	82.61	43.48
60	79.13	91.30	84.35	76.52	80.00	79.13	41.74
61	90.91	90.91	100.00	81.82	90.91	90.91	45.45
62	71.43	71.43	71.43	71.43	71.43	71.43	28.57
63	84.93	86.30	83.56	83.56	82.19	82.19	38.36
64	83.33	83.33	83.33	83.33	83.33	83.33	16.67
65	92.89	96.21	92.42	93.84	94.31	94.79	40.28
66	83.72	93.02	83.72	79.07	83.72	76.74	41.86
67	75.00	80.00	80.00	75.00	75.00	75.00	35.00
71	60.00	100.00	100.00	60.00	80.00	80.00	80.00
72	84.78	91.30	89.13	86.96	88.04	86.96	41.30
73	83.33	87.50	83.33	83.33	87.50	87.50	33.33
74	84.57	90.12	86.42	85.19	86.42	87.04	41.98
90	73.68	89.47	73.68	73.68	73.68	73.68	31.58
Total	83.75	89.51	85.67	83.83	84.79	84.47	41.07

Table 8a illustrates the rates of response regarding the questions on the original source of information on innovation distinguishing between internal and external ones. Of the internal sources, the higher rate is due to *answer 36* (the operational departments of service production), while among the external ones the highest is *answer 42* referred to suppliers of equipment, materials and components. The picture finds confirmation

also when we look at these data from a dimensional perspective (we do not provide the latter table).

Table 8b – Distribution of response rates according to scale of importance: Questions 36 - 50

<i>Options</i>	<i>Answer 36</i>	<i>Answer 37</i>	<i>Answer 38</i>	<i>Answer 39</i>	<i>Answer 40</i>	<i>Answer 41</i>	<i>Answer 42</i>	<i>Answer 43</i>
0	21.86	35.55	47.97	42.68	28.88	29.67	15.20	23.77
1	5.36	7.47	5.96	9.99	9.39	9.71	8.72	8.19
2	10.45	12.85	9.18	13.77	11.91	14.61	16.15	14.79
3	21.86	19.51	12.20	17.65	16.97	22.87	29.62	23.50
4	20.63	14.49	14.85	9.70	14.17	14.07	19.86	18.49
5	19.84	10.12	9.84	6.21	18.68	9.07	10.45	11.27
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 8b (continued)

<i>Options</i>	<i>Answer 44</i>	<i>Answer 45</i>	<i>Answer 46</i>	<i>Answer 47</i>	<i>Answer 48</i>	<i>Answer 49</i>	<i>Answer 50</i>
0	71.80	24.06	38.60	71.44	76.02	71.18	82.85
1	8.99	15.03	14.21	11.17	9.07	10.05	1.56
2	7.65	20.04	17.94	8.88	7.18	8.15	1.75
3	7.17	22.27	17.48	5.44	5.00	6.45	2.73
4	2.68	12.79	7.94	2.39	2.17	3.03	4.87
5	1.72	5.81	3.83	0.67	0.57	1.14	6.24
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 8b shows the distribution of the responses according to the six-grade scale ranking which ranges from 0 ('not relevant at all') to 5 ('crucial'). From the analysis of this table there emerges that the four most important (adding up options 4 and 5) sources of information for the innovative firms are operational departments of service production as long as internal sources are concerned; on the other hand, the three most relevant external sources of information are, in order, customers, suppliers, and consultancies.

The next tables illustrate the response rates to questions 51-62 — concerned with the objectives of innovation —, the tables being organised both by sector (table 9a) and by firms' dimension (table 9b). Objectives of innovation range from modifying the range of existing services (*Answer 51*) to upgrade technologies in use (*Answer 61*). As we can see the response rates included in table 9a are quite high, ranging from 85.7 to 98.2% (leaving apart answer 62, 'other'), which means that firms have a clear idea of what the objective of innovation is.

Of course, given the overall high response rate, we will observe high rates even in table 9b, in which figures are shown according to the dimension of the firms. It is worthwhile stressing that 96.7% of the firms responded to question 59 which concerns improvements the quality of services. Also given the overall high rates of respondents we find confirmation of the fact that it is much easier for the firms to respond to qualitative rather than to quantitative questions.

Table 9a – Sectoral distribution of response rates: Question 51 – 62

<i>Sector</i>	<i>Answer 51</i>	<i>Answer 52</i>	<i>Answer 53</i>	<i>Answer 54</i>	<i>Answer 55</i>	<i>Answer 56</i>
50	89.29	94.64	87.50	85.71	91.07	89.29
51	85.38	89.33	82.61	85.77	90.91	84.98
52	89.16	90.36	87.95	87.95	91.57	86.75
55	86.96	86.96	85.51	86.96	91.30	88.41
60	78.26	85.22	82.61	82.61	89.57	81.74
61	90.91	90.91	100.00	90.91	90.91	90.91
62	71.43	71.43	71.43	71.43	71.43	71.43
63	83.56	89.04	80.82	83.56	90.41	87.67
64	83.33	83.33	83.33	83.33	83.33	83.33
65	97.63	98.58	94.79	95.73	97.63	96.68
66	88.37	90.70	83.72	86.05	93.02	88.37
67	80.00	90.00	85.00	80.00	90.00	85.00
71	100.00	100.00	100.00	100.00	100.00	100.00
72	89.13	95.65	86.96	96.74	92.39	92.39
73	87.50	91.67	95.83	87.50	91.67	83.33
74	88.89	92.59	87.65	88.27	92.59	87.65
90	73.68	78.95	73.68	73.68	73.68	73.68
Total	89.29	94.64	87.50	85.71	91.07	89.29

Table 9a (continued)

