Künstliche Intelligenz

Chancen und Risiken für Wirtschaftsprüfung und Finanzwirtschaft

Deggendorfer Forum zur digitalen Datenanalyse e.V. (Hrsg.)

IDW VERLAG GMBH

Vorwort

Auf dem 15. Deggendorfer Forum für digitale Datenanalyse behandelten Experten die Möglichkeiten und Grenzen des Einsatzes Künstlicher Intelligenz und statistischer Methoden.

Computer durchsuchen heute mit raffinierten Algorithmen Steuererklärungen, Unternehmensbilanzen oder Daten aus statistischen Erhebungen. Auf diese Weise finden sie Fehler, Manipulationen und Tendenzen in den Daten und schaffen so Grundlagen für immer schwerwiegendere Entscheidungen.

Aber kann der Mensch Algorithmen und „Künstlicher Intelligenz" das Denken überlassen? Wo kann das nützlich sein, wo gefährlich? „Algorithmen – Werkzeuge eines neuen Denkens?" hieß das Motto des Forums 2019. Hinter vielen Methoden der Künstlichen Intelligenz (KI) stecken Mathematik und Statistik. Deshalb waren Statistik und der Kampf gegen Manipulationen, Missverständnisse und der verantwortliche Umgang mit statistischen Aussagen zentrales Thema vieler Vorträge und Diskussionen des Forums.

Das Deggendorfer Forum richtet sich seit seinen Anfängen im Jahr 2005 vor allem an Mitglieder prüfender Berufe in Wirtschaft und Finanzbehörden, deren tägliche Aufgabe es ist, in immer größeren und unübersichtlicheren Datenbergen Fehler und Hinweise auf wirtschaftliche Risiken, versteckte Fallen und Manipulationen zu finden.

In diesem Jahr waren zwei besonders prominente Gastredner eingeladen worden. „Statistische Ethik und der Weg voran in der statistischen Praxis" hatte der erste Gastredner seinen Vortrag überschrieben. **Prof. Andreas V. Georgiou** hat nicht nur praktische Erfahrung im Erstellen komplexer Statistiken, er ist auch ganz persönlich von den Konflikten betroffen, die entstehen können, wenn jemand versucht, eine Statistik nach international anerkannten Kriterien und ethischen Prinzipien aufzustellen. Georgiou hatte viele Jahre beim Internationalen Währungsfonds Erfahrungen im Umgang mit Finanzdaten gesammelt, bevor er 2010 die Leitung des nationalen Statistikamtes in seiner

Heimat Griechenland übernahm. Die „Hellenic Statistical Authority“ (ELSTAT) berechnete unter seiner Leitung die staatlichen Finanzstatistiken des Landes neu und orientierte sich dabei vollständig am EU-Recht. Das Ergebnis waren stark nach oben revidierte Defizit- und Schuldenstatistiken.

Ohne auf seinen aktuellen Konflikt und juristische Auseinandersetzungen über seine Person einzugehen, hielt Georgiou ein flammendes Plädoyer für die Unabhängigkeit von Statistikbehörden. „Offizielle Statistik ist ein öffentliches Gut“, sagte er. Wie andere öffentliche Güter müssten statistische Daten eines Landes für jedermann auch ohne Bezahlung zugänglich sein. Er forderte internationale Qualitätskriterien für Statistiken und eine internationale unabhängige Behörde, die Regeln aufstellen und Prüfungen ausführen könne. Mangelhafte Statistiken eines Landes, so Georgiou, hätten nicht zuletzt Folgen auch für andere Länder, was sich aktuell beispielsweise in Auseinandersetzungen über internationale Finanzstabilität, Klimaschutz und militärische Sicherheit zeige.

Doch Statistiken müssen nicht nur korrekt erstellt, sondern auch richtig gelesen werden. Das war das Thema von **Prof. Dr. Gerd Gigerenzer** einem international vielfach ausgezeichneten Forscher auf diesem Gebiet. Er ist Direktor des Harding-Zentrums für Risikokompetenz am Max-Planck-Institut für Bildungsforschung in Berlin sowie Gründer und Gesellschafter von „Simply Rational – Das Institut für Entscheidung“. Zusammen mit dem Bochumer Ökonomen Thomas Bauer und dem Dortmunder Statistiker Walter Krämer betreibt er seit 2012 die Webseite „Unstatistik des Monats“.

