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1 Statistical ethics and the way forward in statistical practice (Andreas V. Georgiou)

1.1 Introduction and Summary

Statistics are involved in most aspects of today's societies: in government and other political and social processes, in the economy, and in the development of science and technology and of knowledge in general. The power and ubiquitous nature of statistics makes them vulnerable to a host of problems (e.g., manipulation, falsification, misuse) that are difficult to check and control. In the area of official statistics, there have been significant efforts to create institutional environments and processes aimed at safeguarding statistical principles and ethics. This paper discusses major modalities that have emerged in recent decades. It proceeds to show that these modalities are not adequate, not only because they lack global coverage/application, but for other fundamental reasons too: Official statistics is a global public good with inherent implications about its optimal quality. In addition, the institutional setting of the production of official statistics within the executive branch of government necessarily implies significant conflicts of interest and thus serious risks for the quality of statistics. The paper discusses the kind of substantial institutional reforms at national and international level that are necessary to safeguard ethics in the production of official statistics: They include creating, at the international level, a new agency to monitor the implementation of statistical principles and ethics in the production of official statistics in countries around the world and, at the national level, moving to institutional independence for the production of official statistics. Moreover, there is a need for a host of other safeguards of statistical ethics to be implemented by all countries. In the somewhat special case of the European Union, there is a need for a new integrated system of production of European statistics. Finally, international and supranational codes of ethics for official statistics need to be updated.

For statistical practice in general, besides official statistics, such as in business, political/social organizations and academia, the challenges are in some ways greater due to the multitude of decentralized statistical practitioners and the wide variety of settings for statistical practice. The

paper discusses various steps to strengthen ethics in the production and use of statistics. It is essential for society to methodically pursue the intensive cultivation of an ethical statistical culture. There is a need for widespread education about statistics and statistical ethics in particular. A tradition should be established for public commitments to professional statistical ethics by statistical practitioners as well as their various counterparts, at both the level of the individual and the level of the institution. In addition, organizations and businesses could establish statistical ethics boards that would oversee the implementation of ethics. Professional statistical societies should engage more in adjudication of issues of ethical statistical practice. The review process of professional publications could be further strengthened to support statistical ethics. Private auditors of statistical practice could audit the statistical work of organizations and businesses. Finally, statistical practitioners need to be more autonomous, and thus organizationally somewhat separate from the rest of the professional/research/scientific team they collaborate with.

1.2 Official statistics

In the area of statistical production that is official statistics the problem of potential manipulation, falsification and misuse has in recent decades been recognized as a clear danger and there have been efforts to create institutional environments and processes aimed at safeguarding the use of statistical principles and ethics in the production of this type of statistics. They inter alia include international and national codes of statistical ethics, supranational and national legislation, international statistical standards, and supranational and national institutions and processes. Below we discuss some of these major institutional modalities that have emerged in recent decades.

In respect of principles and ethics in the area of official statistics, the United Nations Fundamental Principles of Official Statistics (UNFP) have been a major reference point for the practice of official statistics since 1994, when they were adopted by the United Nations Statistical Commission (UNSD 2014). In 2014, the UNFP were enhanced with a useful preamble and were adopted by the General Assembly of the United Nations. This indicated the – albeit only very recent – recognition at the global level that reliable and objective official statistics are crucial for decision making.

Currently the implementation of the UNFP is monitored via a survey conducted every ten years by the United Nations Statistical Division (UNSD). The survey sent to country authorities is processed by the UNSD and its aggregated results are presented at the United Nations Statistical Commission. The current system of monitoring implementation of the UNFP is thus based on potentially incomplete or potentially biased evidence provided through self-assessment.

Moreover, while the UNFP have been useful as a reference point, it became clear overtime that more was needed in terms of coverage and specificity of statistical principles/ethics, as well as detail regarding best practices. For example, more was needed regarding naming and directly addressing the statistical principle of “professional independence” in the production of official statistics, about which the UNFP are completely silent.

In this context and spurred by the crisis in European Union official statistics – European statistics – in 2004, which was triggered by the uncovering of the misreporting of Greece’s deficit and debt statistics used for Greece to adopt the euro, the European Statistical System adopted in 2005 the European Statistics Code of Practice. This was a significant evolution of the UNFP in terms of coverage, specificity as well as boldness with regard to professional ethics for official statistics producers. For example, principle 1 of this Code of Practice is about “professional independence” and goes to some length in providing 8 specific criteria that have to be met to effectively support professional independence (Eurostat 2017). Nevertheless, a close reading of the European Statistics Code of Practice reveals that in some areas discounts vis-à-vis available best practices were adopted for seemingly political reasons, as for example, in the area of privileged pre-release access to official statistics, where policymakers and others are still allowed to potentially have such access. Codes of practice similar to the European Statistics Code of Practice were also adopted by other national and supranational entities around the world, such as the UK’s Code of Practice for Statistics, which was adopted in 2009 (UK Statistics Authority 2018).

