BANCA D'ITALIA

EUROSISTEMA

Questioni di Economia e Finanza

(Occasional Papers)

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by G. D'Alessio, R. De Bonis, M. Piazza, L. Infante, G. Nuzzo, S. Sabatini, F. Zanichelli, R. Gambacorta, G. De Blasio, S. Federico, J. Marcucci, L. Bartiloro and E. San Martini

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STATISTICS FOR ECONOMIC ANALYSIS: THE EXPERIENCE OF THE BANK OF ITALY

by G. D'Alessio*, R. De Bonis**, M. Piazza***, L. Infante*, G. Nuzzo*,
S. Sabatini*, F. Zanichelli*, R. Gambacorta*, G. De Blasio*,
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Abstract

The paper provides an overview of the main statistics produced by the Bank of Italy: financial accounts, monetary statistics, balance of payments, household and business surveys. The volume discusses the problems related to the measurement of economic phenomena, how statistics can be used for policy evaluation, the challenges for official statistics posed by globalization, the digital economy and big data. Finally, we show the policy adopted by the Bank of Italy for the dissemination of statistics and the role of the Research Data Center.

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STATISTICS FOR ECONOMIC ANALYSIS:
THE EXPERIENCE OF THE BANK OF ITALY

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1. Statistics at the Bank of Italy: an overview *
(G. D'Alessio, R. De Bonis and M. Piazza)

1.1. Introduction

The goal of this volume is to provide an overview of the statistics produced by the Bank of Italy for economic analysis. We will discuss the problems concerning the measurement of economic phenomena, underlining the links of statistical data with the methods employed in real-world analysis and with policy tools.

Measurement issues may appear quite technical and are often confined to the usually unread appendixes of economic reports. However, as the saying goes, the devil is in the details; understanding the way statistics are produced, their real meanings and their limits is essential for a deeper comprehension of economic facts.

In this introduction, we provide a historical sketch of statistics at the Bank of Italy, starting from the experiences conducted in the 20th century (Section 1.1); we then summarize the progress in statistics since the 1990s (when the European Monetary Institute – the predecessor of the ECB – was created) to nowadays, with the problems created by the marked rise of globalization, the explosion of the digital economy and the big data revolution (Section 1.2).

Sections 1.3 and 1.4 briefly examine the institutional framework in which the Bank of Italy operates and its specific functions; both these aspects strongly influence its statistical production along the two dimensions of "what" and "how" it is produced.

Statistics play a fundamental role in modern society. They influence the public debate, provide evidence of problems and suggest possible solutions. Statistical data may also help in the construction of more effective public policies, by introducing "objective" elements to which the planning and monitoring of government action can be anchored and helping the public opinion in the evaluation of the results achieved.

The proximity of statistics to political issues and the awareness that even a mere description of a phenomenon cannot avoid assuming one perspective rather than another imposes special attention to the theme of impartiality and, more in general, of data quality.

Section 1.5 explores in detail the various dimensions of data quality at the Bank of Italy. According to the Public commitment to European Statistics subscribed by all the national central banks in the European System of Central Banks (ESCB), data quality does not refer to the final output only (i.e. data must be accurate and reliable and their diffusion timely) but also involves the environment (i.e. statistics must be produced in a context where professional and scientific independence is ensured) and the process (i.e. the estimation methods employed must be adequate). Section 1.6 summarizes the content of the volume.

1.2. Statistics at the Bank of Italy in the 20th century

Statistics are a crucial tool for the studies carried out by the Bank of Italy (BI) as part of its institutional activity. Throughout its history, the BI has not only been a

*The authors would like to thank Silvia Fabiani and Laura Mellone for their useful suggestions. The opinions expressed in this book do not necessarily represent the views of the Bank of Italy.

regular user of the data published by other organizations, but has also been an active producer of statistics, both on banking and finance, and on businesses and households.

The BI's interest in statistics is long-standing. A few years after the Great Depression, in the second half of the 1930s, the BI started to collect banking statistics, in order to better carry out its main institutional functions of ensuring monetary and banking stability.

During the 1950s, the BI began to collect information on Italian joint-stock companies by conducting surveys of balance sheet items for a group of firms that was eventually enlarged from an initial core of 60 to more than 400. Over time, the survey progressively expanded to include data on investments as well, becoming what is now the Survey on Industrial and Service Firms, covering more than 4,000 sampling units. Since the beginning, this survey has proved to be a fundamental tool for an early understanding of the strategies and the problems of the productive sectors.

Paolo Baffi, Director General of the BI from 1960 and then governor from 1975 to 1979, gave a further boost to banking and financial statistics. Under his guidance, the Central Credit Register was created in 1964.

In 1964, the BI estimated the first full matrix for the financial accounts, consisting of a dual-entry table demonstrating, item by item, the financial flows among the sectors listed in the rows and columns. Since then, the publication has been issued on a regular basis and today it is one of the standard tools used to study financial flows and stocks in the institutional sectors.

In the first half of the 1960s, the BI developed another statistical instrument that has proved to be fundamental for analysing the economic behaviour of Italian households: the survey on household income and wealth (Baffigi et al., 2016). It was not the result of a sudden choice but the consequence of a long process started in the 1950s that benefited from the cultural and political environment of those years. Over the years, micro-level data derived from household surveys have given a remarkable contribution to our knowledge of household economic conditions, the preferences of individuals and the determinants of financial decisions, such as risk aversion and intertemporal preferences.

1.3. The silent revolution and other drivers of change

The BI's statistical production underwent a deep transformation in the last decade of the twentieth century, under the pressure of various factors.

The first factor that triggered substantial changes in financial and economic statistics was something that occurred inside the European Union. The Treaty on European Union, signed in Maastricht (1992), assigned to the European Monetary Institute (EMI) – the predecessor of the ECB, active between 1994 and mid-1998 - the task of promoting the harmonization of statistics in view of the upcoming establishment of the euro area. The statute of the European Central Bank made the new institution responsible for defining the statistics necessary for the conduct of monetary policy, assigning the collection of data to the national central banks (NCBs).

The main task of the preliminary work carried out by the EMI was the harmonization of the statistics required for the construction of monetary and credit

aggregates. Only homogeneous statistics enable aggregation for the euro area and comparison across countries.

The harmonization of a large number of statistical indicators produced in many countries, characterized by different regulatory frameworks and socio-economic contexts, turned out to be a very difficult operation. According to De Bonis and Piazza (2020), "in 1994, European banking statistics – which are the basic components of monetary and credit aggregates – resembled the Tower of Babel. Across countries, there were differences in the definition of banks; in the classifications of balance sheet items; in the coverage of statistics (i.e. the whole population of banks versus samples; in the frequency of statistics (monthly data vs. quarterly data); in the timeliness for reporting data to the central banks also varied".

On top of that, the EMI was also working in a situation of uncertainty over the data to be collected, as the definition of the monetary policy strategy had to wait for the birth of the ECB. Harmonization was therefore needed, but in which direction precisely?

The main choice made by the EMI was to collect data from monetary financial institutions (MFIs), the intermediaries that defined the new money-making sector. MFIs are institutions that collect deposits and/or close substitutes of deposits and that grant loans and/or invest in securities. MFIs include central banks, banks, money market funds and other institutions that collect deposits and provide loans.

Building on this first step that was essential for effective monetary policy-making, a whole programme for statistical data collection in the financial domain took shape, addressing step-by-step all the major non-bank financial intermediaries.

Further down the road, it was understood that more granular information was needed to properly give recognition to the heterogeneity of economic agents as well as to provide some flexibility in responding promptly to users' needs as they arose. Moreover, granular data provide more opportunities for the joint use of data from different sources.

A strong push in this direction also came with the global financial crisis, starting in 2007, which showed that more granular data were needed to better reconstruct interconnections and vulnerabilities across and within economies. The Great Financial Crisis acted as a notable driver of statistical action in another way too, by triggering international initiatives with strong support from policymakers. This was especially the case for the G20 Data Gaps Initiative (FSB-IMF, 2009, 2016) that had the objective of filling data gaps for financial stability analyses and policies highlighted by the financial crisis.

A further factor favouring the transformation of financial data collection was the change in the institutional architecture for micro- and macroprudential supervision. The Banking Union, especially the creation of the Single Supervision Mechanism in 2014, provided an impulse for the harmonization of supervisory statistics, also triggering a reflection on the potential for some streamlining of European data collection as a whole, along the lines drawn by the BI more than thirty years previously (Signorini, 2018). As maturity mismatches and asset/liability transformations proved to be key in financial system distresses, new harmonized statistical indicators of liquidity and leverage at micro and macro levels were developed for banks; moreover, due to the growing

importance of nonbank financial institutions (NBFIs), a more effective data collection for such intermediaries was implemented.

In more recent years, further pivotal drivers of change have emerged, namely digitalization, globalization and climate change.

Digitalization, and the big data revolution it produced, has two different types of impact on statistics. The first relates to its potential uses for statistical production, because we can produce new indicators, reduce time lags in the availability of statistics and exploit innovative data sources for the production of official statistics. While these new sources – called big data, and, more recently, non-traditional data – raise several conceptual challenges relating to their quality, stability, representativeness and access to data, as well as practical challenges relating to their security and confidentiality and even issues of interpretation of the results generated by artificial intelligence, it is clear that official statistics cannot afford to renounce the wealth of data produced today by the digital economy. During the pandemic, unconventional indicators produced by the private sector filled some gaps in official statistics, providing timely information on new social and economic dynamics as well.

A second aspect to be considered is that the use and exchange of data has become part of production processes and products: economic activity and economic welfare associated with digital products might be under-measured if statisticians fail to adapt their existing processes and/or to keep up with the pace of innovations. The debate regarding the economic value to be assigned within the national accounting schemes to new applications that are of great importance in people's lives, such as facebook, e-mail or twitter, is still open. According to some scholars, an underestimation of these elements could even explain the reduced GDP growth in recent years.

Globalization poses new challenges for statistical producers as well; the fragmentation of production makes the accurate measurement of cross-border flows difficult and blurs the distinction between internal (domestic or national) and external (foreign) economic activities; the distinction between resident and non-resident units – a key aspect for national accounts – is fading. Phenomena such as offshoring, transfer pricing and corporate inversion may make it extremely difficult to compile meaningful statistics.

Climate change, with the associated risk of a higher frequency and intensity of environmental disasters in the future (i.e. floods, landslides, fires, droughts and high temperatures), may have serious consequences for the economy and for the financial system in particular (Climate-Related Financial Risk); in order to contrast this trend, mitigation policies at the international level are required.[1] Both the risks linked to climate change and the opportunities linked to the transition towards a low carbon economy need for the construction of a system of statistics able to account for the underlying phenomena and monitor the progress towards the desired goals effectively.

The wide availability of data collected in several heterogeneous forms has highlighted the role of data integration.

[1] "Climate Action - Take urgent action to combat climate change and its impacts" has been included as one of the Sustainable Development Goals (SDGs) in the United Nations 2030 Global Development Agenda,.

The BI was a pioneer in the integrated approach to reporting schemes for banks where the main information needs of the central banks are - whenever possible - summarized in a single framework, requiring a single statistical return from banks, an approach that is currently being pursued at the European level too. This approach ensures consistency across datasets derived from this source and reduces the burden of reporters and the need for burdensome *ex-post* data reconciliation. Moreover, the adoption of a shared corporate statistical data dictionary makes a semantic integration among sources possible, thus favouring the comparability of data collected through different procedures and allowing a multi-purpose use of data collected for different needs (e.g. for monetary policy, supervision, financial stability, payment system oversight and consumer protection). [2]

The process of data integration has led to the creation of a corporate statistical data warehouse (DWH), grouping most of the aggregate statistics produced by the BI (Casa et al., 2022). The statistical DWH constitutes the core of the dissemination policy of statistical data that feeds both the automatic production of most statistical publications and the web applications for the data retrieval and visualization made available to the users.

In recent years, the strategy of data integration has also been extended to sample surveys. While the need for international comparison of survey data has grown over time, calling for greater coordination across countries, the role of the big surveys on firms and on households has been progressively taken over by a complex system of heterogeneous sources of microdata, combining structural surveys, high-frequency polls, administrative or commercial records and unstructured data.

The growing availability of microdata has led to the creation of a Research Data Centre (RDC), an infrastructure devoted to the management of this particular kind of data, concentrating statistical expertise for its treatment.

The RDC has two main goals. For external users, it is the centralized point of access for the microdata that the BI makes available to external researchers and other institutions, exclusively for research purposes. The data are provided to users anonymously and in full compliance with the data privacy regulations.[3] Such an "open data" strategy, allows the replicability of internal analyses, thus strengthening the scientific credibility of the BI, and permits external researchers to conduct autonomous studies in fields of common interest. The availability of data outside the BI can also have positive side effects on the quality of the data, by encouraging more scrupulous behaviour on the part of the producers and allowing the suggestions received from users to be incorporated. The data are provided to users in compliance with the data privacy regulations.

[2] https://www.ecb.europa.eu/stats/ecb_statistics/co-operation_and_standards/reporting/html/index.en.html.

A first version of the 'Matrice dei Conti' was issued in 1974 and a second one in 1989: since then, the data used for monetary policy as well as for supervision are reported according to a single framework.

[3] The BI does not provide users with direct identifiers of respondents (i.e. names, codes) nor does it provide very detailed information that could allow respondents to be identified indirectly. In cases (e.g. firm data) where anonymization could not fully safeguard the confidentiality of respondents (e.g. due to the presence of outliers), the BI adopts a remote processing system which allows researchers to process elementary data, ensuring that individual information cannot be visualized.

For internal users, instead, the RDC is the infrastructure where both internally produced and externally acquired data (i.e. Istat, OECD, and so on) are collected, documented and made available to researchers. As a result, the RDC is a repository of data, metadata and documentation derived from surveys, administrative data and other sources of microdata.

1.4. Statistics at the Bank of Italy and the institutional framework

The BI's statistical activities have been always influenced by the national and the international context. Nowadays the BI is part of the European System of Central Banks (ESCB), made up of the European Central Bank (ECB) and the National Central Banks (NCBs) of EU Member States. This framework strongly orientates the statistical production.

The ESCB's statistical function is based on a legal mandate to collect all necessary data in order to produce and disseminate statistics in the area under the ESCB's responsibility. The role of promoting the operational and strategic cooperation inside the ESCB is assumed by an internal Statistical Committee (STC). More specific forms of collaboration inside the ESCB are carried out by working groups and task forces.

The BI is also part of the Eurosystem, i.e. the system of euro-area central banks responsible for conducting the single monetary policy. It comprises the ECB and the NCBs of the EU member states that have adopted the euro. In January 2022, the Eurosystem includes 19 countries (Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia and Spain) out of the 27 countries belonging to the ESCB.

The BI also contributes to the official statistics within its national framework. In Italy, in 1989 a law set out the principles and guidelines for the reorganization of public statistics, creating the National Statistical System (SISTAN). The SISTAN is a network of National Statistical Authorities that provides official statistical information. It assures a uniform institutional environment, the homogeneity of methods and the rationalization of the processes of official statistics through an organizational and functional coordination plan, involving the entire public administration at central, regional and local level. The task of coordinating the SISTAN is statutorily held by the National Statistical Institute (Istat) and its president is also the head of SISTAN.[4] The BI strongly cooperates with Istat by providing statistics within its sphere of competence, but is not part of SISTAN. This choice preserves the independence requirement of the central bank while at the same time favouring the development of collaboration.

At the European level, there is a similar relationship between NCBs and National Statistical Institutes (NSIs). The ESCB is not part of the European Statistical

[4] The statistical activity of the SISTAN is subject to supervision by the Commission on Quality Assurance of Statistical Information (COGIS). The COGIS has the task of monitoring the impartiality, completeness and quality of the statistical information produced by the SISTAN, and the compliance of the statistical information with the regulations, directives and recommendations of international organizations. It also contributes to ensuring compliance with the legislation on statistical confidentiality and data protection. It also expresses an opinion on the National Statistical Programme, which establishes the statistical activities of public interest entrusted to the SISTAN and the related objectives. One member of the COGIS is usually from the BI.

System (ESS), a partnership involving Eurostat and NSIs, but closely cooperates with it. In fact, European laws have underlined the institutional separation between the ESS and the ESCB and have clearly defined both systems as producers of official European statistics, endowed with autonomous statistical powers and separate governance structures. European macroeconomic statistics are developed, produced and disseminated by the ESS and the ESCB within their respective spheres of competence.

The Committee on Monetary, Financial and Balance of Payments Statistics (CMFB) is the forum for promoting the coordination of statisticians from NSIs and Eurostat on the one hand, and NCBs and the ECB on the other. The production of the Balance of Payment (BOP) statistics has also been influenced by changes in the institutional framework. Up to the end of 2007, these statistics were produced by the BI in cooperation with the Ufficio Italiano Cambi (UIC), which used to collect data on payments (settlements) to and from abroad, made on behalf of third parties, mainly from banks. After the suppression of UIC and its incorporation into the BI, which occurred at the beginning of 2008, the BI began to carry out this task autonomously. In connection with this change, the data collection system for compiling the BOP was radically innovated, resorting to a mix of sample surveys on firms, reports from banks and entities supervised by BI, and administrative sources for other subjects. Such a thorough review has contributed to tackling the development of cross-border operations following liberalization and given the opportunities provided by new technologies, with the consequent progressive deterioration of the quality of systems based on banking statistics.

1.5. The functions of the BI and its statistical production

The statistical production of the BI is closely connected to its institutional functions, which are designed to ensure monetary and financial stability, indispensable conditions for lasting economic growth. More in detail, the BI:

- contributes to the decisions on the monetary policy of the euro area and performs the tasks entrusted to it as a national central bank in the Eurosystem;
- promotes the smooth functioning of the payments system through its direct management of the main circuits and by exercising oversight powers of guidance, regulation and control;
- is the designated National Competent Authority (NCA) within the framework of the Single Supervisory Mechanism (SSM). As the national supervisory authority, it seeks to ensure the sound and prudent management of intermediaries, the overall stability and efficiency of the financial system, and compliance with the rules and regulations of those subject to supervision;
- is the National Resolution Authority, and carries out the preliminary and operational tasks envisaged by the Single Resolution Mechanism for European banks in difficulty;
- performs services on behalf of the State by carrying out treasury operations (public sector receipts and disbursements), acting as agent for the public debt, and combating usury;

- is responsible for producing the quantity of euro banknotes established by the Eurosystem, managing the currency in circulation and combating counterfeiting;
- promotes consumer protection, fair and transparent relations between intermediaries and customers. and implements financial education initiatives for students and adults;
- offers its advice to Parliament and Government on economic and financial matters.

In order to increase the effectiveness of its performance of monetary policy tasks and other institutional functions, the BI undertakes a large volume of analysis and research in the economic, financial and legal fields. The collection of data and the production and the dissemination of statistics form the basis on which economic analysis in the BI is conducted.

The use of statistics is firstly necessary to help make informed decisions in the economic and financial field. «Know before deciding» is one of Luigi Einaudi's most famous quotes, Governor of the BI from January 1945 until May 1948, and then President of the Republic until May 1955.

Statistics are also useful for establishing a dialogue with citizens, businesses and institutions. Through statistics, the BI accounts for its actions because the evidence motivates the decisions taken (accountability). According to Alexandre Lamfalussy, President of the European Monetary Institute (EMI) from 1994 to 1997, "When monetary policy measures cannot be justified and explained through statistical data, the measures will not be understood, and the executing institutions will lose credibility … and credibility is one of the most treasured assets of a central bank".

More in general, statistics are important for democracy. On the one hand, the availability of statistical indicators introduces objective elements to which the planning and monitoring of government action can be anchored. On the other hand, the evaluation on the part of the public regarding the achievement of the objective is supported by data.

In order for statistics to play this role, the statistical production must be entrusted to independent bodies, which carry out their work with accuracy and impartiality, producing high-quality statistics. It is also necessary to provide open and transparent access to basic information, also in order to guarantee as far as possible the replicability of official assessments by third parties.

1.6. The quality of ESCB statistics

Given the importance of statistics in the decision process, great importance is attached to quality. The Public commitment on European Statistics by the ESCB mentions 15 characteristics of quality belonging to three different areas: (i) the institutional environment, (ii) statistical processes and (iii) the output.

(i) Institutional environment

1. Professional independence. The independence of the ESCB is guaranteed by Article 130 of the Treaty and Article 7 of the Statute and implies that there is to be no political interference in the ESCB's performance of its statistical function. In accordance with the Statute, the ESCB shall not "seek or take instructions from EU institutions, bodies, offices or agencies from any government of a Member

State or from any other body". Moreover, the production of ESCB statistics must meet the criterion of scientific independence, which implies that the choice of sources, definitions, methodologies and statistical techniques for the development and production of ESCB statistics, as well as decisions about the timing and content of all forms of dissemination, must be guided solely by statistical considerations.

2. Mandate for data collection. The ESCB must have a clear legal mandate to collect information for European statistical purposes. This implies that it is empowered to impose sanctions on reporting agents that fail to comply with their obligations.
3. Adequacy of resources. Human and financial resources are commensurate with the statistical work programme.
4. Commitment to quality. The ESCB's statistical function systematically and regularly identifies strengths and weaknesses to continuously improve the process and product quality.
5. Statistical confidentiality. The protection of confidential statistical information collected by ESCB members that relates to single statistical units must be ensured.
6. Impartiality and objectivity. ESCB statistics must be developed, produced and disseminated in a neutral manner. Furthermore, they must be equally accessible to all users in order to maintain public confidence in the integrity of the policy decisions of which they form the basis.

(ii) Statistical processes

7. Sound methodology. ESCB statistical methodology must be based on ESCB and EU legislation and standards, and/or internationally agreed standards, guidelines or best practices.
8. Appropriate statistical procedures. Effective and efficient statistical procedures are implemented throughout the statistical production chain.
9. Minimization of the reporting burden. The ESCB must establish appropriate procedures to enable user requirements to be met while minimizing the burden on reporting agents.
10. Cost-effectiveness. The costs of producing ESCB statistics must be in proportion to their merits and the resources must be used optimally.

(iii) The output

11. Relevance. ESCB statistics must fulfil stated or implied user needs.
12. Accuracy and reliability. ESCB statistics must provide accurate and reliable information on the phenomenon that they are intended to measure. "Accuracy" can be defined as the closeness of the statistical output to the (unknown) true value of the variable that is being measured, while "reliability" refers to the closeness of revised estimations of a specific statistic to the initial value released.
13. Timeliness and punctuality. ESCB statistics must be timely and punctual, whereby "timeliness" refers to the time lag between the availability of the information and the event or phenomenon to which it relates and "punctuality" refers to the time lag between the actual date of release of the data and the date by when the data should be released.
14. Consistency and comparability. ESCB statistics must be consistent: (1) over time, (2) within the dataset that is published in a single release, (3) across datasets and

(4) across different frequencies for the same dataset; where appropriate, they must be (5) comparable with the statistics of other regions and countries.

15. Accessibility and clarity. Information on data and metadata must be presented in a clear and understandable form, as well as being easily and readily available to all users.

Whenever it is possible and appropriate, the applied criteria must comply with European and internationally agreed standards, guidelines and good practices, such as the System of National Accounts (2008 SNA), the Balance of Payments and International Investment Position Manual (BPM6), the International Monetary Fund's Special Data Dissemination Standard (SDDS), and the United Nations' Fundamental Principle of Official Statistics.

1.7. The content of the book

This book describes the production, dissemination and analysis of statistics at the BI. In section 2, we describe the Financial Accounts, their link with the system of national accounts and the way these statistics are used by economists and policy makers. In section 3, we provide a brief introduction to monetary and banking statistics, describing both their compilation and uses, following the approach routinely adopted by the Bank of Italy to promote a close link between statistics production and data interpretation. Section 4 shows the main characteristics of the balance of payments and analyses how the main figures are currently estimated and interpreted.

Sections 5 and 6 present the main characteristics and use of the sample surveys conducted by the BI on households and firms respectively, while section 7 illustrates the characteristics and the results of the survey on the financial literacy of the adult population. Section 8 completes this part by showing some examples of how microdata can be used formally to obtain evidence on policy measures.

Sections 9 to 11 analyse some issues of particular relevance for the current statistical production. Section 9 deals with international cooperation in official statistics, showing how it moved to a new dimension following profound institutional changes in Europe as well as the strong emerging trend toward more interconnected economies that requires a global picture for many phenomena; Section 10 shows how globalization and the digital economy pose new challenges to statisticians involved in the production of official statistics. Section 11 then presents some reflections on how big data can provide a significant contribution in the field of official statistics. Lastly, Section 12 describes in detail how BI statistics are currently provided to internal and external users and the role played by the Research Data Centre in the dissemination of microdata.

