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REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

on the implementation of Decision No 1608/2003/EC of the European Parliament and of the Council on science and technology statistics

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EXECUTIVE SUMMARY

Official statistics on science, technology and innovation (STI statistics) in the European Union are largely based on Decision No 1608/2003/EC of the European Parliament and of the Council of 22 July 2003 concerning the production and development of Community statistics on science and technology[1]. In close cooperation with Member States, this Decision has been implemented by Eurostat through legislative measures and voluntary data collections and through Eurostat's own statistical production.

This report evaluates the implementation of the individual statistical actions listed in Article 2 of the Decision. These actions aim at establishing a statistical information system on science, technology and innovation to support and monitor EU policies.

Commission Regulations (EC) No 753/2004 and No 1450/2004 implementing Decision 1608/2003/EC relate to the two data collections which are regularly performed within the European Statistical System (ESS) by Member States' statistical authorities. Both research and development (R&D) and innovation statistics collected under these two implementing Regulations have become recognised and widely quoted reference data in EU policy monitoring in the STI area.

Together with R&D data, the former Regulation also describes statistical work covering the other areas of STI statistics, such as human resources in science and technology, high-technology industries and knowledge-based services, and patents. Statistics in these areas are produced by Eurostat directly using the existing source data and statistics (external or internal to Eurostat). This is complemented by voluntary data collection within the ESS on the careers of doctorate holders.

The quality of the statistical data has become more essential because of policy orientation and monitoring and in particular the fact that policy targets are set through statistical information. The Europe 2020 strategy, like its predecessor the Lisbon strategy, has set a precise target for R&D intensity (spending 3% of EU GDP on R&D by 2020) and it is therefore of the utmost importance that the quality of the measurement is and stays at a high level.

The adoption of the above Regulations implementing Decision No 1608/2003/EC has stabilised STI data quality. This has been followed by gradual and ongoing improvements and close monitoring of quality. Agreeing and implementing international standards and methodology and constant discussion of their relevance in a dynamic measurement framework aim to keep the statistics up to date and of first-class quality.

In further development work on STI statistics both the priorities set by the policy needs and the development of the ESS as a whole will be taken into account. Given the priorities already set by the Europe 2020 strategy and its flagship Innovation Union initiative, a balance will be sought between new work and actions to further improve the existing STI statistics.

[1] OJ L 230, 16.9.2003, p. 1.

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1. INTRODUCTION

This report concerns the implementation of Decision No 1608/2003/EC of the European Parliament and of the Council of 22 July 2003 concerning the production and development of Community statistics on science and technology (hereafter: the Decision).

This is the second report that the Commission is required to submit to the European Parliament and the Council by Article 5 of the Decision. The first report was adopted on 14 December 2007[2].

In June 2010 the European Council adopted the Europe 2020 strategy for jobs and smart, sustainable and inclusive growth[3]. It also confirmed the five EU headline targets, one of which is to improve the conditions for innovation and research and development (R&D), in particular with the aim of raising combined public and private investment levels in this sector to 3% of gross domestic product (GDP).

In addition, in its Communication of 6 October 2010[4], the Commission proposed an indicator reflecting R&D and innovation intensity and, to monitor overall progress in innovation performance, an annual Research and Innovation Union scoreboard[5].

The Competitiveness Council has also called for work to identify a limited and consistent set of indicators which will serve as an operational tool in line with the Council political objectives and strategies to monitor progress towards full achievement of the European Research Area[6] (a European 'single market' for research and innovation, where researchers, ideas and knowledge circulate freely).

The report takes stock of how the statistical information system on science, technology and innovation has been implemented to support and monitor EU policies. The first part of the report focuses on the implementation of the measures provided for in Article 2 of the Decision. It is followed by chapters on data quality, costs and the statistical burden. The final chapter of the report looks ahead to strategic actions that should be taken in the years to come.