There also exists legislation in many countries that has been built up in recent decades and provides for the production of official statistics. These national statistical laws can inter alia provide the legal basis and

the mandate for official statistical production; define the national statistical system (NSS); provide for the institutional setting of the national statistical office and its leadership, provide for the governance institutions of the NSS, and set the responsibilities of the national statistics office and other producers of official statistics. Very importantly, statistical laws often also provide for the statistical principles and ethics that official statistics producers are to observe. Statistical laws can do this both by direct discussion of such statistical principles and ethics in the law itself and/or by reference in the law to existing international or national codes of such principles and ethics, such as those discussed above.

In the supranational setting of the EU, there also exists such a statistical law – the statistical law of the EU, which is Regulation 223/2009 of the European Parliament and of the Council, as amended by Regulation (EU) 2015/759 (Regulation (EU) 2015). According to the precedence principle, this European law is superior to the national statistical laws of member states of the EU and should be observed in every member state of the Union.

There may also be specialized statistical legislation at national or supranational levels that provide for special topics in official statistics. For example, in the EU there is a large body of sectoral statistical legislation that provides rules for the compilation of official statistics in specific statistical domains. For example, Regulation (EU) No 549/2013 of the European Parliament and of the Council on the European system of national and regional accounts in the European Union provides the rules for the compilation of national accounts in EU member states. Beyond those laws, in the EU there can be manuals and guidelines that are provided by the statistical office of the EU, Eurostat, to deal with specific statistical compilation issues and have an enhanced legal status.

There are also international statistical standards set by the international community. International organizations, usually working together, produce these standards to be followed in the compilation and dissemination of official statistics in various domains. These international standards provide important frameworks within which supranational and national statistical laws and manuals are developed. For example, the current System of National Accounts, the 2008 SNA, was put together by the Intersecretariat Working Group on National Accounts,

comprising the European Commission, the IMF, the OECD, the UN and the World Bank, and was adopted by the United Nations Statistical Commission. It constitutes the framework within which the EU has developed and adopted the European System of Accounts (ESA 2010) in the form of the above noted Regulation (EU) No 549/2013. An example of a dissemination standard for some specific macroeconomic statistics is the Special Dissemination Standard of the IMF, which specifies periodicity and timeliness standards for these statistics.

There can also exist institutions and processes to provide (some) oversight of whether the rules of production of official statistics are followed. These rules can concern either statistical ethics/principles or the specific methodological rules of statistical production in a given statistical domain.

In the EU the institution that oversees the implementation of statistical ethics/principles in the production of European statistics is the European Statistical Governance Advisory Board (ESGAB). There can also be national level bodies, such as the Good Practice Advisory Committee of the Greek statistical system that was set up in 2013, that have as a goal the oversight of implementation of some basic statistical principles and ethics in the national statistical system. The work of such institutions can be supplemented by processes whereby the production of official statistics in a country may be scrutinized by international teams of experts regarding whether they follow statistical principles. An example of such processes is peer reviews. There have been two sets of peer reviews in the European Statistical System, in 2006-8 and in 2013-15 and all EU member states (and EFTA countries) as well as Eurostat had to participate in them. There have also been peer reviews in a number of African countries, in certain countries of the Latin American and Caribbean Region, and in a few other countries around the world, but they have been voluntary. Another example of such processes is the International Monetary Fund's Reviews of Standards and Codes (ROSCs) regarding statistical data. The ROSCs are also voluntary and usually get carried out once for a country with a possibility for an update some years down the road. However, these assessments reached their peak in the first decade of the 21 century and have been carried out less frequently by the IMF since then.

For countries in the EU there are some quality assessment procedures in place for European statistics they produce. However, only a small subset of all European statistics produced by member states are subjected to rigorous quality assessment by the statistical office of the European Union, Eurostat. These more rigorous and regular quality assessments are tied to the explicit use of the concerned statistics in the governance of the EU. There are also some other vehicles in the international area for assessing the quality of specific statistical data sets or specific aspects of them. One is offered by the IMF to its member countries, in the context of its Reviews of Standards and Codes (ROSCs). However, as noted above, these assessments are voluntary, usually get carried out once for a country, and have become infrequent in recent years. The IMF also monitors observance to its dissemination standards – such as the above noted Special Data Dissemination Standard – for certain macroeconomic statistics of countries that subscribe to those standards.