<i>Sector</i>	<i>Answer 57</i>	<i>Answer 58</i>	<i>Answer 59</i>	<i>Answer 60</i>	<i>Answer 61</i>	<i>Answer 62</i>
50	89.29	91.07	96.43	94.64	98.21	28.57
51	85.77	88.54	96.44	93.28	88.93	35.18
52	89.16	91.57	93.98	91.57	90.36	39.76
55	84.06	85.51	95.65	94.20	84.06	36.23
60	90.43	91.30	95.65	88.70	86.96	33.91
61	90.91	100.00	100.00	100.00	81.82	18.18
62	71.43	71.43	71.43	100.00	71.43	0.00
63	86.30	89.04	97.26	89.04	84.93	34.25
64	83.33	83.33	100.00	100.00	83.33	50.00
65	97.16	98.58	99.05	87.16	99.05	30.33
66	90.70	97.67	100.00	90.70	93.02	30.23
67	80.00	95.00	95.00	90.00	80.00	35.00
71	100.00	100.00	100.00	100.00	100.00	20.00
72	90.22	92.39	95.65	93.48	92.39	31.52
73	83.33	87.50	95.83	95.83	95.83	33.33
74	88.89	93.83	97.53	94.44	93.83	36.42
90	73.68	84.21	94.74	89.47	89.47	26.32
Total	89.29	91.07	96.43	94.64	98.21	28.57

Table 9b – Distribution of response rates according to firm size

<i>Classes</i>	<i>Answer 51</i>	<i>Answer 52</i>	<i>Answer 53</i>	<i>Answer 54</i>	<i>Answer 55</i>	<i>Answer 56</i>
20_99	81.14	89.76	83.89	86.45	89.61	85.39
100_249	88.42	91.58	86.32	87.37	94.21	89.47
250 and more	90.38	94.18	91.39	91.39	94.94	92.15
Total	87.83	91.43	86.63	88.15	91.99	88.15

Table 9b (continued)

<i>Classes</i>	<i>Answer 57</i>	<i>Answer 58</i>	<i>Answer 59</i>	<i>Answer 60</i>	<i>Answer 61</i>	<i>Answer 62</i>
20_99	85.09	88.86	95.93	92.47	89.19	35.39
100_249	93.16	95.26	97.89	96.32	93.68	32.63
250 and more	93.67	95.70	97.47	93.67	93.92	30.63
Total	89.03	91.99	96.72	93.43	91.35	33.47

Unsurprisingly table 10a shows a rather low rate of response to a difficult question: ‘indicate the percentage of total 1995 turnover connected to innovative services’. In fact the overall rate of response is 43.4% which means that more than 56% of the firms were not able (or willing) to provide such a figure. An explanation of this evidence is that it is conceptually difficult for the firms to lend an empirical content to the ‘simple’ theoretical conceptualisation as implied in the question.

Table 10a – Sectoral distribution of response rates: Question 63

<i>Sector</i>	<i>Firms</i>	<i>Answer 63 N.</i>	<i>Answer 63 %</i>
50	56	23	41.07
51	253	109	43.08
52	83	31	37.35
55	69	20	28.99
60	115	47	40.87
61	11	8	72.73
62	7	2	28.57
63	73	36	49.32
64	6	3	50.00
65	211	65	30.81
66	43	16	37.21
67	20	6	30.00
71	5	2	40.00
72	92	60	65.22
73	24	17	70.83
74	162	91	56.17
90	19	6	31.58
Total	1249	542	43.39

Table 10b – Distribution of response rates according to firm size

<i>Classes</i>	<i>Firms</i>	<i>Answer 63 N.</i>	<i>Answer 63 %</i>
20_99	664	315	47.44
100_249	190	74	38.95
250 and more	395	153	38.73
Total	1249	542	43.39

As for table 10b we think it is rather surprising that smaller firms had a higher rate of response. A possible answer to these figures may lie in that bigger firms have a much more complex organisational and operational structure so that they find it even more difficult to identify the contribution of the innovative activity within the firm.

Table 11a – Sectoral distribution of response rates: Questions 64 - 67

<i>Sector</i>	<i>Answer 64</i>	<i>Answer 65</i>	<i>Answer 66</i>	<i>Answer 67</i>
50	100.00	85.71	87.50	85.71
51	96.05	89.33	92.49	85.38
52	98.80	93.98	96.39	95.18
55	97.10	97.10	97.10	95.65
60	97.39	85.22	88.70	84.35
61	90.91	90.91	90.91	100.00
62	100.00	100.00	100.00	100.00
63	97.26	90.41	91.78	89.04
64	100.00	100.00	100.00	83.33
65	100.00	98.10	97.63	97.16
66	100.00	100.00	95.35	95.35
67	100.00	95.00	95.00	95.00
71	100.00	100.00	100.00	100.00
72	97.83	93.48	94.57	91.30
73	91.67	87.50	87.50	87.50
74	97.53	92.59	95.06	91.98
90	94.74	89.47	94.74	89.47
Total	97.76	92.39	93.92	90.87

Table 11b – Distribution of response rates according to scale of importance

<i>Options</i>	<i>Answer 64</i>	<i>Answer 65</i>	<i>Answer 66</i>	<i>Answer 67</i>
1	23.18	29.90	22.34	7.58
2	60.52	68.54	69.14	68.37
3	16.30	1.56	8.53	24.05
Total	100.00	100.00	100.00	100.00

Table 11c – Distribution of response rates according to firm size

<i>Classes</i>	<i>Answer 64</i>	<i>Answer 65</i>	<i>Answer 66</i>	<i>Answer 67</i>
20_99	97.29	89.31	91.72	87.20
100_249	98.95	94.21	93.16	92.63
250 and more	97.97	96.71	97.97	96.20
Total	97.76	92.39	93.92	90.87

Table 11a contains the rates of response to the perceived impact of innovation on employment — which has in its background the issue of technological unemployment. However as we can see from table 11b the largest majority of the firms (the percentage is always higher than 60%) responded that innovation does *not* affect employment (row 2), not even when we try to distinguish between different skill levels (columns 2, 3, and

4 which indicate respectively highly, medium, and low qualified workers). Finally, in table 11c, as there often occurs, big firms tend to have a higher response rate.

