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**Reference period for the Community
Innovation Survey: two or three years?**

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Reference period for the CIS: two or three years?¹

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Executive summary

This paper analyses the effect of the length of the reference period on the results provided by a Community Innovation Survey (CIS). Since the first CIS survey (CIS1) to the last one (CIS4) a three year reference period has been used so as to identify innovative firms. Only for the CIS light survey (carried out between CIS3 and CIS4) a small number of countries, including Luxembourg, have collected innovation data based on a two year reference period.

The inclusion of our CIS light national results in that analysis gives insights on the impact of a two year reference period on the CIS results. To do so, we compare some CIS light results to some CIS3 and CIS4 results. In doing so, it has to be pointed out that comparison between results from different survey has to be made with care. Indeed, some modifications in the concepts, methodology and definitions used may have a significant impact on the results provided and as a consequence lead to difficulties in the comparison process. More economic environment, which changes over time, is also likely to significantly impact firms' innovation activities.

In order to circumvent these difficulties and to have additional insight, additional data on innovation activities launched in 2005 or planned to be launched in 2006 were collected through our CIS4 survey (the field of the survey took place in the beginning of 2006). Based on these data we build a second two year reference period (2005-2006) in line with the methodology and definitions used in three year reference period (2002-2004).

As an introduction to this paper, we present advantages and disadvantages of respectively a three year reference period and a two year reference period. We also put our attention on a first insight regarding the persistence of innovation. To our opinion, this persistence and its impacts are key points in the resolution of two issues related to the length of the reference period that next CIS surveys will have to face: (1) should we alternate full CIS survey based on a three year reference period and light one based on a two year reference period, (2) should we rather opt for a specific reference period for all the next surveys (full or light) and in that case which one?

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A first part is dedicated to present the methodological aspects. More precisely, we present, over the last CIS data collections, some changes in the methods used for collecting and producing the datasets and variation in firm's environment. Indeed these aspects are likely to affect the results and as a consequence have to take into account in order to make reliable comparisons over the CIS results. A second part aims to the examination of the impact of the length of the reference period on the propensity to innovate by size and sector (manufacturing industry / service). A third part is dedicated to the profile of the innovative and non innovative firm through different lengths of the reference period: with a shorter reference period are the innovative firms, in comparison to the non innovative ones, more often involved in international markets, do they more often belong to a group, do they more often belong to specific sectors? In a last part we compare innovative firms' behaviour between CIS3, CIS light and CIS4. In order to do so, we put our attention on the following themes related to innovation process: sources of information, innovation activities and effects of innovation.

Key words: Community Innovation Survey, length of the reference period, Luxembourg.

Introduction

The Community innovation survey aims to provide, at the firm level, harmonised and comparable information on innovation activities in the European countries. In order to do so, clear methodological guidelines defined in the Oslo Manual and in the task forces dedicated to CIS preparation are submitted to national statistical institutes and other centres in charge of the survey. Through the different rounds of the survey these guidelines were modified and improved leading to progress related to data quality and comparability across countries. However, an important aspect remains stable along that process: the length of the reference period used for identifying innovating firms.

This stability does not mean that this aspect is not questionable. As an illustration, the Oslo Manual stipulates that “it is recommended that the length of the reference period for innovation surveys should not exceed three years or be less than one year” (p. 61) and that “the length of the reference period is a compromise between different requirements” (p. 129). Indeed, on the one hand a short reference period should increase the accuracy of the results (respondent’s memory decreases over time). On the other hand, a longer period would allow covering long life phenomena (e.g. innovation effects) or infrequent phenomena.

Moreover, two important aspects have to be considered regarding the length of the reference period: (1) the consistence of descriptive results with those of previous rounds, which should allow comparison over time, (2) the stakeholders’ experience, including firms surveyed, with the current reference period. These two criteria speak in favour of the current three year reference period.

In other side, the request from different stakeholders of more frequent innovation data (i.e. every two years) brings to the fore this stability. Indeed, collecting innovation data every two years and based on a three year reference period should create overlaps between the rounds of the survey. Due to that, it would be difficult to attribute to a specific round the innovation that will explicitly take place in the overlapping year (OSLO Manual p. 130). A two year reference period solves that issue.