Dort praktiziert Gigerenzer, was er in seinem Vortrag dringend anmahnte: „Risikokompetenz muss gelehrt werden.“ In eigenen Studien, so Gigerenzer, habe sein Institut festgestellt, dass selbst ein Großteil der Ärzte medizinische Statistiken nicht verstehe und deshalb Risiken falsch einschätze.

Mehrfach plädierte der Forscher für bessere Aufklärung über statistische Begriffe und deren Bedeutung, möglichst schon in der Schule. Meldungen, die statistische Angaben missinterpretierten oder dazu verleiten, sind zahlreich. Zu Gigerenzers Aktivitäten gehört es auch, Manager, amerikanische Bundesrichter und deutsche Ärzte in der Kunst

des Entscheidens und im Umgang mit Risiken und Unsicherheiten zu trainieren.

Mit den Möglichkeiten und Folgen des Einsatzes von Künstlicher Intelligenz in der Wirtschaftsprüfung befasste sich auch **Axel Zimmermann**, Geschäftsführer der Audicon GmbH in Düsseldorf. Er schloss sich der Definition von Künstlicher Intelligenz an, die Amazon-Chef Jeff Bezoz geliefert hat: In den vergangenen Jahrzehnten hätten Computer im Wesentlichen Aufgaben automatisiert, die sich mit klaren Regeln und Algorithmen beschreiben ließen. Moderne Techniken des maschinellen Lernens, genannt Künstliche Intelligenz, erlaubten es nun, dasselbe zu tun, wenn die Regeln nicht so ohne weiteres zu nennen seien. Zimmermann führte weiter aus: „Die Technologie wird viele Teile der klassischen Prüfung übernehmen." Das verändere die Tätigkeit des Prüfers „disruptiv", das klassische Modell der Abschlussprüfung stehe „zur Disposition".

Auch die diSCIS GmbH in Dreieich war dabei, Künstliche Intelligenz einzusetzen. „Unter Digitalisierung verstehen wir die Automatisierung von Routinetätigkeiten der Fachkräfte", sagte der Geschäftsführer **Knut Fischer**. Ziel sei, die „Kopfmonopole" und das Fachwissen der (Bilanz)-Experten „in die Maschine zu transformieren", damit den Mitarbeitern mehr Raum für das Querdenken und kreative Ideen geschaffen werden könne. diSCIS erwartet von der KI unter anderem, Informationen auch aus unstrukturierten Quellen wie etwa Fließtexten gewinnen zu können, Zusammenhänge zu erkennen oder automatisierte Entscheidungen zu treffen. Entscheidend für die Compliance sei, dass solche Entscheidungen stets transparent blieben. Knut Fischer sprach hier das „Vier-Augen-Prinzip" in der KI an. Das bedeutet: Einem lernfähigen System, das eine Entscheidung treffen soll, wird aus Sicherheitsgründen ein zweites, welches die gleiche Aufgabe hat, an die Seite gestellt. Wenn beide Systeme zu widersprüchlichen Ergebnissen kämen, so Fischer auf Nachfrage, sei der Mensch die letzte Instanz.

Ein KI-System darf nicht nur auf abstraktes Agieren festgelegt werden. Es müsse auch „konkret handeln und selbstständig agieren". So das Verständnis von **Siegfried Köstlmeier**, wissenschaftlicher Mitarbeiter am Lehrstuhl für Betriebswirtschaftslehre, insbesondere Finanzdienstleistungen, der Universität Regensburg. Für den Einsatz der KI

für finanzwissenschaftliche Aufgaben gilt es, häufige Fehler bei der Einführung von KI-Systemen zu vermeiden. KI darf nicht ohne klaren Mehrwert oder mit blindem Vertrauen eingesetzt werden. Es geht um Transparenz, Flexibilität und Praxistauglichkeit. Am Anfang muss daher eine klare Zielsetzung festgelegt und die an der Einführung beteiligten Personen identifiziert werden. Die KI soll auf die Zukunft, auf prognostische Analysen fokussiert werden, nicht auf den Rückblick, etwa das Controlling. Und natürlich muss klargestellt werden, wie viel Entscheidung an das System abgegeben werden solle. Für die Implementierung eines KI-Systems werden von Herrn Köstlmeier vier bis fünf Jahre veranschlagt.

