The Istat strategy to support quality by strengthening collaboration with academia

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Abstract

The need for developing methodological solutions for more efficient and high-quality official statistics in the modern information context, characterized by new (non-probabilistic) data sources and new technological assets, requires National Statistical Institutes to strengthen research collaborations and knowledge exchange not only among them, but also with the academia. Istat has developed a strategy for fostering an effective collaboration considering several forms of partnerships and research collaborations, and the participation in education and training of students and researchers. The strategy exploits some of the existing Istat "infrastructures for research", established since 2017 in order to ensure that the methodological developments are in line with the current academic research, so that robust and efficient methodological innovations actually improve the quality of statistical processes and products. In the paper, we discuss the role of these infrastructures such as the Advisory Committee for Statistical Methodologies, the Istat Innovation Laboratory. Besides the traditional participation in education and training of students and researchers, we also illustrate the role of the Istat Research Committee to support joint research projects with the academia. Finally, we will present l results achieved thanks to joint research activities, main problems encountered and open issues.

Keywords: Methodological research, collaboration, academia, knowledge sharing.

1. Introduction

The Italian National Institute of Statistics (Istat) is the main producer of official statistics in Italy. It operates in continuous interaction with the academic and scientific world and carries out its activity in complete autonomy, under the supervision of the Presidency of the Council of Ministers. Thanks to specific National decrees and Regulations, Istat has also a role of Public research body dedicated to the production and analysis of statistical data. Istat's mission - set out in its Statute - is to "*serve the community through the production, development and dissemination of high quality statistical information, analysis and forecasts, carried out in full autonomy and on the basis of rigorous ethical-professional principles and the most advanced scientific standards* (…)".

The need for ensuring efficient and high-quality statistics in the modern information context, characterized by new (non-probabilistic) data sources and new technological assets, requires Istat to adopt the most advanced scientific standards in its production processes. This implies the continuous improvement of methodological and technological solutions, strengthening research collaborations and knowledge exchange not only among Narional Statistical Institues

(NSIs), but also with the academia, and ensuring the internal development of the skills necessary for the exploitation of new technologies and statistical methodologies.

Among the principles of organization and functioning of the Institute, the Istat Statute explicitly promotes the collaboration with universities, research bodies and institutions and with other public and private entities. Furthermore, in order to encourage research activities and exchange of knowledge within the scientific community, the Istat Organization Regulations states that the Institute has to promote collaboration with universities and research institutions to allow access to data, in compliance with current legislation.

In this regulatory and legal context, over the last few years Istat has developed and progressively strengthened a strategy for fostering effective collaboration with academia, considering several forms of partnerships and research collaborations, and expanding the participation in education and training of students and researchers. This strategy is endorsed by the definition, within the Istat strategic Plan (called *Integrated Plan of Activity and Organization* - PIAO), of a specific Section named *Research Plan*. The *Research Plan* is aimed at programming the research and innovation activities in terms of qualitative and quantitative objectives, financial, technical and professional resources necessary for their realization, allowing integrating these elements within the performance cycle and the financial-economic system of the Institute. This strategy is supported by the so-called *Istat infrastructures for research*, such as the Research Committee, the Advisory Committee for Statistical Methodologies, and the Laboratories, having each specific roles in terms of supporting the development and valorisation of research and innovation activities carried out within the Research Plan, monitoring their implementation, and communicating their results.

In Section 2 the role of the Istat infrastructures for research are illustrated, with special reference to the collaboration with academia. Sections 3 and 4 illustrate different ways of enhancing collaboration between Istat and academia through different types of agreements and by means of education activities, respectively. In Section 5 the main problems encountered so far and open issues for future work are discussed.

2. Infrastructures for research

Since 2017, Istat has established some infrastructures for research to orient, support and monitor research and innovation activities. The infrastructures for research are designed to carry out the following activities:

- developing the Istat *Research Plan*, dedicated to orienting, organizing and giving coherence to Istat's research activities*;* the *Research Plan* also concerns the investment in research

and innovation that the Institute supports with the national and international scientific community*;*

- ensuring that Istat research and innovation activities are in line with the *Research Plan* and with the research community;
- facilitating and monitor agreements and collaborations with the scientific community;
- promoting training activities with academia at national and international level;
- promoting communication of the research and innovation results internally and outside the Institute.