Nevertheless, it has also to be remained what type of data are collected: (1) the propensity to innovate over the reference period, (2) some information relating to innovative and non innovative firms, (3) some characteristics of the innovation process over the reference period, (4) the different innovation expenditures for the last year of the reference period and (5) measures of product innovation output for the last year of the reference period. As a consequence, a decrease of the length of the reference period (from three years to two years or one year) should impact the main results of the survey to the extent that the persistence of innovating activities differs by firms’ types.

The main objective of this paper will be to give insights on the extent of this persistence and its impacts. To our opinion these aspects are key points in the resolution of two issues related to the length of the reference period that next CIS surveys will have to face: (1) should we alternate full CIS survey based on a three year reference period and light one based on a two year reference period, (2) should we rather opt for a specific reference period for all the next surveys (full or light) and in that case which one?

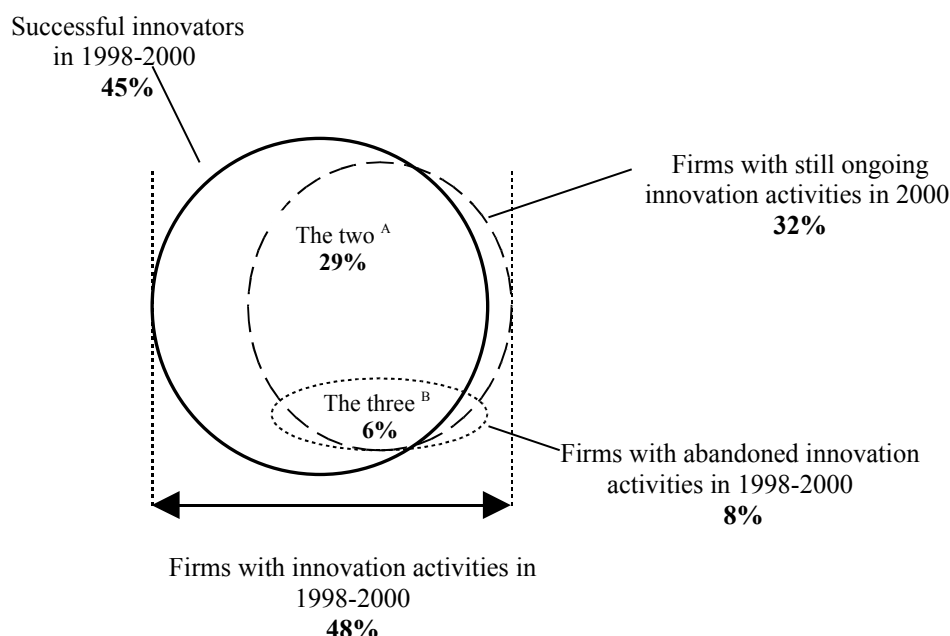
In order to have a first insight about this persistence, one can point out his attention to CIS3 national datasets. Indeed, those make the distinction between innovation success, ongoing

innovation and abandoned innovation (i.e. in CIS4 the distinction between ongoing and abandoned was dropped).

As we do not have access to results from other countries, we have pointed out our attention to our national CIS3 dataset (figure 1). This one shows that most of innovating firm in 1998-2000 (two-third of them) point out that they have at least one other innovation project still ongoing at the end of the reference period. Due to that, one can expect that many of these firms will be again innovative in the next round of the survey. More, one can hypothesize that most of these firms would be innovative with a shorter reference period. But to what extend? The question remains.

In order to fine-tuned these first insights, we use and compare over time our national CIS datasets. Those offer the opportunity to compare, in our national context, the effect of the length of the reference period on the CIS results. Indeed, as a small number of countries, we have collected, through our CIS light survey, innovation data, based on a two year reference period. For the purpose of that comparison, we will also consider our CIS3 and CIS4 results. In doing so, it has to be pointed out that comparison between results from different rounds of the survey has to be made with care. Indeed, some modifications in the concepts, methodologies and definitions are likely to affect the results provided and as a consequence to lead to difficulties in the comparison process. More economic environment, which changes over time, is also likely to significantly impact firms' innovation activities. These two aspects have to be considered in order to make reliable comparisons.

Figure 1: To what extent are firms innovating parsimoniously: a first insight.