The topics analysed in this volume do not cover all the statistics collected and compiled by the Bank of Italy. The choice of topics mainly reflects the original focus of most statistical work on statistics for economic and financial analysis, in line with the original purpose of the contributions included here, i.e. as background documentation for the course on Bank of Italy statistics held since 2016 at La Sapienza University in Rome as part of the European Master's in Official Statistics (EMOS). This is a Master's programme, to which more than 30 Universities across Europe now adhere, to familiarize the graduates with the system of official statistics, production models, statistical methods and dissemination. There are other several important domains – such as payment statistics or supervisory statistics – that are becoming increasingly important

and that we do not discuss here in the detail they would deserve. Going forward, the content of these and other similar courses, and accordingly that of possible future editions of this volume, will likely reflect the ever-changing nature of statistical work.

A list of the most frequently used abbreviations is presented at the end of the book.

"It is the mark of a truly intelligent person to be moved by statistics": this sentence, attributed to George Bernard Shaw and/or Bertrand Russell, inspired our book.

Suggested readings

De Bonis R. and M. Piazza (2020), A silent revolution: How Central Bank Statistics Have Changed in the Last 25 Years, Banca d'Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 579.

Additional references

Baffigi, A., L. Cannari and G. D'Alessio (2016), Fifty years of household income and wealth surveys: history, methods and future prospects, Banca d'Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 368.

Casa M., L. Graziani Palmieri, L. Mellone and F. Monacelli (2022), The integrated approach adopted by Bank of Italy in the collection and production of credit and financial data, Banca d'Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 667.

Signorini L. F. (2018), Tra segnalazioni nazionali e reporting armonizzato europeo: rafforzare la cooperazione tra gli intermediari e le autorità, Opening address, workshop on "Strengthening cooperation between intermediaries and Authorities" ("Rafforzare la cooperazione tra gli intermediari e le autorità"), Banca d'Italia, 15 May.

2. An introduction to Financial Accounts *(L. Infante)*

2.1. Introduction

In this section we discuss the content of the financial accounts, their link with the system of national accounts and the way these statistics are used by economists and policy makers.

The financial accounts are part of the sequence of accounts represented in the national accounts (NA) and measure the amount of saving invested in the financial system by the institutional sectors. In the NA,[5] the economy is broken down into institutional sectors, grouping units with a similar economic role. Sectors are mutually exclusive, i.e. a unit that belongs to a sector cannot belong at the same time to another sector. The institutional sectors are:

- non-financial corporations
- financial corporations, which is in turn broken down into:
    - monetary financial institutions
    - other financial intermediaries
    - financial auxiliaries
    - insurance corporations
    - pension funds
- general government
- households and non-profit institutions serving households
- rest of the world

Figure 2.1 reports the sequence of accounts defined in the NA. Saving, i.e. the part of disposable income not used for consumption, may be used to acquire either non-financial assets or financial assets. Asset acquisitions are recorded in the capital account in the first case and in the financial account in the second case. If the saving is larger than the value of the non-financial assets acquired, the capital account – which measures the change[6] in non-financial assets – records a positive balance (net lending) and this positive balance signals that the remaining resources have been used to acquire financial assets.[7] Conversely, if the saving is not sufficient to acquire non-financial assets, the sector needs financial resources from the financial system and, consequently, the capital account records a negative balance (net borrowing).

The capital and financial accounts therefore are strongly connected, since their balance (net lending/net borrowing) is conceptually the same. If the capital account records a positive balance, namely positive resources after the acquisition of non-financial assets, these resources are used to acquire financial assets or to reduce financial liabilities. Consequently, the difference between financial assets and financial

[5] The compilation of the system of national accounts statistics follows specific rules that are described in the System of National Accounts handbook (SNA2008), or in the European System of Accounts (ESA 2010) handbook in the case of European countries.

[6] The acquisition minus the disposal of non-financial assets.

[7] In reality, a unit may decide to buy both a non-financial and a financial asset at the same time. If the amount of saving is not enough to cover the expense, that unit may resort to debt (i.e., to an increase in financial liabilities).

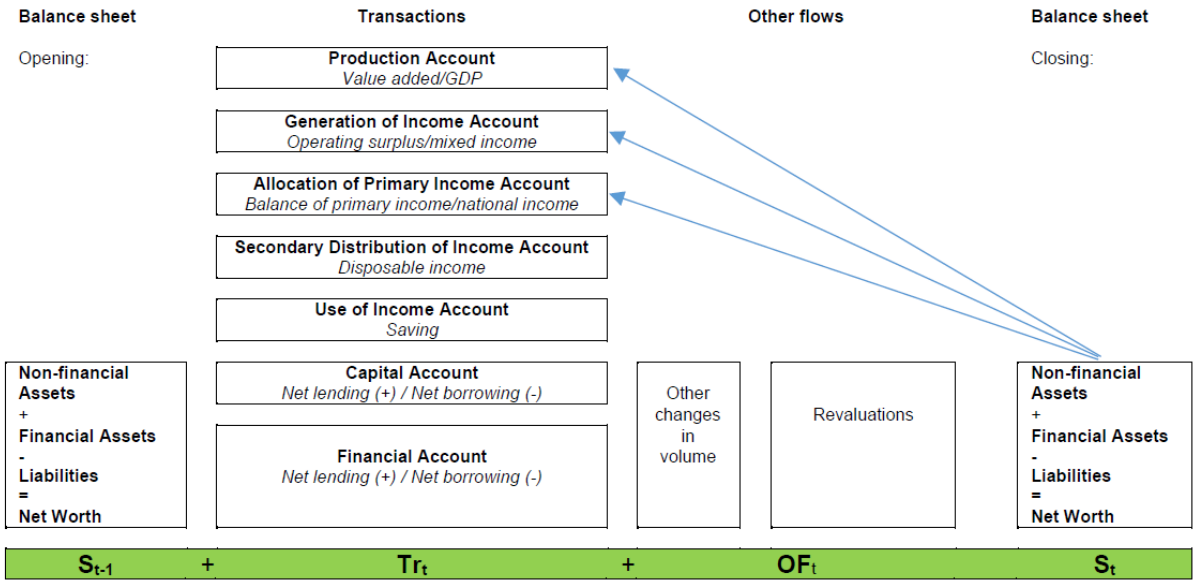
liabilities (the balance of the financial account) has to be equal to the balance in the capital account.[8] We may alternatively say that the financial account shows how the net lending from the capital account is invested on the asset side (e.g. by acquiring deposits, securities, shares or insurance technical reserves) or, symmetrically, the financial account highlights how the net borrowing from the capital account is financed by taking on liabilities (i.e. loans, securities).

The stocks of non-financial and financial assets (i.e. the sum of acquisitions made in the previous years, net of disposals) are recorded into the balance sheets. Both for non-financial and financial assets, the opening balance sheets at *time t* (S_{t-1}) plus the transactions (Tr_t) and the other flows (i.e. other changes in volume and revaluations on assets/liabilities held in *time t-1*; Of_t) gives the final value of balance sheets at *time t* (S_t) Figure 2.1).[9]

Balance sheets are connected with the transaction accounts, because the income generated by the holding of these assets is entered into the production account, the generation of income account, and the allocation of primary income account (i.e. dividends, interest on financial assets).

To sum up, the financial accounts are macroeconomic statistics that can be compiled for any institutional sectors, and report financial balance sheets[10] (stocks) and transactions (flows).

Figure 2.1 - The sequence of accounts



[8] While conceptually the balance in the two accounts is the same, in practice they present differences, due to the different data sources employed. The difference between the net lending/net borrowing reported in the capital account and the net lending/net borrowing reported in the financial account is called 'vertical discrepancy'.

[9] The sequence of accounts can be compiled for any institutional sector.

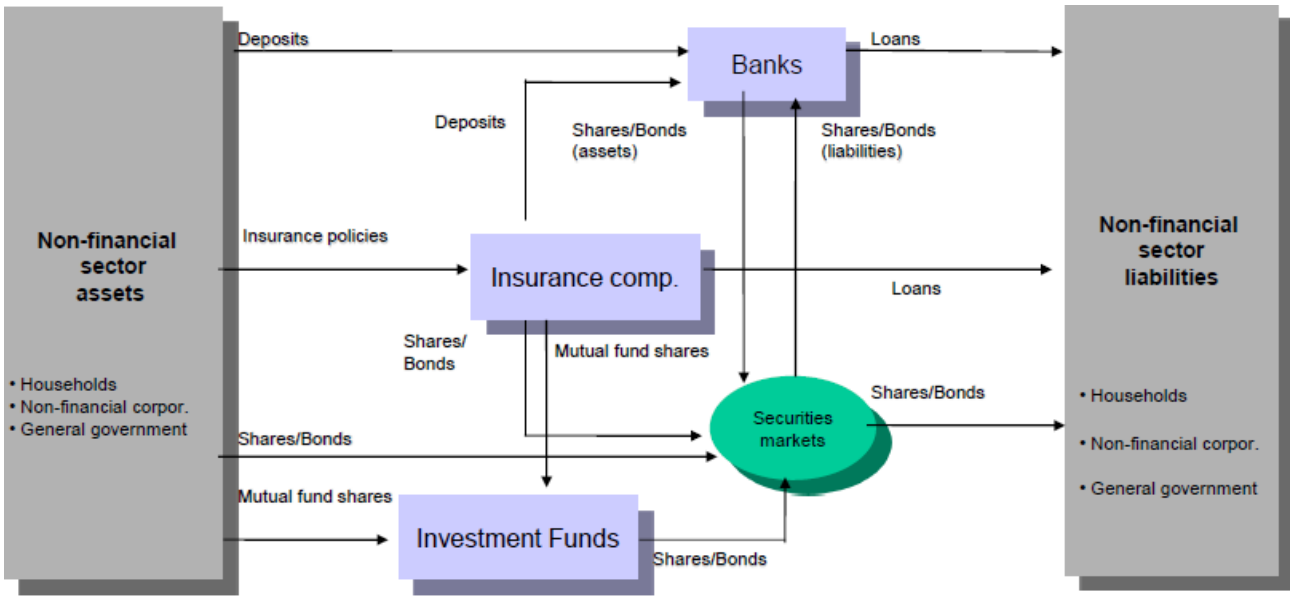
[10] The part of a balance sheet referring to financial instruments.

2.2. Financial account scheme

One of the goals of the financial accounts is to describe the functioning of a financial system from a macroeconomic point of view. A financial system is a complex network of relationships connecting units that have a surplus of financial resources with units that need those resources.

In the example reported in Figure 2.2, the units on the far left have a surplus of financial resources (they are net lenders) while the units on the far right want to obtain resources. These two groups may get in touch either directly through the financial markets or indirectly through financial intermediaries. A household investing part of its saving in shares issued by a listed corporation represents an example of two units lending and borrowing resources directly, without going through an intermediary. The most common case of financial intermediation is that of a household investing saving in a bank deposit; the resources collected by the bank in the deposit, in turn, are used to grant a loan to the corporation. In this second example, the household and the corporation get in touch indirectly through the bank, by means of two different financial instruments: deposits and loans.

Figure 2.2 - The financial system: a flowchart



Similarly, the decision by a unit to buy an investment fund share is another example of financial resources channelled to units indirectly, through the intermediation of an investment fund.

Table 2.1 reports an example of the Italian financial accounts, in particular, the table focusing on stocks at the end of 2019. Assets and liabilities are reported for 10 institutional sectors, broken down by financial instrument (in the rows). Since the financial accounts are compiled following accounting rules (see the next paragraph), for any instrument, the sum of assets across sectors must be equal to the sum of liabilities across sectors. As an example, the sum of "Currency and transferable deposits" on the

asset side across all the sectors must equal the sum of "Currency and transferable deposits" on the liability side across the sectors.

The rest of the world sector contains all the financial relationships that residents (Italians in this case) have with non-residents. For instance, deposits on the asset side of the rest of the world represent the amount of deposits collected abroad by (almost exclusively) Italian monetary financial institutions.[11]

The rest of the world sector is closely linked to another key statistic: the financial account of the balance of payments. In fact, the total assets of the rest of the world (which indicate the amount of financial wealth that non-residents have invested in Italy) must equal the total liabilities in the balance of payments; in a similar way, the total liabilities of the rest of the world must equal the total assets in the balance of payments.[12]

[11] Monetary financial institutions include the central bank, the depository corporations and the monetary investment funds.

[12] In the balance of payments, the assets and the liabilities refer to residents vis-à-vis non-residents, while in the financial accounts the assets and the liabilities are those of rest of the world vis-à-vis the resident economy. The sum of the asset side of all the resident sectors would end up in the asset side of the balance of payments, and the same principle would apply to liabilities. However, this comparison may be done only for total assets or total liabilities, since the balance of payments does not report the financial instruments described on the SNA, but rather follows a different classification.

Table 2.1

Financial assets and liabilities in 2020 (1)

(stocks in millions of euros)

	Institutional sectors									
	Non-financial corporations		Financial corporations							
			Monetary financial institutions		Other financial institutions		Financial auxiliaries		Insurance corporations and pension funds	
	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Monetary gold and SDRs	**–**	**–**	**128,560**	**7,751**	**–**	**–**	**–**	**–**	**–**	**–**
Currency and transferable deposits	**452,444**	**61,035**	**669,211**	**2,593,449**	**81,127**	**–**	**20,792**	**–**	**20,175**	**–**
with MFIs	402,625	–	380,536	2,593,449	76,754	–	20,735	–	18,969	–
with other residents	10,674	61,035	161,229	–	1,554	–	–	–	612	–
with the rest of the world	39,145	–	127,447	–	2,819	–	56	–	594	–
Other deposits	**26,423**	**–**	**585,010**	**1,400,637**	**140,563**	**..**	**87,458**	**–**	**492**	**–**
with MFIs	17,456	–	520,709	1,400,637	140,563	–	87,458	–	487	–
with other residents	..	–	4,831	–	–	..	–	–	–	–
with the rest of the world	8,966	–	59,470	–	..	–	..	–	5	–
Short-term securities	**1,643**	**2,598**	**34,869**	**..**	**13,502**	**27**	**8,174**	**–**	**9,982**	**–**
issued by general government	1,390	–	17,909	–	12,851	–	6,879	–	4,479	–
issued by other residents	..	2,598	..	..	27	27	..	–	..	..
issued by the rest of the world	253	–	16,960	–	624	–	1,295	–	5,503	–
Medium/long-term securities	**65,491**	**151,152**	**1,491,212**	**278,523**	**122,949**	**231,676**	**62,912**	**–**	**674,601**	**15,079**
issued by MFIs	2,772	–	79,541	278,523	10,237	–	1,721	–	16,108	–
issued by central government: CCTs	293	–	95,586	–	897	–	772	–	10,632	–
issued by central government: other	46,729	–	943,110	–	32,250	–	52,806	–	343,228	–
issued by local government	11	–	3,825	–	..	–	..	–	520	–
issued by other residents	2,012	151,152	173,887	–	14,880	231,676	366	–	17,072	15,079
issued by the rest of the world	13,674	–	195,264	–	64,685	–	7,247	–	287,041	–
Derivatives and employee stock options	**14,594**	**14,775**	**152,143**	**177,305**	**3,018**	**1,541**	**704**	**669**	**1018**	**602**
Short-term loans	**36,932**	**238,217**	**356,526**	**..**	**34,357**	**102,444**	**..**	**52,595**	**5**	**1,862**
of MFIs	–	151,953	356,526	..	–	52,081	–	52,589	–	817
of other financial corporations	–	19,849	–	..	34,357	–	..	–	5	..
of general government	–	–	–	–	–	–	–	–	–	–
of other residents	36,932	37,698	–	–	–	–	–	–	–	–
of the rest of the word	–	28,718	–	..	–	50,363	–	5	–	1,045
Medium/long-term loans	**35,952**	**877,730**	**1,445,844**	**67,635**	**310,470**	**121,396**	**..**	**7,878**	**2,352**	**11,046**
of MFIs	–	516,027	1,445,844	61,671	–	82,242	–	7,656	–	3,572
of other financial corporations	–	187,798	–	27	310,470	6,115	..	149	2,352	16
of general government	–	56,553	–	5,937	–	..	–	..	–	366
of other residents	35,952	20,708	–	–	–	–	–	–	–	–
of the rest of the word	–	96,644	–	..	–	33,040	–	72	–	7,093
Shares and other equity	**708,694**	**1,853,548**	**173,340**	**147,931**	**267,512**	**203,877**	**43,207**	**22,921**	**129,234**	**123,036**
issued by residents	363,110	1,853,548	96,920	147,931	215,991	203,877	32,717	22,921	62,459	123,036
of which: listed shares	92,949	365,591	30,520	89,451	45,185	19,043	5,683	–	4,403	29,414
issued by the rest of the world	345,584	–	76,420	–	51,521	–	10,489	–	66,775	–
Mutual fund shares	**29,465**	**–**	**26,569**	**1,877**	**66,014**	**343,731**	**56,749**	**–**	**289,284**	**–**
issued by residents	8,572	–	21,784	1,877	1,274	343,731	19,763	–	35,930	–
issued by the rest of the world	20,893	–	4,785	–	64,740	–	36,986	–	253,354	–
Insurance reserves and standard guarantees	**11,173**	**111,119**	**20,414**	**11,475**	**–**	**–**	**–**	**–**	**3,945**	**1,008,861**
Life insurance and pension funds	–	111,119	–	11,475	–	–	–	–	–	957,427
Other reserves	11,173	–	20,414	–	–	–	–	–	3,945	51,434
Other accounts receivable/payable	**589,572**	**564,943**	**11,492**	**3,149**	**2,217**	**1,386**	**43**	**73**	**6,807**	**5,069**
Trade credits	552,021	506,476	229	292	–	–	–	–	1,690	1,371
Other	37,552	58,467	11,263	2,858	2,217	1,386	43	73	5,116	3,697
Total	**1,972,384**	**3,875,117**	**5,095,191**	**4,689,732**	**1,041,730**	**1,006,079**	**280,038**	**84,134**	**1,137,894**	**1,165,555**

(1) Rounding may cause discrepancies.

cont.

Table 2.1

(cont.)

Financial assets and liabilities in 2020 (1)

(stocks in millions of euros)

	Institutional sectors											
	General government						Households and non-profit institutions serving households		Rest of the world		Total	
	Central government		Local government		Social security funds							
	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Monetary gold and SDRs	–	–	–	–	–	–	–	–	**7,751**	**128,560**	**136,311**	**136,311**
Currency and transferable deposits	**57,093**	**168,591**	**19,082**	**–**	**11,355**	**–**	**1,127,276**	**–**	**586,745**	**222,225**	**3,045,299**	**3,045,299**
with MFIs	39,068	–	16,874	–	11,355	–	1,040,029	–	586,504	–	2,593,449	2,593,449
with other residents	7,568	168,591	..	–	..	–	47,748	–	241	–	229,626	229,626
with the rest of the world	10,458	–	2,208	–	..	–	39,498	–	–	222,225	222,225	222,225
Other deposits	**15,276**	**67,905**	**3,869**	**–**	**344**	**–**	**437,446**	**–**	**244,385**	**72,723**	**1,541,265**	**1,541,265**
with MFIs	11,195	–	3,668	–	344	–	374,372	–	244,385	–	1,400,637	1,400,637
with other residents	–	67,905	–	–	–	–	63,074	–	–	–	67,905	67,905
with the rest of the world	4,081	–	201	–	..	–	..	–	–	72,723	72,723	72,723
Short-term securities	**1**	**125,589**	**9**	**..**	**16**	**–**	**1,237**	**–**	**83,551**	**24,769**	**152,983**	**152,983**
issued by general government	1	125,589	9	..	16	–	1,102	–	80,953	–	125,589	125,589
issued by other residents	–	–	–	–	–	–	..	–	2,598	–	2,625	2,625
issued by the rest of the world	–	–	–	–	–	–	134	–	–	24,769	24,769	24,769
Medium/long-term securities	**6,113**	**2,371,501**	**3,220**	**12,143**	**36,386**	**–**	**245,858**	**–**	**998,988**	**647,656**	**3,707,731**	**3,707,731**
issued by MFIs	12	–	523	–	1,081	–	36,448	–	130,081	–	278,523	278,523
issued by central government: CCTs	34	124,611	22	–	121	–	1,358	–	14,896	–	124,611	124,611
issued by central government: other	564	2,246,890	1,409	–	11,037	–	130,184	–	685,575	–	2,246,890	2,246,890
issued by local government	..	–	..	12,143	55	–	4	–	7,727	–	12,143	12,143
issued by other residents	5,503	–	1,015	–	21,195	–	1,266	–	160,709	–	397,907	397,907
issued by the rest of the world	–	–	251	–	2,897	–	76,599	–	–	647,656	647,656	647,656
Derivatives and employee stock options	**..**	**28,843**	**..**	**883**	**..**	**..**	**1,057**	**27**	**118,662**	**66,551**	**291,195**	**291,195**
Short-term loans	**..**	**8,150**	**–**	**4,430**	**–**	**128**	**13,248**	**42,716**	**80,132**	**70,657**	**521,200**	**521,200**
of MFIs	–	3,929	–	3,591	–	128	–	38,473	–	52,964	356,526	356,526
of other financial corporations	–	4,222	–	839	–	–	–	4,243	–	5,211	34,362	34,362
of general government	..	–	–	–	–	..	–	–	–	..	..	..
of other residents	–	–	–	–	–	–	13,248	–	–	12,482	50,180	50,180
of the rest of the word	–	–	–	–	–	–	–	–	80,132	–	80,132	80,132
Medium/long-term loans	**138,390**	**114,263**	**11,476**	**106,994**	**4,902**	**16**	**–**	**704,234**	**205,979**	**144,174**	**2,155,366**	**2,155,366**
of MFIs	–	44,877	–	57,807	–	16	–	602,208	–	69,769	1,445,844	1,445,844
of other financial corporations	–	723	–	7,923	–	..	–	97,108	–	12,965	312,823	312,823
of general government	138,390	694	11,476	38,004	4,902	–	–	4,918	–	48,295	154,768	154,768
of other residents	–	2,099	–	–	–	–	–	–	–	13,145	35,952	35,952
of the rest of the world	–	65,870	–	3,260	–	–	–	–	205,979	–	205,979	205,979
Shares and other equity	**134,272**	**–**	**15,328**	**..**	**24,005**	**–**	**936,385**	**–**	**576,155**	**656,819**	**3,008,132**	**3,008,132**
issued by residents	114,418	–	13,521	..	23,595	–	852,425	–	576,155	–	2,351,312	2,351,312
of which: listed shares	26,436	–	2,134	–	543	–	60,346	–	235,300	–	503,499	503,499
issued by the rest of the word	19,853	–	1,807	–	410	–	83,960	–	–	656,819	656,819	656,819
Mutual fund shares	**71**	**–**	**2,868**	**–**	**1,290**	**–**	**685,905**	**–**	**25,650**	**838,258**	**1,183,866**	**1,183,866**
issued by residents	67	–	62	–	1,265	–	231,239	–	25,650	–	345,608	345,608
issued by the rest of the word	4	–	2,806	–	25	–	454,666	–	–	838,258	838,258	838,258
Insurance reserves and standard guarantees	**77**	**20,075**	**1,029**	**–**	**..**	**–**	**1,191,106**	**38,656**	**2,391**	**39,949**	**1,230,135**	**1,230,135**
Life insurance and pension funds	–	–	–	–	–	–	1,153,485	38,656	1,196	36,004	1,154,681	1,154,681
Other reserves	77	20,075	1,029	–	..	–	37,621	–	1,196	3,945	75,454	75,454
Other accounts receivable/payable	**74,237**	**23,498**	**23,242**	**62,654**	**28,764**	**17,520**	**137,932**	**183,235**	**111,859**	**124,639**	**986,164**	**986,164**
Trade credits	–	4,046	–	45,803	–	2,078	108,099	99,663	86,318	88,628	748,357	748,357
Other	74,237	19,452	23,242	16,851	28,764	15,442	29,833	83,572	25,541	36,011	237,808	237,808
Total	**425,529**	**2,928,415**	**80,122**	**187,104**	**107,063**	**17,664**	**4,777,449**	**968,867**	**3,042,246**	**3,036,980**	**17,959,647**	**17,959,647**

(1) Rounding may cause discrepancies.

An important statistic that can be recovered from Table 2.1 is household *net financial wealth*, given by the difference between total assets and total liabilities. This value is generally positive and indicates the amount of saving that households lent either to residents or to non-residents. At the same time, the *net financial wealth* of non-financial corporations is usually negative; the stocks reported in this table (referring only to the financial side) equal the non-financial assets (machinery, buildings, and so on) of the corporations. Moreover, general government reports negative financial wealth, since the public debt is usually much higher than financial assets.[13]

On the asset side, the financial accounts make it possible to analyse the portfolio choices of households (i.e. preference for more liquid assets or for government securities); economists are usually interested in finding heterogeneity in portfolio choices across countries.

A table similar to 2.1 is also produced for transactions. In this case, the difference between the total assets and total liabilities of a given sector is defined as net lending/net borrowing (net lending when the sign is positive, net borrowing when the sign is negative). As mentioned above, the net lending/net borrowing balance should be equal to the net lending/net borrowing from the capital account, though in the practice there are some differences (technically labelled as 'vertical discrepancies') due to the different data sources used for compiling the two accounts. Finally, it is worth remembering that, similarly to what we already discussed for stocks, the sum of net lending/net borrowing across all the sectors should be zero.