The infrastructures for research characterized by an active and prominent role of the Istat methodological division are: i) the Advisory Committee on Statistical Methods, which involves experts from National and International Universities who are in charge of revising and discussing methodological research projects; ii) the Innovation Laboratory, which is a virtual and physical place where Istat researchers and external experts can collaborate on advanced methodological research projects; iii) the Research Committee, which is in charge of coordinating and developing the Istat *Research Plan*, monitoring its implementation, and of supporting and facilitating joint research projects with the external scientific community (also the ones carried out within the Advisory Committee on Statistical Methods and the Innovation Laboratories).

2.1 Advisory Committee on statistical methods

In line with similar committees organized in other important NSIs (e.g. Statistics Canada and Statistics Netherlands), the Advisory Committee on Statistical Methods (ACSM) has the objective to support and advise Istat methodological research projects. The main Committee objective is to ensure the overall success of the projects in terms of quality of results achieved. Furthermore, the Committee members should assist Istat researchers in aligning their methodological project to the most recent advances. The ACSM meets twice a year with the following duties:

- *Methodological support and advice to strategic projects*. Each project is audited in a Committee meeting, receiving comments by two specific board members, named principal discussants, as well as by other Committee members. The Committee provides a collection of comments and recommendations to the project members in order to take into consideration actions for improving the overall project quality. The Committee continuously gives assistance to the projects, following their advances in follow-up meetings, and checking the projects results in terms of publications and applications on current Istat statistical production processes.

- *Tutoring of strategic projects*. Some projects are assisted by a tutor, i.e. a reference expert (ACSM member or a researcher suggested by the ACSM) to be contacted for advices. Tutoring takes place remotely and during the meetings, specific sessions dedicated to discussion on tutored project progresses are organised.
- *High-level training actions*. The ACSM discusses and proposes training actions in methodological areas, suggesting possible trainers.

ACSM members belong to different academic and professional environments covering almost all methodological areas applied in an official statistics context. Since 2017, the Committee has been renovated three times. So far, the Committee has involved representatives of Statistical Institutes and Universities from all over the world: Italy, Canada, U.K., Norway, Estonia, the Netherlands, Australia. Until now, the ACSM has granted its support to 46 Istat strategic projects.

2.1.1 Istat annual workshop on methods for official statistics

This annual event, organized with the support of the ACSM, has the objective to gather researchers on statistical methodologies applied in the official statistics context from the academia and statistical institutes, in order to promote exchange of ideas and good practices on the methodological research issues applied in the official statistics context.

The two past workshops[1] focused mainly on understanding the impact of new data sources (big data and more in general non-probability data) and new methods (e.g. machine learning) for official statistics production. The workshop consists of three or four one-hour master classes by leading statisticians from NSIs, National and International Universities, and Eurostat, and about 10 talks on specific topics (e.g. methods for multi-source data; methods for non-probabilistic data; machine learning for official statistics etc.). The workshop is held in mixed-mode with the possibility to interact remotely. The sessions' recordings are made available on-line, and after the event the proceedings are published (e.g. Istat, 2023).

The workshop represents an important occasion for Istat researchers to share their research results, discuss methodological solutions and explore possible areas for collaborations with the academic world.

2.2 The Innovation Laboratory - LabInn

The Innovation Laboratory (*Labinn*) is one of the infrastructures that Istat has set up to respond to the evolving need for statistics, to improve the quality of production processes and

[1] First workshop web site: https://www.istat.it/en/archivio/277812

Second workshop website: https://www.istat.it/en/archivio/288564

to strengthen the research and innovation in the Institute. Labinn provides very strong and high-performance computing infrastructure for testing ideas in a dedicated location, as well as the chance to dedicate time to research.