Finally, one might also mention the existence in a couple of countries of a certification process of official statistics. The process is aimed at providing a certification that a certain level of quality is achieved by the official statistics produced by a statistical producer in the country. In the case of the UK, such certification is carried out by the UK Statistics Authority. In the case of Greece, certification is carried out by the national statistical office itself (ELSTAT) and it concerns the statistics of the other producers of official statistics within Greece.

We have aimed to provide a sense of currently available arrangements for assessing and supporting the quality of official statistics, and in particular the implementation of statistical principles and ethics. We have noted the existence of codes of principles and ethics, statistical laws, sectoral statistical legislation, international and supranational standards and manuals, and bodies and processes aimed at assessing adherence to statistical principles and high statistical quality in general.

While the area of official statistics has displayed a significant evolution in recent decades, especially since the 1990s, by building the arrangements described above, what we have described should not convey the impression of solidity and adequacy. Specifically, this ‘web’ of arrangements is very far from covering every country of the world and doing so effectively. Not every country has a statistical law and not every such law, when it

exists, properly provides for the implementation of statistical principles in the national statistical system. Relatively few countries have national level institutions with the mandate to oversee the implementation of statistical principles. Quality assessment of statistical output provided by supranational or international entities does not apply to all countries, is not frequent and effective enough when it takes place, and – even if some domains of official statistics are assessed – many statistical domains are not subject to such quality assessment. Moreover, only a small subset of countries in the world have their implementation of statistical principles and ethics reviewed by supranational entities and processes.

The ‘web’ of arrangements is relatively dense in some parts of the world, e.g., the European Union, while in other parts of the world the ‘web’ is quite sparse. One might then be tempted to believe that the area of official statistics is on its way to address the issue of principles and ethics in the production of its statistics and that what is needed is just the spreading of best practices from some parts of the world, such as the European Union, to the rest of the world – the spreading and thickening of the ‘web’, so to speak, so that it effectively covers the global community of official statistical production.

However, the difficulties in addressing the issues of ethics and quality in official statistics are more formidable than that. There are significant challenges beyond the absence of global coverage/application of the arrangements we have described above. There are problems with the effectiveness of the arrangements themselves even when they are applicable to the official statistics of a given country. We would argue that the national, supranational-regional and international statistical systems are in need of significant further reforms and evolution, with changes that could be characterized in some areas as veritable paradigm shifts.

To see why there are significant challenges for official statistics, it is essential to recognize that official statistics is a public good. And it is not only a public good at the national level (e.g., the level of Germany), but also at the supranational level (e.g., the level of the EU) and, even further, it is a global public good, i.e., a public good for the entire world. The recognition that official statistics is a public good at various levels has significant implications and points the way to the kind of substantial institutional reforms at national and international level that are necessary.

Let us first turn to why official statistics is a global public good. Official statistics is a global public good as it provides non-excludable and non-rival benefits to all users around the world.¹

A public good in economic theory is characterized by non-excludability and non-rivalness. Non-excludability means that it is technically impossible or extremely costly to exclude any individual from the consumption of the good. Official statistics meets the criterion of non-excludability as official statistics are by the current practice characterizing them available to all users, irrespective of whether they have paid for these statistics or not.

The other criterion of a public good – non-rivalness – is the property of a good that prevents rivalry among its consumers because consumption of the good by any one consumer does not diminish its availability to other consumers. The appearance of new consumers does not lead to a correspondingly lower consumption by others, as is the case with private goods. Official statistics meets this criterion as the use of the statistics by one user does not prevent other users from using these statistics.

However, official statistics is not just a public good for a certain geographic region or for a nation state (which it is); it is a global public good in the sense that it is a good that is non-rivalrous and nonexcludable throughout the whole world, as opposed to a public good that exists as such in just one region or nation state. International financial stability, climate change mitigation, global public health issues such as the elimination of infectious diseases, curtailing the proliferation of weapons of mass destruction are some examples of global public goods. Official statistics and their quality would surely qualify as a global public good for the following reasons.

The demand for official statistics arises from the different types of users that exist and are the government and state administration of the country producing the specific statistics, but also those of partner countries in the region and of countries in other parts of the world (directly or through international organizations), the research/scientific communi-

¹ This analysis is from Georgiou (2017).

ty both inside and outside the country that produces the statistics, the domestic and international markets, the domestic public and the public of other countries. Thus, the demand for official statistics is represented by the marginal social benefit curve, which is the vertical sum of the marginal private benefit curves of users around the globe.