Table 12a – Sectoral distribution of response rates:
Questions 68 –69

<i>Sector</i>	<i>Firms</i>	<i>Answer 68</i> <i>N.</i>	<i>Answer 68</i> <i>%</i>	<i>Answer 69</i> <i>N.</i>	<i>Answer 69</i> <i>%</i>
50	56	55	98.21	55	98.21
51	253	251	99.21	251	99.21
52	83	83	100.00	83	100.00
55	69	69	100.00	69	100.00
60	115	114	99.13	115	100.00
61	11	11	100.00	11	100.00
62	7	7	100.00	7	100.00
63	73	73	100.00	73	100.00
64	6	6	100.00	6	100.00
65	211	211	100.00	211	100.00
66	43	43	100.00	43	100.00
67	20	20	100.00	20	100.00
71	5	5	100.00	5	100.00
72	92	92	100.00	92	100.00
73	24	22	91.67	22	91.67
74	162	162	100.00	162	100.00
90	19	19	100.00	19	100.00
Total	1249	1243	99.52	1244	99.60

Table 12b – Distribution of response rates
according to the scale of importance

<i>Options</i>	<i>Answer 68</i> <i>N.</i>	<i>Answer 69</i> <i>N.</i>	<i>Answer 68</i> <i>%</i>	<i>Answer 69</i> <i>%</i>
0	184	79	14.80	6.35
1	159	83	12.79	6.67
2	308	203	24.78	16.32
3	326	300	26.23	24.12
4	228	444	18.34	35.69
5	38	135	3.06	10.85
Total	100.00	100.00	100.00	100.00

Table 12c – Distribution of response rates according to firm size

<i>Classes</i>	<i>Firms</i>	<i>Answer 68</i> <i>N.</i>	<i>Answer 69</i> <i>N.</i>	<i>Answer 68</i> <i>%</i>	<i>Answer 69</i> <i>%</i>
20_99	664	661	661	99.55	99.55
100_249	190	189	189	99.47	99.47
250 and more	395	393	394	99.49	99.75
Total	1249	1243	1244	99.52	99.60

Table 12a and 12c present the firms' evaluation of the importance of technological innovation on the overall economic performance during to two different three-year periods, 1993-1995 (*Answer 68*) and 1996-1998 (*Answer 69*). We have to remind that the latter three-year period was the 'near future' when the questionnaire was circulated. Virtually all the firms responded to these questions.

In table 12b we show how firms have evaluated the relative importance of the impact of innovations on the overall economic performance according to a scale ranging

from 0 ('not relevant at all') to 5 ('crucial'). The higher concentration of answers is 2 ('moderately important') and 3 ('important') which seems to imply that firms have chosen a sort of 'safe' middle ground. Only 3% of the firms have evaluated as 'crucial' the importance of innovation on economic performance in 1993-1995, while 10.8% perceived in a similar way the impact of innovation in the near future.

Starting from the next table, response rates concern sometimes the total sample of firms and sometimes only the innovators. In particular, table 13a and 13c consider the whole sample, while table 13b takes into account only the innovative firms. The main question asked concerns the factors hampering innovation or making it unnecessary. Various options were available from prohibitive costs of innovation (*Answer 70*) to innovation itself being perceived as a non strategic factor for the firm (*Answer 86*). Once more a scale of 6 options was considered.

Table 13a – Sectoral distribution of response rates (total sample): Questions 70 - 86

Sector	Answer 70	Answer 71	Answer 72	Answer 73	Answer 74	Answer 75	Answer 76	Answer 77
50	64.40	62.83	57.59	60.73	59.16	59.16	61.78	60.21
51	64.51	63.62	62.59	62.74	61.27	62.74	62.89	62.59
52	68.05	67.46	65.38	66.57	65.38	65.09	66.57	67.46
55	63.30	63.30	60.55	61.16	60.86	59.94	61.16	61.47
60	67.31	70.83	64.10	66.99	65.38	64.74	65.38	64.42
61	50.00	50.00	50.00	50.00	47.06	50.00	50.00	50.00
62	47.06	47.06	47.06	47.06	47.06	47.06	47.06	47.06
63	63.96	64.86	62.16	62.61	63.06	63.51	63.96	63.06
64	77.27	72.73	77.27	77.27	72.73	72.73	72.73	72.73
65	71.63	71.28	71.63	71.28	71.97	71.28	70.59	70.93
66	75.00	70.31	65.63	70.31	65.63	68.75	68.75	67.19
67	51.52	54.55	51.52	54.55	54.55	54.55	57.58	57.58
70	71.43	71.43	71.43	71.43	71.43	71.43	71.43	71.43
71	71.43	66.67	61.90	61.90	66.67	66.67	66.67	61.90
72	76.92	77.62	75.52	75.52	71.33	74.13	76.22	73.43
73	80.77	84.62	69.23	76.92	80.77	73.08	73.08	73.08
74	66.85	66.48	64.09	65.19	63.54	63.35	64.83	64.64
90	76.79	76.79	76.79	76.79	76.79	76.79	76.79	76.79
Total	66.83	66.83	64.21	65.27	64.12	64.34	65.18	64.82

Table 13a (continued)

Sector	Answer 78	Answer 79	Answer 80	Answer 81	Answer 82	Answer 83	Answer 84	Answer 85	Answer 86
50	60.21	59.16	60.21	60.73	60.21	60.21	59.16	24.61	35.60
51	62.30	62.89	62.59	63.33	62.15	62.30	62.00	17.99	30.09
52	65.09	66.27	65.98	67.75	66.57	65.98	65.38	22.78	35.50
55	60.55	60.24	59.63	59.94	62.08	60.86	60.55	14.68	46.18
60	63.78	65.06	63.78	66.03	66.35	64.10	63.46	8.65	26.92
61	50.00	50.00	52.94	47.06	52.94	50.00	50.00	11.76	38.24
62	47.06	47.06	52.94	58.82	47.06	47.06	47.06	11.76	23.53
63	62.61	62.16	63.06	62.16	62.61	62.61	61.71	14.41	31.98
64	72.73	72.73	72.73	72.73	72.73	68.18	72.73	13.64	27.27
65	70.93	71.63	71.63	71.28	70.93	70.93	70.59	9.34	7.27
66	70.31	71.88	68.75	71.88	73.44	70.31	68.75	12.50	6.25
67	51.52	57.58	54.55	57.58	57.58	54.55	54.55	21.21	15.15
70	71.43	71.43	71.43	71.43	71.43	71.43	71.43	28.57	50.00
71	66.67	71.43	61.90	66.67	66.67	61.90	66.67	23.81	38.10
72	72.73	73.43	73.43	76.92	74.13	72.73	71.33	16.08	10.49
73	73.08	73.08	73.08	76.92	76.92	73.08	76.92	0.00	0.00