2.3. Institutional framework and sources

The Italian financial accounts are compiled by the Bank of Italy (BI) in accordance with the European System of Accounts 2010 (ESA 2010), thereby ensuring a high level of comparability across countries.

The BI produces and transmits quarterly financial accounts statistics at the European Central Bank and annually at the Eurostat.

The quarterly statistics report both stocks and transactions and they are useful to study some cyclical aspects of financing, complementing the analysis that derives from other statistics (like banking statistics). The focus of the analyses is usually on institutional sectors or on comparison across countries; using the financial accounts it is impossible to say anything on the distribution of wealth (being a macroeconomic statistics).

The production of financial accounts requires the coordinated use of several primary sources that are put together in a consistent way, along with some components to be estimated. The main sources are:

- money and banking supervisory data;
- balance of payments;
- insurance corporations and pension fund supervisory data;
- stock market data;

[13] The value of the public debt in the financial accounts does not match that reported in the official statistics (Maastricht definition), since the liabilities in the financial accounts are computed at market values, while the public debt (which includes only deposits, loans and securities) is reported at nominal value.

- security issuance data;
- custodian statistics;
- direct reports from the Ministry of Economy and Finance;
- central balance sheet office data;
- information from the National Institute of Statistics (Istat).

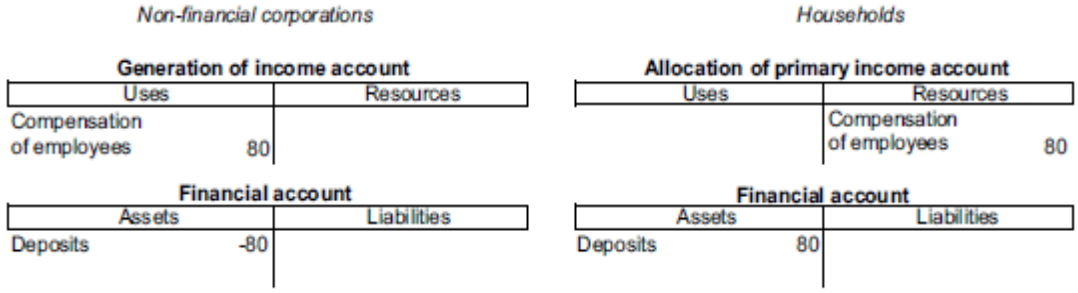
Data from different sources may present inconsistencies. For example, deposits as reported in supervisory data on insurance corporations may differ from deposits as reported in banking statistics. In this cases, some adjustments are required to ensure that total assets equal total liabilities. In other cases, the data may not have the proper timeliness or frequency. For instance, data from central budget offices (i.e., the balance sheets of non-financial corporations) are available only at an annual level, while financial accounts are produced quarterly. In this case, estimates may be based on econometric forecast methods.

2.4. Accounting rules behind the financial and national accounts

The compilation of national accounts is based on the quadruple-entry bookkeeping. Based on this principle, any transaction reported in the system of national accounts must involve two sectors: the reference sector and the counterpart sector (for instance, if a bank collects deposits from a household, the reference sector may be the banking sector and the counterpart may be the household sector). Furthermore, for any sector the transaction should be recorded in two different accounts. The logic is very close to that of double-entry bookkeeping, where accountants focus only on one specific unit without being interested in the counterparts.

A first example of recording is shown in Figure 2.3. In this case, we have a non-financial corporation that pays wages to households. In the non-financial sector's generation of income account, the amount of compensation of employees is recorded under uses (which stands for costs). Since it is a payment, it requires the reduction of deposits in the financial accounts. For the household sector, compensation of employees is recorded in the allocation of primary income account under resources (profits), along with an increase in deposits.

Figure 2.3 - Recording the payment of wages[14]

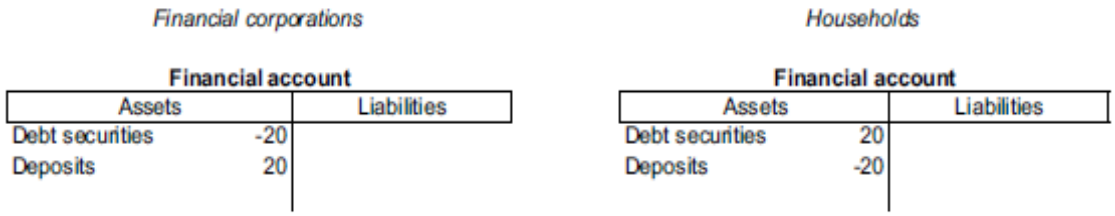


The operation is balanced, since net lending/net borrowing increases for households (by 80) while it decreases for non-financial corporations (by -80). Consequently, the sum of net lending/net borrowing across the two sector is zero. If we

[14] The examples in Figure 2.3 and Figure 2.4 are drawn from van de Ven and Fano (2017), Chapter 1.

assume this as the only transaction to take place, the payment of wages (being a cost) implies a negative saving for non-financial corporations and, therefore, a negative balance (net borrowing) in the capital account, similarly to what we may observe in the financial account (total assets minus total liabilities). For households, wages represent an increase of resources and a positive saving and, therefore, a positive balance in the capital account (net lending), similarly to what we may record in the financial account.

Figure 2.4 - Purchase of debt securities



In the example reported in Figure 2.4, households buy, on the secondary market, securities from a financial corporation. The latter sector records a reduction of debt securities in its portfolio and an increase of deposits for the same amount. Since securities are a financial instrument, the whole operation involves only the financial accounts items. This operation is recorded symmetrically by households. The key point is that in this case net lending/net borrowing remains unaffected, as the transaction only implies a change in the composition of the portfolio of the two sectors. Entries of this kind are called financial transactions and, since they have no impact on the economic accounts, do not change the net lending/net borrowing of the sector.

To sum up, the bookkeeping rules ensure the consistency of the accounts, which translates into two important features of the financial accounts: 1) all the asset across all the sectors must be equal to all the liabilities across all the sectors; 2) the net lending/net borrowing in the financial accounts, for any sector, must be equivalent to the net lending/net borrowing in the capital account.

Other rules of compilation refer to the time of accounting, which states that flows and stocks should be recorded following the accrual accounting principle, i.e. at the moment in which the economic value is created or exchanged (and not when the payment is made). Moreover, flows and stocks – mainly concerning shares, securities, investment fund shares – should be reported at the market value, while deposits and loans are reported at nominal values. Finally, the financial accounts are generally reported on a non-consolidated basis, i.e. without offsetting financial transaction between institutional units that are part of the same sector. However, consolidated accounts are produced as well and transmitted to Eurostat.

2.5. The who-to-whom presentation

The financial accounts may be presented in who-to-whom (w-t-w) tables that provide an insight into the sources and destination of financial funds. The who-to-whom presentation describes the interactions between sectors and has drawn the attention of policy makers, in particular following the 2008 financial crisis.

The financial crisis showed that financial shocks may have an impact not only within the sector, from credit to consumption or from credit to investments, but they may also spill over into other sectors. The relationships depicted in the w-t-w tables are able to disentangle the channels through which shocks may reverberate within the financial system.

Table 2.2 - Long-term debt securities in the euro area in a who-to-whom presentation

2. Outstanding amounts

		LIABILITIES									
	2020 Q3	Total	Non-financial corporations	MFIs [1]	of which: other MFIs [2]	Non-MMF investment funds	Other financial institutions [3]	Insurance corporations and pension funds	General government	Households [4]	Rest of the world [5]
ASSETS	Total	24,119.8	1,550.0	3,604.5	3,604.5	9.8	3,571.3	72.2	10,126.0	0.0	5,185.9
	Non-financial corporations	187.9	29.5	8.2	8.2	0.0	20.2	0.7	31.7	0.0	97.7
	MFIs [1]	8,079.9	308.2	1,131.0	1,131.0	0.0	1,180.2	10.9	4,435.7	0.0	1,013.9
	of which: other MFIs [2]	4,075.9	117.6	666.2	666.4	0.0	1,052.5	9.8	1,565.5	0.0	664.3
	Non-MMF investment funds	4,865.3	428.7	415.0	415.0	0.0	520.9	15.1	779.7	0.0	2,705.8
	Other financial institutions [3]	871.0	37.0	54.4	54.4	0.0	322.2	17.5	197.8	0.0	242.1
	Insurance corporations and pension funds	4,355.4	425.7	538.9	538.9	0.0	308.5	23.5	2,106.7	0.0	952.2
	General government	435.6	25.0	69.7	69.7	0.0	37.2	2.7	179.8	0.0	121.2
	Households [4]	487.6	31.6	218.7	218.7	0.0	64.3	1.8	118.3	0.0	52.9
	Rest of the world [5]	4,836.9	264.4	1,168.6	1,168.6	9.8	1,117.9	0.0	2,276.3	0.0	

Source: ECB.
1) Includes the central bank, other deposit-taking corporations and money market funds.
2) Includes deposit-taking corporations (other than the central bank) and money market funds.
3) Includes other financial intermediaries (except insurance corporations and pension funds), financial auxiliaries as well as captive financial institutions and money lenders.
4) Including non-profit institutions serving households (NPISH).
5) Non-resident units engaged in transactions with resident units.

Figure 2.5 - Long-term debt securities in France and Italy: w-t-w picture

Table 2.2 reports an example relating to long-term debt securities. By looking at the first row, we see that general government is the largest issuer of securities in the euro area (compared with other sectors), with €10,126 billion. Going down this column, we observe that MFIs is the sector that holds the highest share of these securities (€4,435 billion), followed by the rest of the world (€2,276 billion).

Figure 2.5 shows a comparison between France and Italy, again regarding of long-term debt securities. The amount of general government issues are higher in Italy than in France (consider the size of the liabilities, in light blue). Banks hold a larger share of public debt in Italy than in France, followed by the rest of the world (consider now the assets in dark blue). In the case of France, the rest of the world is the largest holder of French public debt.

2.6. On the uses of financial accounts

Different topics are studied through financial accounts data, ranging from monetary policy to financial stability, shadow banking or sectoral interconnectedness. Flows and stocks may be used in the economic analysis, according to their information content. Financial flows are helpful to understand aspects closely related to the business cycle of a country; usually these data complement statistics on the real side of the economy (inflation, sales, hours worked, orders). Data on stocks, describe the financial structure of an economy and assess whether the level of indebtedness or leverage of the system is too high in comparison to other economies. Moreover, they help in understanding whether economies are more bank-based or market-oriented. Quick examples and discussions on the use of these statistics will be illustrated in the next subsections.

Analysis of financial flows in monetary analysis

The first example concerns monetary policy, namely the set of instruments available to maintain price stability.

To this aim, the European Central Bank (ECB) takes decisions based on two pillars: economic analysis and monetary analysis. Financial accounts (along with economic accounts) are used as a cross-check of the two pillars, to take into account all information useful to evaluate the risks connected to price stability. Monetary analysis at the ECB is based on the assessment of the liquidity situation made by exploiting information on the monetary aggregate M3 and its counterparts (especially loans to the private sector). In particular, the analysis focuses on the relationship between M3 and its counterparts on the consolidated balance sheet of the MFI sector, with the aim of understanding whether variations in liquidity holdings are driven by credit growth or by portfolio shifts between money and other financial assets. Financial accounts represent a useful tool, in this regard, that make it possible to measure portfolio shifts between monetary and non-monetary financial assets, since they report the complete spectrum of financial instruments. Furthermore, through the financial accounts, it is possible to evaluate all the sources of financing for the non-financial private sector.

Figures 2.6 and 2.7 report the sources of funding for non-financial corporations and households, respectively. The figures are based on the flows. The red part of the histogram quantifies bank loans to non-financial corporations. Before the inception of

the global financial crisis, bank loans increased considerably, in particular between 2002 (after the dot.com bubble burst) and 2008. After 2008, bank credit shrunk, and we may also observe negative transactions from 2012 to early 2018. In part, bank funding was offset through the issuance of shares and other equity. A similar trend may be observed when we focus our attention on households. Bank credit increased in the years preceding the financial crisis and then decreased after the crisis, and has not yet recovered those levels. Net lending/net borrowing (Figure 2.8) is also used by the ECB to evaluate the different behaviour of the sectors in borrowing or lending financial resources. Again in Figure 2.8 and focusing on the post-crisis period, we may first observe that the general government became a large net borrower, due to the adoption of different fiscal policy measures to counter the business cycle. Non-financial corporations went from being net borrowers to being net lenders, they since generally try to postpone their decisions to make physical investments (i.e. machinery), which require large upfront payments. At the same time, a lower level of investments may also stem from a reduction in the supply of credit by banks and other intermediaries (lower supply of resources instead of lower demand of resources). To better tackle this issue, further analyses, conducted using more sophisticated tools such as econometric models, are required. Finally, as Figure 2.8 shows, the financial sector became a sector with an abundance of saving, while in normal times it usually recorded no saving due to its intermediation role.

Figure 2.6 - The Italian non-financial corporation financing

(millions of euros; four-term sum)

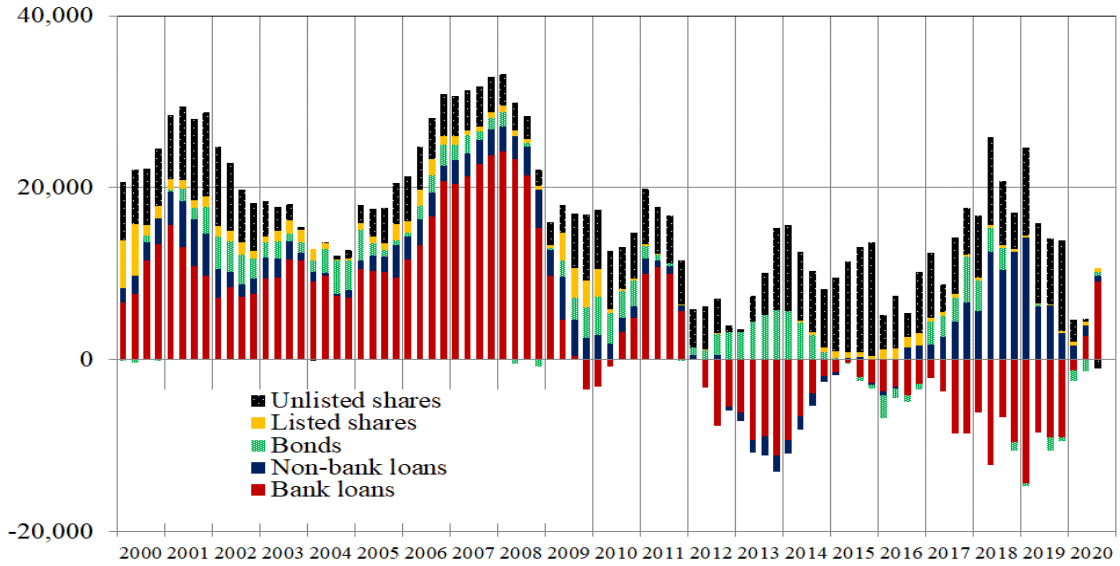


Figure 2.7 - The Italian household financing
(millions of euros; four-term sum)

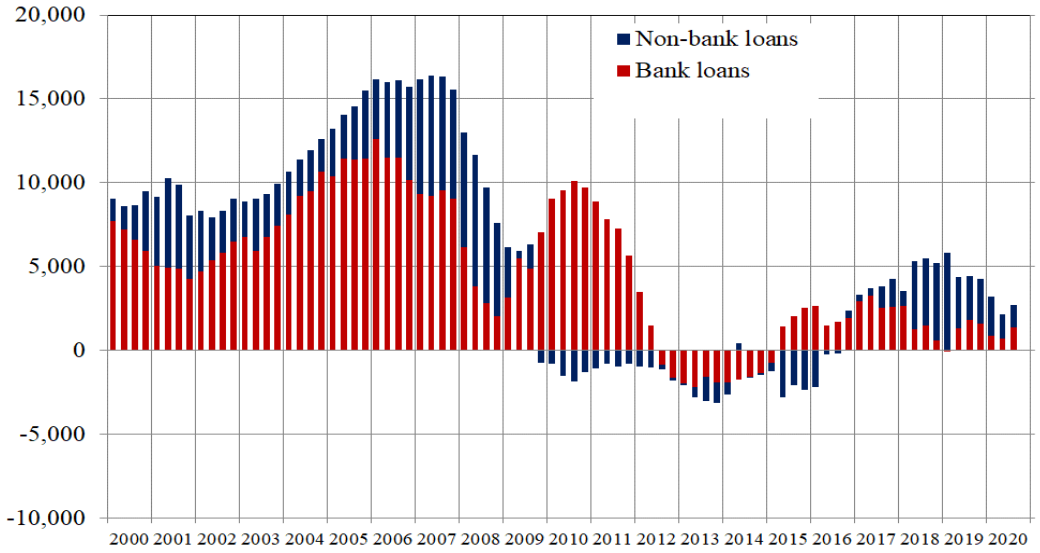
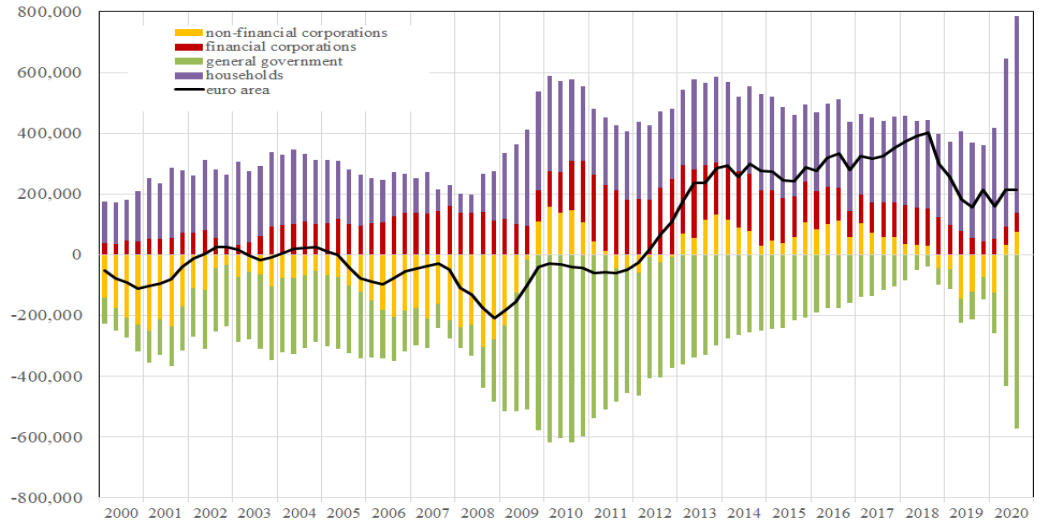


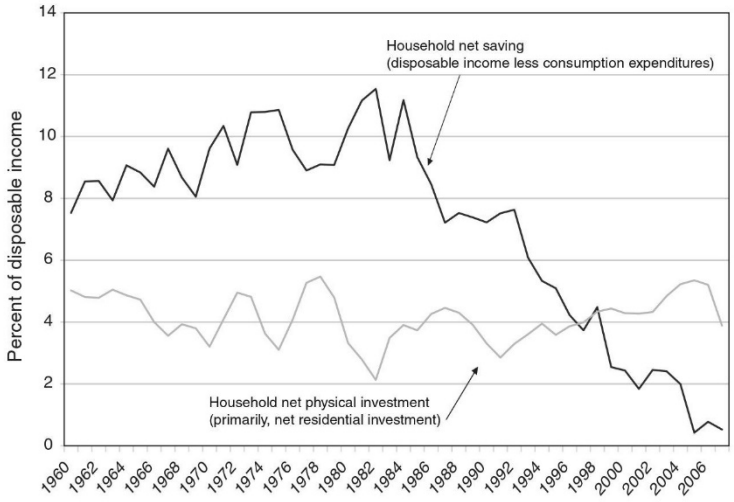
Figure 2.8 - Net lending/net borrowing in the euro area
(millions of euros, four-term sum)



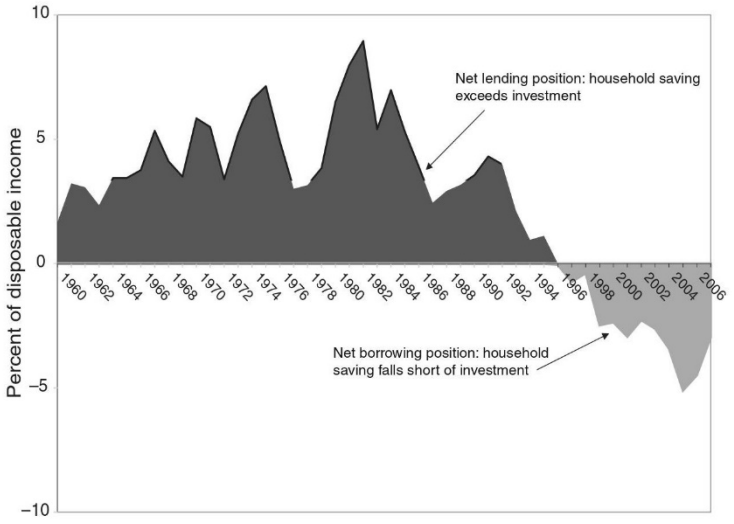
Using financial account flows to detect macroeconomic imbalances

Another application is the use of financial accounts for detecting macroeconomic imbalances, which may to some extent signal potential future crises. After the financial crisis, many economists highlighted that in the national accounts statistics there was a lot of information that had been neglected by economists and policy makers. For instance, in their work, Palumbo and Parker (2009) argue that some possible large imbalances could have been anticipated by looking at simple indicators, such as the net lending/net borrowing of households (Figure 2.9).

Figure 2.9 - US households



HOUSEHOLD SECTOR NET SAVING AND INVESTMENT IN THE SNA CAPITAL ACCOUNT, 1960 TO 2007



NET LENDING (+) OR BORROWING (−) BY US HOUSEHOLDS IN THE SNA CAPITAL ACCOUNT, 1960 TO 2007

Source: Palumbo and Parker (2009).

The authors point out that the saving rate of households became almost zero before the crisis, while during the period 1960-1985 it was around 10 per cent of disposable income (Figure 2.9). After providing financial resources to other sectors from 1960 to 1990, at around 4 to5 per cent of disposable income, households started to become net borrowers. Net borrowing reached 5 per cent of disposable income in 2005-2006. In the meantime, this reduction in the saving was strongly correlated with a rise in housing investments (gross fixed capital formation), but also increased net mortgage debt at an unprecedented rate. Therefore, what emerges is that households changed their normal status and went from being the sector that provides financial resources to the economy to a sector that uses financial resources. Consequently, the US economy started looking for resources abroad, thereby increasing the debt towards non-residents and injecting vulnerabilities in the economy.

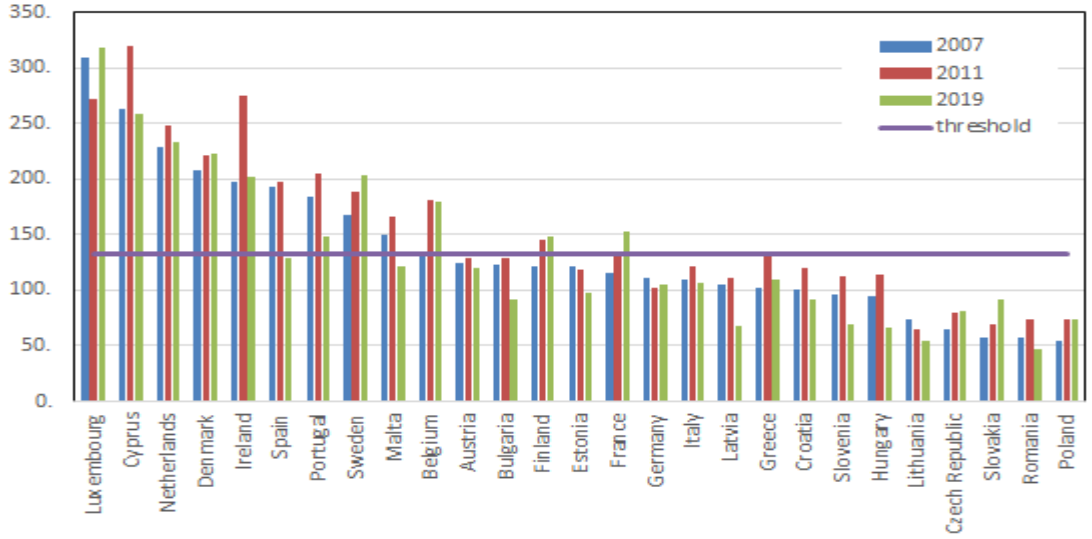
Macroeconomic Imbalance Procedure (MIP)

As already mentioned above, financial accounts may be useful to analyse risks that can endanger the financial system and, in turn, the real economy. Risks may arise either from macroeconomic conditions, e.g. the normal downturn phase of the business cycle, or from imbalances within the financial systems that trigger liquidity issues such as those observed during the global financial crisis or market risks (i.e. shocks that hit the prices of financial instruments). After the onset of the global financial crisis, the European Commission decided to design a surveillance tool called the Macroeconomic Imbalance Procedure (MIP) to monitor the presence of sectoral imbalances. This approach was in line with that adopted by the IMF in the 1990s, after the Asian crisis, when it proposed a balance sheet approach to identify mismatches such as the currency mismatch, the liquidity mismatch, and the role played by the leverage or maturity mismatch.