2. IMPLEMENTATION OF THE DECISION

2.1 Implementation by the Commission

Decision No 1608/2003/EC has been implemented by Eurostat through legislative measures and voluntary data collections within the Member States and through Eurostat's own statistical production.

Most importantly, there are two implementing Regulations in force:

Article 2(1) and (2) of the Decision

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2 COM(2007) 801.

3 CO EUR 9, CONCL 2.

4 COM(2010) 546. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Europe 2020 Flagship Initiative — Innovation Union.

5 COM(2010) 546.

6 2945th Competitiveness Council meeting, Brussels, 29.5.2009.

• Commission Regulation (EC) No 753/2004 of 22 April 2004 implementing Decision No 1608/2003/EC of the European Parliament and of the Council as regards statistics on science and technology[7], which concentrates particularly on R&D statistics. This Regulation covers also statistics on human resources in science and technology ('HRST statistics'), statistics on high-technology industries and knowledge-based services, patent statistics and other STI statistics (without, however, assigning direct tasks to Member States).

Article 2(2) (innovation) of the Decision

• Commission Regulation (EC) No 1450/2004 of 13 August 2004 implementing Decision No 1608/2003/EC of the European Parliament and of the Council concerning the production and development of Community statistics on innovation[8].

Both R&D and innovation statistics collected through these two implementing Regulations have became recognised and widely quoted reference data in EU policy monitoring.

The main achievements in the various domains of STI statistics have been:

2.1.1 R&D statistics (including statistics on government budget appropriations or outlays allocated to R&D, known as GBAORD statistics)

R&D statistics measure R&D performance in Europe. R&D expenditure and R&D personnel from the point of view of the R&D performing enterprise or institution are compiled in various dimensions and breakdowns. These statistics are based on the 'Frascati Manual' and will be used inter alia for compiling public and private R&D investment intensity indicators for the Europe 2020 strategy. They have until now been used to compile the Lisbon and Barcelona Council indicator on R&D intensity.

Main achievements:

• Increased data production volume and data quality and harmonisation of the data collection questionnaire and time series with the OECD;

• Agreement reached on the treatment of 'R&D funded from abroad';

• Initiation of measuring trans-nationally coordinated research in Europe (GBAORD and trans-national public R&D performers)

• Improvement of the quality and harmonisation of the data through the established quality reporting and initiation of improvement actions on this reporting basis.

2.1.2 European innovation statistics

The Community innovation surveys measure the innovation performance of enterprises in Europe. They provide indicators on innovation activities, the various types of innovation, innovation expenditure, the effects or cooperation on innovation. These surveys are the only harmonised source for measuring innovation in Europe and beyond. They are based on the 'Oslo Manual'.

Main achievements:

• Release of the 2005 Eurostat/OECD Oslo Manual 2005, which also covers organisational and marketing innovation;

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[7] OJ L 118, 23.4.2004, p. 23.

[8] OJ L 267, 14.8.2004, p. 32.

• Preparation of several rounds of the Community innovation survey with a harmonised survey questionnaire and methodology including ad hoc modules covering eco-innovations and creativity and skills (respectively for 2008 and 2010);

• Opening and extending access to the CIS microdata via Eurostat's SAFE Centre and through CD-Rom releases for wider research use.

Article 2(2) (HRST, patents and high-tech statistics) of the Decision

2.1.3 Statistics on human resources in science and technology, high-technology industries and knowledge-based services and patent statistics

Based on the 'Canberra Manual', HRST statistics measure the share of the workforce who have a tertiary level education in science and technology or are employed in a science and technology occupation. High-tech and knowledge statistics monitor the sectors of the economy which are characterised by high knowledge intensity (e.g. pharmaceuticals, computers, telecommunication, aircraft, R&D). These two sets of statistics are produced by Eurostat using existing statistical data from other surveys and statistical data compilations at Eurostat. Patent statistics are in general used as output indicators related to science, technology and innovation and these indicators are produced at Eurostat on the basis of administrative data coming from the European Patent Office or other major patent offices. World-wide comparisons of patenting activities allow the innovative capacity of the respective economies to be assessed.