74	64.64	65.01	65.38	66.85	65.56	64.83	64.46	15.84	35.36
90	75.00	75.00	75.00	73.21	75.00	75.00	75.00	8.93	17.86
Total	64.31	64.82	64.64	65.63	65.21	64.46	64.03	15.83	29.52

Table 13b – Sectoral distribution of response rates (innovative firms): Questions 70 - 86

<i>Sector</i>	<i>Answer 70</i>	<i>Answer 71</i>	<i>Answer 72</i>	<i>Answer 73</i>	<i>Answer 74</i>	<i>Answer 75</i>	<i>Answer 76</i>	<i>Answer 77</i>
50	60.71	62.50	57.14	57.14	57.14	57.14	60.71	57.14
51	59.68	59.29	58.50	57.71	57.31	58.89	59.68	58.89
52	66.27	66.27	63.86	66.27	65.06	65.06	65.06	67.47
55	56.52	53.62	55.07	53.62	55.07	53.62	55.07	55.07
60	58.26	61.74	54.78	60.00	58.26	57.39	58.26	55.65
61	36.36	36.36	36.36	36.36	36.36	36.36	36.36	36.36
62	57.14	57.14	57.14	57.14	57.14	57.14	57.14	57.14
63	54.79	54.79	52.05	53.42	52.05	53.42	54.79	53.42
64	83.33	83.33	83.33	83.33	83.33	83.33	83.33	83.33
65	72.51	72.04	72.04	72.51	72.99	72.04	71.09	71.09
66	72.09	67.44	62.79	67.44	65.12	65.12	69.77	67.44
67	45.00	45.00	40.00	45.00	45.00	45.00	50.00	50.00
71	40.00	40.00	20.00	20.00	40.00	40.00	40.00	20.00
72	75.00	73.91	72.83	73.91	68.48	71.74	72.83	70.65
73	79.17	83.33	70.83	79.17	79.17	75.00	75.00	75.00
74	66.05	66.05	64.20	64.20	62.96	62.35	64.20	62.35
90	63.16	73.68	63.16	63.13	63.16	63.16	63.16	63.16
Total	64.13	64.21	61.89	62.93	62.13	62.29	63.25	62.21

Table 13b (continued)

<i>Sector</i>	<i>Answer 78</i>	<i>Answer 79</i>	<i>Answer 80</i>	<i>Answer 81</i>	<i>Answer 82</i>	<i>Answer 83</i>	<i>Answer 84</i>	<i>Answer 85</i>	<i>Answer 86</i>
50	57.14	57.14	57.14	57.14	57.14	57.14	55.36	3.57	14.29
51	58.10	58.50	58.10	58.50	58.89	58.10	56.92	3.16	7.51
52	65.06	65.06	65.06	66.27	65.06	65.06	62.65	4.82	7.23
55	55.07	53.62	53.62	53.62	55.07	53.62	55.07	2.90	15.94
60	55.65	58.26	53.91	58.26	57.39	55.65	55.65	4.35	6.09
61	36.36	36.36	36.36	36.36	36.36	36.36	36.36	0.00	9.09
62	57.14	57.14	57.14	57.14	57.14	57.14	57.14	0.00	0.00
63	53.42	53.42	52.05	53.42	54.79	53.42	52.05	1.37	4.11
64	83.33	83.33	83.33	83.33	83.33	83.33	83.33	0.00	16.67
65	71.09	72.04	71.56	71.56	72.04	72.04	70.62	2.37	1.42
66	67.44	69.77	67.44	69.77	72.04	67.44	67.44	0.00	0.00
67	40.00	50.00	45.00	50.00	50.00	45.00	45.00	10.00	15.00
71	40.00	40.00	20.00	40.00	40.00	20.00	40.00	0.00	0.00
72	69.57	70.65	70.65	75.00	71.74	69.57	68.48	3.26	3.26
73	75.00	75.00	75.00	79.17	79.17	75.00	79.17	0.00	0.00
74	64.81	64.20	64.20	66.05	65.43	64.81	64.20	2.47	8.02
90	63.16	63.16	63.16	57.89	63.16	63.16	63.16	0.00	5.26
Total	62.05	62.69	61.81	63.25	63.25	62.13	61.41	2.88	6.33

Table 13c – Distribution of response rates according to firm size (total sample)

<i>Classes</i>	<i>Answer 70</i>	<i>Answer 71</i>	<i>Answer 72</i>	<i>Answer 73</i>	<i>Answer 74</i>	<i>Answer 75</i>	<i>Answer 76</i>	<i>Answer 77</i>
20_99	65.00	64.69	62.34	63.30	62.08	62.12	63.30	63.08
100_249	69.10	68.13	65.94	66.42	65.94	66.67	66.91	66.42
250 and more	72.07	73.84	69.98	71.75	70.47	70.95	70.95	70.14
Total	66.83	66.83	64.21	65.27	64.12	64.34	65.18	64.82

Table 13 c (continued)

<i>Classes</i>	<i>Answer 78</i>	<i>Answer 79</i>	<i>Answer 80</i>	<i>Answer 81</i>	<i>Answer 82</i>	<i>Answer 83</i>	<i>Answer 84</i>	<i>Answer 85</i>	<i>Answer 86</i>
20_99	62.43	63.00	62.73	63.56	63.00	62.78	62.30	17.81	35.18
100_249	65.94	67.15	66.67	68.37	67.64	65.94	66.42	13.87	22.87
250 and more	70.14	69.98	70.30	71.43	71.75	69.66	68.86	9.79	13.00
Total	64.31	64.82	64.64	65.63	65.21	64.46	64.03	15.82	29.51

Table 13d – Distribution of responses according to scale of importance (absolute figures):
Questions 70 – 84