In the case of the MIP, the surveillance procedure uses a scoreboard of indicators assessing condition of a sector or of the whole economy. The indicators simply provide evidence of the healthy state of the sectors or of the economy without triggering any sanctioning procedure, although for every indicator there is a threshold. The action is not automatic and the final evaluation of the economy is based on the economic reading of the indicators, which means that economists make judgments and agree with the country on some path to be followed in order to rebalance the indicators. The indicators cover three areas:

- external imbalances and competitiveness indicators;
- internal imbalances indicators;
- labour market indicators.

Figure 2.10 - MIP: private sector debt by country
(as a percentage of GDP)



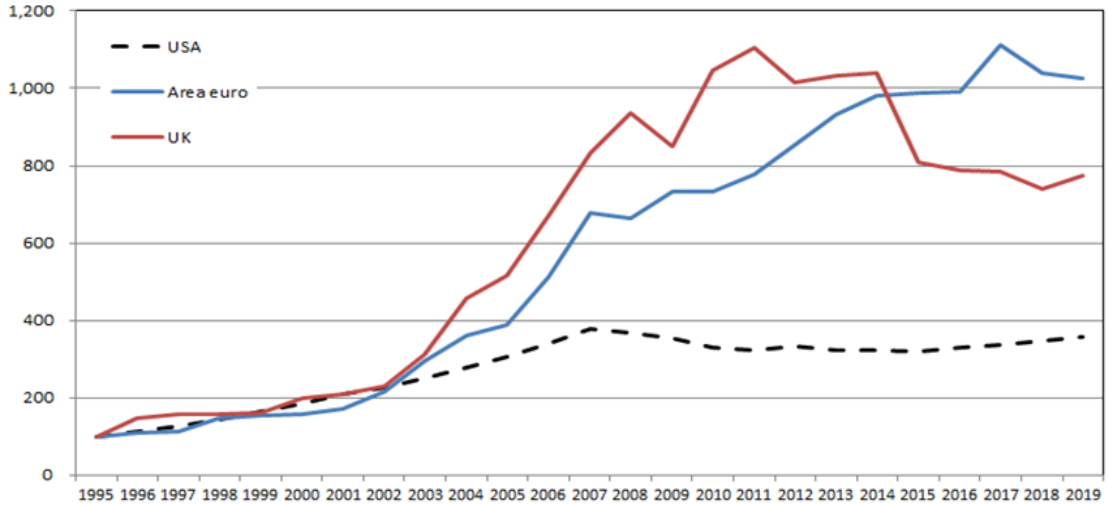
Three indicators are based on financial accounts data (private sector debt, private sector credit flow, total financial sector liabilities) in the area of internal imbalances indicators. Private sector debt is a very simple ratio between household and non-financial corporation financial debt (stocks), consolidated at the sectoral level as a share of GDP. Figure 2.10 shows private debt across European countries over three years: 2007 (before the crisis), 2011 (the year of the introduction of the MIP) and 2016 (the last available year). The horizontal line represents the reference threshold, which should not be exceeded.

What can we learn from this picture? First, that following the global financial crisis the ratio worsened; few countries recovered pre-crisis debt levels; on average, at the end of 2019, the debt was aligned to the theoretical threshold.

A quick glance at the financial sector

As for the financial sector, economists noticed that a significant role in the run-up of macroeconomic imbalances was played by the other financial intermediaries. First, you may notice that by simply looking at the total assets (Figure 2.11) as reported in the financial accounts it is possible to observe an abnormal growth in the size of this sector. In the US, total assets tripled in less than a decade, but the euro area caught up to the US over the same period by recording a sixfold increase, and the UK, from a lower starting point, a sevenfold increase. Why did this happen?

Figure 2.11 - Other financial intermediaries
(total assets; index number, 1995=100)



The strong relationship between banks and other financial intermediaries and the use of leverage by the other financial intermediaries may contribute to explaining this trend. In fact, the banking model changed over the decades considered; banks adopted an "originate to distribute" model instead of an "originate to hold" model. This means that banks granted loans and then transferred these loans to other financial intermediaries (in particular to financial vehicles), which in turn bought the loans and issued securities to repay the loans (securitization). Moreover, these intermediaries made large use of leverage to enlarge their assets during the expansionary phase of the business cycle, mainly by making a pro-cyclical use of the leverage.

Suggested readings

van de Ven P. and D. Fano (2017), *Understanding Financial Accounts*, OECD.

Additional references

Adrian T. and H. S. Shin (2008), Liquidity, Monetary Policy and Financial Cycles, *Current Issues in Economics and Finance*, v. 14, Federal Reserve Bank of New York.

Cesaroni T., R. De Bonis and L. Infante (2018), Firms' Financial Surpluses in Advanced Countries: The Role of Net Foreign Direct Investments, *Economia Politica*, vol. 35.

De Bonis R. and A. F. Pozzolo (2012), *The Financial Systems of Industrial Countries*, Springer.

Palumbo M. G. and J. A. Parker (2009), The Integrated Financial and Real System of National Accounts for the US: Does it Presage the Financial Crisis?, *American Economic Review*, v. 99.

Papademos L. and J. Stark (2010), *Enhancing Monetary Analysis*, ECB.

Winkler B., A. van Riet and P. Bull (2013), *A Flow of Funds Perspective on the Financial Crisis*, Palgrave Macmillan.

3. Monetary and Financial Statistics: compilation and uses *(G. Nuzzo)*

3.1. Institutional framework

In this section, we provide a brief introduction to Monetary and Financial Statistics, describing both their compilation and uses, following the approach routinely adopted by the Bank of Italy (BI) to promote a strict link between producing statistics and interpreting data.

Since the 1980s, driven by the widespread recognition that inflation is a monetary phenomenon in the long term, central banks monitor and disseminate monetary aggregates in the pursuit of price stability.

Before the introduction of the euro, there were considerable differences across European countries in the definition and collection of monetary and credit statistics. Preliminary works, carried out by the European Monetary Institute (EMI) before the introduction of the euro (specifically in the period 1994-1998) revealed the complexity of harmonizing these statistics (De Bonis and Piazza, 2020).

Three main decisions were taken to achieve the harmonization of monetary statistics in the euro area.

The first step was the identification of monetary aggregates. Before the euro was introduced, the different definitions of monetary instruments used across central banks were the result of the heterogeneous characteristics of financial assets and payment methods, which, inherently, change over time and differ across economic areas. Moreover, the different degree of "liquidity" of financial instruments, i.e. their ease of conversion into banknotes, led to the definition (and monitoring) of several monetary aggregates by central banks.

Hence, to achieve the harmonization, three definitions of money were identified in the euro area, ranging from a narrow definition (M1) to an intermediate one (M2) and to a larger one (M3) with the increasing inclusion of less liquid instruments (Table 3.1).

Table 3.1 – Definition of the euro-area monetary aggregates by instrument included

	M1	M2	M3
Currency in circulation	X	X	X
Overnight deposits	X	X	X
Deposits with agreed maturity of up to 2 years		X	X
Deposits redeemable at notice of up to 3 months		X	X
Repos (excluding repos with CCPs)			X
Money Market Funds (MMFs) shares/units			X
Debt securities with a maturity of up to 2 years			X

The second step consisted in the identification of the money-issuing sector, in the form of Monetary Financial Institutions (MFIs), including the following entities (the European System of Accounts, ESA 2010, codes are given in brackets):

- Central Banks (S.121)
- Deposit-taking corporations (DTCs) (S.122) i.e. credit institutions[15] and other DTCs such as electronic money institutions;[16]
- Money market funds (S.123).[17]

The inclusion of monetary market funds among MFIs is justified by their typical activities of issuing shares with a high degree of substitutability with bank deposits and investing in securities.

A list of MFIs was made for the following reasons:

- to ensure that the (potential) statistical reporting population is complete and homogeneous;
- to derive a comprehensive and consistent list of institutions subject to – or exempt from – the Eurosystem's minimum reserve requirements;
- to derive a comprehensive and consistent list of counterparties eligible for Eurosystem operations;
- to allow MFIs to correctly identify their business with other MFIs (classification of interbank business for statistical purposes).

The last step consisted in the definition of the money-holding sector, i.e. the euro-area resident entities that hold monetary instruments and whose money disposal is of relevance for the transmission mechanism from interest rates to prices. The "money-holding sector" consists of euro-area residents other than MFIs and central government.

The principal aim of the definition of the MFI sector for statistical purposes is to provide the European Central Bank (ECB) with a comprehensive statistical picture of monetary developments in the euro area.

MFI balance sheet item (BSI) statistics represent the statistical basis for the ECB's monetary analysis[18] and for calculation of the reserve base of credit institutions for the ECB's minimum reserve system. A European Union Regulation, binding on

[15] Credit institutions are defined in Art. 4(1)(1) of the Capital Requirements Regulation as undertakings whose business is to take deposits or other repayable funds from the public and to grant credits for their own account. Other repayable funds may also include proceeds from the sale of bank bonds to the public.

[16] Electronic money institutions are entities authorized to issue electronic money, i.e. electronically or magnetically stored monetary value as represented by a claim on the issuer and which may be used to make payments to a variety of other entities. According to Directive 2009/110/EC, those institutions are not considered as credit institutions, and hence they are not subject to minimum reserves requirements. According to Regulation ECB/2013/33, they remain in the MFI population if their principal activity is the issuance of e-money. In such case, they are classified as other MFIs.

[17] In line with the criteria for supervisory purposes established by the European Securities and Markets Authority (ESMA), Money Market Funds (MMFs) are collective investment undertakings that: 1) pursue the objective of maintaining the principal value of the fund and provide returns in line with interest rates on money market instruments; 2) invest in money market instruments (Directive 2009/65/EC) or deposits with credit institutions or, alternatively, ensure that the liquidity and valuation of the portfolio is assessed on an equivalent basis; 3) ensure that the money market instruments held are of high quality.

[18] MFI balance sheet data are also used as an input to the quarterly integrated economic and financial accounts of the ECB and Eurostat and for the compilation of balance of payments documents.

euro-area resident[19] MFIs,[20] lays down the reporting requirements. Additional ones are required under an ECB Guideline, albeit they are binding only on members of the Eurosystem. Approximately every five years, BSI regulations are revised in order to consider those financial innovations with an impact on monetary aggregates and users' demand that is constantly evolving. Usually, requirements are at first introduced as a guideline and then confirmed in mandatory regulation requirements.

3.2. Balance Sheet Items (BSI) content

MFIs data are broken down into several balance sheet items. As for liabilities, the main items are deposits, debt securities issued, and capital and reserves. In particular, deposits are distinguished by different degrees of liquidity (overnight, redeemable at notice, with agreed maturity, repos). As for assets, the main items are loans, securities, and shares held,[21] fixed assets. Loans are broken down into different technical forms and, as for loans to households, also according to their purposes (house purchase, consumer credit, and other purposes).

The MFIs' counterparties (debtors, depositors, holders of securities) are classified based on their place of residence (domestic, other euro-area countries, rest of the world),[22] institutional sector and economic activity.

3.3. Types of data

BSI statistics provide both outstanding amount **(**stock data**)**, referring to the last calendar day of the period, and transaction data (flows).

More in detail, for each type of financial instrument, financial transactions (flows) can be defined as net acquisitions of financial assets, or the incurrence of liabilities as a consequence of an interaction between institutional units by mutual agreement. Types of transactions are taking or repaying a deposit, granting a loan or receiving a repayment, buying or selling a security (or relinquishing it on redemption).

However, the outstanding amount (stocks) can also vary between two periods for reasons other than transactions, i.e. for "adjustments". Therefore, one of the main compilation issues in BSI statistics is to separate adjustments from transactions.

In more formal terms, for period *t*, *transactions/flows* (F_t) are the interactions between institutional units by mutual agreement in the period *t*. These are not necessarily the difference between the stock at the end of period *t* and the stock at the end of period *t*-1, since adjustments A_t must be netted out: $F_t=S_t-S_{t-1}-A_t$.

[19] "Residence" refers to the single institutional units (economic entities that are capable of owning goods and assets, of incurring liabilities and of engaging in economic activities and transactions with other units in their own right). Therefore, resident MFIs include resident branches that have their head office abroad, but exclude foreign branches of resident institutions.

[20] Classification as an MFI does not necessarily mean that an institution must provide full statistical returns, since the BSI Regulation gives National Central Banks (NCBs) exemptions on a national basis, provided the MFIs supply monthly balance sheet returns making up at least 95 per cent of the total national MFI balance sheet. However, BI does not use this discretion.

[21] The repurchased bonds of own issue have been excluded since December 2017.

[22] Some balance sheet items can also be collected by identifying counterparties resident in EU countries (not only those in the euro area).

In order to compile flow statistics, F_t, data on the value of transactions are derived in a timely manner from the balance sheet in terms of stocks (S_t) and from the adjustments (A_t), i.e. changes in stocks not due to transactions (reclassifications;[23] exchange rate changes; other valuation changes, e.g. write down of loans, changes in prices of securities held).

Transactions are then used to compute growth rates. Some of the main BSI series (e.g. growth rates and monetary aggregates developments) are seasonally adjusted in order to remove calendar effects. The procedures used by the ECB also cater for calendar adjustment, where relevant. The seasonal adjustment approach used for the euro-area monetary aggregates and counterparties relies on multiplicative decomposition using the X-12-ARIMA method. The influence of detected outliers and calendar adjustments is removed ex-ante in order to minimize the potential distortions of the (estimated) seasonal component.

3.4. MFI Interest rates (MIR)

In order to assess the impact of monetary policy on retail banking, the Eurosystem has collected monthly harmonized statistics on bank interest rates since January 2003. The collection started with 45 rates, then increased to the current 117 rates, according to various characteristics.

MIR statistics provides data on interest rates and on business volumes both on loans and deposits.

Rates are net of bank fees for a better assessment of the effects of monetary policy. Nevertheless, an annual percentage rate of charge (APRC) is collected on consumer credit and on house purchase loans.

Since the aim is to collect normal prices, interest rates are computed by taking into account only performing loans.

The interest rates refer to outstanding amounts and new business for the main forms of funding and lending. New business is defined as any agreement between the household (HH) or the non-financial corporation (NFC) and the reporting agent. It comprises:

- all financial contracts, that specify for the first time the interest rate of the deposit or loan;
- all new negotiations of existing deposit and loan contracts, in which there is an active involvement of the household (HH) or non-financial corporation (NFC).

New business does not include:

- prolongations of existing deposit and loan contracts that are carried out automatically, i.e. without any active involvement of the HH or NFC;
- renegotiations of loans for debt restructuring granted at rates below market conditions;

[23] These relate to: changes in the composition of the reporting sector; changes in the structure of the MFI sector (mergers, acquisitions and divisions); changes in the sector classification or residence of customers; changes in the classification of financial instruments; correction of previous reporting errors.

- bad loans.

Since the end of 2014, due to a further classification among new operations, it is possible to differentiate by new contracts and renegotiations.

Almost all the euro-area countries collect monthly interest rates (MIR) data on a sampling basis. National central banks (NCBs) can stratify the reference reporting population into homogeneous strata and then either select the actual reporting population at random from each stratum or select the largest institutions within each stratum. BI follows the latter approach.[24] The minimum national sample size must be such that the maximum random error (in the case of a probabilistic sample) and the synthetic mean absolute error (in the case of the largest institutions, as is the case in Italy, within a stratum) are contained within pre-defined thresholds. The samples are periodically checked and if necessary revised to assure compliance with these targets.

The types of data available on loan interest to HHs are distinguished based on the loan purposes (house purchases, consumption, other purposes), the initial period of interest rate fixation[25] and bank overdrafts are indicated separately.

For loan interest rates, applied both to HHs and NFCs, a breakdown is available by size of the loan (up to/over an amount of €1,000,000). A separate piece of evidence is available for bank overdrafts and for interest rates on loans secured by collateral, by period of interest rate fixation, details on size, and loan maturities.

In addition, four composite cost-of-borrowing indicators[26] are provided: a) the total for HHs for house purchase; b) the total for NFCs; c) the total for short-term loans, i.e. up to 1 year and including overdrafts (both HHs and NFCs); d) the total for long-term loans, i.e. over 1 year (both HH and NFC).

3.5. Non-bank intermediaries statistics

Central banks are used to collecting data on non-bank intermediaries (quite small and controlled in Italy)[27] mainly since households and businesses can replace, to a certain extent, MFI deposits and loans with instruments offered by other intermediaries. Furthermore, the financial crisis provided additional motivation for collecting these data.

A broad classification, following the European System of Accounts (ESA) 2010, distinguishes between six categories of financial intermediaries other than MFIs (Table 3.2). Within some of these categories, we identify intermediaries having specific data collection duties in the Eurosystem.

[24] At the end of 2020, the Italian sample consisted of 66 banks, representing about 85 per cent of both the loans and the deposits of the Italian banking system.

[25] The initial period of interest rate fixation is the period after the signing of the contract in which the agreed interest rate is not going to change. The initial period of fixation may be shorter than or equal to the original maturity of the loan.

[26] The "composite cost-of-borrowing indicators" are synthetic measures calculated as the weighted average of the interest rates applied by the banks to the various categories of loan and are based on the Eurosystem common methodology.

[27] Gola et al. (2020).

Table 3.2 Non MFI intermediaries – ESA classification

S124	Non Money-Market Funds
S125	Other Financial Intermediaries
S126	Financial Auxiliaries
S127	Captive financial auxiliaries and money lenders
S128	Insurance corporations
S129	Pension funds

Statistics on Non Money-Market Funds, also called **Investment Funds** (IFs), are collected under an ECB regulation first approved in 2008, then recast in 2013 (ECB/2013/38). An IF is an undertaking for collective investment that invests in financial and/or non-financial assets with the purpose of investing capital raised from the public.

IFs are broken down into six categories: equity; bond; mixed, real estate, speculative (hedge funds); and other. IFs are also divided by open-end and closed-end funds (the latter also include venture capital companies and private equity funds). Since the end of 2020, they are also broken down between undertakings for collective investment in transferable securities (UCITS) and non-UCITS. Most of the data are collected quarterly, while some are collected monthly.

Financial vehicle corporations (FVCs), among S.125 intermediaries, provide quarterly balance sheet data. Statistics are collected not only for bank securitized loans but also for those not originated by banks and for other securitized assets (i.e. General Government assets). Information on securitized loans distinguishes the sector and residence of the borrower. Asset-backed securities are broken down according to their original maturities.[28]

Statistics on insurance corporations (ICs)[29] show separate information according to their operating licence. This split results in four reporting sectors: reinsurance, life, non-life and composite insurance. Reinsurance corporations can only engage in (life and non-life) reinsurance business. Composite insurance corporations hold both life and non-life operating licenses.

As for insurance and pension funds statistics (PF),[30] the Eurosystem collects data according to Regulation (ECB/2014/50) which allows NCBs to derive the necessary statistical information, as far as possible, from data reported for supervisory purposes under the EU's Solvency II Framework. As some additional data are needed for statistical purposes, over and above the supervisory requirements, the regulation also

[28] For further information on the use of FVC statistics, see Nuzzo (2017).

[29] According to ESA 2010, ICs are financial corporations and quasi-corporations which are principally engaged in financial intermediation as the consequence of the pooling of risks mainly in the form of direct insurance or reinsurance. Pooling of risks is a system to make large financial losses more affordable by combining the risks of many individuals and business entities and transferring them to an insurance company in return for a premium.

[30] According to ESA 2010, PFs are defined as financial corporations and quasi-corporations that are principally engaged in financial intermediation as the consequence of the pooling of social risks and needs of the insured persons (social insurance). PFs as social insurance schemes provide income in retirement, and often benefits in case of death or disability.

includes the "ECB add-on". The approach to the collection of statistics on pension funds is very similar (ECB/2018/2).

Starting from June 2021 a particular kind of data collection has been used for Systemic Investment Firms (SIFs) i.e. those investment firms above very elevated thresholds (e.g. in terms of assets) defined under the Capital Requirements Regulation (CRR). They are included in the non-MFI credit institutions and subject to data collection under the BSI Regulation (even if not complete) and reserve base requirements.

3.6. Trends and developments in monetary and financial statistics

There are three main trends in monetary and financial statistics.

The first one is to give increasing relevance to microdata. Granular data permit us to take better account of the heterogeneity among economic agents.

The main microdata sources useful for monetary and financial statistics and analysis are the following:

- The Central Credit Register is a long serving database established in 1964,[31] which nowadays stores information on loans above €30,000 (with some exceptions, e.g. all bad loans are included) and collateral between the financial system (all Italian intermediaries – not only banks) and customers;
- AnaCredit is a harmonized archive of data collected from European major banks on loans to legal entities greater than €25,000 (first bank reporting in 2018);
- The Centralised Securities Database (CSDB) contains data on securities issued, held or brokered by EU residents or denominated in euro, whoever the issuer is and wherever they are held. It has been operational since 2009. Data referring to Italy in the CSDB have as a source the BI archive on securities ("Anagrafe Titoli").

All this granular information can be appropriately used in aggregated statistics when enriched with a reference database (Register of Institutions and Affiliates Data - RIAD - and the Italian component "Anagrafe dei Soggetti") containing information on the residence and sector of the counterparts. The number (legal entities) and quality of information available in the database are constantly improving, including an increasing number of entities.

In addition, since a few years ago, BSI and MIR data are sent by the NCBs to the ECB also breaking down the main items by single intermediaries. This is also due to the increased ECB role in banking supervision (see the Single Supervisory Mechanism – SSM).

The second main trend is a boost to the harmonization process for the financial statistics collected in the Eurosystem. The harmonization refers to:

[31] By maintaining this database, the Bank of Italy provides the participating banks and other intermediaries with a tool that can improve their ability to assess customers' credit ratings and manage credit risk.

- data collection with the aim of overcoming the different national statistical requirements among euro countries and reducing the redundancies in actual reporting (e. g. AnaCredit, BSI, MIR, Securities Holding Statistics - SHS). An ESCB programme, called the Integrated Reporting Framework – IReF, was launched in December 2021 following consultations through a Qualitative Stock Takings and a Cost Benefit Analysis that concluded that the expected benefits outweigh the costs for the majority of stakeholders. The tentative go-live of IReF is in 2027;
- data dictionaries through the Banks' Integrated Reporting Dictionary - BIRD- that provides banks with up-to-date reference material to help them produce statistical and supervisory reports. The BIRD was developed by the ESCB and the banking industry, following a similar experience at the BI (called PUMA). Its documentation is freely available to all interested parties, who can choose whether to participate to the initiative.

The third trend is the further development of measures for liquidity and leverage at micro and macro level. Maturity mismatches and asset/liability transformations have proven to be key in financial system distresses. This applies not only to banks, but also to non-bank financial intermediaries, and among the latter, to investment funds in particular, as emerged in the early months of 2020, during the recent COVID-19-related crisis.

Defined in a simple way at micro-level, leverage indicators present the ratio between selected financial assets and their total equity, while liquidity risk indicators measure the risk of a firm being unable to meet its financial obligations without incurring unacceptable costs or losses through fund raising and asset liquidation.

3.7. A guide to reading Bank of Italy Statistical Publication on banks, financial institutions and money

Even if the Statistical Database (Base Dati Statistica - BDS) is the main tool for the dissemination of the statistics series, BI presents also data in PDF format for the easy reading and interpretation of interrelated elements. This section aims to provide a general overview of these publications highlighting their main characteristics and differences and suggesting which one to use depending on different main objectives of the users/analysts.

Concerning timeliness,[32] "Bank and Money: national data" (BAM) provides comprehensive updated data on bank balance items[33] and interest rates. In addition,

[32] This report is published around t+40 days after the end of the reference month of data provided. A few data are disseminated a few days before to comply with the IMF's Special Data Dissemination Standard (SDDS) on Depository corporation survey and Bank of Italy Balance-sheet aggregates.

Euro-area aggregates, including the monthly monetary aggregates drawn from the MFIs balance sheet, are first published in a press release on the 19th working day following the month to which they relate. NCBs are not allowed to publish national contributions to the euro-area monetary aggregates or counterparts before the ECB publishes the euro-area data.

most of the statistics are harmonized at the Eurosystem level. It contains also a specific section on the single Monetary Policy Statistics and the Italian components (notably it also includes information on BI's statistical balance sheet). Its cover usually presents some graphics depicting the developments of the same items over recent years and some brief comments.