A: successful innovators in 1998-2000 with ongoing innovation activities in 2000.

B: successful innovators in 1998-2000 with ongoing innovation activities in 2000 and abandoned innovation activities in 1998-2000.

Source: CIS3; dataset from Luxembourg.

In order to circumvent these difficulties and to increase the validity of our first results, we have collected additional data, through our CIS4 survey, on innovation activities finalized in 2005 or planned to be finalized in 2006 (the field of the survey took place in the beginning of 2006). Based on these data, we built a second two year reference period 2005-2006 in line with the methodology and definitions used in three year reference period 2002-2004.

A first part of this paper is dedicated to present, over the last CIS data collections, some changes in the methods used for collecting and producing the datasets and variation in firms' environment. Indeed, these aspects are likely to affect the results. A second part is aimed to the examination of the impact of the length of the reference period on the propensity to innovate by size and sector (manufacturing industry / service). A third part is dedicated to shed light on the profile of the innovative and non innovating firms through different length of the reference period: with a shorter reference period are the innovative firms, in comparison to the non innovating ones, more often involved in international markets, do they belong more often to a group, do they belong more often to a specific sector, are they more often engaged in R&D activities? In a last part we will compare innovative firms. In order to do so, we put our attention on the following themes related to innovation process: sources of information, innovation activities and effects of innovation. Therefore it has to be pointed out that some of questions on innovation process have been modified/improved through the different rounds of the survey. We have to retain those that will appear as enough comparable.

1 - Testing the impact of the length of the reference periods: the methodological guidelines

The results that we provide in the next sections have to be regards as experimental. Indeed, our tests and comparisons are contingent upon the methodological guidelines used in the different rounds of the survey. The two first paragraphs are dedicated to present (in comparison to CIS3) the guidelines used for our CIS light and CIS4. In a third paragraph, we present our additional CIS4 question dealing with innovation activities in 2005 and 2006. In a last paragraph, we give some insights on firms' environment along the last CIS data collection.

It has also to be noticed that for two sectors (i.e. the whole sale trade sector, the transport and communication sector) large discrepancies were found in the results over the rounds of the CIS. In order that these inconsistencies will not impact the comparison process, decreasing the reliability of our exam, these two sectors will be excluded to the analysis.

1.1 CIS light survey

As previously stated, our CIS light was conducted on a two year reference period (i.e. 2002-2003). As a consequence, firms were required to point out whether or not they were innovative in product or process in 2002 and/or 2003, and if so, to provide information on their innovation practices.

In order to collect those data, a questionnaire based on the CIS3 one was prepared. Most of the questions and definitions used are from CIS3. Nevertheless, some modification, relating to

methods for protecting innovation and other important changes, were introduced (i.e. strategy, management, organisation, marketing and aesthetic change) and the question relating to hampering factors for innovation were not included in the questionnaire.

It has also to be noticed that some changes were made in the methods used for collecting the data. Indeed, for CIS3 (and also CIS4) data were collected via face to face interviews. This method was not fully applied in our CIS light. Indeed, in order to decrease response burden data were collected in two phases. A first one was dedicated to identify innovative firms (introduction of product or process innovation, innovation activity still ongoing and abandoned innovation) and non innovating ones, R&D performers and firms that have had registered a patent. This first phase was carried out by phone calls of our experienced CIS interviewers. A second phase collected information on innovation activities (innovation process) and R&D performers. This second phase was conducted via face to face interviews. In this second phase the following traditional CIS themes were included: innovation activities, sources of innovation, innovation co-operation, effects of innovation. Some additional questions, not from the CIS3 questionnaire, were also added.

1.2 CIS4 survey

For CIS4, the questionnaire developed by Eurostat and a task-force dedicated to that preparation was used. In addition to these questions, Luxembourg's firms were also surveyed on their R&D activities. To do so, we have attached to the end of the CIS4 questionnaire, a distinct small R&D questionnaire. This practise aims that R&D questions do not affect respondents' perception of innovation. As for CIS3, CIS4 data were collected via face to face interviews.

More, it has to be noticed that we have introduced some additional questions in the CIS part. Indeed, firms were surveyed on the introduction of product or process innovations in 2005 and in 2006 (see 1.3) and on acquisition and transfer of knowledge. Therefore, in order to stay fully in line with the reference CIS4 questionnaire, we not have modified any items related to the reference CIS4 questions. More, we not have changed the questions order.