<i>Answer</i>	<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>9</i>	<i>Total</i>
<i>Answer 70</i>	876	181	279	392	245	253	1105	3331
<i>Answer 71</i>	1159	172	191	227	190	287	1105	3331
<i>Answer 72</i>	1412	207	206	153	91	70	1192	3331
<i>Answer 73</i>	1178	188	239	266	162	141	1157	3331
<i>Answer 74</i>	1261	234	223	224	123	71	1195	3331
<i>Answer 75</i>	1308	189	190	209	149	98	1188	3331
<i>Answer 76</i>	1203	234	250	229	148	107	1160	3331
<i>Answer 77</i>	1307	281	241	192	88	50	1172	3331
<i>Answer 78</i>	1501	201	166	151	74	49	1189	3331
<i>Answer 79</i>	1195	258	270	225	119	92	1172	3331
<i>Answer 80</i>	1457	254	178	145	67	52	1178	3331
<i>Answer 81</i>	1234	247	264	210	133	98	1145	3331
<i>Answer 82</i>	1325	180	172	201	146	148	1159	3331
<i>Answer 83</i>	1740	187	112	64	30	14	1184	3331
<i>Answer 84</i>	1402	240	214	159	70	48	1198	3331

Table 13e – Distribution of responses according to scale of importance (%): Questions 70 - 84

<i>Answer</i>	<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>9</i>	<i>Total</i>
<i>Answer 70</i>	26.30	5.43	8.38	11.77	7.36	7.60	33.17	100.00
<i>Answer 71</i>	34.79	5.16	5.73	6.81	5.70	8.62	33.17	100.00
<i>Answer 72</i>	42.39	6.21	6.18	4.59	2.73	2.10	35.79	100.00
<i>Answer 73</i>	35.36	5.64	7.18	7.99	4.86	4.23	34.73	100.00
<i>Answer 74</i>	37.86	7.02	6.69	6.72	3.69	2.13	35.88	100.00
<i>Answer 75</i>	39.27	5.67	5.70	6.27	4.47	2.94	35.66	100.00
<i>Answer 76</i>	36.12	7.02	7.51	6.87	4.44	3.21	34.82	100.00
<i>Answer 77</i>	39.24	8.44	7.24	5.76	2.64	1.50	35.18	100.00
<i>Answer 78</i>	45.06	6.03	4.98	4.53	2.22	1.47	35.69	100.00
<i>Answer 79</i>	35.88	7.75	8.11	6.75	3.57	2.76	35.18	100.00
<i>Answer 80</i>	43.74	7.63	5.34	4.35	2.01	1.56	35.36	100.00
<i>Answer 81</i>	37.05	7.42	7.93	6.30	3.99	2.94	34.37	100.00
<i>Answer 82</i>	39.78	5.40	5.16	6.03	4.38	4.44	34.79	100.00
<i>Answer 83</i>	52.24	5.61	3.36	1.92	0.90	0.42	35.54	100.00
<i>Answer 84</i>	42.09	7.21	6.42	4.77	2.10	1.44	35.97	100.00

Commenting on tables 13a and 13c, contrary to what one would expect the rate of response is rather low concentrating around 65%. The fact that 35% of the firms have not provided an answer may be due to two different reasons: first, firms actually did not respond; second, firms ticked only the relevant options ‘forgetting’ to indicate as not relevant all of the other options. This case can be interpreted as partial missing answer which may determine a bias in the figure thus obtained; this in turn can determine, from a statistical perspective, a problem in the estimation of the published data.

Bearing the above in mind, figures show a fairly broad range of values. For instance, ‘only’ 47.06% of firms belonging in sector 62 deemed the cost of innovation to be too high, while 80.77% of sector 73 considered it too high (*Answer 70*). Also, when we look at the columns containing answer 85 and 86 of table 12a, it is worth emphasising that 15.83% of firms of the total sample did not innovate in the three-year period 1993-1995 because they had already innovated (*Answer 85*), while 29.5% of firms of the same sample did not think innovation as a strategic factor (*Answer 86*). About table 13b we have to point out that even when we consider only innovative firms similar structural problems emerge.

Tables 14a and 14b show the response rate to question 87 concerning future plans of the firm with respect to the introduction of product or process innovation; the rate is quite high — nearly 99% — so that firms did not show any difficulty in answering this dichotomic question; also in this case the dimension does not matter, as also the 20-99 category shows a 98.74% rate. Table 14c refers to the respondents, that is about 99% of the total sample, and distinguishes between firms which intend to introduce innovations in the near future (‘yes’) and firms which do not (‘no’). As a whole, 58.78% of firms declares the intention to innovate in the three years following the survey, while 41.22 do not intend to innovate. We have to stress that there exists a high variability among sub-sectors in the propensity to innovate, ranging from 35.71 of sector ‘real estate activities’ (sector 70) to 92.31 of sector ‘research and development’ (sector 73).

There emerges here a doubt which has both empirical and theoretical implications. On the one hand, firms which state that they will innovate can be both firms which have already innovated and have already developed ideas on new innovations to be implemented in the near future; on the other hand firms which declare that they will not innovate might be firms which have already implemented an innovation during the period 1993-1995, so that they do not foresee any new one. Of course it would be interesting to identify firms which have already innovated and intend to innovate in the near future, so that we would face innovation waves.

Table 14d takes into account only the firms which answered ‘yes’ to the question 87 above (1938 firms), and shows the response rates to question 88 which asked the firms to qualify the kind of expected innovation (service innovation leaving unchanged the process of production/delivering 88.1; innovation in the process of production and/or in the delivering systems, leaving unchanged the service 88.2; innovation in both service and process of production/delivering 88.3). Of the 1938 firms which answered ‘yes’ to question 87 only 1393 were capable of supplying an explicit answer about the nature of the expected innovation. This means that while firms can easily provide a generic positive answer to a general question on expected innovations, they find it more difficult to supply a more detailed answer.