Further details on loans and deposits are available in the BI's quarterly report "Banks and Financial Institutions: Financing and Funding by Sector and Geographical Area". The main differences from BAM are the provisions of data: they are not only related to banks but also include other financial institutions. In addition, a geographical breakdown of the main items is given.

As for data on the characteristics and number of borrowers, bank-borrower relationships, credit quality, borrowing terms and conditions (lending rates and guarantees), the main statistical source is the quarterly report "Banks and Financial Institutions: Credit Conditions and Risk by Sector and Geographical Area". Interestingly, this report also includes information from the Central Credit Register (CCR) and AnaCredit microdata permitting us to differentiate heterogeneities about the gender of the borrower, the size of the loans and making available information on multiple-bank lending and on collateral conditions.

The monthly report "The Financial Market" contains:

- portfolio composition of management services run by banks, securities firms and asset management companies;
- statistics on the balance sheets of Italian open-end investment funds (harmonized and non-harmonized) compiled on the basis of the harmonized Eurosystem definitions. It means information on the net assets and net subscriptions of investment funds managed by Italian financial intermediaries and of funds of non-resident financial intermediaries marketed in Italy.

As for data on the geographical distribution of the banking and financial system (i.e. on the number of financial intermediaries), bank branches and employees, broken down by geographical location and type of bank, see the report "Banks and Financial Institutions: Branch Network", which is published annually.

Suggested readings

De Bonis R. and M. Piazza (2020), A silent revolution: How Central Bank Statistics Have Changed in the Last 25 Years, Banca d'Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 579.

Gola C., M. Burroni, F. Columba, A. Ilari, G. Nuzzo and O. Panzarino (2017), Shadow banking out of the shadows: non-bank intermediation and the Italian regulatory framework, Banca d'Italia, Banca d'Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 372.

[33] More in detail: main asset and liability items; funds raised by holding sector and instrument; loans classified by sector of economic activity, maturity and type; bad debts by sector of economic activity; loans and bad debts by branch of economic activity; composition of banks' securities portfolios; securities held on deposit by banks; securitized banks loans by type and borrowing sector.

Nuzzo G. (2017) “A critical review of the statistics on the size and riskiness of the securitization market: evidence from Italy and other euro-area countries”, Banca d’Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 403.

4. The Italian Balance of Payments *(S. Sabatini)*

4.1. Main concepts

The **balance of payments (BOP)** is an accounting system that records all the economic and financial transactions[34] that occur in a given period (a month, a quarter or a year) between the institutional units of a country and the rest of the world.

An **institutional unit** is an entity that:

- is entitled to own goods or assets in its own right;
- is able to take economic decisions and engage in economic activities, for which is directly responsible and accountable;
- is able to incur liabilities on its own behalf and to enter into contracts;
- compiles a complete set of accounts (or could compile it if required).

There are two main types of institutional units:

- households (persons or groups of persons that represent consumers);
- corporations (including quasi-corporations[35]), nonprofit institutions and government units (which represent producers).

Artificial institutional units are identified in special cases. Some examples are branches, land and other natural resources owned by non-residents.

An institutional unit is **resident** in an economic territory when there is, within the economic territory, some location in which or from which the unit engages and intends to continue engaging, either indefinitely or over a finite but long period of time (at least over a year), in economic activities and transactions on a significant scale.

The **accounting system** underlying the international accounts derives from broad bookkeeping principles and relies on:

- **vertical double-entry bookkeeping** (also known in business accounting simply as double-entry bookkeeping);
- **horizontal double-entry bookkeeping**;
- **quadruple-entry bookkeeping**.

According to the **vertical double-entry bookkeeping**, each transaction recorded in the BOP for an account requires a corresponding and opposite entry in the BOP for a different account. The double entry has two equal and corresponding sides known as debit and credit. This principle ensures that the total of credit entries and the total of debit entries for all transactions are the same, thus allowing the consistency of the accounts for a single unit to be verified.

[34] For BOP purposes, a transaction means an exchange of goods, services or income but also financial flows between an institutional unit resident in a certain economy and the rest of the world.

[35] Quasi-corporations are enterprises that produce goods and services, have complete sets of accounts, including balance sheets, but do not have a separate legal personality. In Italy, they include "società in nome collettivo (collective partnerships)", "società in accomandita semplice (limited partnerships)", "società semplici (informal associations)", "società di fatto (de facto corporations)" and individual enterprises with more than 5 employees.

The concept of **horizontal double entry book-keeping** reflects the mutual economic relationships between different institutional units in a consistent way: if unit A provides something to unit B, the accounts of both A and B show the transaction for the same amount: as a payment in A's account and as a receipt in B's account.

The simultaneous application of both vertical and horizontal double-entry bookkeeping results in a **quadruple-entry bookkeeping**, which is the accounting system underlying the recording of transactions in the national accounts and international accounts.

Every transaction should be recorded in the BOP on an **accrual basis**, i.e. when a change of ownership takes place or when economic value is created, transformed, exchanged, transferred or extinguished. In other words, the effects of economic events are recorded in the period in which they occur, irrespective of whether cash was received or paid or was due to be received or paid.

According to the different types of transactions recorded in the BOP, the accrual basis implies that:

- transactions in goods and financial assets should be recorded when a change of ownership takes place;
- transactions in services should be recorded when the service is provided;
- transactions referred to income and transfers should be recorded when the claim arises.

Each transaction recorded in the BOP should be valued at **market price**. Market prices are defined as the amounts of money that willing buyers pay to acquire something from willing sellers. They refer to the current exchange value, that is, the value at which goods and other assets, services, and labours are exchanged or else could be exchanged for cash. When market prices for transactions are not observable, valuation according to market-equivalent prices provides an approximation for market prices.

4.2. BOP main accounts

The scheme reported in Table 4.1 summarizes the structure of the balance of payments.

The balance of payments is divided into three main sections: **Current account, Capital account and Financial account.**

The **Current account** registers transactions in goods, services, and primary and secondary income. In the current account, two different columns are distinguished: *credit* and *debit*. Net is calculated as '*credit – debit*'. Credits occur when a resident exports goods or services or receives income from abroad, whereas debits occur when a resident imports goods or services or pays income abroad.

Goods are physical, produced items over which ownership rights can be established and whose economic ownership can be passed from one institutional unit to another by engaging in transactions. They may be used to satisfy the needs of the buyer or to produce other goods or services. This item comprises merchandise trade, net exports of goods under merchanting (the purchase by an Italian operator of goods from

a non-resident operator and the subsequent resale of the same goods without their physically crossing the Italian border) and non-monetary gold.

Table 4.1 - The structure of the Balance of Payments (BOP)

BOP item	Credit	Debit	Balance /Net
1. Current account • *Goods* • *Services* • *Primary and secondary income* 2. Capital account			
	Net acquisition of assets	Net incurrences of liabilities	Balance/Net
3. Financial account • *Direct investment* • *Portfolio investment* • *Financial derivatives (other than reserves) and employee stock options* • *Other investment* • *Reserve assets* 4. Net errors and omissions			

Services are the result of a production activity that changes the conditions of the consuming units, or facilitates the exchange of products or financial assets. Services can be classified into three main categories:

- *Travel*, which includes goods and services, for own use or to give away, acquired from an economy by nonresidents during visits to that economy,
- *Transport*, which is the process of carriage of people and objects from one location to another as well as related supporting and auxiliary services,
- *Other services* (construction, insurance and pension services, financial services and so on).

Primary income represents the return that accrues to institutional units for their contribution to the production process or for the provision of financial assets.

Three different types of income are distinguished:

- *Compensation of employees* (associated with the production process);
- *Investment income* (associated with the ownership of financial assets);
- *Other primary income* (taxes on production and on imports, subsidies on products and fees deriving from the use of natural resources).

Secondary income includes redistribution of income, that is, when resources for current purposes are provided by one party without anything of economic value being supplied as a direct return to that party. Examples include personal transfers (workers'

remittances), taxes on income and wealth, social contributions and current international cooperation.

The **capital account** shows gross acquisitions and disposals between residents and nonresidents of:

- *non-produced non-financial assets* (which includes natural resources, licences, leasing contracts, marketing resources and goodwill);
- *capital transfers* (which includes transfers of ownerships of fixed assets, of funds linked to the acquisition or disposal of fixed assets and the forgiveness of debts).

The **financial account** records transactions that involve financial assets and liabilities and that take place between residents and non-residents. Transactions included in the financial account are divided into *Net acquisition of assets* and *Net incurrences of liabilities*. Under each column, a (+ sign) means an increase in foreign assets (or liabilities) whereas a (- sign) implies a reduction in them.

Assets and liabilities are classified according to five different functional categories:

- Direct investment;
- Portfolio investment;
- Financial derivatives;
- Other investment;
- Reserve assets.

In each functional category, assets and liabilities are classified according to the underlying financial instrument.

Direct investment is a category of cross-border investment associated with a resident in one economy **having control or a significant degree of influence** on the management of an enterprise that is resident in another economy. Direct or indirect **possession of 10 per cent or more of the voting rights** is proof of such a relationship.

As well as the equity that gives rise to control or influence, direct investment also includes investment associated with that relationship, including investment in indirectly influenced or controlled enterprises, investment in fellow enterprises and debt and reverse investment. Direct investment is classified as follows:

- Equity;
- Reinvested earnings;
- Debt instrument.

Direct investment also includes **investment in private and commercial real estate**.

Portfolio investment includes cross-border transactions and positions involving debt or equity securities, other than those included in direct investment or in reserve assets.

Portfolio investment may be broken down **by instrument** (equity, investment fund shares, short-term and long-term debt securities), **by original or remaining maturity** (less or more than one year), **and/or by resident and counterpart sector**.

A **financial derivative** is a financial instrument that is linked to another specific financial instrument, indicator or commodity and through which specific financial risks

(such as interest rate risk, foreign exchange risk and so on) can be traded in their own right in financial markets. This category is identified separately from the others insofar as it concerns the transfer of risk rather than the provision of funds or other resources. Financial derivatives do not generate primary income.

Other investment is a residual category that includes transactions other than those included in direct investment, portfolio investment, financial derivatives and reserve assets. The other investment category is classified by instruments and includes:

- other equity;
- currency and deposits;
- loans;
- insurance technical reserves;
- trade credit and advances;
- other accounts receivable/payable;
- SDR allocations (holdings of SDRs are included under reserve assets).

The **reserve assets** of a national central bank belonging to the Eurosystem refer to claims on non-residents of the euro area that are liquid, negotiable and readily available to the monetary authority, denominated in convertible currencies other than the euro, monetary gold, reserve positions in IMF and SDRs.

According to double entry book-keeping, since each transaction consists in the exchange of one economic asset for another asset (i.e. goods vs money), two different registrations of the same amount are required for each of them, one on the credit (asset) side and one on the debit (liability) side.

Consequently, the algebraic sum of the records should be zero by construction. Unfortunately, given the complexity and heterogeneity of the data collection and processing system, differences can occur between the two values due to errors and approximations in the different data sources for the calculation of the different items and to inconsistencies in the estimation processes.

To offset these discrepancies and square the accounts, the errors and omissions item (EO) has been introduced, calculated as the difference between the balance of the financial account (FA) and the sum of the balances of the current (CA) and capital account (KA). In formulae:

Current account balance: CA = (Xg-Mg)+(Xs-Ms)+(Ir-Ip) **(1)**

X=export (g=goods, s=services)
M=import (g=goods, s=services)
Ir=Income received
Ip= Income paid

Capital account balance: KA = K(Credits) – K(debits) **(2)**

Financial account balance: FA = ΔAssets-ΔLiabilities **(3)**

EO=FA-(CA+KA) **(4)**

4.3. The International Investment Position (IIP)

The BOP can be considered as a country's income statement. Consequently, in order to complete the country's financial statements, a balance sheet should also be compiled.

The International Investment Position (IIP) is this balance sheet. The IIP is a statistical statement that shows the value of financial assets and liabilities of residents of an economy vis-à-vis non-residents at a given time. The IIP is classified according to the same five functional categories adopted in the financial account of the BOP.

Table 4.2 – The structure of the International Investment Position (IIP)

IIP		Assets	Liabilities	Balance
	Direct investment	a_1	l_1	a_1-l_1
	Portfolio investment	a_2	l_2	a_2-l_2
	Derivatives	a_3	l_3	a_3-l_3
	Other investment	a_4	l_4	a_4-l_4
	Reserve assets	a_5		a_5
	Total	$\sum a_i$	$\sum l_i$	$\sum a_i-\sum l_i$

The balance ($\sum a_i-\sum l_i$) is the **net IIP**.

The following relationship between the net IIP and the BOP (i.e. between stocks and flows) applies:

$$\textbf{Net IIP}_{t+1}\textbf{= Net IIP}_t\textbf{+ FA + Adj.} \qquad \textbf{(5)}$$

Net IIP_t = Net IIP at the end of time t

FA = balance of the BOP financial account between time t and time t+1

Adj. = Price, exchange rates and other adjustments occurring between time t and time t+1

If no EO occurred (EO $\rightarrow$0), then **CA+KA = FA.** Consequently:

$$\textbf{Net IIP}_{t+1}\textbf{= Net IIP}_t\textbf{+ CA+KA + Adj.} \qquad \textbf{(6)}$$

In a coherent framework, this means that, when the errors and omissions are not significant, the cumulative sum of the current account and capital account balance, except for the valuation adjustments, should be close to the net IIP.

4.4. Relationship with National Accounts

The National Accounts describe, through a system of sectoral accounts, the "production - income - consumption – accumulation" circuit that takes place in a given period, at the level of each single institutional sector (including the "Rest of the world" sector) or at the level of the economy as a whole.

The international accounts (BOP and IIP) correspond to the Rest of the world accounts of the National Accounts. They differ in the sense that the BOP (IIP) is calculated from the perspective of the resident sectors, whereas the National Accounts data for the Rest of the world are calculated from the perspective of non-residents. As a consequence, assets in the National Accounts for the institutional sector 'Rest of the World' are BOP (IIP) liabilities, and liabilities in the National Accounts for the institutional sector "Rest of the World" are BOP (IIP) assets.

Gross Domestic Product (**GDP**) is the monetary value of all the finished goods and services produced within a country's borders in a specific time. It includes:

- all **private and public consumption** (C),
- **investments** (I),
- **government outlays** (G) and
- the **foreign trade balance** ((Xg-Mg) + (Xs-Ms))

$$\mathbf{GDP = C + I + G + (Xg-Mg) + (Xs-Ms)} \qquad \mathbf{(7)}$$

Adding to the GDP the balances of primary and secondary income (Ir-Ip) with foreign countries, GDP becomes the Gross National Income (**GNI**):

$$\mathbf{GNI = GDP+Ir-Ip = C+I+G+(Xg-Mg)+(Xs-Ms)+(Ir-Ip) =}$$

$$\mathbf{= C+I+G+CA} \qquad \mathbf{(8)}$$

The accounts for the use of income explain the GNI in terms of public consumption/expenditure and savings:

$$\mathbf{GNI = C + G + S} \qquad \mathbf{(9)}$$

Consequently

$$\mathbf{S - I = CA} \qquad \mathbf{(10)}$$

If CA<0, then S<I: investments in the country are financed by foreign investors.

If CA>0, then S>I: investments in the country are financed by internal savings.

4.5. The International standards

The International Monetary Fund (IMF) is the international organization with the task of defining the international standards for the compilation of external statistics. The IMF regularly publishes and updates a specific Manual in order to meet the need for harmonizing the rules (concepts and definitions, classifications and presentation schemes) for the compilation of the balance of payments and the international investment position.

The last edition (VI) of the Balance of Payments and International Investment Position Manual was published in 2009 and has been adopted worldwide. The Manual harmonizes the rules and the schemes for presenting phenomena, but each country adopts its own data sources to produce its BOP and IIP. At the euro-area level, the European Central Bank adopts the international standards defined by the International Monetary Fund through a specific Guideline that must be followed by each euro-area country, including Italy.

In 2020, the IMF started the process of updating the BOP/IIP Manual and the 7th edition will be published in 2025.

4.6. The compilation of the Balance of Payments (BOP) in Italy

In Italy, the BOP was initially compiled on the initiative of the Government and the Central Bank, with the aim of supporting international multilateral negotiations on loans before and especially after the First World War. At the beginning, it was occasionally compiled to assess the "external" sustainability of economic trends and was systematically compiled only later, in the context of Italy's accession to new international institutions after the Second World War. The IIP became mandatory much more recently (around 1990).

At national level, external statistics are necessary for the calculation of important national economic aggregates (GDP, GNI and so on) and for the analysis of the vulnerability of the country with respect to external shocks (for example, in the event of financial crises in countries towards which national investments are directed). Through the analysis of the BOP balances, it is possible to assess the degree of internationalization and competitiveness of resident companies (for example by monitoring the evolution of the "direct investments" component). As Italy belongs to a monetary union, the national BOP is no longer relevant for the definition of the exchange rate policy.

National BOP/IIP statistics contribute to the development of the BOP/IIP for the EU/euro area, thus providing useful indications for the definition of the monetary and exchange rate policy. The BOP/IIP support the analysis of the economic and financial relationships of the EU/euro area with the rest of the world and the analysis of the euro's relevance as an international currency. The external statistics favour taking economic policy decisions at EU level and interventions in international negotiations on trade in goods and services between WTO members.

The role of BOP/IIP statistics has become increasingly central, given the growing relevance of the analysis of macroeconomic imbalances and their monitoring by the European Commission, also through the "**MIP[36]-Scoreboard"**. The MIP has been adopted to prevent and correct possible imbalances in EU countries. Two of the indicators included in the MIP refer to the BOP/IIP:

- the 3-year backward moving average of the Current Account balance (CA) as a percentage of GDP, with thresholds of +6 per cent and -4 per cent, and
- the net International Investment Position (IIP) as a percentage of GDP, with a threshold of -35 per cent.

At euro-area level, the ECB, while being able to define and manage a data collection system independently, uses the systems already in place in the individual euro-area countries. Each country provides the ECB with its balance of payments, distinguishing between transactions with euro-area countries and non-euro area countries. The ECB uses national non-euro area BOP/IIP data to compile euro-area external statistics. National contributions must be compiled according to international standards (ECB Guideline and EU Commission Regulation) in order to ensure consistency and to facilitate the calculation of the final aggregate.

The compilation of BOP/IIP statistics in Italy relies on the use of multiple data sources, different for each combination of institutional sectors and BOP/IIP items (a

[36] Macroeconomic Imbalance Procedure.

flexible double-entry "matrix of data sources"). Most of the data sources are sample surveys: in particular, the new system core data source is "direct reporting" (DR), a set of sample surveys on non-financial and insurance enterprises. Other sample surveys are those regarding tourism and international travel and merchandise transport.

In order to avoid information redundancies as much as possible, a general review of many data sources internal to the Bank of Italy was carried out with the aim of integrating them with the necessary requirements for BOP/IIP compilation. One example is the use of MFI supervisory reports for the compilation of BOP/IIP statistics.

The BOP/IIP compilation system in Italy also provides for the use of already existing administrative data sources originally set up for non-statistical purposes.

In the following schemes, the double-entry "matrix of data sources" for the Current and Capital account and for the Financial account is reported:

Table 4.3 – Current account: matrix of data sources

		Resident sector					
		General government	Monetary authority	Monetary and financial institutions	Non-financial and insurance companies	Other financial intermediaries	Households
Current and capital account	Goods	COE + INDTRA	COE + INDTRA	COE + INDTRA	COE + INDTRA	COE + INDTRA	COE + INDTRA
	Services: Travel and Passenger Transport	INDTUR	INDTUR	INDTUR	INDTUR	INDTUR	INDTUR
	Services: Merchandise transport	INDTRA	INDTRA	INDTRA	INDTRA	INDTRA	FA + ST
	Services: other services	BI	BI	MC	DR	AIF	FA + ST
	Compensation of employees	BI	BI	MC	DR	AIF	FA + ST
	Current and capital transfers						
	Investment income	MC+ST+BI	BI	MC	DR	AIF + ST	FA + ST

Table 4.4 – Financial account: matrix of data sources

		Resident sector					
		General government	Monetary authority	Monetary and financial institutions	Non-financial and insurance companies	Other financial intermediaries	Households
Financial account	Direct investment	FA		MC	DR	AIF	FA
	Portfolio investment	MC+DR+DBTIT	BI	MC+DR+DBTIT	MC+DR+DBTIT	MC+DBTIT+AIF	MC+DBTIT+FA
	Derivatives	BI	BI	MC	DR	AIF	FA
	Other investment	BI	BI	MC	DR	AIF	FA

COE = Foreign trade statistics (National Statistical Institute) - DR = Direct reporting - INDTRA = Transport survey - INDTUR = Travel survey - ST = Estimates/Modelling - AIF = other financial intermediaries' reports - BI = Central bank internal data sources - DBTIT = Securities database (internal and ECB Centralized Security Database) - DR = Direct reporting - FA = Administrative data sources - MC = Integrated Bank Reports

4.7. BOP/IIP Data dissemination

The balance of payments data are released on both a monthly and a quarterly basis; the international investment position and external liabilities other than equity (external debt) data are only released on a quarterly basis.

The provisional balance of payments monthly data for month M of quarter Q are first released about a month and a half later (M+6 weeks) to Eurostat, the ECB and at national level.

The provisional international investment position and external debt data and the balance of payments data, which are only available quarterly (services other than international travel and transport; detailed data on other primary income, secondary income and capital account), are disseminated three months later (Q+82 days), to Eurostat, the ECB, the IMF and at national level.

Annual IIP, Foreign Direct Investment (FDI) and detailed data for services are disseminated after approximately nine months (T+9 months) to Eurostat, the ECB and the IMF.

Suggested readings

Balance of payments and International investment position - Methodological notes (https://www.bancaditalia.it/pubblicazioni/metodi-e-fonti-note/metodi-note-2019/note_bop_201911_eng.pdf?language_id=1)

Additional references

Balance of Payments and International Investment Position - Manual (only in Italian) (https://www.bancaditalia.it/pubblicazioni/metodi-e-fonti-manuali/manuale_BOP.pdf?language_id=1)

BPM6 https://www.imf.org/external/pubs/ft/bop/2007/bopman6.htm

5. Household surveys at the Bank of Italy
(F. Zanichelli)

5.1. Introduction

The BI periodically conducts surveys on households to gather information on their economic conditions. These data are of great importance for performing the BI's activities, such as the analysis of the transmission mechanisms of monetary policy measures, the supervision of the financial system and the evaluation of the impact of new policies and events on the economy.

Survey microdata complement the information obtained from macro sources (e.g. the national accounts), as they have some specific features that make them a unique source of information. In particular, in surveys, multiple information is collected on the same statistical unit (e.g. simultaneous information on the income, wealth and consumption of the same household). This makes possible the economic analysis of specific sub-populations of interest (such as those that are financially vulnerable, the young or the less educated) and the study of the distributional features of the phenomena of interest (such as the distribution of income and wealth in the population). Furthermore, surveys are a flexible instrument, which enable the collection of specific information of interest, including expectations, individual preferences and behavioural aspects.

The most important household survey carried out by the Bank of Italy is the Survey on Household Income and Wealth (SHIW), which was started in the 1960s in order to gather information on the incomes and savings of Italian households. Over the years, it has grown considerably in scope and it now covers all the components of households' budgets (including financial wealth and indebtedness) and other aspects of households' behaviours, such as the payment methods employed. The SHIW is currently carried out approximately every two years and all the interviews are conducted in person. Since its implementation, the SHIW has been one of the most important sources of information on Italian households and a reference point for economic research.

As in other statistical fields, the need emerged in the 1990s to obtain comparable sample estimates between countries. Firstly, the BI made the data available on some international platforms (e.g. the Luxembourg Income Study and the Luxembourg Wealth Study). In order to make international comparisons more effective, BI experts participated in some initiatives aimed at harmonizing definitions, questionnaires and survey methods between countries (e.g. the Canberra Group promoted by the OECD).

Following this line, in 2010, the BI, other NCBS and the ECB started a new project, the Household Finance and Consumption Survey (HFCS), with the aim of collecting harmonized information on euro-area households' wealth, income and consumption. The Italian data are derived from the SHIW, after being suitably harmonized. The HFCS is now a solid tool with which to conduct reliable comparative analyses of household economic behaviour across the European countries.

In more recent years, however, the need for information on households has considerably increased and the SHIW alone is not enough to answer all the questions. First, the SHIW questionnaire is long and complex and, in order to avoid an excessive

burden on the respondents, only a small amount of additional questions can be included in each wave. Furthermore, the relatively low frequency of the SHIW makes this survey unsuitable for responding quickly to sudden information needs. For these reasons, in the last decade, several ad-hoc surveys have been implemented, usually based on online survey techniques, which enable quick implementation and shorter fieldworks. The most important example is the Special Survey of Italian Households, which was started after the outbreak of the COVID-19 pandemic when the fieldwork activities of the SHIW were suspended. The Special Survey was administered using remote devices and it made it possible to fill the information gap and gather timely data on the impact of the pandemic on the economic conditions of Italian households.

