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SEMINAR ON STRATEGIC ISSUES IN BUSINESS STATISTICS

SESSION II: EMERGING AREAS, NEW DEVELOPMENTS AND USER NEEDS IN
BUSINESS STATISTICS

**EVOLUTION IN RESEARCH AND DEVELOPMENT AND INNOVATION
STATISTICS: PROBLEMS AND CHALLENGES IN MEASURING INNOVATION
STATISTICS**

Note by the National Statistical Institute of Spain

Summary

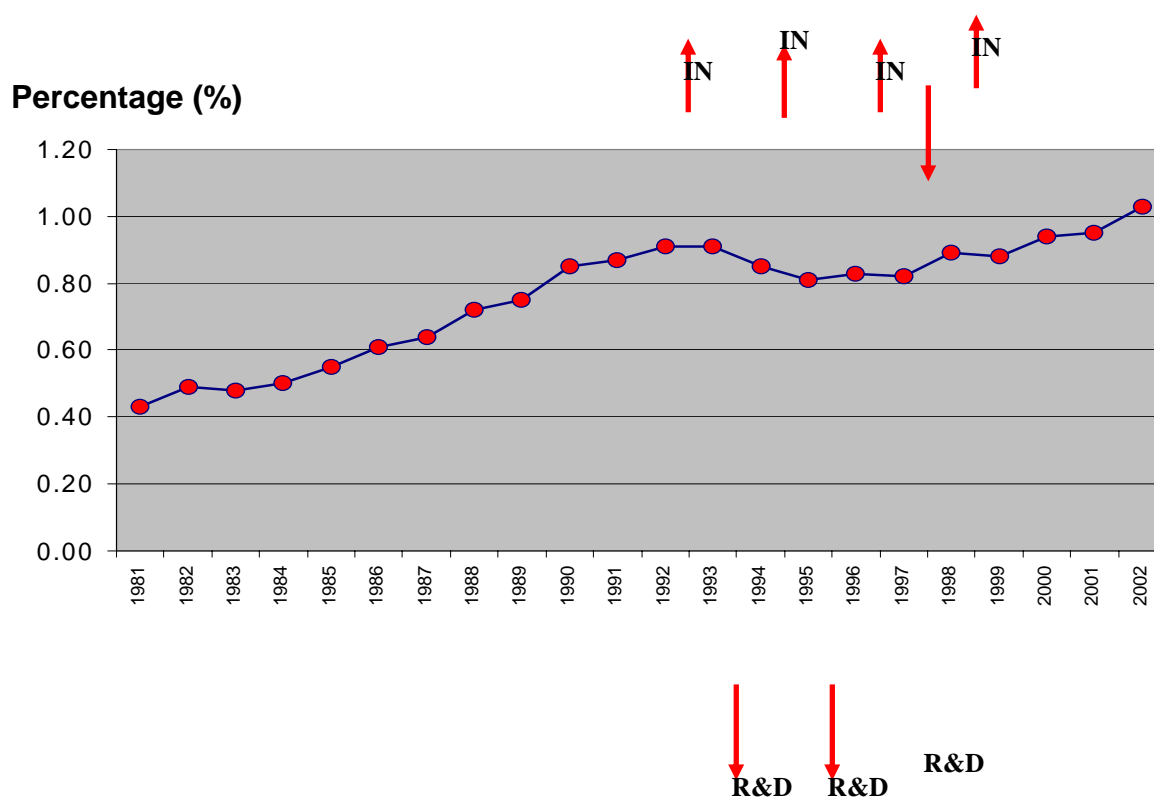
The Conference of European Statisticians selected in June 2008 (ECE/CES/74) the topic “Strategic issues in business statistics” for a seminar to be held at its 2009 plenary session. The Bureau, acting on behalf of the Conference, approved the outline for the seminar at its February 2009 meeting (ECE/CES/2009/2) and requested Spain to prepare a note to provide basis for the discussion.

The note provides an overview of the evolution of the research and development and innovation statistics in Spain, the challenges and obstacles in this area, and the applied solutions.