Table 14a Sectoral distribution of response rates (total sample): Q. 87

<i>Sector</i>	<i>Firms</i>	<i>Ans. 87-N</i>	<i>Ans. 87%</i>
50	191	189	98.95
51	679	670	98.97
52	338	333	98.52
55	327	324	99.08
60	312	311	99.68
61	34	34	100.00
62	17	16	94.12
63	222	221	99.55
64	22	22	100.00
65	289	287	99.31
66	64	64	100.00
67	33	33	100.00
70	14	14	100.00
71	21	21	100.00
72	143	140	97.90
73	26	26	100.00
74	543	536	98.71
90	56	56	100.00
Total	3331	3297	98.98

Table 14b Distribution of response rates according to firm size (total sample)

<i>Classes</i>	<i>Firms</i>	<i>Answer87 N.</i>	<i>Answer87 %</i>
20_99	2297	2268	98.74
100_249	411	409	99.51
250 and more	623	620	99.52
Total	3331	3297	98.98

Table 14c – Sectoral distribution of response rates and related options (total sample): Question 87

<i>Sector</i>	<i>Answer 87 N.</i>	<i>Answer87.1 N. (Yes)</i>	<i>Answer87.1 %</i>	<i>Answer87.2 N. (No)</i>	<i>Answer87.2 %</i>
50	189	109	57.67	80	42.33
51	670	399	59.55	271	40.45
52	333	149	44.74	184	55.26
55	324	120	37.04	204	62.96
60	311	185	59.49	126	40.51
61	34	16	47.06	18	52.94
62	16	11	68.75	5	31.25
63	221	130	58.82	91	41.18
64	22	10	45.45	12	54.55
65	287	248	86.41	39	13.59
66	64	56	87.50	8	12.50
67	33	26	78.79	7	21.21
70	14	5	35.71	9	64.29
71	21	12	57.14	9	42.86
72	140	112	80.00	28	20.00
73	26	24	92.31	2	7.69
74	536	286	53.36	250	46.64
90	56	40	71.43	16	28.57
Total	3297	1938	58.78	1359	41.22

Table 14d – Sectoral distribution of response rates and related options (total sample)

<i>Sector</i>	<i>Firms</i>	<i>Answer 88.0 N.</i>	<i>Answer 88.0 %</i>	<i>Answer 88.1 N.</i>	<i>Answer 88.1 %</i>	<i>Answer 88.2 N.</i>	<i>Answer 88.2 %</i>	<i>Answer 88.3 N.</i>	<i>Answer 88.3 %</i>
50	191	82	42.93	25	13.09	23	12.04	61	31.94
51	679	280	41.24	85	12.52	87	12.81	227	33.43
52	338	189	55.92	32	9.47	34	10.06	83	24.56
55	327	207	63.30	25	7.65	44	13.46	51	15.60
60	312	127	40.71	30	9.62	46	14.74	109	34.94
61	34	18	52.94	2	5.88	10	29.41	4	11.76
62	17	6	35.29	1	5.88	3	17.65	7	41.18
63	222	92	41.44	13	5.86	45	20.27	72	32.43
64	22	12	54.55	1	4.55	3	13.64	6	27.27
65	289	41	14.19	16	5.54	20	6.92	212	73.36
66	64	8	12.50	4	6.25	6	9.38	46	71.88
67	33	7	21.21	1	3.03	11	33.33	14	42.42
70	14	9	64.29	0	0.00	2	14.29	3	21.43
71	21	9	42.86	0	0.00	4	19.05	8	38.10
72	143	31	21.68	12	8.39	13	9.09	87	60.84
73	26	2	7.69	4	15.38	2	7.69	18	69.23
74	543	257	47.33	33	6.08	71	13.08	182	33.52
90	56	16	28.57	2	3.57	5	8.93	33	58.93
Total	3331	1393	41.82	286	8.59	429	12.88	1223	36.72

4. Conclusion: What can we learn from these surveys?

The Community innovation surveys aim at gathering statistical information so that one can infer the nature and main features of the innovative behaviour and performance of (European) firms. One of the ‘obvious’ consequences consists of the use of such information for policy prescriptions.

What we have seen are the characteristics of the questionnaire used to this end, and up to now we have refrained from doing any consideration about the theoretical background of the questions asked. In other words, we have assumed, as usually in this sort of analyses, that published data are characterised by a sort of theoretical neutrality. However, the latter point, together with the possible statistical problems which can arise in the process of data estimation, has been recently tackled by quite a few contribution both in economic statistics and applied economics. Examples are the work on the possible consequences deriving from the presence of sampling errors in surveys such as the U.S. retail sales index (Bell and Wilcox, 1993), from the use of seasonal adjustment methods (Ghysels and Perron, 1993; Maravall, 1997), and from the adoption in National Accounting of untested hypotheses such as specific aggregation schemes (Cainelli and Lupi, 1999).

A first point we want to stress consists of the theoretical background which underlies the survey: in fact the basic assumption implied in the questionnaires used is that the main characteristics of innovative behaviour in service sector are basically the same as the ones that we find in manufacturing. Actually, most of the questions are directly derived from the questionnaire adopted for the manufacturing survey, and it is not a simple coincidence that the service survey has been centered on ‘technological’ innovation. Coombs and Miles (2000) refer to this way of transferring methods and concepts developed for studying manufacturing innovation to service innovation as an

“assimilation approach”. This assimilation process, however, does not necessarily capture core aspects of the innovative activities typical of the service sector. Put it another way, questions and methods which may perfectly fit with manufacturing innovativeness can introduce theoretical biases in the empirical investigation of service innovation, while leaving aside important features.

Ideally, it would have been much better to have a specific approach for dealing with innovation in services, which would thus sign a ‘demarcation’ (Coombs and Miles, 2000):

“This approach ... argues that services innovation is highly distinctive, following dynamics and displaying features that require novel theories and instruments. This approach, although not fully developed, has been the underpinning of specialised studies of innovation in services, and is now being tacitly applied by the use of ‘dual approach’ surveys which adopt different questioning styles for manufacturing and service firms.” (Coombs and Miles, 2000, pp. 85-86).

We have to point out that the development of analytical tools to investigate innovative behaviour of the service sector is fairly recent. In fact, leaving aside a few early contributions (e.g. Barras 1986; Soete and Miozzo, 1989), a broader debate has taken place only in the mid-1990s (Miles, 1996; Hauknes, 1996; Gallouj and Weinstein, 1997). This is because a specific approach to innovation in services is quite difficult to realize, while on the other hand there already existed a fully developed theory concerned with manufacturing. It was thus easier to borrow concepts from the latter. The reason which justifies these difficulties in developing a specific innovation theory lies in the marked heterogeneity typical of the service sector, which comprises as diverse subsectors ranging from information technology to domestic service.

Three points need be emphasised. First of all, when the CIS-II took place the debate had not yet reached a sufficient degree of maturity, and it is worth stressing that when the questionnaires were being circulated some relevant works were being published, i.e. the questionnaires’ structure could not have benefited from those contributions. Secondly, even today a fully developed — let alone accepted — theory does not exist. However, thirdly, the CIS-II experience together with the theoretical debate of the last few years has made it possible to lay the foundations of a demarcation approach — in this sense one can see Metcalfe and Miles (2000).