Einen kritischen Blick auf den Einsatz der KI in der Wirtschaftsprüfung wirft **Prof. Dr. Ludwig Mochty**, der an der Universität Duisburg-Essen einen Lehrstuhl für Wirtschaftsprüfung, Unternehmensrechnung und Controlling innehat. Die derzeitige Praxis der analytischen Prüfung ist in „allen Teilschritten stark von Ermessensentscheidungen geprägt." Das pflichtgemäße Ermessen des Prüfers spielt dabei eine große Rolle. Aktuell wird noch wenig zwischen der Erhebung der Fakten und ihrer Auswertung getrennt. Praxis ist oft eine „intransparente Vermischung von Ermessen und überschlägiger Rechnung". Das hat Einfluss auf die Einführung der Künstlichen Intelligenz". Einen hohen Respekt vor dem Beruf des Wirtschaftsprüfers" vorausgeschickt, bleibt ein kritisches Fazit. Notwendig ist eine stärkere Trennung zwischen Befund und Urteil. Eine weitere Voraussetzung ist der Aufbau einer empirischen betriebswirtschaftlichen Wissensbasis nach dem Vorbild der evidenzbasierten Medizin zur Objektivierung der prüferischen Erfahrungen.

Stefan Rickert, Betriebsprüfer und Dozent für neue Prüfungstechniken am Finanzamt Wismar, stellt vor, wie man mit den Mitteln der Statistik der Manipulation von Zahlenreihen auf die Schliche kommen kann.

Rückert schildert nicht nur besonders interessante einzelne Fälle, sondern macht auf ein Grundproblem aufmerksam: „Die Finanzverwaltung hat in einem Rechtsstaat zweifellos ihre Prüfungsmethoden und Analysetechniken offenzulegen." Das muss so sein. Der Steuerpflichtige muss wissen, wie geprüft wird, aber er kann sich so natürlich auch darauf einstellen. Es entwickelte sich ein Wettlauf zwischen immer raffinier-

teren Formen der Manipulation und weiterentwickelten Prüfverfahren. Statistische Wahrscheinlichkeiten helfen der Finanzverwaltung dabei übrigens nicht. Geht so ein Wettlauf vor Gericht, muss das Finanzamt eindeutige Beweise liefern. Allein die Tatsache, dass Zahlen *mit hoher Wahrscheinlichkeit* manipuliert sind, genügt den Gerichten nicht.

Die Beiträge in diesem Buch beleuchten das Motto der Veranstaltung noch einmal in besonderer Weise. Dies war für die Autoren eine besondere zusätzliche Herausforderung, für die wir uns sehr bedanken.

Mein besonderer Dank richtet sich an die Kooperationspartner der audicon GmbH, der BDO AG, dab GmbH, DATEV eG und der Technischen Hochschule Deggendorf, die unsere Veranstaltung seit vielen Jahren unterstützen.

Für die Anpassung der schriftlichen Beiträge an ein einheitliches Layout bedanke ich mich bei Frau Elena Kellner, Studentin der THD, außerdem bei Frau Annette Preuß vom Verlag des Instituts der Wirtschaftsprüfer sowie bei meinem Mitstreiter Herrn Ernst-Rudolf Töller für die vielfältigen Anregungen, Diskussionen und wertvollen Kommentare.

Das nächste Deggendorfer Forum für digitale Datenanalyse ist für April 2020 bereits in Planung, bleiben Sie uns als Leser und Teilnehmer treu.

August 2019 Prof. Dr. Georg Herde

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.

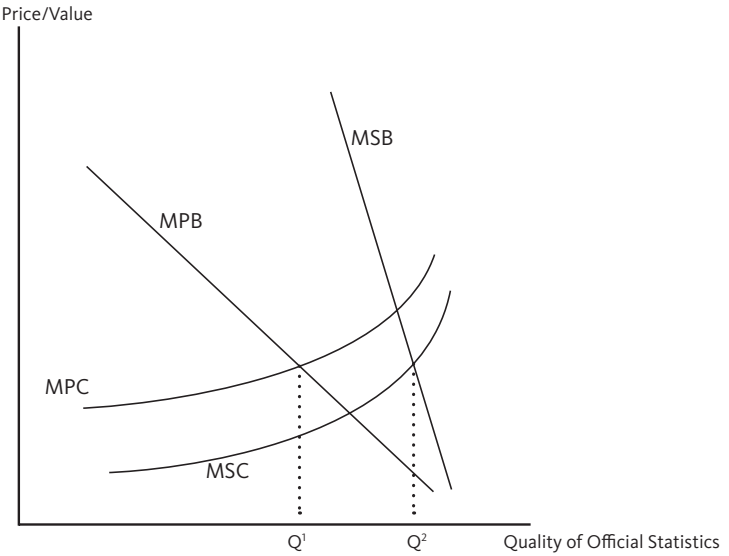

Abb. 1.1: Globally optimal quality of official statistics

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).