The supply side for official statistics is provided by the marginal social cost of producing these statistics. The government of a country that is producing official statistics is presumably estimating the marginal social cost. However, in the context of externalities, the marginal social cost may be different from the marginal private cost. In the specific case of official statistics the marginal private cost is the cost borne by the government actually producing the official statistics. The production of a certain level of quality of official statistics involves a positive externality: the production of an extra increment of quality in such statistics in country A reduces the cost of producing official statistics in other countries, as higher credibility of statistics in country A improves the credibility of statistics in country B. By the same token, if the quality of statistics in country A is low, then by association, country B's official statistics producer will have to work harder in order to avoid the perception of country B's official statistics being afflicted by the same predicament. Moreover, lower quality statistics in one country will lead to lower quality statistics in another country when counterpart data are used in the production of official statistics.

The intersection of the marginal social cost (MSC) line and the marginal social benefit (MSB) line corresponds to the globally optimal quality of official statistics Q2 (Graph 1). If, however, the production of official statistics is left completely to the devices of the national authorities, they will naturally tend to opt for producing official statistics with a lower quality, at Q1, which is corresponding to the intersection of the marginal private cost (MPC) line and the marginal private benefit (MPB) line. Quality at Q1 is less than the quality that is optimal from the point of view of the entire world, i.e., Q2.

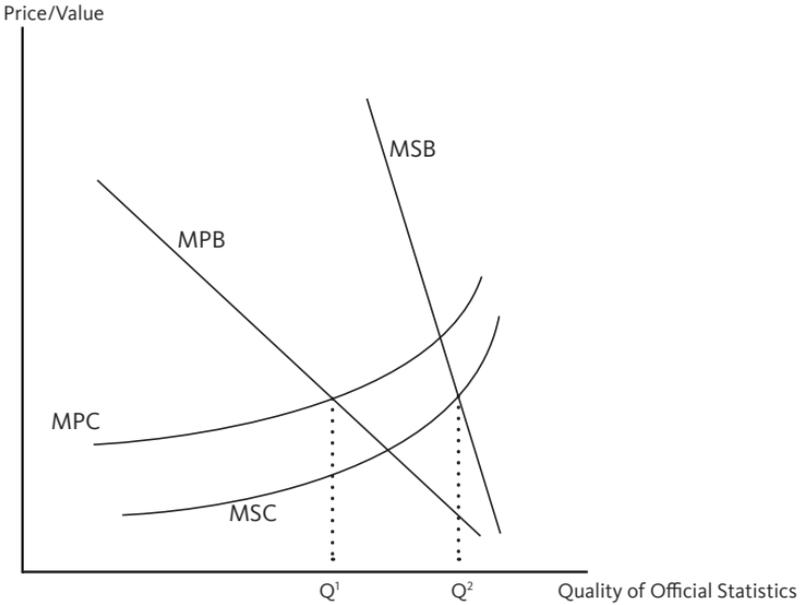


Abb. 1.1: Globally optimal quality of official statistics

All these matters because the net social benefit, represented by the area between MSB and MSC up to their intersection, is larger than the area between the MPB and MPC curves up their intersection. The global community is worse off if the quality of official statistics is left to the natural tendencies of national authorities. What is necessary is some important input from outside the country that pushes the national authorities to produce higher quality official statistics.

Besides the fact that official statistics is a global public good, there is another fundamental fact of official statistical production that must be taken into account in discussing the necessary reforms in official statistics. It is the fact that statistical offices or bureaus are virtually always part of the executive branch of government and, in many cases, they are actually a part of (embedded in) policy making bodies.² This implies significant risks for the implementation of international statistical principles during the production of official

² This analysis is from Georgiou (2018a) and Georgiou (2019).

statistics by such offices – risks for inter alia the principles of professional independence, impartiality and objectivity, and statistical confidentiality.

The risks arise because of a fundamental conflict of interest in this (current) institutional setting of official statistical production. Specifically, the risks arise because official statistics are a big part of the information by means of which the various branches of government carry out their roles in providing checks and balances to each other. Moreover, these risks arise because official statistics also make information accessible to the public, which inter alia allows citizens to assess the impact of policies, thus improving accountability of the branches of government for their performance. As official statistics are tasked with providing the various branches of government and the citizenry with the information that enables the checking of the work of various parts of government, a fundamental conflict of interest arises when the production of this critical information gets carried out by one of the branches of government that is being checked on the basis of this information.