I. INTRODUCTION

1. In Spain, there are two important series of indicators that attempt to measure research, development and innovation: research and development (R&D) statistics and technological innovation statistics.
2. In Spain, the collection of R&D statistics goes back to 1964. Over the past decades, many different organizations have taken part in their development (e.g. Ministry of Education and Science, Chief Cabinet of Juan de la Cierva, Industry and Technology Innovation Head Office, etc.), but since 1986, the collection has been carried out by the Instituto Nacional de Estadística (INE), Spain's national statistical office. The collection of R&D statistics in Spain follows the Organisation of Economic Co-operation and Development (OECD) methodological recommendations of the "Proposed Standard Practice for Surveys on Research and Experimental Development" (better known as the "Frascati Manual"). This Manual was updated recently and it differs from the previous version in that it recommends specifically "that all enterprises performing R&D, either continuously or occasionally, should be included in R&D surveys".
3. Up until 2001, R&D statistics were based exclusively on a census of those statistical units known to be performing or to have performed R&D activities in the past, either in the public or private sector. Although this census covers more than 6.000 units, the coverage has not always been complete as it is still difficult to identify new starting enterprises or enterprises carrying out R&D for the first time. In addition, the statistics were collected only during the odd-numbered years.
4. The objective of R&D statistics is to measure the national effort in R&D activities with the aim of supplying the required information to make the right decision about science and technology policies. More specifically, it is about obtaining data on the economic and human resources dedicated to the research performed by all economic sectors in the country. The Gross Domestic Expenditures on Research and Development (GERD) represents the total aggregate expenditures spent on R&D by each sector, regardless of source of funds or ownership. The indicator of human resources is obtained by calculating the full-time equivalence of personnel dedicated to R&D activities (researchers and other personnel).
5. Since 1992, in addition to the traditional R&D survey, a new survey on technological innovation has been carried out in the even-numbered years. Some basic R&D questions were also included in this survey.
6. The data provided by both surveys showed that the indicators obtained through different methodologies created breaks in the series, as can be seen in the following Figure 1 (IN – innovation survey, R&D – research and development survey).

Figure 1
Research and development expenditure as a percentage of Gross Domestic Product



7. Given these results, it was decided to carry out both surveys annually, coordinating a census of potential research companies using random samples.

II. EVOLUTION OF THE RESEARCH AND DEVELOPMENT AND INNOVATION STATISTICS IN SPAIN

A. Innovation Survey in enterprises and the research and development statistics since 2002

8. The common sample for these statistical operations is derived from a directory of approximately 26 600 fixed enterprises performing R&D activities every year, using information from previous years or information gathered when a company requests public funds to perform R&D activities in the reference year, or when it received tax deductions.

9. Information about units receiving public funds to carry out R&D activities is requested every year by the Civil Service and all the Autonomous Regions with the purpose of updating the directory. This information is later linked with the information contained in the previous directory, and updated by adding or deleting records as is necessary.

10. To complete the directory, 26 700 enterprises randomly obtained from a Central Enterprises Directory (DIRCE) are added, raising the final sample up to 53 300 enterprises.

11. These 26 700 random enterprises taken out from DIRCE come from a stratified population of 16 5649 enterprises of 10 or more employees with respect to the following variables:

- (a) Size of the enterprise (where the stratum formed by enterprises with 200 or more employees is examined in an exhaustive way);
- (b) Main economic activity branch according to the Classification of Economic Activities (NACE-93 Rev.1).