Nevertheless, it has to be remembered that the CIS questionnaires have been changed/improved over time. Some variable items were modified in CIS4 in comparison to CIS3. Some sub-questions were introduced. For example, a distinction between product innovation in goods and service was inserted in CIS4. Other distinctions, relating to process innovation, were also included in the CIS4 questionnaire. Those aim to improve the notification of product and process innovation in the service sector. These improvements are, however, likely to affect our ability to compare innovation rates over CIS3 and CIS4.

1.3 The inclusion of an additional question in CIS4: (1) to have innovated (i.e. in product or process) in 2005, (2) or to have planned to do so in 2006

The field of our CIS4 took place in the beginning of 2006 (January to mid-March). Due to that, respondents were fully informed of whether or not an innovation has occurred in the firm in 2005. More, we expect that respondents had adequate insights on innovation projects that would be finalized for 2006.

In practise, we included the following question in CIS4: “did your firm introduce in 2005 or plan to do so in 2006 an innovative product or process”. For 2005, the three following responses were offered:

- “Yes, an innovative product”
- “Yes, an innovative process”
- “No, neither an innovative product nor an innovative process”

For 2006, an additional response was offered:

- “Do not know”.

This question, drawn from the German innovation survey (Mannheim innovation panel), was address to all firms covered by the survey (i.e. the innovative and non innovative ones). In order to compute innovate rate in 2006, firms pointing out that they do not know whether or not a innovation will occur in 2006 were reported as non innovative for 2006 (3% of the firms provided that response).

These responses are used for the establishment of the following reference period: 2005-2006, 2005, 2006. Pointing out our attention to this building, based on the CIS4 results, it has to be remembered that respondent’s memory decreases over time, and as a consequence, recent innovation successes (in 2005 or 2006) are more likely to be reported than previous ones. More, some innovations planed for 2006 can have been delayed or been unsuccessful. If this occurs, responses provided by respondents overestimate innovation successes in 2006. In other way, some innovations not planned at the beginning of 2006 could have taken place in 2006.

1.4 Firms’ environment along the last years

Firms’ environment may have a significant impact of firm’s decision to undertake innovation activities. Indeed, innovation is function among other of legal environment, technological opportunities, and demand (national and international). On the latter factor, some variations have occurred along the last years. In fact and until 2000, the growth was high (around 5% per year in Luxembourg), whereas growth was low (around 1% in Luxembourg) in the period 2001-2003, and still high since 2004 (around 4% per year in Luxembourg). As a consequence, less innovation activities are expected in the period 2001-2003.

One can expect that the decision to undertake R&D activities depend less on these factors. Indeed, R&D activities develop firms’ absorptive capacities (Cohen and Levinthal, 1989 and 1990). To profit of them, firms have to be involved in R&D along a medium-term or a long-term period. More, due to this absorptive capacity hypothesis, propensity to undertake R&D activities are expected to depend less on the length of the reference period (i.e. firms have advantage to undertake R&D activities along a medium-term period) than the propensity to innovate.

Firstly, due to these changes in firms’ environment and the reduction of the length of the reference period, less innovation activities are expected in CIS light. Secondly, the CIS light innovators are expected to be more often engaged in R&D.

2 - Length of the reference period and propensity to innovate

The following paragraphs are dedicated to the exam of the propensity to innovate. To do so, we make the distinction between the following reference periods: 1998-2000 (CIS3), 2002-2003 (CIS light), 2002-2004 (CIS4), 2005-2006, 2005 and 2006. In a first paragraph this exam is carried out across three size classes (10-49 employees, 50-249 employees, 250 employees and more). In a second one, it is realized across two economic sectors (manufacturing sector, service sector).

2.1 Length of the reference period and propensity to innovate by size

Looking at the two standard results, innovating in 1998-2000 (CIS3) and innovating in 2002-2004 (CIS4), it appears that small and medium size firms have tended more often to innovate in 2002-2004 (table 1). At the opposite, big size firms have tended to innovate more often in 1998-2000, than in 2002-2004, therefore this discrepancy is small and it has to be noticed that due to the small size of our sample large differences are needed to be statistically significant.