With official statistics production taking place within the executive there are more risks that external pressures will materialize concerning statistical methods and outcomes, timing and content of statistical releases, and even with regard to statistical confidentiality. Very importantly, there are also more risks that official statisticians will anticipate the above pressures, or just the preferences and sensibilities (actual or perceived) of ‘political masters’ or ‘colleagues’ in the executive, and engage in self-censorship, self-repression and modification of their own behavior in their work as statisticians. And this can take place without overt pressure from any official or institution within the executive branch of government.

The above risks are mediated and amplified by administrative and resource dependencies of official statistics production on the executive branch of government. An example is hierarchical/authority/accountability relationships of officials in the statistics office with officials in a policy making body. Another example is control by a policy making body and by its policy officials of the provision to, and

use by, the statistics office of human, financial and other resources. Such dependencies create or amplify conflicts of interest.³

We have aimed to establish that official statistics is a global public good with inherent implications about its optimal quality. In addition, we have aimed to show that the institutional setting of the production of official statistics within the executive branch of government necessarily implies significant risks for the quality of official statistics, and in particular about independence, impartiality and objectivity in the production of official statistics. With these findings in mind we would like to now proceed to draw the implications for the adequacy of existing arrangements around the world for assessing and supporting the quality of official statistics, and in particular the implementation of statistical principles and ethics.

In brief, there is a need for a new international agency to monitor the implementation of statistical ethics in the production of official statistics around the world.⁴ At the national level there is a need to move towards institutional independence for the production of official statistics.⁵ There are also a number of other safeguards that need to be put in place much more fully than at present regarding the institutional and legal framework of official statistical production. In the somewhat special case of the European Union, there is a need for a new integrated system of production of European statistics. Finally, there is also a need for amendments to codes of ethics such as the UN Fundamental Principles of Official Statistics and the European Statistics Code of Practice. Below we discuss some of these needed reforms.

As a global public good, official statistics needs to be managed appropriately at the global level so as to achieve a socially optimal outcome from the point of view of the world community. Different types of global public goods require different types of international entities and legal frames to manage them. Therefore, the management of official statistics as a global public good would not normally be expected to fit into the

³ The role that conflicts of interest play in creating deep ethical dilemmas for various professions (e.g. accountants) has been recognized in behavioral economics (Ariely 2010).

⁴ This point is from Georgiou (2017).

⁵ This point is from Georgiou (2018a).

mandate of existing international entities. There is a need for an institution that will be the central operating vehicle of a system of monitoring the implementation of statistical principles and ethics in official statistics. The current system of monitoring the implementation of statistical ethics and thus of the quality of official statistics in individual countries is severely limited.

This is because it is effectively a system of voluntary self-assessment and self-monitoring and thus of limited reliability and usefulness. Moreover, the peer reviews that have taken place in a small subset of countries, although helpful, do not constitute, for a number of reasons, the appropriate long term solution to the issue of optimally managing the global public good of official statistics. Thus, effective monitoring of the implementation of statistical principles and ethics in official statistics, through regular evaluation, verification, follow-up and published reports in the form of audits by an independent international institution at the global level is essential for rigorous, timely and harmonized implementation of statistical ethics in the long run.

At the national level, anywhere in the world, the production of official statistics should cease being carried out by one of the branches of government, whose performance is being assessed on the basis of these statistics. Given that official statistics are tasked with providing the various branches of government and the public with the information that enables checking on the performance of various parts of government, the optimal setup for statistical production ought to avoid the conflict of interest that is inherent in the current approach of official statistics being produced by the executive branch of government.

In order to eliminate this conflict of interest and fully and sustainably observe the principle of professional independence of producers of official statistics, there should be institutional independence of the production of such statistics. Behaviors and practices consistent with professional independence are more likely to be followed in a sustained manner in official statistics production when such production is institutionally independent and not subject to the modalities

of institutional dependence characterizing the current approach of official statistics as part of the executive branch of government.⁶

Having argued that there is a need to move to institutional independence for official statistics production, national statistical systems around the world should also aim to implement some additional safeguards in a ‘belts-and-braces’ approach we advocate. These safeguards are necessary to ensure that official statistics are produced with professional independence, impartiality and objectivity as well as high marks in other aspects of quality. They inter alia include:

- Enshrining in law the implementation of statistical principles in the national statistical system, including in particular those of professional independence, impartiality and objectivity
- Governments publicly undertaking policy commitments to support confidence in official statistics by maintaining or improving conditions for the implementation of statistical principles
- Putting in place national level institutions with the mandate to report on the implementation of statistical principles and in particular the principle of professional independence
- Providing in law for appropriate selection procedure, term in office and termination procedure of incumbency of the head of the statistics office
- Providing in law for control by the statistics office of its human and other resources
- Quality assessment of official statistics output by supranational entities
- Review of implementation of statistical ethics and principles by supranational entities and processes