Main achievements:

• Together with the OECD and the UNESCO Institute for Statistics (UIS) and based on strong user needs, preparation and broad implementation of voluntary direct data collection in Member States for 'statistics on the careers of doctorate holders' ('CDH statistics') monitoring resident doctorate holders, including their personal characteristics, educational and work history, international mobility, etc.;

• Continuation and stepping-up of regular production of the HRST and high-tech statistics based on existing data sources;

• Assessment of the underlying classifications and their feasibility for offering information on the knowledge-intensive economy (activities);

• Together with other international institutions (such as the European Patent Office — EPO, the World Intellectual Property Organisation — WIPO, the US Patent and Trademark Office — USPTO, the Japan Patent Office — JPO, the US National Science Foundation — NSF, or the OECD), establishment and further improvement of EPO PATSTAT, the harmonised raw database covering, inter alia, EPO patent applications and USPTO patents granted;

• Contribution to and review of the 2009 revision of the OECD Patent Manual in cooperation with the above-mentioned other major users of patent data and statistics;

• Improvement and application of Eurostat's method for harmonising the names of the patent applicants to allow the production of additional patent statistics, e.g. patent concentration ratios, and for the assignment of patent applicants to institutional sectors. A first version of the two methods was applied to EPO and USPTO applicant names in 2006 and the methods were updated in 2009 based on all EPO PATSTAT applicant names;

• As of 2005 onwards, the significant efforts undertaken in data treatment and methodological developments have allowed an expansion of patent indicators, e.g. high-tech, biotech, foreign ownership, intra-EU and international co-patenting, patent citations, energy technologies.

Article 2(2) (gender-disaggregated statistics) of the Decision

Personnel variables of the R&D data collection, HRST and voluntary CDH statistics offer the gender breakdowns where appropriate. This has vastly facilitated publication of the Commission's report on women's role in science — the 'She Figures' — in 2006 and 2009.

Article 2(3) of the Decision

The methodological work has continued in close cooperation with the other international partners, in particular the OECD. This has led, among other things, to the new and revised manuals as referred to above, rationalised data collection tools and processes for the R&D data and the CDH data collection. Standards and classifications have been updated to comply with the revised background classifications (economic activity, product classification, socio-economic objectives).

Article 2(5) of the Decision

The main dissemination channel for the detailed STI data and related documentation is Eurostat's statistical web-based database, which can be accessed free of charge. Database dissemination is supported by numerous statistical publications and News Releases. Furthermore, the main findings are quoted on the Eurostat web service Statistics Explained. Apart from this statistical output, Eurostat began offering research access to the CIS microdata via its SAFE Centre and through CD-Rom releases. This has contributed greatly to international innovation research inside and outside the Commission. The Commission also disseminates the STI data in several policy reports (including in particular those related to the Europe 2020 strategy and its predecessor).

2.2 Implementation of STI statistics in Member States

This section describes briefly the measures taken in Member States with regard to STI statistics collected directly from them: R&D/GBAORD statistics, the Community innovation survey and voluntary CDH statistics. For the other domains, other existing data sources are used which are not included in STI surveys to be carried out by Member States.

R&D/GBAORD statistics

To meet the requirements of Regulation (EC) No 753/2004, many countries adapted their national questionnaires and data collection from 2002/2003 onwards. As referred to in the first report, a number of countries had problems with transmission of R&D and GBAORD data for the first two obligatory reference years (2003 and 2004), with special reference to the completeness of the data and meeting the deadlines imposed by the above Commission Regulation. Subsequently, data availability and deadline compliance improved considerably.

Systematic monitoring of compliance with the statistical legislation has resulted altogether in six 'non-compliance' notifications to Member States for data related to the reference years 2006-2008. By now the coverage problems and the delays in data deliveries have been mainly limited to non-systematic occurrences in the national data production systems (accidental problems, temporary lack of resources, major redesign of production). Transmission of the R&D variables requested on a voluntary basis has remained incomplete.