Every year a call for projects to collect innovative ideas is launched. To enter the Labinn, a review process of the projects is carried out by subject matter experts, computer scientists and methodologists. Within Labinn, a collaborative experience is fostered in which distinct skills and expertise are integrated.

Enhancing the function of research through partnerships with the research community outside of Istat, primarily the university, is another of Labinn's objectives. External collaborations foster and facilitate the fruitful process of interaction through the establishment of a network of knowledge, research and innovation that strengthens the virtuous circuit in which the Institute is embedded through partnership agreements, conventions with other research bodies and organizations at the national and international level.

As discussed in the following, research protocols are signed for the implementation of research projects carried out jointly by Istat and other recognized research organizations. Currently, only Istat researchers in the protocol may access data. The partner institution, usually universities, provides methodological support. The Research Committee has initiated activities to check with the Data Protection Officer, the Legal Affairs Service and the IT Infrastructure Management Service, the possibility of allowing physical access at Istat's premises to data by external researchers. The discussion clarified that from a legal point of view, it is possible; concerning the IT architecture, one could leave the structure of the current Labinn unchanged and use a device dedicated to outsiders and that does not allow access to the institution's Internet or intranet. This new way of accessing data related to research protocols should be the subject to a privacy risk assessment. Further analyses on this issue are still in progress.

3. Protocols and research partnerships

One of the most well established ways at Istat to carry out scientific collaborations with public and private research bodies, including foreign ones, is to undersign agreements, protocols and partnerships based on common scientific research and innovation purposes. Collaborations are established through agreements or contracts that represent structured frameworks where roles, responsibilities and areas of mutual interest are defined. Such agreements are non-onerous transactions, that is, they may provide for any financial movements between the parties only by way of reimbursement of expenses or financing, without profit margins.

This kind of agreements involve applied research projects in social, economic, territorial and methodological research fields, and has the main advantage to allow for sharing not only applied and theoretical results, but also some types of data, under the legal constraints ensuring data privacy. Such collaborations contribute to the production of public value and to the achievement of institutional performance, and are part of the of Istat's operational planning process.

As an example of research collaboration in the methodological area, Istat is at present carrying out a research protocol in the area of applied methodologies with several Italian universities. The joint research project lasts three years and will end in mid-2025 and includes the universities of: Perugia, Alma Mater Studiorum of Bologna, Scuola Superiore Sant'Anna of Pisa, Sapienza University of Rome. The study is aimed at the application of new methods of predictive estimation and evaluation uncertainty for the production of indicators for municipal and sovra-municipal territorial domains based on the integration between survey data and data from administrative sources. A first objective of the project, which essentially concerns social surveys, is to update, adapt and test methodologies already applied by Istat as part of the new data production process based on registers. In particular, this objective focuses on the study of Small Area Estimators (SAE). Another equally ambitious objective of this joint project is to study new methodologies for the new production process, in particular aimed at quantifying the uncertainty for register estimates. We remember that Istat's new data production model, launched in last years with the Institute's modernization process, combines information from non-probabilistic sources with that observed through sampling surveys, systematized through the Permanent Censuses. This new production approach opens new and important perspectives and lines of methodological research that affect many, if not all, phases of the statistical data production process. The research project starts from these assumptions and has the ambitious objective of taking up the challenge of identifying and proposing new SAE methodologies. Furthermore, we highlight the important study underway with La Sapienza University to formalize experiments and compare different methodologies for quantifying the uncertainty associated with the estimates produced, especially in case of inferences produced through the integration of different data sources.

Another major example of collaboration on methodological developments between universities and NSIs at the European level is the research project called “A Life Course Dynamics Approach for Non-Standard Employment” established between Istat, Statistics Netherlands and the Vrije Universiteit Amsterdam, having a duration of five years (from 2022 to 2027). This research investigates the effects of measurement errors on employment contract data and mobility trends across time. It combines data from the Employment Register

and the Labour Force Survey comparing employment data from 2016 to 2021 between Italy and the Netherlands. The project aims to assess the effect of measurement errors within each country using a multiple-group hidden Markov model, enabling meaningful cross-national contrasts. It is worth adding that the possibility of extending the collaboration to the problem of evaluating the accuracy of the estimates produced with this type of model is currently being evaluated.