⁶ The issue of institutional independence of official statistics production as a distinct concept from that of professional independence of official statisticians is fundamental. The distinction is akin to the distinction between institutional independence and decisional independence in the case of the judiciary. Institutional independence of official statistics production is when the latter is independent from the executive, legislative or judicial branches of government. Professional independence is when official statisticians (i) have the sole responsibility for deciding on statistical methods, standards and procedures, and on the content and timing of statistical releases; (ii) have responsibility for ensuring that statistics are developed, produced and disseminated in an independent manner; (iii) are free from political and other external interference in developing, producing and disseminating statistics; and (iv) engage in the compilation of statistics solely based on statistical principles and statistical legislation in force, without letting any other concerns, including fear or favor, sway their statistical decisions.

It should be pointed out that some of the safeguards mentioned above actually constitute necessary conditions for extracting official statistics production from the executive branch of government and supporting its institutional independence. At the same time, the formal declaration and explicit recognition in law of the institutional independence of the production of official statistics would help bring about the appropriate and strong form of the above safeguards (such as regarding the control by the statistics office of its resources) and create a very firm basis for the effective implementation of these safeguards.

We now turn to the somewhat special case of the European Union – the supranational entity, which also needs a paradigm shift in the production of its official statistics.⁷ The system for the production of critical European statistics – i.e., the official statistics necessary for the governance of the Union and the functioning of its common market – is not adequate. It is important to note that European statistics are official statistics that are a public good at the level of the EU as a whole (besides being also a global public good). There have been significant crises in the European Statistical System (ESS) and there have been ex-post efforts to strengthen it over the past twenty years. However, these efforts have remained within the confines of the same paradigm: autonomous production of European statistics at the national level by member states under a self-regulatory approach, with some occasional external surveillance and quality assessment of member states' production of European statistics by Eurostat. Thus, while member states have moved to union mode in other areas, the ESS has remained in partnership mode, trying to produce an EU-level public good at national level. Moreover, the inherent conflict of interest in having autonomous member-state production of statistics, which are in turn used to apply EU rules to member states, can be expected to lead to recurring cases of differential application of the common statistical rules. Despite the efforts of many official statisticians and policymakers over decades, the current system of production of European statistics is lagging behind the needs of the times. Instead of being an enabling condition for the implementation of the current EU rules, it actually hampers the EU and creates vulnerabilities, leading to welfare losses for the EU. As well as being inherently incapa-

⁷ This argument is from Georgiou (2018b).

ble of consistently producing European statistics at the appropriate level of quality and harmonization, it is simply a costly system – financially and in terms of burden to survey populations – foregoing significant economies of scale and other possible efficiency gains.

A new, integrated ESS is essential for the current level of integration of the European Union. In addition, such a system is a precondition for any further integration of the EU. The new ESS would achieve the goals of assured and harmonized quality for European statistics, as well as of minimizing their cost of production and the response burden to survey populations, by integrating the production and dissemination of statistics, and engaging in all investment and innovation as a single organization.

Finally, we would like to note that there is a need to update international and supranational codes of ethics for official statistics to reflect, for example, the need to have both professional and institutional independence in official statistical production, and the need for complete equality of users in accessing releases of official statistics, eliminating pre-release access.

Thus, in the area of official statistics, while there has been a lot of progress over the past quarter century towards the support of statistical principles and ethics, there is still a long way to go with necessary reforms to achieve adequate and sustainable conditions of existence for these ethics.

1.3 Statistical practice in general

In areas of statistical practice beyond official statistics, such as in academia and business, the challenges for statistical practice are in some ways greater than in official statistics due to the multitude of statistical practitioners and the wide variety of settings for statistical practice. Such statistical practitioners currently depend to a large extent on their own devices if they want to engage in statistical practice with integrity and quality.

In these circumstances, a priority effort should be for society to methodically pursue the intensive cultivation and support of a statistical cul-

ture through the spread, study and espousing of professional statistical ethics, such as those included in the International Statistical Institute Declaration on Professional Ethics (ISI 2010) or in the American Statistical Association's Ethical Guidelines for Statistical Practice (ASA 2018).

A pillar of this effort should be education regarding statistics and their principles and ethics, starting with children and young people.