European innovation statistics

The Community innovation surveys have become part of the standard statistical infrastructure in the Member States following the requirements of Regulation (EC) No 1450/2004. The Community innovation survey 2004 was perceived as less burdensome and easier to implement at national level. In the survey for 2006 voluntary work took place to facilitate full use of the Oslo Manual definition of an innovation and, finally, the 2008 survey covered both technological (process and product) and non-technological (organisational and marketing) innovations on an equal footing on a mandatory basis.

Apart from one Member State no notable non-compliance has been identified. The tabulated data for 2006 and 2008 were delivered in time and in complete form by almost all Member States. Deliveries allowed dissemination of EU data in time for the major Commission report on innovation. However, Eurostat is not receiving all the national microdata sets or all the desired variables as these transmissions remain voluntary.

Statistics on the career development of doctorate holders ('CDH statistics')

Based on strong user needs, the broader production of CDH statistics started in 2006 and 2007 in more than 20 Member States on a voluntary basis. In this context, countries started to work on using national administrative data sources and registers, building up national sample frames covering all resident doctorate holders, calculating sample size, drawing up the national survey questionnaires and developing data collection techniques. This work continued with the equivalent 2009 survey, testing the stability of the concepts, definitions and data production systems. A broader evaluation of the production of CDH statistics will be conducted after the results from this survey are made available in 2011.

3. DATA QUALITY

Article 2(4) of the Decision

The framework for the data quality of STI statistics is the European Statistics Code of Practice[9], which covers 15 main principles. Several principles relate to the general institutional settings of the Member States' authorities and their organisations (professional independence or adequacy of resources) contributing to the overall quality of European statistics, while some of the principles (such as sound methodology through manuals) are internationally established, commonly and constantly evaluated and available to everybody. Several quality principles that are directly related to the STI surveys are covered and monitored through regular quality reporting (inter alia accuracy, coherence and comparability).

Eurostat has been collecting national quality reports on R&D and GBAORD statistics since 2007 and for each two-yearly round of the Community innovation survey since 2004. Quality reporting on voluntary CDH statistics has been included in the provision of the national metadata in both rounds of the data collection.

Some of the statistical quality issues arising in the various domains are highlighted below.

• **R&D statistics.** The recommendations on data compilation made in the OECD Frascati Manual have generally been observed. The quality of European R&D statistics improved with the implementation of Regulation (EC) No 753/2004. The data users have not raised criticisms concerning the relevance, accuracy or comparability of the data. However, some coverage and measurement-related improvements are desired.

• **European innovation statistics.** The timeliness, completeness and comparability of the national data sets have improved thanks to the shorter, clearer questionnaires, the improved production and implementation process at national level and greater familiarity with the innovation concepts on the part of respondents. Users have found the data very relevant and have requested still better comparability and accuracy for the numeric variables. A harmonised model questionnaire prepared in line with Regulation (EC) No 1450/2004 is considered to have made a positive contribution to the comparability of the results.

[9] COM(2005) 217.

• **CDH statistics.** The 2006 CDH data collection was the first attempt at a large-scale data collection on doctorate holders. Particularly challenging was finding sources for the representative sampling that would also allow issues of international mobility to be addressed.

• **Other STI statistics.** For the other domains the quality improvements largely depend on progress made with the source data. Considerable progress has been made in this respect with the data from the EU Labour Force Survey, Trade statistics or PATSTAT. Classifications used have been updated in line with the revised economic activity and product classifications.

4. COST AND BURDEN

Eurostat measures the costs and burden imposed by business statistics in a number of statistical domains. According to the most recent overall analysis of response burden in the Member States launched in June 2009, STI statistics (R&D and innovation statistics) are situated to 10th place in terms of the burden on respondent enterprises among the 16 business statistics covered. The annual burden of STI statistics fluctuates somewhat, reflecting the two-yearly nature of the innovation statistics.