Online surveys have advantages and disadvantages compared with traditional face-to-face surveys. On the one hand they are more flexible and allow information to be gathered quickly; on the other hand, they often suffer from selection bias, as part of the population does not have access to Internet. Furthermore, online surveys might be less accurate in collecting quantitative information due to the absence of an interviewer that provides clarification on complex questions and motivates the respondents.

More recent developments are moving towards a mixed approach, with both online and personal interviews carried out at different frequencies, and the availability of auxiliary information on respondents (such as administrative data). A solution in the future might be to address the increasing need for timely information on households, at the same time maintaining high quality standards.

The following sections focus on the BI's main surveys of households: the Survey on Household Income and Wealth, the Household Finance and Consumption Survey and the Special Survey of Italian Households. Each survey is described in detail with respect to its contents, methodological aspects and main uses.

5.2. The Survey on Household Income and Wealth (SHIW)

The Survey on Household Income and Wealth (SHIW) was started in the 1960s to gather information on the incomes and savings of Italian households. Over the years, the survey has grown in scope and it now includes information on wealth, debts and other aspects of households' economic and financial behaviour, including, for instance, their expectations and the payment methods used (Baffigi et al., 2016).

Before 1987, the survey was conducted on a yearly basis, which was then changed to a two-year frequency (except for 1998). In the most recent editions, the sample consists of about 8,000 households, which correspond to approximately 20,000 individuals, distributed over more than 300 Italian municipalities. In order to facilitate the analysis of changes in the phenomena investigated, since 1989, part of the sample has comprised households already interviewed in previous waves (*panel households*). Additionally, for intergenerational analyses, all the new households that are formed by members of panel households who leave the original household (e.g. those formed by the children who start a new household) are included in the sample as well.

5.3. The questionnaire design

The questionnaire has a modular structure and it touches all the main aspects of household finances (Table 5.1). About 80 per cent of the questionnaire is permanent, i.e.

it is not modified from one wave to another, in order to ensure time series consistency and limit the effects due to changes in the question wording as much as possible. The remaining part of the questionnaire is variable and it is defined for each wave of the survey in cooperation with the researchers of the BI's Economics and Statistics Directorate, in order to investigate themes of specific interest at the time of the survey.

Table 5.1 - The structure of the questionnaire

Section	Topic
A	Composition of the household
B	Employment and income
C	Payment instruments and forms of saving
D	Principal residence, other properties and debts
E	Household expenditure
F	Supplementary pension plans and insurance policies
G	Information to be provided by the interviewer

5.4. The selection of the sample

The target population of the survey is the population of households (officially) resident in Italy; it does not include people living in institutions (convents, hospitals, prisons and so on) or those who are in the country illegally. There are two main stages in the selection of the sample, with municipalities and households as the primary and secondary sampling units respectively. In the first stage, the municipalities in which the interviews will be conducted are selected, after being stratified by region and population size. Within each stratum, the municipalities are selected to include all those with a population of more than 40,000 people and those with panel households (self-representing municipalities), while the smaller municipalities are selected on the basis of probability proportional to size sampling (PPS).[37] In the most recent editions of the survey, the number of first-stage units has varied between 350 and 390 municipalities. In the second stage, the households to be interviewed are randomly drawn from the civic registers of the selected municipalities; in addition to these households, all households which have been interviewed in at least two waves of the survey are included in the sample (panel households) and a refresher sample is drawn from households only interviewed in the previous edition.

5.5. The fieldwork

The fieldwork is contracted out to a private company, with professional interviewers recruited by the survey agency. The interview stage is preceded by a series

[37] The PPS procedure (i.e. the selection of a city based on a probability proportional to its population) is sometimes chosen by statisticians because when the sampling size is equal across the secondary units (the same number of interviews in every city, in our case), the same probability of selection for every household in the population is obtained. In such a case, we can avoid using sampling weights (defined as the inverse of the probability of selection). In the SHIW, this only applies approximately and only in some strata; the use of the sampling weights is then recommended.

of meetings at which officials from the BI and representatives of the company give instructions directly to the interviewers. Before the actual survey, a pilot survey is conducted in order to test the new questions.

All interviews are conducted in person (face-to-face interviews) at the main household residence. Starting from the 1998 survey, data have mainly been collected with the aid of a computer, using the Computer-Assisted Personal Interviewing program (CAPI). This electronic questionnaire, in addition to storing data, also ensures the correct flow of the questionnaire and performs a number of checks, making it possible to remedy any inconsistencies in the data directly in the presence of the household. The data are provided by the reference person, defined as the household member who is most informed about the household finances. In the most recent editions, interviews last on average 50 minutes. However, there are considerable variations within the sample and the length of the interview is positively correlated with income and with the number of household members, especially if they are income-earners.

5.6. Quality checks

After the fieldwork, coherence checks are performed on the data and a number of corrections are made by re-contacting the household, by using auxiliary information (for instance, information from the previous waves for panel households) or by imputing some data. It is necessary to impute answers for all the elementary variables that make up the aggregates. The amount of imputed data is generally small and mainly concerns the variables for which it is possible for households not to provide an exact response, such as the fringe benefits of employees and the value of financial assets. Regression models are used to impute the missing values on the basis of other available information. In order to avoid an excessive concentration around average values, a random component is added, extracted from a normal variable with a mean of zero and a variance equal to that of the residuals in the regression model. This preserves the mean and the variance of the data actually measured.

5.7. Survey weights

If the probability of being selected is constant for all the units in the sample, then the unweighted sample mean is an unbiased estimator of the population mean of the phenomena of interest. In practice, however, the sample units are often selected with unequal probabilities. In the SHIW, the two-stage complex sample design with stratification of first-stage units is not EPSEM (equal probability selection method); furthermore, the propensity of households to participate in the survey is not constant. Therefore, in order to compute unbiased estimators, which refer to the whole reference population, survey weights are needed (Faiella and Gambacorta, 2007).

The final weights are the result of the following steps:

1) the initial weights are computed as the inverse of the selection probability (design weights);
2) the weights are then adjusted for unit non-response, by multiplying them by the inverse of the response rate in the municipality;
3) the weights are further modified in order to take into account the panel component. The social and demographic characteristics of the panel households may differ in some respects from those of the whole sample,

essentially owing to non-participation (attrition). This potential source of distortion in the estimates can be corrected by post-stratifying the panel section of the sample based on a number of characteristics of the previous survey;

4) lastly, the weights are calibrated to account for additional information from external sources. This procedure improves the accuracy of the estimators and further limits the distortions relating to the unit non-response. In particular, the variables used for calibration are gender, age group, geographical area and size of the municipality of residence.

5.8. Sampling and non-sampling errors

Even when using survey weights, estimates of population parameters based on survey data unavoidably come with errors. There are two main types of errors that might occur:

- **Sampling errors** derive from observing a sample instead of the whole population and they decrease as the sample size grows**;**
- **Non-Sampling errors** might occur during the process of data collection and measurement (for instance, non-response and measurement errors) and they do not decrease with the increase of the sample size.

In general, there is a trade-off between increasing the sample size (thereby reducing sampling errors) and maintaining a high quality level of the interviews (thereby reducing non-sampling errors).

5.9. Sampling errors

Different samples selected from the population produce different estimates of the parameter of interest. The sampling error is quantified in terms of variance of the estimator. In the simplest case of a Simple Random Sampling (SRS), the variance of the sample mean is given by:

$$\text{var}(\bar{y})_{srs} = \frac{1}{n} * s^2 * (1 - \frac{n}{N})$$

which grows with the estimated variance of the analysed variable (s^2) and decreases when increasing the sample size (n).

The features of complex survey designs (such as the SHIW design) have a different impact on the variance (Table 5.2). The actual variability of the estimators can be determined with techniques that take into account both the sample selection procedure and the nature of the estimators (Faiella, 2008). This can be done with replication methods that consist in obtaining information on the variability by repeating the estimation on 'replicates' of the original sample. For this purpose, Jackknife replication weights are disseminated with the SHIW data.

Table 5.2 – Some features of the SHIW sample design and their impact on the variance of estimators

Feature	Description	Effect on variance
Stratification	Divide the population into groups according to some characteristics (e.g. income classes, regions, etc…), then select units in each of these groups; it improves the efficiency of estimators if the strata are correlated with the variable of interest.	Decrease
Clustering	Select a subset of clusters (e.g. municipalities) to reduce the costs and time of fieldwork, but units within the same cluster are usually more homogenous with respect to the whole population.	Increase
Multi-stage	Combine features of stratification and clustering.	Undetermined
Weights	Using survey weights is necessary to have unbiased estimators, but they usually increase the variance.	Increase

5.10. Non-Sampling errors

The fieldwork activities are crucial for the quality of the survey data. Non-sampling errors usually occur during the fieldwork and they do not depend on the sampling nature of the survey; instead, they can be present in both sample surveys and censuses.

Non-sampling errors can mainly be divided in two groups:

1. **Unit non-response:** these errors derive from the fact that some households are not willing to participate in the survey. However, non-response is only a problem when those who do not participate in the survey have different characteristics (in terms of the variables of interest) from the respondents. By dividing the population into two groups, responding (r) and not responding (nr), the average value of a variable y can be decomposed as:

$$\bar{y} = \frac{N_r}{N}\bar{y}_r + \left(1 - \frac{N_r}{N}\right)\bar{y}_{nr}$$

and the error obtained by basing the estimate only on the respondents is equal to:

$$\bar{y}_r - \bar{y} = \left(1 - \frac{N_r}{N}\right)(\bar{y}_r - \bar{y}_{nr})$$

which increases both with the non-response rate and with the difference between the mean value of y in the two groups (respondents and non-respondents).
Many studies have shown that non-response is not at random in the SHIW, i.e. non-respondents differ from respondents in their characteristics of interest (D'Alessio and Faiella, 2002). For instance, wealthier households generally have a lower propensity to participate in the survey.

Several measures have been taken in order to reduce non-participation in the survey. First, the households are sent an advance letter to inform them about the aims and the importance of the survey and to reassure them about the confidential use of their data. Second, interviewers must try to contact the household at least four times (at different times and days of the week, including the weekend) and the first contact is always in person. Third, interviewers are specifically trained and provided with some materials to overcome distrust and increase participation (ID badge, brochure describing the survey, newspaper articles, symbolic gifts and so on). Finally, respondents are given a toll-free number and the contacts of the people taking care of the survey in the BI for clarifications.

2. **Response errors** might occur during the interview and they include: data entry errors, involuntary response errors (such as recall errors and difficulty in understanding the questions) and voluntary response errors (such as incorrect answers due to social desirability and under-reporting of income and wealth).
Several measures are taken in order to reduce response errors and to increase the quality of the data. First, the use of CAPI considerably reduces data entry errors thanks to the automated checks that are performed in real time during the interview. Second, the question wording is carefully evaluated and the questions are tested during the pilot phase before the fieldwork in order to assess their clarity. Interviewers are also trained to help respondents in the retrieval process of answers. Finally, under-reporting and voluntary response errors are addressed by conducting the interviews face-to-face at the household's main residence and by using special techniques to reduce under-reporting (such as the unfolding bracket technique).
For the SHIW, the main source of response error is the under-reporting of economic variables, in particular of certain sources of income (such as self-employment income) and wealth (financial assets and dwellings other than the household's main residence). For instance, in one study, the total response bias for household income was estimated to be about 12 per cent of reported income, while the relative standard error for the same statistics was about 1.2 per cent (Neri and Zizza, 2010).

5.11. Main aggregates and indicators

The two main economic aggregates which can be computed with the SHIW data are household income and household net wealth.

Household income

Household income is computed as the sum of all incomes earned by all the household members (Table 5.3). All income components are collected in the SHIW, net of taxes and social contributions. In addition to household income, per-capita income can be computed as the ratio between household income and the number of household members, in order to account for the household size.

In order to enable a comparison of households of differing compositions, the equivalent income can be computed as the ratio between household income and the

number of equivalent adults.[38] This allows us to account for the age structure of the household and the presence of economies of scale.

Table 5.3 – Income computation in SHIW

Variable name	Description (1)
Y	Net disposable income
YL	Payroll income
YL1	Net wages and salaries
YL2	Fringe benefits
YT	Pensions and net transfers
YTP	Pensions and arrears
YTP1	Pensions
YTP2	Arrears
YTA	Other transfers
YTA1	Financial assistance (wage suppl., etc.)
YTA2	Scholarships
YTA3	Alimony and gifts
YTA31	received
YTA32	paid (-)
YM	Net self-employment income
YMA1	Self-employment income
YMA2	Entrepreneurial income
YC	Property income
YCA	Income from real estate
YCA1	Actual rents
YCA2	Imputed rents (2)
YCF	Income from financial assets (3)
YCF1	Interest on deposits
YCF2	Interest on government securities
YCF3	Income from other securities
YCF4	Interest payments (-)

Y = YL + YT + YM + YC

(1) A minus sign indicates that the item is included with a negative sign when calculating the aggregate.
(2) Excludes buildings used for self-employment.
(3) Interest rate * capital stock.

Household net wealth

Household net wealth is computed as the difference between total household assets (real and financial assets) and total financial liabilities (Table 5.4). While income is a flow, wealth is a stock and it is collected with reference to the last day of the year (e.g. 31/12/2016 for the 2016 survey).

[38] The OECD-modified equivalence scale is usually adopted, which assigns a weight of 1 to the household head, a value of 0.5 to each member aged 14 or over, and a value of 0.3 to each member under the age of 14.

Table 5.4 – Net wealth computation in the SHIW

Variable name	Description[(1)]
W	Net wealth
AR	Real assets
AR1	Real estate
AR2	Business equity
AR3	Valuables
AF	Financial assets
AF1	Deposits
AF2	Government securities
AF3	Other securities
AF4	Trade credit or credit due from other households
PF	Financial liabilities (-)
PF1	Liabilities to banks and financial companies
PF2	Trade debt
PF3	Liabilities to other households
W = AR + AF – PF	

(1) A minus sign indicates that the item is included with a negative sign when calculating the aggregate.

Poverty indicators – an example

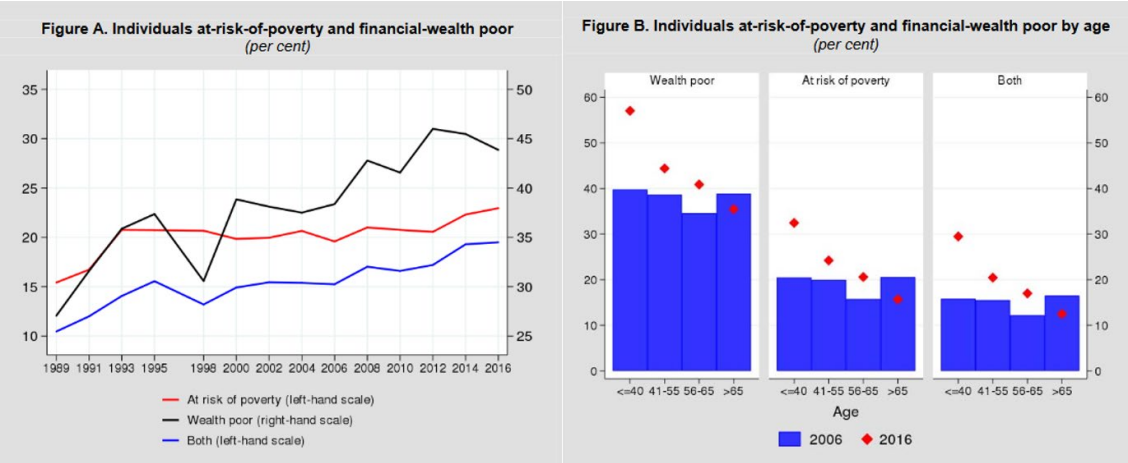
Many poverty indicators can be computed using SHIW data (Bank of Italy, 2018b), complementing the official measures produced by Istat.[39] Using SHIW data, the material well-being of a household is connected with the economic resources available to meet the household's needs. Persons whose income is below a socially acceptable threshold, conventionally set at 60 per cent of median equivalent income, are deemed 'at risk of poverty' or 'income poor'. However, this definition does not take account of other financial resources that households may rely on to meet their needs. Therefore, individuals are defined as 'financial-wealth poor' when their wealth in the form of liquid financial assets, adjusted to take account of household structure, is not enough to maintain a minimum standard of well-being (at-risk-of-poverty threshold) for a period of three months in the absence of income.

Both these indicators are relative measures: the condition of an individual can change even if their income/wealth does not change, but the economic conditions of other households do change.

According to SHIW data, the share of individuals at risk of poverty increased from 1989 to 2016 (the latest available edition of the survey) and it reached an all-time high of 23 per cent in 2016 Figure 5.1A). Wealth poverty is even more widespread, and in 2016, 44 per cent of the population were in this condition, a share that is still much higher than that recorded in 2006, but below the peak registered in 2012. With the start of the financial crisis, the incidence of wealth poverty rose faster than the share of persons at risk of income poverty. This led to a rapid rise in the share of persons who fall under both categories - from 15 per cent in 2006 to almost 20 per cent in 2016 - after remaining essentially stable for the previous 10 years.

[39] The Italian poverty measures computed by Istat are defined in terms of consumption. However, information on consumption is collected without the necessary reliability in the SHIW.

Figure 5.1 - Individuals at risk of poverty and financial-wealth poor in SHIW



Survey data allow us to investigate how the trend in the incidence of poverty affects different household groups. For instance, between 2006 and 2016, the trend in the incidence of material deprivation differed by age group, and the differences widened (Figure 5.1B). The incidence of income and wealth poverty declined among older households, while it rose among those with younger heads of household.

5.12. Results and dissemination of the data

The main results of the Survey on Household Income and Wealth are commented on in a report published by the BI in the Statistics series (Bank of Italy, 2018b).

Anonymized survey data are distributed for research purposes and they can be freely downloaded from the survey website: https://www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-imprese/bilanci-famiglie/index.html.

On the dedicated website, other material is available to users, such as a historical database with harmonized data from 1977 (which enables easy time series analysis), excel tables with the most relevant statistics, questionnaires and documentation for each survey wave and a bibliography, listing all the papers based on SHIW microdata (at the time of writing, more than 800 publications).

5.13. The Household Finance and Consumption Survey (HFCS)

Description of the survey

The Household Finance and Consumption Survey (HFCS) is a harmonized sample survey on euro-area households' wealth, income and consumption coordinated by the ECB. The survey is conducted on a voluntary basis by the national central banks and statistical institutes. The survey was started in 2010 and the Italian data derive from the Survey on Household Income and Wealth, after being suitably harmonized (e.g. incomes in the HFCS are reported as gross values, including taxes and social security contributions).

The HFCS was conducted in 2010, 2013 and 2016. In the third wave, it involved all the euro-area countries, as well as Croatia, Hungary and Poland, for a total sample of more than 91,000 households (European Central Bank, 2020a). The following wave is on the years 2019-2020 (whose data at the beginning of 2022 are not yet available, due to the pandemic).

Methodological aspects

The National Central Banks follow a methodology that is as homogenous as possible and use harmonized definitions to gather data on households' balance sheets, both stocks and flows, with special focus on the wealth components. Nevertheless, cross-country differences should be interpreted with great caution.

Methodological, institutional and economic differences certainly have an impact on the indicators across countries. For instance, wealth is measured at the household level but the average size of a household differs from country to country. Since higher levels of household wealth are generally observed for larger households, differences in the demographic structure should be taken into account when comparing indicators on household wealth (for instance, by comparing per-capita wealth instead of mean wealth).

Some examples of the differences, which are important to take into account when using the HFCS data, are:

- Methodological differences: fieldwork periods, ex post adaptation of pre-existing surveys, sample design (over-sampling);
- Economic differences: structure and composition of the household in different countries, propensity to purchase housing, changes in asset prices;
- Institutional differences: pension and social security systems, taxation of assets.

The ECB publishes a Methodological Report that describes the main features and differences in the national surveys (European Central Bank, 2020b).

Results and dissemination of the data

The full documentation is available on the project website: https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.

The microdata, in anonymous form, are available on request to researchers for academic and research purposes. Access to the data can be requested through the ECB website.

5.14. The Special Survey of Italian Households

Description of the survey

The outbreak of the COVID-19 pandemic in 2020 had a side effect on the production of statistics: many surveys, which are usually based on in-person interviews (including the SHIW), had to be interrupted or postponed. At the same time, there was a clear need for timely data on the impact of COVID-19 on the economic conditions of households.

For these reasons, the BI started a new survey, the Special Survey of Italian Households, in order to gather timely information on the impact of the COVID-19 pandemic on the economic conditions and expectations of households.

Six waves of the survey were carried out in the period between March 2020 and September 2021. The sample consists of 2,000-3,000 households and it includes a panel component of households interviewed in multiple waves of the survey. The interviews are conducted remotely using a specific device, similar to a tablet and designed to be easily used by all the population groups, including those that are less familiar with the use of electronic devices (such as the older parts of the population).

The questions included in the questionnaire are mainly qualitative and the focus is on the impact of the COVID-19 pandemic on the economic conditions, expectations and behaviours of households.

Results and dissemination of the data

The main results of the survey are commented on in the BI's Economic Bulletin and in dedicated publications (Neri and Zanichelli, 2020; Rondinelli and Zanichelli, 2020, 2021a, 2021b, 2021c, 2021d).

The full documentation of the survey and the anonymized microdata are available on the project website: https://www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-imprese/indag-straord-famiglie-italiane/index.html.

Suggested readings

Bank of Italy (2018a), The Survey on Household Income and Wealth, *Methods and Sources: methodological notes*.

Bank of Italy (2018b), Survey on Italian Household Income and Wealth, *Statistics series*.

Additional references

Baffigi, A., L. Cannari and G. D'Alessio (2016), Fifty years of household income and wealth surveys: history, methods and future prospects, Banca d'Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 368.

D'Alessio G. and I. Faiella (2002), Non-response behaviour in the Bank of Italy's Survey of Household Income and Wealth, Banca d'Italia, *Temi di Discussione (Working Papers)*, no. 462.

European Central Bank (2020a), The Household Finance and Consumption Survey: methodological report for the 2017 wave, ECB Statistics Paper Series, no. 35.

European Central Bank (2020b), The Household Finance and Consumption Survey: results from the 2017 wave, ECB Statistics Paper Series, no. 36.

Faiella I. (2008), Accounting for sampling design in the SHIW, Banca d'Italia, *Temi di Discussione (Working Papers)*, no. 662.

Faiella I. and R. Gambacorta (2007), The weighting process in the SHIW, Banca d'Italia, *Temi di Discussione (Working Papers)*, no. 636.

Neri A. and R. Zizza (2010), Income reporting behaviour in sample surveys, Banca d'Italia, *Temi di Discussione (Working Papers)*, no. 777.

Neri A. and F. Zanichelli (2020), 'The main results of the special survey of Italian households in 2020', Banca d'Italia, *Note COVID-19*, June 2020.

Rondinelli C. and F. Zanichelli (2020), 'The main results of the second wave of the special survey of Italian households', Banca d'Italia, *Note COVID-19*, November 2020.

Rondinelli C. and F. Zanichelli (2021a), 'The main results of the third wave of the special survey of Italian households', Banca d'Italia, *Note COVID-19*, March 2021.

Rondinelli C. and F. Zanichelli (2021b), 'The main results of the fourth wave of the special survey of Italian households', Banca d'Italia, *Note COVID-19*, May 2021.

Rondinelli C. and F. Zanichelli (2021c), 'The main results of the fifth wave of the special survey of Italian households', Banca d'Italia, *Note COVID-19*, September 2021.

Rondinelli C. and F. Zanichelli (2021d), 'The main results of the sixth wave of the special survey of Italian households', Banca d'Italia, *Note COVID-19*, November 2021.

6. Business surveys at the Bank of Italy
(R. Gambacorta)

6.1. An overview

Data from firms gathered through sample surveys make possible the collection of detailed information on a country's production system that contributes notably to providing information both for conducting microeconomic research and assisting economic policy decisions.

The Bank of Italy has a long tradition of "pioneering" in business surveys, as it is one of the national central banks with the longest experience in gathering information from firms. Over the last decade, the number of central banks with a business survey programme has been increasing rapidly, also giving rise to international collaborations for sharing methodologies, such as the "Central Bank Business Surveys and Liaison Programmes" to which the Bank of Italy actively contributes by providing experiences and best practices.

One of the peculiar characteristics of the business surveys conducted by the Bank of Italy lies not only in the availability of historical data, but also in the completeness of the information available, collected through coordinated surveys to obtain timely and detailed information on the economic situation.

Indeed, to overcome the lack of statistical data on the Italian economy, in the 1970s, the Bank of Italy (BI) began conducting sample surveys of firms.

The first survey to be conducted was the annual Survey of Industrial and Service Firms (SISF), which started in 1972. To complement these data, and meet additional informational needs, further surveys have been progressively added over time. In 1993, the Business Outlook Survey of Industrial and Service Firms (BOS) was started to gather further qualitative information on the economic condition of firms. Furthermore, the quarterly Survey on Inflation and Growth Expectations (SIGE) was introduced in 1999 to analyse economic trends and business expectations. Finally, since 2009, the BI has also been conducting the quarterly Survey on the Italian Housing Market (SIHM), which covers a sample of real estate agents and collects their opinions on housing market trends in terms of both residential sales and rents.