If what we have just said refers to the problems, characteristics and links between theoretical considerations and the structure of the questionnaire, now let us take into account the way in which firms answered the questions and what we can infer from these answers.

First of all, firms seem to show a lower capability to respond to quantitative questions than to qualitative ones. This does not mean that qualitative questions are intrinsically ‘better’ than quantitative ones, but rather, firms may have difficulties in quantifying some aspects of their innovative process. In fact, innovation in services often are pervasive and affect the whole organisation of the work process and the competencies, making thus difficult the clear identification of specific components of costs. A clear example is given by the response rate to question 63 (where firms were required to provide a percentage estimate of total 1995 turnover connected with the new services). Also, one has to keep into account that firms may be reluctant to provide quantitative

data on their innovative efforts despite all of the assurances on confidentiality granted to them — but this is an insurmountable obstacle.

Secondly, the introduction of indirect indicators might be useful: an example, concerning innovative capabilities, could be asking a question on the percentage of employees capable of using specific software packages.

Thirdly, from the analysis of the previous sections there emerges that the response rates show a greater variability at the sectoral level rather than at the dimensional level; put it another way, the response rate does not depend on the dimension of the firms, but rather on the sector in which the firm itself operates. This result indicates that it would be advisable to perform surveys which take into account a more limited number of subsectors, characterised by greater homogeneity.

A clarification is needed to remember that the Italian survey considered a fairly ‘high’ minimum size, i.e. 20 employees — and we have emphasised that such a minimum size excludes 99% of firms and 66% of employees of the tertiary sector; should we consider smaller firms, we suspect that the response rates would be more variable, i.e. the small dimension would affect response rates.

Two final remarks emerge, one dealing with data construction, and the other with data utilization. The first point concerns the role played by economic theory in guiding the construction of statistical information – and in this sense, theory was not yet developed enough when the survey took place. The second remark concerns policy implications; in fact policy prescriptions addressing the service sector based on manufacturing-biased concepts and methods may lead to ‘biased’ policy interventions.

Appendix A

In appendix A we provide the list of sectors included in the survey:

- 50 Sale, maintenance and repair of motor vehicles and motorcycles; retail trade of automotive fuel.
- 51 Wholesale trade and commission trade, except of motor vehicles and motorcycles.
- 52 Retail trade, except of motor vehicles and motorcycles, repair of personal and household goods.
- 55 Hotels and restaurants.
- 60 Land transport; transport via pipelines.
- 61 Water transport.
- 62 Air transport.
- 63 Supporting and auxiliary transport activities; activities of travel agencies.
- 64 Post and telecommunications.
- 65 Financial intermediation
- 66 Insurance and pension funding, except compulsory social security.
- 67 Activities auxiliary to financial intermediation.
- 70 Real estate activities.
- 71 Renting of machinery and equipment without operator and personal and household goods.
- 72 Computer and related activities.
- 73 Research and development (R&D).
- 74 Other business activities
- 90 Sewage and refuse disposal, sanitation and similar activities.

Appendix B

Appendix B contains the list of questions used in Istat's questionnaire. We will follow the numbering applied by Istat in order to rewrite and elaborate the information contained in the paper questionnaires. This explains, for instance, why section 1 of the questionnaire begins with question eight. Incidentally, questions one to seven included general information on the enterprise, from the number of employees to the Ateco classification.

Here we provide the structure of the questionnaire as divided into sections and questions (Q.); the latter ought to be actually called options allowed within each section.

Preliminary information

Q. 7: does the firm belong to a business group?

Section 1

Q. 8: total firm turnover in 1993; Q. 9: total turnover in 1994; Q. 10: total turnover in 1995 (each in million lire); Qs. 11-13: quantity of exports with respect to total turnover in 1993, 1994, 1995 (each in million lire).

Section 2

Given the definitions previously indicated, has the firm introduced technological innovations during the period 1993-1995? Q. 14: 'yes' (note that the firms answering 'no' had to go directly to section 10, so that numbering of questions concerns, up to number 69, only innovating firms).

Section 3

Indicate the typology of innovations introduced during the three-year period 1993-1995. Q. 15: service innovation; Q. 16: process or improved methods to deliver the service; Q. 17: the firm introduced innovation(s) which are not classifiable in either way.

Firms were also given the possibility to describe briefly the most important innovations introduced in the three-year period 1993-1995.

Section 4

Resources devoted to technological innovation in 1995.

Section 4.1 Cost borne in 1995 for innovative activities

Q. 18: R&D; Q. 19: estimated expenditure involved in million lire (e.e.i.); Q. 20: planning and designing; Q. 21: e.e.i.; Q. 22: acquisition of know-how; Q. 23: e.e.i.; Q. 24: software; Q. 25: e.e.i.; Q. 26 training; Q. 27 e.e.i.; Q. 28: marketing; Q. 29: e.e.i.; Q. 30: innovative investments; Q. 31: e.e.i.; Q. 32 total; Q. 33: total e.e.i.

Q. 34: in case no figure has been supplied, indicate the reason: no innovative expenditure; impossible to estimate the costs; other.

Section 4.2 Q. 35: personnel devoted to the above-indicated innovative activities in terms of full time equivalents.

The options considered in section 4.1 deserve a comment: in fact, firms were given the possibility to tick each item indicated, but not necessarily they were able (or willing) to provide the related estimated figure. Thus, for instance a firm could tick Q. 26 — i.e. we know that some training activities had been carried out — but could leave blank Q. 27, asking the e.e.i.

Section 5

This section is concerned with the sources of information for innovation, which the firm was also asked to rank in order of importance, from 0 (not relevant) to 5 (crucial). The information sources could be either internal (Qs. 36-39) or external (Qs. 40-50) with respect to the firm. The items included are: Q. 36: operational departments of service production; Q. 37: marketing department; Q. 38: R&D; Q. 39: other internal sources; Q. 40: customers; Q. 41: competitors; Q. 42: suppliers of equipment, materials and components; Q. 43: consultancy enterprises; Q. 44: patents, licences, etc; Q. 45: conferences, seminars, specialised journals or magazines; Q. 46: exhibitions, fairs, etc.; Q. 47: private research institutes; Q. 48: public research institutions, such as National Research Council, National Agency for Alternative Energy, etc. (excluding universities); Q. 49: universities and other higher teaching institutions; Q. 50: other.