Figure 2
Sample of research and development and innovation survey

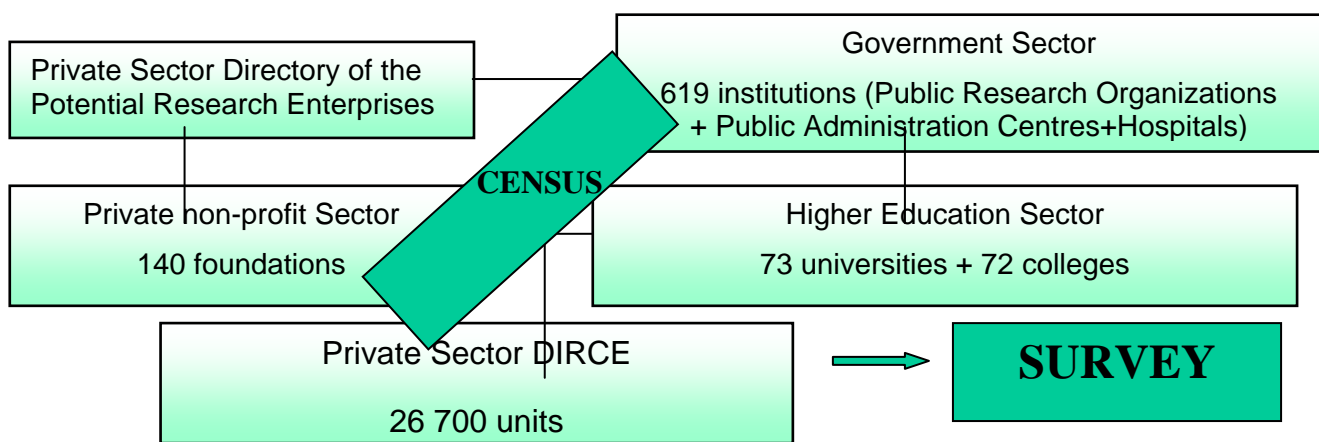
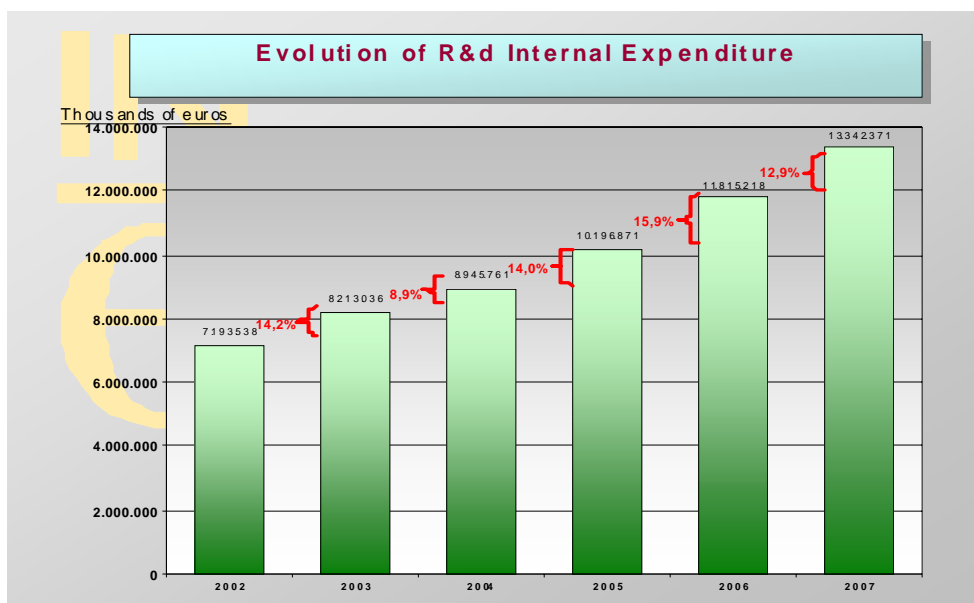


Figure 3
Evolution of research and development expenditures



III. CHALLENGES AND OBSTACLES IN RESEARCH AND DEVELOPMENT AND INNOVATION STATISTICS: APPLIED SOLUTIONS

12. Among the problems and challenges in measuring innovations, we can find the following:

A. Sampling using the mixed system

13. In order to avoid the jumps in the series illustrated in the figure 1, the sample is built by a means of a mixed system. This system gathers in a unique census both innovative enterprises and those which may be performing R&D activities. This census is completed with a random sample which allows to obtain annually both R&D and innovation indicators.

B. Innovation (New Oslo Manual 2005)

14. The Innovation Survey tries to offer direct information about the technological innovation process in enterprises, providing indicators that show the different aspects of this process (economical impact, innovative activities, cost).

15. In June 2005, the Science and Technology Group approved a new version of the Oslo Manual (2005) where the concept of innovation was widened and incorporated two additional concepts:

- (a) Marketing innovation; and
- (b) Organization innovation.

16. The update of the Manual was carried out because of the need to extend the definition of innovation to innovations performed by each branch of the services economy. This change will, however, create breaks in the statistical series from 2008 onward.

17. Spain, which has carried out several pilot surveys since 2006, will publish the very first series according to this new disaggregating system in 2009. Links between series will be established in order to avoid breaks.

18. The design of the questionnaire that is going to be carried out for reference year 2008 follows the Eurostat common questionnaire. It includes the two new innovation concepts which are placed at the end of the questionnaire without affecting the rest of the questionnaire. Innovation variables such as cooperation or source of funding are only aimed at process and product innovation.