The architecture of these surveys, conducted at different times of the year and through various survey modes and on complementary topics, allows the BI to gather complete and timely information on the conditions of firms in the Italian economy.

Specifically, the SISF is conducted each year in spring and collects quantitative information on the components of firms' budget, investments, turnover, employment, prices and funding with a detailed questionnaire. The BOS is conducted in autumn, and gathers qualitative information on employment dynamics, liquidity needs, and revisions with respect to the investment plans declared in the spring survey. These two surveys, both conducted with the support of the BI's regional branches, share more or less the same sample, in order to follow the evolution of firms' economic behaviour throughout the year. The SIGE, administered at the end of each quarter on a different sample and through an external agency, complements this information by gathering data on the

general economic situation and on firms' operating conditions, with a focus on inflation expectations and firms' price setting behaviours. Finally, the SIHM, also conducted quarterly, collects information on the real estate market and house price trends.

The possibility to administer these surveys in-house makes these tools particularly flexible, as it is possible to design questions that perfectly match the BI's information needs, and extremely reliable, as the internal validation of the data ensures the maximum transparency of the quality of the data produced. The timeliness and richness of these data mean that they are still essential today to support many of the activities carried out by the BI and in particular to conduct economic research that can offer a fundamental contribution to monetary and economic policy decisions, financial stability analysis and regional level studies. In particular, the microdata complement macroeconomic information (such as that from National Accounts) for studying firms' behaviours and expectations, and their distribution among agents so as to observe territorial differences. Furthermore, these surveys contribute to increasing the BI's accountability by providing statistical evidence in support of its decisions. Finally, following a strict protocol able to preserve the privacy of the respondents, the data are shared with external users and other institutions to help economic agents in making informed decisions and to evaluate economic policy measures, thus providing a service to the community in general.

In the following paragraphs, each of the BI's firm surveys will be described in detail, with respect to its contents, methodological aspects and the main uses. We then show how external users can access the survey data.

6.2. Survey on Industrial and Service Firms

It started in 1972 as the Survey in Investment by Manufacturing Firms, and since then the SISF survey has progressively widened the target population, increasing both its sample size and the range of topics to meet the BI's growing information needs, and became the Survey on Industrial and Service Firms (Bank of Italy, 2017a). In detail, prior to 1998, the survey only covered industrial processing firms with 50 or more workers; the field of observation was then extended in 1999 to include all manufacturing firms as well as energy and extractive industries, and since 2001, firms with 20 to 49 workers. In 2002, non-financial private service firms with 20 or more workers were also added to the sample. Finally, in 2006, the survey was extended to construction companies with 20 or more workers, and construction firms with 10-19 workers have been included in the sample since 2013.

The current sample includes over 4,500 Italian firms operating in the industrial and private non-financial services sectors, comprising about 3,000 industrial firms with 20 or more workers, about 1,000 private and non-financial service firms with 20 or more workers, and about 500 construction firms with 10 or more workers.[40]

The survey adopts a one-stage stratified sample design based on non-proportional selection probabilities.[41] Strata are defined as a combination of firms'

[40] The NACE 2007 classification of economic activities has been adopted since the 2010 survey. The survey does not include financial intermediation and insurance companies, general government, the school and health sectors, and other social and personal public services.

[41] The sampling design was revised in 1987, and since then has remained largely unchanged, although the overall number of firms sampled has gradually increased over the years.

branch of activity, size class in terms of employees,[42] and the region in which the firm's head office is located. The reference population is composed of all firms, in the selected branches of activity and employment size, whose registered head office is in Italy. The population is made up of the firms registered in the Central Balance Sheet database (Cerved), integrated by those listed in the National Institute of Social Security (INPS) database to minimize the risk of under-coverage. The sample mainly has a panel structure: firms observed in the previous edition of the survey are always contacted again if they are still part of the target population, while those no longer wishing to take part are replaced following substitution rules provided to the interviewers.[43]

The data for a survey referring to one year are collected in the course of interviews conducted between February and April of the following year. Interviews are administered by officials of the BI's local branches, with extensive knowledge of the local and regional economy, and specially trained to conduct business surveys. To increase survey participation, firms are first contacted by e-mail and can decide to participate using different survey modes: face to face interview, telephone interview and, since the 2010 survey, questionnaires can also be self-administered by firms using a web application.

The questionnaires[44] are composed of:

- *core questions*: they collect general information on the firm and its structure, investments, employment, turnover, operating results, capacity utilization and financing. Specifically, for employment, investments and turnover, information is requested with respect to three periods: the survey reference year, the previous year and the following year in order to obtain a wide and coherent set of data that fully characterize the actual and the expected firm situation;
- *special topic questions*: they cover different topics each year, which are the subject of detailed cyclical or structural analysis, and they are decided shortly before the survey is administered, to take into account all the current information needs of the Institute's researchers. New questions are tested by means of pilot questionnaires designed to assess whether they are easy to understand and whether firms can effectively provide this information;
- *assessment of the respondent burden*: since 2003, the questionnaire has been recording information about respondents' feelings regarding the effort involved in filling in the questionnaire and the factors affecting it. These aspects are monitored closely to avoid measurement errors or non-response due to satisficing behaviour,[45] and various measures are adopted to reduce the burden of the survey in the design of

[42] The size classes, which were based on the end-of-year workforce until 2003 and on the average annual workforce thereafter, are: 20-49 (the class of 10-19 employees has been added to the sample of construction since 2013), 50-99, 100-199, 200-499, 500-999, 1,000-4,999, and 5,000 and over employees. Firms in the last class form a self-representative (census) stratum.

[43] The firm should ideally be replaced by another with similar characteristics, and selected from an exhaustive list that is updated yearly.

[44] Questionnaires are slightly different among economic branches (industry, services and construction) and size class in terms of employees (less than 50 workers or 50 workers and more).

[45] For a review of the effects of the respondent burden on data quality, see Bottone et al. (2018).

the questionnaire (using filters, question randomization[46]) and to provide incentives for firms (personalized feedback for respondents).

The data collected are subject to different levels of quality checks. A first set of checks (range of values, filters, internal consistency) is embedded within the web application through which data are uploaded. These checks are directly managed by respondents in the case of self-administered questionnaires or by the interviewer in other cases and the questionnaire cannot be uploaded if they are not respected. A second set of checks, performed on data once the questionnaire is uploaded, highlight data outside certain thresholds, based on comparisons with data provided by firms in the same stratum or using external information. In these cases, the BI officer responsible for the interview contacts the firm directly to assess the validity of the data or to correct them. Further checks are based on editing techniques (outlier detection) or selective editing, which produces a list of priorities for checking outliers based on their importance for the final estimates. A final check regards data homogeneity: firms are excluded from the sample if they are affected by extraordinary events (such as mergers or split-ups) that may prevent homogenous results from being provided within the period surveyed. Data collected by firms that, even if affected by these events, guarantee that they are able to provide homogenous data (by considering the extraordinary event to have taken place at the beginning of the year prior to the survey reference year, or by pretending the event never occurred and reconstructing the data accordingly), are included in the sample (after being carefully checked). This practice provides greater stability to the estimates of variations, which are the main objective of the survey.

Firms may encounter difficulties in answering some questions that could be left blank. In the few cases in which the non-response concerns one of the main variables, such as investment, expenditure or turnover, the missing data are imputed.[47] In general, ratio estimators are used to impute data, setting the number of the firm's employees as a denominator in order to capture the scale effect. The imputation technique uses linear models, also including a randomized component, based on both cross-sectional information and on the panel structure to account for firm individual effect. For the same variables, data are also provided at constant prices (i.e. to last year's price levels) using a sector average of deflators provided directly by firms.[48]

Weights are computed using a two-step procedure. First, design weights are computed as the inverse of the probability of inclusion in each stratum. In the second stage, weights are post-stratified using an iterative proportional raking technique, which aligns sample weights to the known information on the population distribution.[49] Using

[46] In order to contain the respondent burden, some of the questions in the special topic section are asked of a random subset of firms.

[47] The percentage of imputed data is usually small for both preliminary and final results for the fundamental variables. A higher rate of non-response tends to occur with questions involving forecasts, particularly of investments.

[48] For a review of the deflation method used in business surveys, see D'Aurizio and Tartaglia-Polcini (2008).

[49] Two set of weights are provided. The first is based on the distribution of firms (*peso*) and the second on the distribution of employees (*pesoadd*) that can be used in analyses requiring a scale factor. Since 2012, weights to identify the randomized half samples have also been included (*pesoa* and *pesob*).

provided weights, estimates of totals are obtained using the Horvitz-Thompson unbiased estimator (Horvitz and Thompson, 1952).

To reduce the effects of measurement errors, winsorization techniques are used for investment and turnover to prevent erratic per capita values from excessively influencing ratio estimates. In particular, the "Type II winsorization" technique is used. In this case, values of the variable above or below the fixed cut-off value, set on the basis of the empirical distribution (usually defined by the 5th and 95th percentiles), are squashed against the cut-off in proportion to the sampling fraction according to the following formula:

$$y_i^{wins} = \begin{cases} f * y_i + (1-f) * J & se \quad y_i < J \\ f * y_i + (1-f) * K & se \quad y_i > K \\ y_i & otherwise \end{cases}$$

in which y_i^{wins} is the winsorized value, y_i the observed value, f the sampling fraction, and J and K the lower and upper cut-offs respectively.[50] Therefore, the higher the expansion weight of the anomalous observation the larger the attenuation operated on it, i.e. the closer the winsorized value will be to the threshold.

Finally, to account for the complex survey design and for the weighted scheme adopted, standard errors are estimated using the Jackknife replication technique. Furthermore, multiple imputation is used for imputed values, which entails replicating independently a given number of datasets containing the complete observations (specifically, twenty-five bootstrap samples are extracted from the original sample).

6.3. Business Outlook Survey of Industrial and Service Firms

The BI has been conducting the Business Outlook Survey of Industrial and Service Firms (BOS) since 1993 in order to collect qualitative information on firms' performance and on the dynamics in the main economic variables (Bank of Italy, 2017b). This survey is conducted annually, between September and October, to complement the information gathered for the SISF. To this end, the two sample designs coincide and most of the firms contacted (approximately 90 per cent) are the same as those interviewed in the spring of the same year. The contact protocol of firms is also the same, but in this case, due to the ease of the questionnaire, face to face interviews are less frequent. The BOS questionnaire is actually shorter and simpler than that of the SISF so as not to make the burden greater for panel respondents. Firms are asked to provide mainly qualitative information on the evolution of the main economic variables. The main questions involve revisions with respect to plans and forecasts for investments and sales, employment dynamics, hours worked and liquidity needs. The survey also contains special topic qualitative questions set to accommodate any additional information needs the BI may have. All questions appearing for the first time are tested beforehand. In this case, the main indicators for categorical variables are calculated as frequency balances between positive and negative outcomes.

[50] In the case of firms labelled as outliers, the extreme values are set equal to the cut-off, without taking the sampling fraction into account.

6.4. Survey of Inflation and Growth Expectations

The Survey on Inflation and Growth Expectations (SIGE) has been conducted by the BI since 1999 (Bank of Italy, 2019a).[51] Differently from the previous surveys, this survey is carried out by an external specialist company on a panel of industrial, service and construction firms, which are interviewed in the first three weeks of March, June, September and December.

The survey gathers information on managers' expectations concerning the consumer price index, developments in their own selling prices, demand, investment and employment, and their views on the general economic situation and on the economic conditions in which the firm operates, looking both backwards and forwards. Most of the questions are repeated throughout the various waves, but the survey also contains special topic questions on specific aspects of the economy that warrant further investigation. Most of the data (with the exception of price and inflation expectations) are qualitative and relate to firms' opinions on changes in the real economy in the reference quarter and looking ahead. The qualitative questions in the questionnaire usually have three or five possible answers (for example: worse, the same, better). The answers to qualitative questions are summarized by the balance between the number of favourable and unfavourable responses (neutral responses, such as 'the same', are not used in calculating the balance).

The sample size has progressively increased to 1,500 firms operating in the industrial and private service sector and in construction (since 2013) with their administrative headquarters in Italy and employing 50 or more workers. In particular, the current sample is composed of about 650 industrial firms (excluding construction), 650 private non-financial service firms and 200 construction firms. The sample is stratified according to the economic sector, firm size (number of workers) and the geographical macro-area (of firms' administrative headquarters). The list of firms used to extract the sample is drawn from different administrative sources.[52]

Questionnaires are distributed to company managers and collected mainly by an online purpose-designed interface (Computer Assisted Web Interviews - CAWI). The remaining interviews (about 10 per cent) are conducted by telephone (Computer Assisted Telephone Interviews - CATI). The collected data undergo different quality checks. The support of the computerized data entry procedure prevents the entry of data that are outside the defined interval for the reported variables, typing errors, outliers and missing data (non-response items). In order to limit the impact of any remaining outliers on the mean values for the main variables, the standard estimators are accompanied by robust estimators obtained applying the Type I winsorization, i.e. values outside the range between the 5th and 95th percentiles are set at the threshold values of those percentiles. After winsorization of outliers, the missing data are imputed using stochastic regression models.[53]

[51] The survey was conducted by the BI in collaboration with the newspaper "Il Sole 24 Ore" until the third quarter of 2018.

[52] Central Balance Sheet database (Cerved), Company Registration Report (Infocamere), and confidential list from National Institute of Social Security (INPS).

[53] Currently, imputation is only available for expectations of inflation, own prices, and number of employees, and concerns between 5 to 15 per cent of the values.

The aggregates are evaluated using a weighting coefficient for each sample unit which, for each stratum (combination of sector, firm size and geographical area), takes into account the ratio between the number of respondent companies and the number of companies in the reference universe. Weights are post-stratified (raking) based on the marginal distributions of the population by sector, geographic area and firm size.

6.5. Survey on the Italian Housing Market

The Survey on the Italian Housing Market (SIHM), started in 2009, is conducted quarterly by the BI, in collaboration with Tecnoborsa and the Revenue Agency (Agenzia delle Entrate - OMI). The survey covers a sample of real estate agents and describes their opinions regarding the current and expected trends in the housing market (Bank of Italy, 2019b). Most of the questions are qualitative and collect the opinions of estate agents on the changes in housing sales (both in the reference quarter and looking forward), the number of potential buyers and sellers, average house prices, and indicators regarding the rental market. In the first survey of the year, one section collects information about the structural characteristics of the homes sold: floor area (in square metres), energy class, condition and type of property. As in the SIGE, most of the items are qualitative with answers that may identify positive, neutral or negative feelings and these answers are evaluated using a balance between the number of favourable and unfavourable responses (the neutral answer is not included in the calculation).

The survey is currently carried out on a panel of about 1,500 estate agents who are interviewed on a quarterly basis. The reference population consists of about 32,000 estate agencies that work on behalf of third parties. The list from which the sample is drawn is based on the combination of lists maintained by professional associations and the register of the Chamber of Commerce. The sample is stratified, with the strata defined as follows:

a. the 15 cities in Italy with the biggest populations;
b. 15 areas around the cities in a) that form the hinterland;
c. 4 national macro-areas (North-West; North-East; Centre; South and Islands).

The number of units in each stratum is selected proportionally to the number of transactions recorded in each unit available at the time the sample is created (based on local data provided by the Property Market Observatory). Within each stratum, a minimum number of units is then set so that the sample size is large enough to ensure that the standard errors of the main variable estimators are acceptable. Finally, further units are added to the sample for the metropolitan areas to account for greater variations in the phenomena surveyed.

The data are mainly collected by Computer Assisted Telephone Interviews CATI (65 per cent), while the remaining questionnaires are compiled directly online by the real estate agencies (Computer Assisted Web Interviews – CAWI). The data collected are subject to quality controls to assess the compatibility of the values inserted in the questionnaire with those admissible by the question, the intertemporal coherence of panel data, the presence of abnormal values and the numerical formats necessary for insertion.

Weights are constructed using a two-step procedure. First, design weights are computed as the ratio of the number of firms in the stratum to the population and in the sample. The weights are then post-stratified using the raking technique according to external information on the number of real estate agencies in each of the nine post-strata cells, defined by the combination of three size classes: (1 employee, 2-5 employees, 6 employees and over) and three municipality types (metropolitan, non-metropolitan urban areas and other municipalities).[54]

6.6. External diffusion of Microdata

A system for the remote processing of data collected for the Survey of Industrial and Service Firms, known as BIRD (Bank of Italy Remote access to micro Data) has been available for external users since 2008. The system allows researchers to process data on the BI surveys of firms, ensuring that individual information remains completely confidential. See Chapter 12 for further details.

Available databases include all the BI's firm surveys.[55] Forms, questionnaires, descriptions of the variables, documentation and examples of data use are all available at: https://www.bancaditalia.it/statistiche/basi-dati/rdc/bird/index.html.

Suggested readings

Banca d'Italia (2017a), Survey on Industrial and Service firms, Methods and Sources: methodological notes, Statistics Series.

Banca d'Italia (2017b), Business Outlook Survey of Industrial and Service Firms, Methods and Sources: methodological notes, Statistics Series.

Banca d'Italia (2019a), Survey on Inflation and Growth Expectations, Methods and Sources: methodological notes.

Banca d'Italia (2019b), Italian Housing Market Survey Short-term Outlook, Methods and Sources: methodological notes, Statistics Series.

Additional references

Bottone, M., A. Neri, and L. Modugno (2018), Response burden and data quality in business surveys: the experience of Banca d'Italia, Banca d'Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 467.

D'Aurizio, L. and R. Tartaglia-Polcini (2008), Use of Deflators in Business Surveys: An Analysis Based on Italian Micro Data, *Journal of Official Statistics*, 24(2), no. 277.

Horvitz, D.G. and D.J. Thompson (1952), A generalization of sampling without replacement from a finite universe, *Journal of the American Statistical Association*, no. 47, 663–85.

[54] The information on the distribution of the population used to construct the weights is taken from Istat, and is provided by class of employee and province (NACE code 68 - real estate activity). Updates are published periodically for the population of about two years earlier. The estimates are revised periodically to take account of updates in the survey reference population.

[55] In addition to the surveys treated in this section, the Survey on cross-border transactions in services by non-financial and insurance firms - direct reporting is also available (since 2013). Data have been available since 1984 for the Survey of Industrial and Service Firms.

7. The measurement of financial literacy
(G. D'Alessio and R. De Bonis)

7.1. Why the study of financial literacy is important

An individual's ability to understand and use basic financial and economic concepts plays an important role in achieving an appropriate level of economic wellbeing (Lusardi and Mitchell 2014). Adequate skills enable individuals to take advantage of the opportunities offered by a developed financial system, while taking risks into account in an informed manner. Moreover, the global financial crisis of 2007-2009 and the ensuing Great Recession had shown the risks for the stability of the economy due to the low financial awareness of individuals living in modern societies, causing them to manage financial products inappropriately.

The OECD promoted a Programme for the International Assessment of Adult Competencies (PIAAC) and coordinated an international survey for the measurement of financial literacy, measuring the literacy, numeracy and problem-solving skills among the adult population. The survey is part of the activities of the International Network for Financial Education (INFE) active within the OECD. Many countries have adhered to the project, among which Italy. The first wave was conducted in 2017, the second in 2020 (OECD, 2020). Drawing from D'Alessio et al (2020), in this section we review the methodology of the survey, compare Italy with the other OECD countries and analyse the main determinants of financial literacy.

7.2. How do we measure financial literacy?

The measurement of financial literacy follows the OECD methodology.[56] The overall financial literacy score is the sum of the scores obtained for three components:

(i) *Knowledge* – This aspect concerns the understanding of the basic relationships useful for making financial choices: inflation, interest rates, the difference between simple and compound interest rates and risk diversification. The questions used are adaptations of the big three (or big five) questions originally developed by Lusardi and Mitchell (2007) to capture the comprehension of concepts such as the interest rate, inflation and risk diversification;[57]

(ii) *Behaviour* – This aspect refers to the management of financial resources in the short and long term: setting financial objectives and planning the resources to be used for consumption, bill payments and savings in recent months;

(iii) *Attitude* – This trait reveals the orientation of individuals towards saving, especially precautionary saving, in a long-term perspective.

Financial knowledge has a score ranging from zero to 7, and is the sum of the 7 binary variables (1=correct answer, 0=wrong answer) concerning the following topics:

[56] There are other ways to measure financial literacy. With reference to adults, some questions are included in the Survey of Health, Ageing and Retirement in Europe (SHARE). With regard to young people, the OECD Programme for International Student Assessment (PISA) assesses the knowledge and skills of 15-year-old students.

[57] The first examination of financial literacy using the big three was possible due to a special module on financial literacy and retirement planning that A. Lusardi and O. S. Mitchell designed for the 2004 Health and Retirement Study (HRS), which is a survey of Americans aged over 50 (Lusardi 2019).

- FK1: Purchasing power of money
- FK2: Interest paid on a loan
- FK3: Simple interest calculation
- FK4: Simple and compound interest calculation
- FK5: Risk and return
- FK6: Definition of inflation
- FK7: Diversification

Financial behaviour has a score between zero and 9, being the sum of 7 binary variables (0/1) and one (FB8) variable ranging 0-2

- FB1: Making a budget
- FB2: Saving in the last 12 months
- FB3: Purchase: "Before I buy something I carefully consider whether I can afford it"
- FB4: Punctuality in paying bills
- FB5: Expenditures control
- FB6: Long-term goals
- FB7: Sources of information on financial products
- FB8: Negative saving in the last 12 months

Lastly, financial attitude has a score ranging from 1 to 5, being the average (not the sum) of 3 indicators (1=totally agree – 5=totally disagree):

- FA1: I tend to live for today and let tomorrow take care of itself,
- FA2: I find it more satisfying to spend money than to save it for the long-term;
- FA3: Money is there to be spent.

Financial literacy is computed as the sum of the previous scores and therefore assumes values between a minimum of 1 and a maximum of 21.

In Italy, the most recent survey was conducted by a specialized company between January and February 2020, before the outbreak of the COVID-19 pandemic. The interviews were conducted by professional interviewers on a sample independent of the one interviewed in 2017, consisting of about 2,000 adults, aged between 18 and 79. The answers provided by the survey participants were recorded by the interviewers on their computer following a CAPI methodology (Computer Assisted Personal Interview).

In the 2017 survey, about 2,500 individuals were interviewed. About 1,500 had answered the questions independently using a tablet provided to them by the survey company, while the remaining 1,000 interviews were conducted in the same CAPI mode used in this edition.[58]

In the 2020 survey, the sampling weights were subjected to the same post-stratification procedure as in 2017; the design weights were modified so that the composition of the sample coincided with that of the population, according to some socio-demographic characteristics (gender, age, geographical area).

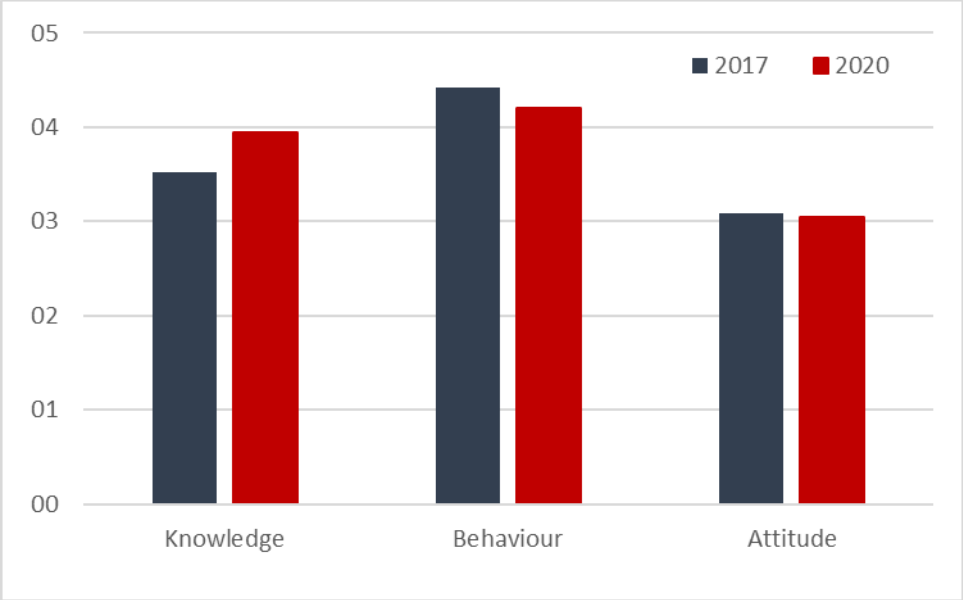
[58] How a questionnaire is administered can sometimes have effects on the answers provided by respondents, and some analyses have been carried out in this regard. The observed effects appear almost nil for knowledge and modest for the other two dimensions.