Attempts have been made following the adoption of Council Decision No 1608/2003/EC to collect data on the cost and burden of the related data collections. Precise measures have been requested in the regular quality reporting but these have proved somewhat difficult to obtain, particularly in a harmonised manner allowing comparisons or evaluation of the overall costs. Many Member States have pointed out that it will not be possible to separate the cost of the R&D and Innovation surveys and data compilations, either from other business and related statistics or from similar activities based only on national needs. Where the data is available, the methodologies used for the reporting are also different among Member States and within Member States between the institutions in charge, so that the information does not allow real meaningful comparisons or publication of the individual cost estimates.

Subject to the above reservations, the average burden measured by time spent filling in the enterprise sector R&D questionnaire for the reference period 2007 varies from 0.7 hours to 4 hours among the 13 Member States where the data is available (with an exception of 6 hours reported by one Member State). The most typical time taken was 2 hours. Much less data is available from other economic sectors although the periods of time spent filling in the R&D questionnaire in the government sector and higher education seem to be much longer than in the enterprise sector, albeit relatively close to each other.

As regards the Community innovation survey, the information included in the quality reporting from the survey waves 2006 and 2008 reveals that the time spent filling in the innovation questionnaire varied between 0.45 and 4.5 hours (with an extreme value of 6 hours). The typical time was 1.7 and 2 hours respectively, being therefore close to the burden of the R&D survey. Weak evidence following the individual Member States' data available from both waves shows that the response burden measured by time spent did not increase between 2006 and 2008. Similarly, the costs for the statistical authorities remained relatively stable from 2006 to 2008. Unfortunately, the cost data remain still relatively poorly covered, not allowing further analysis to be made.

Several calls for grant proposals have been launched under the 2006 and 2009 Commission budget for co-financing the non-mandatory parts of the R&D or CIS data collections or for studying the feasibility of developing new indicators or financing the CDH surveys. Total 2006 commitments were €676 782 for the CIS and €373 311 for CDH, with 10 and 7 Member States and EEA countries participating respectively. In all, 2009 commitments were €163 457 for R&D, €713 475 for the CIS and €898 610 for CDH, with the participation of 8, 16 and 13 Member States and EEA countries respectively.

The 2004 to 2006 Phare Multi-Beneficiary Programmes for statistical cooperation and the 2004 and 2005 Transition Facility Multi-Beneficiary Programme for statistical integration allowed co-financing of the implementation of the R&D, CIS and CDH surveys only in the Member States that joined in the fifth enlargement (2004) and thereafter. The total amount awarded to beneficiaries through these actions was €219631 for R&D, €417723 for the CIS and €426042 for CDH respectively for 11, 12 and 9 beneficiaries.

5. FURTHER DEVELOPMENT OF STI STATISTICS

Statistics need a certain degree of stability. However, in the area of STI statistics the phenomenon of interest is dynamic by its nature and new user needs frequently arise. Responding to the new needs is particularly challenging in the present environment of the European Statistical System as described below.

5.1 Changes in the environment

5.1.1 User requirements

High and continuing political interest in R&D, innovation and the knowledge economy as a whole means constant pressure on STI statistics. User requirements such as more timely and detailed data with improved quality have been known for a long time and many issues are addressed with strengthened tools such as quality reporting, more precise methodology or sharing of good practices. Internationalisation of R&D and expansion of innovation activities to the public sector are examples of the new requirements for statistical monitoring, whose feasibility is being investigated through pilot surveys. New and well justified needs are expected to be steadily addressed to STI statistics in the future.

5.1.2 Production method of EU statistics: a vision for the next decade

The Commission Communication on the vision for European statistics[10] calls for more integrated, more intelligent approaches to the production of statistics. This includes integrating statistical tools and making increased use of administrative sources and also simplifying and improving the statistical regulatory environment, with the aim of obtaining richer statistical data of a forward-looking nature, improving productivity and reducing the response burden.