Section 6

This section considers the objectives of innovations. The options available are: Q. 51: modify the range of services; Q. 52: extend the range of services; Q. 53: develop services with low environmental impact; Q. 54: preserve market share; Q. 55: increase market share; Q. 56: enter new markets; Q. 57: improve flexibility in service production; Q. 58: reduce production costs; Q. 59: improve quality of services; Q. 60: improve working conditions of employees; Q. 61: upgrade technologies in use to the prevailing standards within own sector; Q. 62: other (to be specified).

Section 7

Q. 63 asks for a percentage estimate of total 1995 turnover connected with the new services (as defined in section 3); in case of a missing datum the firm is requested to state why it was not able to provide one.

Section 8

In this section the firm should supply an estimate of the impact of innovation on employment in the three-year period 1993-1995; the three possible effects are considered (i.e. increased, unchanged, and decreased employment). Thus, Q. 64 asks an evaluation of the employment impact of innovation on total employment, Q. 65 on highly, Q. 66 on medium and Q. 67 on low-skilled workers.

Section 9

Here the firm must evaluate the importance of technological innovation for the overall economic performance in 1993-1995 (Q. 68), and is asked to indicate the expectation of innovation itself during the net three-year period (Q. 69). Both questions are ranked from 0 (not relevant) to 5 (crucial).

Section 10

This section concentrates on factors hampering innovation in 1993-1995. Seventeen options are indicated; the first fifteen (Q. 70-Q. 84) are ranked according to the scale 0-to-5, while the two last questions (Q. 85 and Q. 86) have only box to be ticked — see hereafter. Q. 70: innovation costs too high; Q. 71: lack of appropriate source of finance; Q. 72: excessive perceived economic risk; Q. 73: benefits from innovative investment to be reaped over too long a period; Q. 74: difficulties in controlling costs connected to

innovation; Q. 75: insufficient innovative potential (e.g. possibility to carry out R&D); Q. 76: lack of qualified personnel; Q. 77: lack of information on technology; Q. 78: lack of information on markets; Q. 79: resistance to change within the firm; Q. 80: lack of opportunities offered by the technology; Q. 81: lack of customers responsiveness to new services or new ways of delivering services; Q. 82: fulfilling requirements set by legislation, norms, regulations and standards; Q. 83: risk of imitation of competitors; Q. 84: lack of proper technical services to be found outside the firm. Q. 85 considers the possibility that 'innovation was not necessary as the firm had introduced innovation in a previous period' ; finally, Q. 86 allows for the possibility that 'innovation is not deemed strategic for the firm'.

Section 11

The two final questions concern the plans for the near future. Thus, Q. 87 asks if the firm intends to introduce technologically innovative services and/or processes in the three-year period 1997-1999, and the divide is either 'yes' or 'no'; in case of a positive answer Q. 88 offers three different options to qualify the expected innovation (service innovation leaving unchanged the process of production/delivering; innovation in the process of production and/or in the delivering systems, leaving unchanged the service; innovation in both service and process of production/delivering).

References

- Barras R. (1986), Towards a Theory of Innovation in Services, *Research Policy*, vol. 15.
- Bell W.R. and Wilcox D.W. (1993), The effects of sampling error on the time series behaviour of consumption data, *Journal of Econometrics*, vol. 55, pp. 235-265.
- Cainelli G. and Lupi C. (1999), The choice of the aggregation level in the estimation of quarterly national accounts, *Review of Income and Wealth*, series 45, number 4, pp. 483-492.
- Eurostat (1997), Community Innovation Survey II – Core Questionnaire. Service sector, Eurostat.
- Gallouj F. and Weinstein O. (1997), Innovation in Services, *Research Policy*, vol. 26, pp. 537-556.
- Ghysel E. and Perron P. (1993), The effect of seasonal adjustment filters on tests for a unit root, *Journal of Econometrics*, vol. 55, pp.57-98.
- Hauknes J. (1996), Innovation in the Service Economy, *Step Report*, n. 7/96, Oslo.
- Hauknes J. (1999), A service based approach to innovation. A need for new concepts? Challenges for the CIS approach to innovation, WP/STEP Group, November, Oslo.
- Holub H.W. and Tappeiner G. (1994), Modelling on the basis of models, *Review of Income and Wealth*, series 43, pp. 505-510.
- Istat (1996), Questionnaire: Indagine sull'innovazione tecnologica nelle imprese dei servizi. Anni 1993-95. Rilevazione pilota, Rome, Istat.
- Istat (1999), *Censimento Intermedio dell'Industria e dei Servizi, 31 Dicembre 1996 - Italia*, Rome, Istat.
- Maravall A. (1997), Abuse of time series techniques in economic analysis, paper presented at the 5th CEMAPRE Conference, Lisboa, 1997.
- Metcalfe J.S. and Miles I. (eds) (2000), *Innovation systems in the service economy*, London, Kluwer Academic Publishers.
- Miles I. (1996), Innovation in Services: Services in Innovation, WP of the Manchester Statistical Society.
- Oecd-Eurostat (1997), Proposed guidelines for collecting and interpreting technological innovation data. Oslo manual, Paris, Oecd.
- Perani G. and Del Santo A. (1999), “La rilevazione statistica dell'innovazione tecnologica nei servizi”, in: *Economia e Politica Industriale*, n.103, pp. 147-172.
- Richter J. (1994), Use and misuse of national accounts from a modelling perspective, *Review of Income and Wealth*, series 40, pp. 99-110.
- Sirilli G. and Evangelista R. (1998), “Technological innovation in services and manufacturing: results from Italian surveys”, in: *Research Policy*, vol. 27, pp.881-899.
- Soete L. and Miozzo M. (1989), Trade and Development in Services: A Technological Perspective, WP 89-031, Merit, Maastricht.
- Tether B.S. (1999), Innovation in services: A comparison with manufacturing using evidence from the United Kingdom's Community Innovation Survey, WP/CRIC, Manchester.