Looking at CIS light (2002-2003) results, and for every size classes, firms are less innovative in that two year reference period than in CIS3. The same holds if we compare innovation in the two years 2005-2006 to innovation in 2002-2004, except for the big size firms. The length of the reference period appears to reduce the propensity to innovate in small and medium size firms.

Nevertheless, this discrepancy between, a two year reference period and a three year, does not appear as so large. Comparing 2002-2004 results to 2005-2006 results based on an identical selection of firm (CIS4 sample) and similar economic environment, a ten percentage point gap is observed between medium size firm and a four percentage point gap between small size firms.

Table 1: Propensity to innovate by size through CIS3, CIS light and CIS4 datasets (%)

	2002-2004	2002-2003	1998-2000	2005-2006	2005	2006
10 to 49 employees	50	33	42	46	39	42
50 to 249 employees	68	43	58	58	55	55
250 or more employees	84	77	92	86	77	84

Source: CIS3, CIS light and CIS4; datasets from Luxembourg; based on own calculation; 'whole sale trade', and 'transport and communication' sectors excluded.

2.2 Length of the reference period and propensity to innovate by sector

Pointing our attention at the propensity to innovate by sector, we observe that the propensity to innovate across the different periods is more fluctuating in the service sector than in the manufacturing one (table 2). In the manufacturing sector, 47% of the firms have pointed out to have innovative in 1998-2000, 47% in 2002-2004, 36% in 2002-2003, 40% in 2005-2006 and finally 35% in 2005. For the service sector gaps are deeper. More precisely, firms are more often innovative, in the service sector, through CIS4 (2002-2004, 2005-2006, 2005), than through CIS3 (1998-2000) and CIS light (2002-2003). It has to be remembered that CIS light questionnaire has been based on the CIS3 one, and that in CIS4 some change has been managed on the questions dedicated to the identification of product and process innovations.

Table 2: Propensity to innovate by sector through CIS3, CIS light and CIS4 datasets (%)

	1998-2000	2002-2003	2002-2004	2005-2006	2005	2006
Manufacturing sector	47	36	47	40	35	36
Service sector	51	41	64	60	53	56

Source: CIS3, CIS light and CIS4; dataset from Luxembourg; based on own calculation; 'whole sale trade' and 'transport and communication' sectors excluded.

3 - Length of the reference period and profile of the innovative and non innovative firms

In order to have a look at the profile of the innovative firms along different reference periods we consider available data relating to these firms. Among the few variables, we put our attention to firm market (mainly international or not), group belonging, economic activity and R&D activity.

For the latter variable we do not possess, over all the rounds, information regarding R&D activities carried out by non innovative firms. Nevertheless this information is available in our CIS4 dataset. Indeed, one additional question was dedicated to that purpose. Among the firms that have declared, in one hand, to not have succeeded to innovate in 2002-2004 and, in other hand, to not have any ongoing or abandoned innovation activities, only around 1% of them point out that they were engaged in R&D activities (table 3). Due to that result, one would conclude that no significant bias would be included, in the analysis on R&D activities, by pointing our attention only to innovating firms.

Table 3: In-house R&D activity and innovation in product or process in CIS4 (%)

	In-house R&D activity	No in-house R&D activity	Sum
No innovation activities	1	46	47
Ongoing or abandoned innovation	1	1	2
Innovation in product or process	23	28	51
Sum	25	75	100

Source: CIS4; dataset from Luxembourg; based on own calculation.

3.1 Market type and propensity to innovate across the reference periods

It has to be noticed that due to some modifications in the questionnaires, it is not possible to compare the propensities to innovate by main firms' market over all the reference periods. Due to that, we only point our attention to CIS4 results. For that survey, we classify firms by main market (international or not international) and reference period (2002-2004, 2005-2006, 2005, 2006) and point our attention to the firms' propensity to innovate. The resulting cross-tabulation (table 4) shows a significant interaction (at the 5% level) between those variables: a shorter reference period decreases the propensity to innovate for firms mainly active on national markets; at the opposite the propensity remains stable for firms mainly active on international market.