5.1.3 Scarce resources and priority setting

A lack of resources has been reported by national statistical authorities in various contexts during recent years, raising serious concerns regarding the ability to meet ESS statistical requirements. Priority setting therefore becomes more crucial than ever and concerns existing and planned statistical operations alike.

5.2 Improving and evaluating existing STI statistics

The existing statistics need to fulfil the requirement of being sound and fit for purpose. With full use of regular compliance monitoring and systematic collection of the quality reports, the existing data collections, on R&D and innovation in particular, will be kept under constant relevance and quality review. This is now even more important as the Europe 2020 strategy will be monitored amongst others through variable STI indicators.

This operation will be assisted by the Rolling Review in 2011, which is a tool to carry out a complex assessment in a wider sense involving evaluation not only of the statistical data

[10] COM(2009) 404. Communication from the Commission to the European Parliament and the Council on the production method of EU statistics: a vision for the next decade.

produced but also of the process to produce them, the interactions with data providers and interactions with users of the data.

In the light of the environment setting discussed above, the following issues in particular will be addressed with high priority:

• **R&D statistics.** This involves ensuring that the underlying data are measured by all R&D performers or at least estimated when needed, whether or not they are known beforehand, and cover all economic sectors and sub-sectors and all sizes of operating units — therefore covering the totality of R&D (expenditures and personnel) in the economy at a given time. In this context, a core set of indicators to monitor the ERA will be developed. This takes into account sound statistical methodology for treating non-responses in the surveys and addressing the R&D measurement issues, with the aim of increasing the level of international harmonisation.

• **European innovation statistics.** The measurement issues of innovation in its different concepts need to be addressed. This covers in particular the numeric variables, innovation expenditures and turnover from innovation. Furthermore, an assessment will be made of whether extending the coverage (to all business activities, the entire economy) would add new information at a level that would be justified and is methodologically feasible.

In the spirit of the vision for European statistics, a strategy for using an integrated survey on R&D and innovation will be evaluated and an assessment will be made of what would be the impact particularly on the data quality and comparability. This evaluation will attempt to take into account the ESS statistical infrastructure as a whole.

• **CDH statistics.** A thorough evaluation will be made in 2011 of the implementation of the CDH data collection in 2006 and 2009 with a view to assessing the future of this data compilation.

• **Patent statistics.** Richer use of the underlying administrative source will be investigated, in particular in connection with other existing sources for adding the new information and variables. Full use will be made of the improved methodology for name harmonisation.

Improvements in existing STI statistics (as with the new work) will be made in close cooperation with the OECD and other international organisations with which coordination has already been stepped up. This covers work towards revised international methodological manuals.

5.3 New indicators, new data sources

New indicators and new data sources will be frequently requested by the user community. Development work which goes beyond using the existing data sources, including new indicators, new data sources and even further breakdowns of the existing data (as they may involve larger sample sizes or methodological work), will take place only after thorough screening and analysis. This may concern work on patents in technologies or data on other Intellectual Property Rights related to Societal Challenges. Feasibility studies and pilot surveys will also be utilised in this context.

5.4 Updating the legal framework for STI statistics

Adoption of the Europe 2020 strategy and its various flagship initiatives together with monitoring of the European Research Area call for agreement on the statistical monitoring framework for the EU policies set. It is of the utmost importance that the indicators used for those purposes are based on statistics and variables which are in regular statistical production in the Member States and covered by the statistical legislation.

Eurostat therefore aims to review both Regulation (EC) No 753/2004 and Regulation (EC) No 1450/2004 with a view to revising them, taking into account in particular the most recent policy monitoring needs. In doing so a balance will be achieved between existing, new and potentially discontinued statistics and the rationale of integrated legislation and surveys will be investigated. The emphasis will remain on the relevance and quality of the data. New legislation will be considered with particular care.