- Education at all grades, from elementary school onward, should include statistical ethics and basic statistical concepts and analysis. There is usually no argument that students should learn subjects such as basic mathematics and natural science, history, geography, economics and other social sciences as well as civics and philosophy. Understanding basic statistical concepts and techniques and in particular the ethics and principles of statistical practice would complement well and strengthen the above suit of standards subjects. This kind of statistical education is necessary not only for those who will become statistical practitioners but also for – a much more populous group – those who will become employers, clients, team colleagues, research subjects and users of the products of statistical practitioners. They all need to have a clear understanding of the ethics of statistical practice so that they can implement, expect and support ethical statistical practice.
- At the university level of education, consideration should be given to have a statistical principles and ethics course as a basic requirement for a degree in natural, health or social sciences.

Another pillar of the intensive cultivation and support of a statistical culture should be efforts on the part of businesses, organizations and research/academic establishments or parts thereof that are involved in some capacity with statistical practice, either as statistical practitioners or as users of statistical products. These organizations could consider certain arrangements for their staff. For example, they could have, as part of the orientation of new staff, workshops that (re)acquaint the new staff with the basic principles of statistical practice. Even better, all existing staff in the organization could be encouraged, or even required, to participate in such workshops, which would be a standard part of the training program offered to staff of the entity.

The commitment of the staff of an organization, business or research/academic establishment to statistical ethics could also be bolstered by the signing by all staff of a declaration of awareness of statistical ethics and of commitment to such ethical principles. Such a written commitment can be a powerful reference point for all involved – statistical practitioners as well as their counterparts, whether employers, clients, team collaborators or research subjects.

While the above opportunities for acquaintance with and commitment to statistical ethics should be available to the staff of organizations, businesses and research/academic establishments, there could also be explicit commitments to statistical ethics at the level of the institution. It is standard these days to have institutions issue and publicize their mission and vision statements. It would be sensible and appropriate for institutions that produce or use statistics to issue commitments to statistical ethics, as producers or users or both.

In the case of statistical practitioners operating as self-employed consultants or contractors there could be written and publicized commitments of these individual statistical practitioners. The same could apply to the employers/clients/research colleagues of these statistical practitioners. These commitments would aim to be reference points and reminders of the ethical principles that need to guide both the work of the statisticians and of those individuals they work with or for. Such explicit commitments would parallel those discussed above that would be signed by organizations and their staff.

Sources of inspiration for documents such as those we have discussed above would be international standards such as the above mentioned International Statistical Institute Declaration on Professional Ethics (ISI 2010) or the Ethical Guidelines of the American Statistical Association (ASA 2018). However, the documents could and should also address particular issues that may apply to the specific area of statistical practice at stake. The documents we advocate for would help achieve progress in the implementation of ethical principles in the production and handling of statistics. They would also help maintain and further increase confidence in statistics. They would help nurture an ethical statistical culture.

However, the above efforts by themselves would probably not be enough. To both supplement and facilitate the above efforts further steps are called for. There is a need to carefully think of further institutional setups and modalities that could be adopted by academic/research institutions, businesses, political and social organizations with the aim of supporting an ethical statistical culture.

There is sometimes the need to investigate and adjudicate issues of statistical ethics. It is interesting to note that committees on ethics of various national and international statistical organizations usually shy away from such investigation and judgment in specific cases. And this is not because there is no demand for such adjudication. There is a flow of demands and it could be much greater if there was a willingness to look into the cases. However, the answer usually is: "This sort of activity falls outside the scope of our committee, as we do not adjudicate." While such a function is not easy and requires the dedication of scarce human and financial resources, it is important that it exists. The American Statistical Association itself has recognized the importance of responsibly handling allegations of misconduct by dedicating part G of its Ethical Guidelines for Statistical Practice (ASA 2018) to the matter. Thus, there is a need to build up within professional statistical societies the institutional capacity, preparedness and, in particular, keenness to investigate and adjudicate issues of ethical statistical practice.

More broadly, organizations could establish statistical ethics boards/committees that could oversee the implementation of ethics within the organization regarding the area of statistics. Such boards would address issues on both the production and the use of statistics. They would be a place where complaints/allegations about misconduct could be presented, questions about ethical statistical practice and use could be put, and even statistical methods and approaches could be submitted to receive some formal opinion or certification.

There could also be private auditors of statistical practice that could offer their services to organizations to audit the statistical work carried out within the organizations and businesses. For example, a polling organization may find it useful to have its work audited by an independent statistical auditor that would carry out a data quality assessment for the polling organization. The audit would cover both the institutional

environment within which statistics are produced as well as the specific statistical processes used and even, on a sample basis, statistical outputs produced. The rationale for an organization to invite such auditing is that if the organization has the stamp of assessment by a statistical auditing firm, then its output could be more easily accepted by the public and the markets.