4. Education and training

A prominent role in the interaction between Istat and the academia is played by training activities, especially those devoted to actions on highly specialised themes that can boost Istat research activities while aligning methods applied in data production processes to those referenced in the most recent scientific literature. As far as the methodologic area is concerned, most of these actions are performed under the Istat Advisory Committee on Statistical Methods. Since 2017, the ACSM, in collaboration with the Istat training office, has organized master classes held by members of the Committee as well as by external prominent academic researchers. Up to now, the topics covered by the 16 master classes are typical methodologic themes in an NSI: sampling and estimation (with classes on small area, Bayesian approaches, graph sampling or the use of social networks), data integration, statistical disclosure, dealing with non-response. In 2024, two master classes are in schedule: one on the analysis of longitudinal data and the other one on spatially balanced designs. Slides and, possibly, master classes recordings are available on the institutional web site[2].

Outside the Institute, Istat actively participates in the European Master in Official Statistics (EMOS[3]). Among other objectives, EMOS aims to "*educate students in official statistics and data science to become highly skilled statisticians with expertise in official statistics, and facilitate the exchange of knowledge and experience between the European producers of official statistics and lecturers, researchers, and students in this field*." Istat researchers contribute to EMOS program with some courses held at the Sapienza University of Rome on quality, treatment of errors and missing data. Furthermore, every year Istat issues a number of training stages on statistical topics that university students can follow in order to enrich their academic portfolio or as a thesis for their graduation.

Istat is also planning to fund PhD positions in agreement with academic institutions on statistical methodologic themes: this action is planned to be enabled at the 2025/2026

[2] https://www.istat.it/it/ricerca-in-istat/organizzazione/comitato-per-le-metodologie-statistiche

[3] https://cros.ec.europa.eu/dashboard/emos-dashboard

academic year. A specific financing and administrative procedure is being developed, with the support of the Research Committee, aimed at establishing the formal acts with the universities.

5. Main problems and open issues

Fostering collaboration with academia is deemed extremely important at Istat in order to further develop and innovate the current statistical production systems, particularly in this phase characterized by an ever-increasing availability of new data sources and augmented IT capabilities, which are enabling factors to fasten research and to develop new methodologies for more timely and efficient official statistics.

In the paper, we described different types of initiatives put in place at Istat to facilitate and stimulate joint projects with the external scientific community to address research topics or methodological challenges for official statistics, with great advantages in terms of quality, robustness and accuracy of the methodological solutions developed.

One of the most relevant issues to be faced at Istat to facilitate joint research with academia is sharing data with external researchers, under the privacy requirements and regulations at National and European level. Data exchange is allowed under specific conditions, future work at Istat will be to enhance the available technical solutions to further facilitate join research and methodological developments allowing data sharing, starting from innovating the IT infrastructures and tools available in the Labinn.

An additional open issue is represented by the financing capacity and the administrative procedures of the Institute, that need to be further enhanced and extended in order to facilitate some types of collaborations between Istat and the academia, as in the case of PhDs agreements on common research topics funded or co-funded by the Institute.

A key issue having an impact on the collaborations between Istat and the external scientific community, including training and other forms of education, is the availability of human resources and skills, which should be strengthened especially in those research areas (particularly in the field of data science) most affected by innovative projects for official statistics. Collaboration with academia on training and enhancing skills for new official statisticians is actually a key area of investment at Istat (see for example Pratesi, 2023).

References

Istat (2023). Workshop On Methodologies For Official Statistics – *Proceedings*. Rome, Italy: Istat. https://www.istat.it/en/archivio/290538

Pratesi, M. (2023). Distance and in-person learning in statistical higher education: new opportunities for the NSI-academia partnership. 65th ISI World Statistics Congress. Ottawa, 16-20 July – more information https://www.isi-next.org/proposals/proposal/331/detail/