Table 4: Propensity to innovate for those that are mainly active on international markets and those that are not (%)

	2002-2004	2005-2006	2005	2006
Mainly active on international market	63	64	58	62
Not mainly active on international market	52	42	36	35

Source: CIS4; dataset from Luxembourg; based on own calculation; 'whole sale trade' and 'transport and communication' sectors excluded.

3.2 Belonging to a group and propensity to innovate across the reference periods

In order to complete this first result, we make a second distinction between firms belonging or not belonging to a group and measure for these two groups the propensity to innovate over the different reference periods. In that case, calculations are based on CIS3, CIS light and CIS4 datasets. This cross-tabulation shows a significant interaction (at the 10% level): a shorter reference period decreases the propensity to innovate for firms not belonging to a group whereas this propensity remains more stable for firms belonging to a group (table 5). Nevertheless, the exclusion of CIS light results in the test process leads to non significant interactions ($p=0.2$).

Table 5: Propensity to innovate for those that belongs to a group and those that does not (%)

	1998-2000	2002-2003	2002-2004	2005-2006	2005	2006
Belongs to a group	56	51	66	63	58	58
Does not belong to a group	40	21	45	35	29	34

Source: CIS3, CIS light and CIS4; dataset from Luxembourg; based on own calculation; 'whole sale trade' and 'transport and communication' sectors excluded.

3.3 Economic activity and propensity to innovate across the reference periods

As a third exam we consider the interaction between economic activity, length of the reference period and propensity to innovate (table 6). This cross-tabulation shows a significant interaction (at the 5% level). These interactions are due to the low-tech manufacturing sector and the following R&D- architecture and engineering - control and analysis activities (the sectors have been put together due to the application of the confidentiality rules) and to a less extent financial services and computer and related activities.

Table 6: Propensity to innovate by economic activity (%)

	1998-2000	2002-2003	2002-2004	2005-2006	2005	2006
High and medium high-tech manufacturing industry	52	67	71	70	64	63
Medium low-tech manufacturing industry	35	26	32	31	28	29
Low- tech manufacturing industry	55	31	49	34	28	31
Electricity, gas and water supply'	35	25	21	11	11	11
Financial intermediation	46	42	65	64	58	60
Computer and related activities	74	46	65	62	57	55
R&D – Engineering activities and consultancy - Technical testing and analysis	44	30	61	42	30	39

Source: CIS3, CIS light and CIS4; dataset from Luxembourg; based on own calculation; 'whole sale trade' and 'transport and communication' sectors excluded.

3.4 Innovation activities based or not based on R&D across the reference periods

Following the previous impacts on the length of the reference period, one may expect that, with a shorter reference period, firms identified as innovative would be more often engaged in R&D activities. In order to give some insights into this question, we have draw our attention to the proportion of innovating firms that, either provide a positive R&D expenditure, or declare a positive R&D personal, for the last year of the reference period. Based on those criteria, we compare innovative firms in CIS3, CIS light, CIS4 and 2005. As expected, we observe that, with a shorter reference period, innovative activities tend more often to be carried out with some R&D activities (table 7). Firstly, 44% of innovative firms were engaged in R&D activities in CIS3, compared with 55% in CIS light. Secondly, 49% of innovative firms were engaged in R&D in CIS4, compared with 55% in 2005.

Table 7: Proportion of innovative firms that are engaged in R&D activity (%)

	1998-2000	2002-2003	2002-2004	2005
Proportion of innovative firms with in-house R&D activity the last year of the reference period	44	55	49	54

Source: CIS4; dataset from Luxembourg; based on own calculation; 'whole sale trade and 'transport and communication' sectors excluded.

4 - Length of the reference period and behaviour of the innovative firms: comparison of the innovation process over CIS3, CIS light and CIS4

Numerous information describing the innovation process are collected via CIS3 and CIS4. More, the main themes covered by these rounds are stable. Those are about source of information used for innovating, cooperation engaged, innovation activities and innovation expenditures, innovation effects, methods for protecting innovation activities, factors hampering innovation activities.

Most of those themes were also included in our CIS light questionnaire. However, two CIS light exceptions have to be noticed: (1) questions on hampering factors for innovation were excluded, (2) substantial modifications were made on methods for protecting innovation activities in our CIS light. As a consequence those two themes will be excluded to the comparison that will follow.