At this point, it would be important to also note the potential for further strengthening the review process of professional publications. Professional publications are an important locus of filtering of products of statistical practice as the publications' review process aims to ensure that only products that meet certain standards of quality get published. Professional publications need to ensure that their reviewers are fully aware of ethical principles and implement them in their reviewing.⁸ To perform their review function fully, reviewers must also explicitly address whether ethical principles have been met by the products of statistical practice they review. In addition, in order to support incentives for ethical statistical practice, editors and reviewers in professional publications could usefully change the composition of the types of articles that they decide to publish. For example, they could accept to publish more articles that aim to replicate the work of others. They could also accept to publish more articles that do not show 'positive' or 'significant' results and, in general, take steps to address various forms of 'publication bias'. These kinds of reforms would improve incentive structures and help reduce the incidence of phenomena of inappropriate statistical analysis and reporting. All the above require significant investments in time, effort and resources in general. There is arguably room for doing more than what is currently done in these areas.

Delving further into institutional setups and modalities that would help support ethics in statistical practice, the organizational setups and guidelines on the basis of which statistical practitioners and professional/research/scientific teams collaborate may need to change. Statistical practice is often conducted in teams made up of professionals with different professional standards. The statisticians must

⁸ For example, as provided for in the ASA's Ethical Guidelines for Statistical Practice (part F), the ethical reviewer (ASA 2018).

be supported to work ethically in these ‘nonhomogeneous’ environments. Changes should be considered regarding organizational setups and guidelines of work within such teams, whether these teams are operating within the setting of a large business or organization or they are teams of a couple of individuals working in an academic or research setting.

While in the majority of cases of statistical practitioners being embedded in teams of other professionals there are no untoward consequences, there are all too often cases where the statisticians are subjected to “requests for inappropriate analysis and reporting” that may mislead those who use the research findings.⁹ Behavioral economics also alert us that professionals such as accountants experience conflicts of interest. Thus, in the same vein, statistical practitioners working as part of professional/research/scientific teams would also be subject to such conflicts of interest and may under certain circumstances also engage – consciously or subconsciously – in inappropriate analysis and reporting, even without any explicit outside request (i.e., engage in self-censorship).

To be able to reduce the probability of the above – intentional or unintentional – phenomena, statistical practitioners must not feel dependent on the professional/research/scientific team they collaborate with and obliged to follow anything else but their own professional statistical ethics. To achieve this, statistical practitioners could usefully be organizationally separate from the rest of the team they collaborate with.^{10, 11} One possible institutional setup would be for statistical work to be done by statistical practitioners that are from outside the institution the research/scientific team belongs to. An intermediate approach would be to have the statistical practitioners belonging to a specific part of the institution that has its own specific standards, in a similar setup as an internal evaluation office or an internal audit office of an institution. In cases where such separation is not feasible (for example because it could

⁹ See, for example, Wang, Yan and Katz, 2018.

¹⁰ Statistical groups being distinct from the other professionals is consistent with the recognition in the ASA’s Ethical Guidelines (ASA 2018) that “other professions have standards and obligations, research practices and standards that can differ across disciplines, and statisticians do not have obligations to standards of other professions that conflict with these guidelines.”

¹¹ This would be in addition to public commitments to professional statistical ethics and other modalities to support ethical statistical practice, along the lines discussed above.

be the same person who is both the researcher and the statistician) there would have to be public disclosure that the statistical work was carried out by the research/scientific team itself.

The above discussion is not meant to be an exhaustive presentation of possible steps forward in the strengthening of ethics in the production and use of statistics. It is meant to stimulate a discussion and to hopefully provide some ideas that, when implemented in one form or another, can strengthen ethical statistical practice and improve the way statistics contribute to the world.

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Künstliche Intelligenz (KI) ist ein Paradebeispiel für wirtschaftliche, politische und gesellschaftliche Implikationen im Umgang mit Zahlen und Statistiken. Dieses Buch beschreibt die Auswirkungen im unternehmerischen Alltag auf Prüfung, Revision und Controlling.

Themen sind u.a.:

- Ethik in der Statistik und der KI-Forschung
- Analphabetismus im Umgang mit Wahrscheinlichkeiten und Risiken
- Zukunft der Wirtschaftsprüfung unter dem Einfluss der KI
- Spagat des Abschlussprüfers zwischen pflichtgemäßem Ermessen und evidenzbasierten Datenanalysen
- Akademische KI-Modelle und die Herausforderungen bei der praktischen Implementierung in Unternehmen
- Jahresabschlussfassung und -analyse mit KI
- Analyse des Iterationsverhalten von Ziffern zur Enttarnung von Umgehungsmanövern