C. Data collection improvements

19. While public sector information is obtained by INE's own Science and Technology area experts, company data, due to its size, is collected by an INE special unit that has expertise in innovation and R&D concepts and gathers all surveys carried out by INE.

20. Due to the complexity of the questionnaire, INE has planned three proposals aiming to improve the quality of the collected data:

(a) First, INE is attempting to create a specialised data collection team so that the same experienced personnel specialized in the field of science and technology review the questionnaires every year;

(b) Second, the auxiliary information gathered, and its use, increases every year, allowing INE to improve the questionnaire completion error detection system;

(c) Finally, seminars have been conducted with companies and institutions from several Autonomous Regions, with the aim of clarifying the objectives and concepts that are used in the questionnaires and improving their completion. Moreover, these seminars also help to exchange experiences in order to ease the completion referred to above.

D. Information access

21. Researchers may access to Community Innovation Survey micro data files at INE facilities using a determined computer device that lacks Ethernet connections, recording devices such as floppy disks, CD-s or external hard-drive USB ports. These microdata available at INE facilities do not include either direct identification variables or possible data aggregation.

22. In order to allow access to microdata from a secure place like this, researchers must previously sign an agreement with INE, which specifies, among other things: accessed files, work team members and objectives and duration of research. A research report must be sent to INE by the researchers work team before signing the agreement.

23. Access through a secure place has always been done at INE Central Facilities in Madrid. In order to provide access to different researchers' computer device from other Autonomous Regions, regional offices have been provided with a secure place access.

IV. STATISTICS ON BIOTECHNOLOGY

24. Statistics on biotechnology use have been compiled following the methodological guidelines of the Organisation for Economic Co-operation and Development (OECD).

25. The information is collected, from companies, through an additional module attached to the survey on technological innovation directed to all units with potential links to biotechnology. In the case of the public sector, the information is collected through a module attached to the survey of statistics on R&D activities and then directed to all units, which currently produce R&D statistics and are centres of higher learning, public administrations or private non-profit organizations.

26. The main aggregates for quantifying the national output of R&D activity in biotechnology are:

(a) The internal R&D expenditure in biotechnology, which includes the current and capital costs corresponding to R&D biotechnology activities carried out in Spain within the reference year; and

(b) The personnel working on R&D biotechnology activities in Spain within the reference year, in terms of full time equivalent (FTE).

27. Since 2006, the scope of biotechnology statistics has expanded to include units that carry out activities related to biotechnology (not only to biotech R&D), analysis of the type of biotechnology activities being developed and the areas of final application of the finished product of these activities, as well as the impediments to the progress of developing and marketing biotechnology products and processes.

V. FUTURE CHALLENGES

A. Regionalisation of expenditure on research and development and innovation

28. The enterprises selected by headquarters are asked to regionalise their R&D and innovation expenditure by Autonomous Regions. This is a difficult task because, in many cases, enterprises ignore where the innovation takes place. Although data on the regionalised expenditures and personnel are available, it does not occur in the same way with the rest of the variables (e.g. number of enterprises, process and product innovations).

B. Research and development expenditure on the health care sector

29. Given the fact that the R&D expenditures on the health care sector are underestimated, INE hired an external consulting firm to analyse a group of hospitals, with the aim of preparing a report that would enable a better approximation of the health situation and develop a proper questionnaire for this sector as well as parameters to facilitate the estimation of R&D.

30. Despite the study, no parameters were found which would allow the improvement of the response to the questionnaire or the estimation in the case of an absence of response.

C. Innovation expenditure in the construction and accommodation and other sectors

31. Over the last few years, several problems related to the completion of questionnaires were detected in certain economic sectors, in particular in the construction and accommodation sectors. To deal with this issue, INE has developed a new plan which analyses some hotels and building companies in order to find the best suitable questionnaire for these economic sectors.

32. Specific questionnaires have been proposed for those sectors because they usually show difficulties with innovation and R&D concepts. On these special questionnaires, general questions such as "Has the company carried out innovation activities?" were changed for more concise questions. For the accommodation sector, instead of asking them if they are innovative, they are asked if they have new processes of invoicing or any other novelty in their accommodation.

33. Once the questionnaire is completed, their responses are transmitted to the general questionnaires of other activities in order to obtain harmonized indicators.

34. In the future, our aim is to widen these studies to other economic sectors.

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