As some modifications were made on questions or items, all available results do not appear as enough comparable through the different rounds. Due to that, some have been excluded to the comparison.

By comparing innovation process of the innovating firms through CIS3, CIS light and CIS4, it appears that the result do not differ so much across the rounds (table 8). More specifically, no clear differences regarding 'innovation effects' are observed. Pointing our attention to 'sources of information' and 'innovation activities', the main discrepancies arise from CIS3 innovation process in comparison to CIS light and CIS4 ones.

As expected, more firms, among the innovative ones, are involved in R&D activities in the two year reference period 2002-2003 (55%) than in the three year reference period 1998-2000 (44%). As firms engaged in R&D should differ in their innovation process, one would expect that some overall results, relating to the innovation process, would differ between CIS light and CIS3. On this point, Cassiman and Veugelers (2002) have provided evidence, based on Belgium CIS data, of complementarities between in-house R&D and some other innovation activities. Some results follow that expectation. More precisely, source of information from 'government and public research institutes' and 'universities and other higher education institutions' appeared as more important through CIS light innovative firms than through CIS3 ones. The same holds for acquisition of 'other external knowledge' and 'extramural R&D'.

Comparing the CIS light innovation process to the CIS4 one, we observe that among the innovative ones, neither the proportion of firms engaged in R&D activities, nor the main other results, differ significantly. Indeed, only two main discrepancies seem to appear in the results: innovative firms in CIS light tend to point out as more important than in CIS4 information from 'competitors or other enterprise in the sector' and from 'clients and customers'.

Table 8: Innovation process

Source of information for innovation activities	CIS3	CIS light <i>(min=0; max=3)²</i>	CIS4
Government or public research institutes	0.4	0.7	0.8
Universities or other higher education institutions	0.3	0.7	0.6
Competitors or other enterprises in your sector	1.3	1.9	1.6
Clients or customers	1.6	2.2	1.9
Innovation effects	CIS3	CIS light <i>(min=0; max=3)²</i>	CIS4
Met regulatory requirements	1.2	1.6	1.5
Reduced environmental impacts or improved health and safety	0.5	0.7	0.8
Reduced materials and energy per produced unit	0.6	0.5	0.6
Reduced labour costs per unit output	1.0	1.0	1.3
Improved quality in goods or services	2.2	2.2	2.4
Entered new markets or increased market share	1.8	1.9	1.9
Increased range of goods or services	2.0	2.0	2.1
Innovation activities	CIS3	CIS light <i>(Percentage)</i>	CIS4
Market introduction of innovations	31	52	59
Training	73	90	82
Acquisition of other external knowledge	40	55	28
Extramural R&D	24	31	27
Intramural (in-house) R&D	44	55	53
Percentage of innovative firms	50	39	57
Length of the reference period	3 years	2 years	3 years

Source: CIS3, CIS light and CIS4; dataset from Luxembourg; based on own calculation; 'whole sale trade and transport and communication' sectors excluded.

Concluding remarks and implications

Through the comparison of CIS results over different reference periods some conclusions have emerged. Firstly, it appeared that reducing the length of the reference period should decrease the rate of innovators, especially in some service sectors or low-tech manufacturing sectors and in small and medium size firms. Secondly, we have found that this reduction will impact the profile of the innovative firms in comparison to the non innovative ones. Thirdly, it appeared that a short reference period could modify some results related to the innovation process.

As a consequence, and first implication, only one reference period should be used for the next CIS survey, whatever their type (i.e. full CIS surveys, light ones). Indeed, with more frequent surveys, the comparison over the rounds should appear as more and more requested by the users. In order to make these comparisons, a unique reference period is needed.

² Mean of the score measured on a 4-point scale (from not relevant (0) to high (3)).

The second implication is related to the reference period that should be used. As stipulated in the introduction, a two year reference would solve the overlap issue. Nevertheless, with such a reference period overall results would turn toward high-tech and knowledge intensive services and results should be less informative about small and medium size activities leading to a decrease in the usefulness of the data collection. Indeed some parsimonious innovation will be lost through a two year reference period. More, as the next CIS will aim at covering other types of innovation, this drawback will increase. As a consequence, it seems that the second issue overtake the first one relating to the overlap. Therefore, additional insights, from other countries, would be needed to complete this picture.

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