7.3. Financial literacy of adults in Italy

The average level of financial literacy of Italians in 2020 is 11.2, on a scale ranging from 1 to 21, essentially in line with the value observed in 2017. The stability of the overall index hides some variations in the three sub-indices. Financial knowledge recorded a growth of 0.4 points, while the behaviour and attitude indices fell slightly, by 0.2 and 0.1 respectively:[59] only the first decline is statistically significant (Figure 7.1).

The share of subjects who in 2020 recorded a knowledge score judged sufficient by the OECD – a score of 5 or more out of 7 - was 44.3 per cent, compared with 32.6 per cent in the last survey. The percentage of respondents for whom the behaviour score is judged sufficient - 6 or more out of 9 - is stable compared with the last survey (27.3 versus 27 per cent). As regards attitude, however, the share of those who have a score equal to or greater than 4 (in the scale1-5) is 13.7 per cent, down from the last survey (18.8 per cent).[60] However, attitude is the profile for which Italians are in line with the scores of the other countries.

Figure 7.1 - Financial literacy in Italy: the components
(average values)



By examining the indicators according to the characteristics of the interviewees, the 2020 survey confirms that financial literacy has a high variability across individuals, depending on education, gender, age and geographical area.

Graduates have a higher level of literacy than individuals with lower levels of education. Financial literacy is highest between the ages of 35 and 44; it is low in people under 35, also because young people in Italy leave their families of origin late. These gaps are mainly due to the different characteristics of the population in the

[59] The variations observed in this edition for the three components - knowledge, behaviour and attitude - are respectively equal to 5.9, -2.6 and -0.8 per cent of the range of each measure compared with 2017. For the total financial education score, the growth is 1.7 per cent.

[60] The values judged sufficient for the three components are different from each other due to the different scale used for their measurement. In percentage terms, these values correspond respectively to 71.4, 66.6 and 75 per cent of the range used for their measurement.

various age groups, especially in terms of education. The literacy of men is confirmed as being higher than that of women. The same is true for residents in the Centre and North compared with those in the South and the Islands.

The gap between men and women is particularly strong as regards knowledge, especially among those with low educational qualifications and residing in the South and the Islands.

When analysing the gender gap by occupational status, the importance of participation in the labour market emerges, and, therefore, the aspect of a personal income to be managed, a factor that favourably affects financial knowledge. Housewives and retired women contribute to widening the gap in knowledge levels, representing the most fragile subgroups, while self-employed female workers are more prepared than their male counterparts.

7.4. A regression analysis

The analysis of average literacy scores does not allow us to understand the role of individual factors. The characteristics of individuals that influence literacy are correlated to each other: for example, the elderly have lower educational qualifications on average than the young and are more frequently women than men.

To evaluate the effects of various explanatory variables, all other conditions being equal, four linear regression analyses were conducted: the dependent variables are the three components of financial literacy and the total indicator. The independent variables are gender, age (which also captures cohort effects), educational qualifications and geographical area of residence. We used the entire sample of 4,412 individuals interviewed in the two surveys in 2017 and 2020 jointly, introducing a dummy that indicates the year of the survey.

The most significant factors for explaining the differences in the various aspects of financial literacy are educational qualifications, age group and, to a lesser extent, gender and geographical area (see Table 7.1 for regressions and Figure 7.2 for a summary of the results). In particular, educational qualifications are significant for the overall indicator and for all three of its components; considering the contribution to R^2, education is also the main variable affecting overall financial literacy and the components of knowledge and behaviour. As regards age, only the class under 35 appears to have a financial literacy level that, all other factors being equal, is decidedly (and significantly) lower than that of people over 65 (the benchmark in our exercise). The particularly important role that age assumes with reference to attitudes towards the future contributes to this result: younger people appear less attentive than others to the issues of precautionary savings and, in general, to long-term issues.

A financial literacy level lower than that of the elderly also characterizes - other things being equal - the other age groups, but to a lesser extent, and with coefficients that are not always significant (Table 7.1). The age profile, which increases up to 34 years and then tends to decrease after the age of 35, is therefore essentially attributable to the different composition of the population by age group, in particular in terms of educational qualifications.

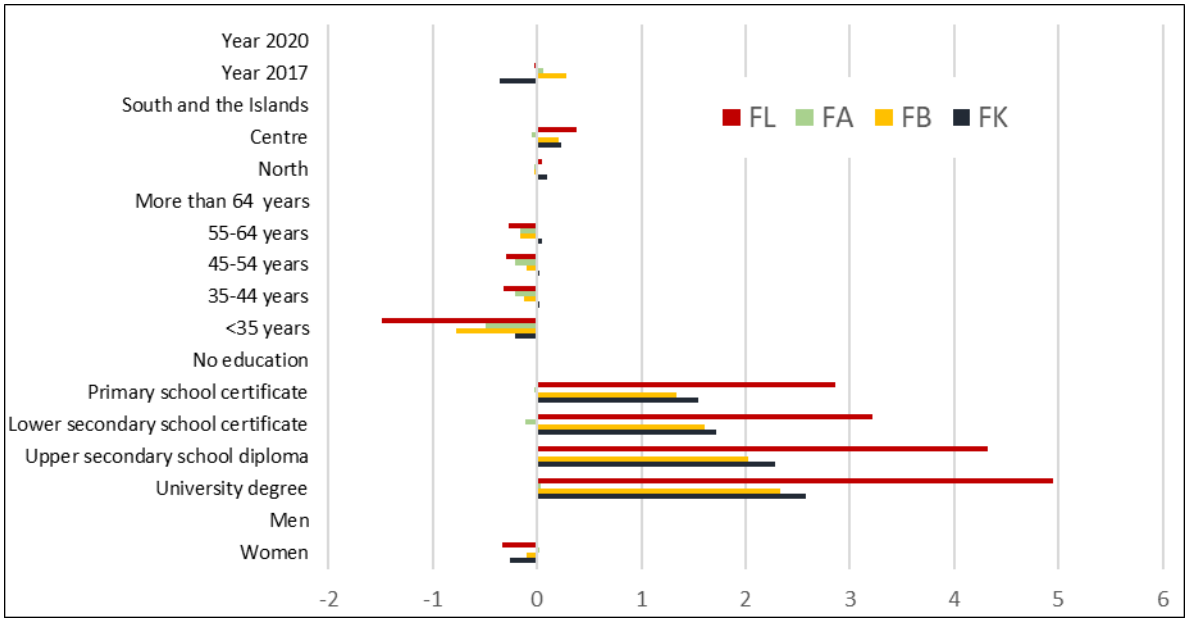
The gender gap is significant for knowledge and for the overall score. The results of the regressions (Figure 7.2) are confirmed by conducting the econometric exercises separately for the years 2017 and 2020.

Table 7.1 - Regression analysis on financial literacy, 2017-2020 (*)

	FK		FB		FA		FL	
	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	1.926	<.0001	2.580	<.0001	3.284	<.0001	7.789	<.0001
Women	-0.259	<.0001	-0.098	0.069	0.029	0.245	-0.328	0.000
Men	0.000	-	0.000	-	0.000	-	0.000	-
University degree	2.577	<.0001	2.332	<.0001	0.038	0.735	4.946	<.0001
Upper secondary school diploma	2.280	<.0001	2.031	<.0001	0.007	0.951	4.318	<.0001
Lower secondary school certificate	1.720	<.0001	1.607	<.0001	-0.113	0.295	3.213	<.0001
Primary school certificate	1.552	<.0001	1.333	<.0001	-0.026	0.811	2.859	<.0001
No education	0.000	-	0.000	-	0.000	-	0.000	-
<35 years	-0.213	0.0282	-0.780	<.0001	-0.491	<.0001	-1.484	<.0001
35-44 years	0.021	0.8385	-0.125	0.184	-0.213	<.0001	-0.317	0.052
45-54 years	0.018	0.8519	-0.104	0.242	-0.209	<.0001	-0.295	0.057
55-64 years	0.053	0.6063	-0.165	0.077	-0.164	0.000	-0.276	0.088
Over 64 years	0.000	-	0.000	-	0.000	-	0.000	-
North	0.099	0.1402	-0.031	0.618	-0.027	0.341	0.042	0.692
Centre	0.228	0.0063	0.204	0.007	-0.051	0.141	0.381	0.004
South and the Islands	0.000	-	0.000	-	0.000	-	0.000	-
Year 2017	-0.360	<.0001	0.275	<.0001	0.057	0.023	-0.028	0.766
Year 2020	0.000	-	0.000	-	0.000	-	0.000	-
R^2	0.062		0.059		0.044		0.081	
N	4,412		4,412		4,412		4,412	
	Contribution to R^2 according to the Shapley-Owen decomposition formula							
Gender	8.3		0.9		2.3		3.2	
Educational level	80.0		62.7		3.1		80.5	
Age	3.0		16.8		85.6		13.0	
Geographical area	0.7		2.6		1.8		2.1	
Year	8.0		17.0		7.1		1.1	
Total	100.0		100.0		100.0		100.0	

(*) The dependent variable is the financial knowledge indicator in the first column, the financial behaviour index in the second column, the index of financial attitude in the third column and the overall financial literacy indicator in the fourth column.

Figure 7.2 – Average effect of explanatory factors of financial literacy in Italy, 2017-2020 (*)



(*) Regression estimates with marginal effects only. Benchmark: estimates in 2020, individual residents in the South and the Islands, over 64 years old, with no education, men. For the significance of coefficients and for further details, see Table 7.1.

Legend: FL = Financial literacy; FK = Financial Knowledge; FB = Financial Behaviour; FA = Financial Attitude.

7.5. International comparison

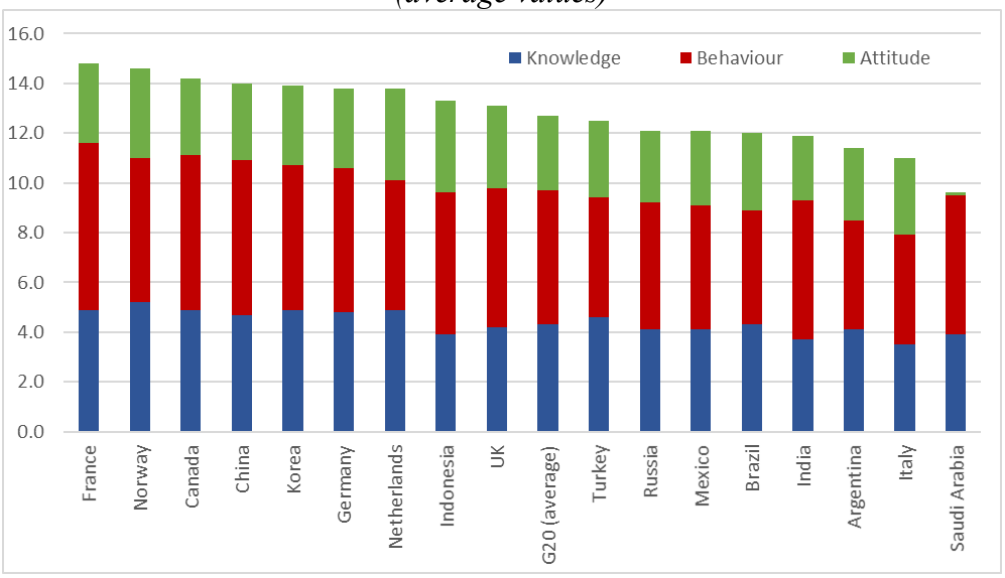
In 2020, Italy was confirmed at the bottom of the OECD international ranking as it was in 2017 (Figures 7.3 and 7.4).[61]

The 26 countries participating in the 2020 wave have an average score of 12.7 - 13 for OECD countries - while, as mentioned above, Italy's score is 11.2.

[61] Considering the overall financial literacy score, Italy was in 25th position out of the 26 countries considered in 2020, ahead of Malta alone, which used a partially different questionnaire, however. Italy has a slightly better relative position for knowledge (20th) and more definitely so for attitudes (12th), while it is last for behaviour. By adopting an alternative index that measures the three components on an identical scale (for example from 0 to 10), Italy would slightly improve its relative position, coming 22nd (overtaking Montenegro, Colombia and Romania).

Figure 7.3: International comparison: financial literacy in 2017

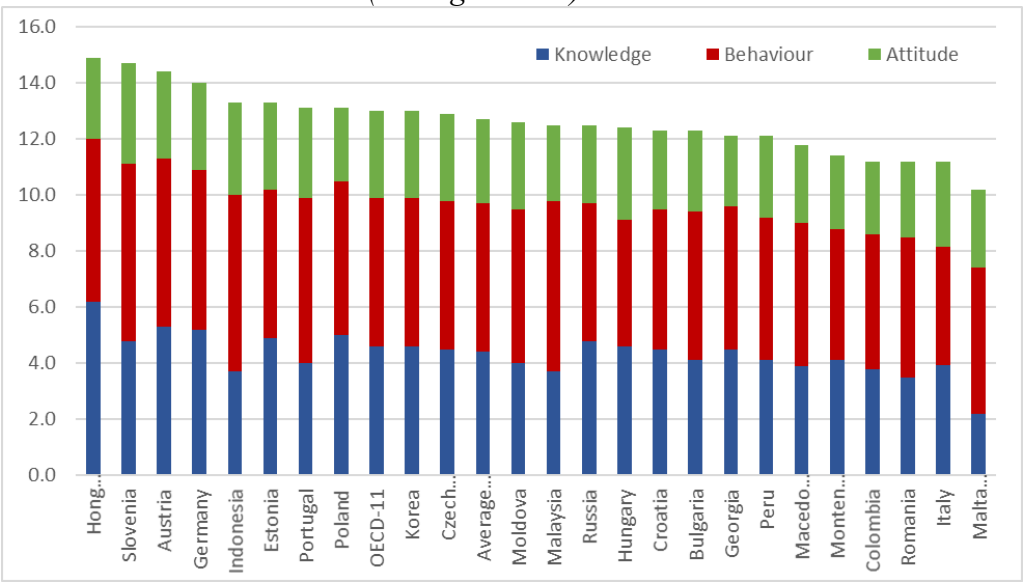
(average values)



Source: OECD (2017), G20/OECD INFE, 'Report on adult financial literacy in G20 countries'.

Figure 7.4: International comparison: financial literacy in 2020

(average values) (*) (**)



Source: OECD (2020) International Survey of Adult Financial Literacy. (*) The average is computed on 23 countries, excluding France, Malta and Thailand. (**) Malta computed its scores using a smaller number of questions, four for knowledge and seven for behaviour.

Comparisons across countries must be considered with caution, as the surveys are not always fully harmonized. For example, some countries conduct face-to-face interviews, while some prefer telephone interviews and others carry out surveys via the web, a mode that requires the availability of a computer and therefore tends to select more educated individuals. In other cases, the survey is carried out (as Italy did in 2017 for about half of the sample) via tablets provided to respondents by the survey company that, while preserving the speed in collecting the survey data via web, reduces the selection effect and the cognitive barriers necessary for their use.

Among the 26 countries that participated in the survey, 12 belong to the OECD, but the OECD average is calculated on 11 countries.[62] France is added as the twelfth country, but only for the comparison of financial knowledge: in fact, the Banque de France did not conduct the analysis on behaviours and attitudes. Knowledge is the most comparable indicator across countries that have very different rates of GDP growth, development of financial markets and regulations.[63] By focusing on the large European countries, between 2017 and 2020, Germany, like Italy, increased its score, while France recorded a slight decline. The average of the OECD countries participating in both surveys is unchanged.

Why does Italy score poorly in financial literacy? The first factor that must be taken into account is the level of education of the population in the 15-64 age class, which is lower than in many other European countries (and lower than the EU27 average). Italy has also a larger older population than other European countries. Moreover, the participation of Italian households in financial markets, in terms of shares or debts, is traditionally low by international standards.

However, the Italians are aware of their modest financial knowledge. The percentage of individuals who believe they have below average knowledge is about 20 percentage points higher than the OECD average. The tendency to underestimate their knowledge is more marked among women: in 2020, 33 per cent of them rated their level of financial knowledge as below average, while in reality they score above average (among men, the percentage is 26 per cent).[64] Between 2017 and 2020, people's perception of lacking financial skills increased.

7.6. Some critical points

The measurement of financial literacy has some critical points that can be useful to bear in mind.

OECD methodology assigns a positive value to savings behaviour, without any reference to the respondent's age or professional condition. This is in contrast to Modigliani's life cycle theory, which says that people try to smooth consumption over life, saving at a young age (when income grows) and consuming in old age (when income declines). Moreover, savings can be influenced by other factors too. For example, after the outbreak of the pandemic, precautionary savings increased, but the increase was due to the recession, rather than to a sudden change in financial literacy.

Further aspects of financial behaviour can be debatable. While drawing up a household budget or carefully considering expenditures is surely a positive financial behaviour, being late in the payment of bills could be determined by the inability to pay.

[62] Austria, Colombia, Korea, Estonia, Germany, Italy, the Czech Republic, Poland, Portugal, Slovenia and Hungary.

[63] Some 30 countries joined the 2016 edition (OECD 2016). Italy joined later, in 2017, together with China, Germany, India, Indonesia and Mexico, for the analysis of the G20 countries (G20 / OECD 2017 report). Just over one third of the countries that had participated in the previous survey (2016/2017) joined the 2020 edition.

[64] Drawing on the literature of psychology, it can be said that Italians fall less frequently into the Dunning-Kruger cognitive bias (Dunning et al., 2003), according to which individuals with little expertise in a field tend to overestimate their own abilities.

This item can be a weak indicator of inappropriate financial behaviour, especially during periods in which recessions and economic crises occur.

The three components (knowledge, behaviour and attitude) give a different contribution in terms of determining the total scores (respectively 7, 9 and 4). Should we correct the survey in order to attribute the same maximum score (i.e. 1-10) to all the components? At the moment, too much weight is placed on «behaviour», which is possibly the most arbitrary component. France chose to work on the "knowledge" questions alone. It should also be considered that, based on the Cronbach coefficient, which measures the reliability of indicators that aggregate answers to different questions, knowledge is the most reliable profile in the survey.

Suggested readings

D'Alessio G., R. De Bonis, A. Neri and C. Rampazzi (2020), Financial literacy in Italy: the results of the Bank of Italy's 2020 survey, Banca d'Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 599.

Additional references

OECD (2020), OECD/INFE 2020 International Survey of Adult Financial Literacy.

Lusardi A. and O.S. Mitchell (2014), The Economic Importance of Financial Literacy: Theory and Evidence, *Journal of Economic Literature*, 52(1), 5-44.

Lusardi A. (2019), Financial literacy and the need for financial education: evidence and implications, *Swiss Journal of Economics and Statistics*, 155:1, 1-8.

8. Counterfactual evaluations: four simple applications *(G. de Blasio)*

8.1. Introduction

In this section, we present four simple applications of counterfactual techniques, providing examples on how microdata can be used for the evaluation of policy measures. These examples focus on the Italian case and concern incentive measures for firms and territories and a study in political economy. The aim of this brief overview is to present to the untrained reader applications that can give an idea of some of the questions that counterfactual techniques are able to answer and a first sketch of methodologies.

Economists very often ask questions about the effect of a measure on socioeconomic outcomes. Some examples: Does a training course help the unemployed find work? Do investment subsidies cause firms to invest more? What is the impact of a highway on the growth of the local economy? Counterfactual methods allow us to answer questions of this type. The idea is to compare the variable we are interested in (for instance, the probability of finding a job for those who took the training course) with the variable that best approximates the counterfactual case (the probability of finding a job if the course had not been taken). Counterfactual analyses use the terms treated and controls to define, respectively, those who are the subject of a given intervention or programme and those who are used to approximate the counterfactual scenario.

In real life policy applications, it is rare to arrange a random experimental design, in which the assignment of the units to the group of treated cases (i.e. subsidy receivers) rather than that of control cases (no subsidies received) is done according to completely random procedures. For this reason, the comparison between the results obtained by the two groups should be handled with care: if the treated cases and the controls are not in exactly the same ex-ante conditions (according to some non-ignorable characteristics), then it is possible to confound pre-existing differences between the two groups with the treatment effect (selection bias). We do not have the space in this short section to cover the methods that can be employed in such a case. Those interested in learning more about them should refer to one of the following volumes, listed in increasing order of difficulty:

- https://www.masteringmetrics.com/
- https://mixtape.scunning.com/
- https://www.mostlyharmlesseconometrics.com/

The rest of the section will present the applications. Section 1 deals with incentives to investment. Section 2 illustrates the case of public guarantees. Section 3 describes a counterfactual exercise referring to EU regional aid. The last section concerns political economy: it shows the economic advantages that have benefited the municipalities that gave birth to the influential politicians of the First Republic.

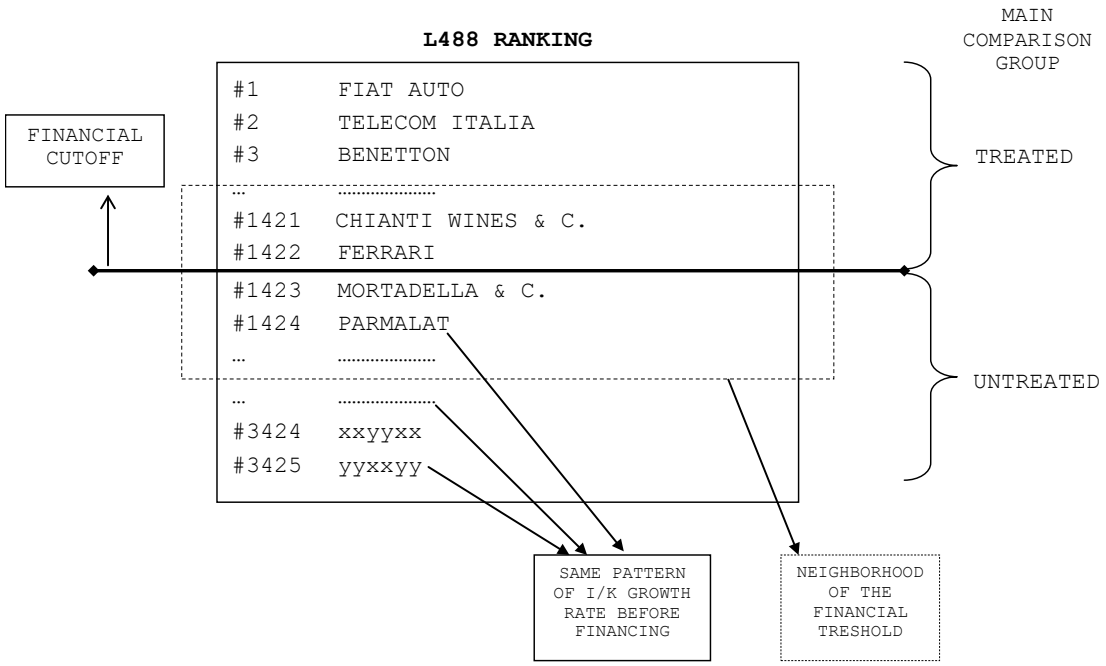
8.2. Subsidies to firms

Financial assistance to manufacturing industry channeled through Law 488/1992 (Law 488) has for many years been the main policy instrument for reducing territorial disparities in Italy. Significant amounts of public money have been spent to stimulate investment. From 1996 to 2003, the funds distributed to industrial firms amounted to €16 billion and involved 27,846 projects, mainly in the southern regions. Law 488 allows firms to receive a public subsidy that covers a fraction of the outlays, if they are willing to invest in lagging areas. The incentives are awarded through competitive auctions according to pre-determined criteria, such as the proportion of firms' equity invested in the project; the number of jobs involved; and the proportion of assistance sought.

The extent to which investment incentives have an economic payoff has been at the forefront of economic research for decades. Moreover, the role of incentives in reducing territorial disparities is a central topic in regional science (Overman and von Ehrlich, 2020). Although this literature is voluminous, there is no agreement on the effectiveness of investment incentives. Evaluating the effects of government-sponsored projects, one has to face the question of what would have happened without the subsidies, i.e evaluating an incentive programme is a counterfactual exercise. Since neither the subsidized firms nor the unsubsidized firms can be considered random draws, the challenge is to construct a valid control group. Moreover, to evaluate whether Law 488 made investments possible that otherwise would not have been made, two more issues need to be tackled. First, it is necessary to analyse the extent to which additional investments have been triggered by time-substitution. To take advantage of the incentives, firms could have brought forward investment projects originally planned for the post-intervention period. Second, one has to study the role of cross-sectional substitution. Subsidized firms may have taken some of the investment opportunities that unsubsidized firms would have exploited in the absence of the incentives.

By adopting a difference-in-differences framework, Bronzini and de Blasio (2006) takes advantage of the auction mechanism that is used to allocate the incentives under Law 488 (Figure 8.1). We compare a group of financed firms with a group of firms that applied for the incentives but were not financed since they scored low in the Law 488 ranking. The main virtue of the rejected application group is that it is very similar to the treatment group in terms of its characteristics. We further check the reliability of the comparison group in two respects. First, we implement an intuitive version of the regression discontinuity design (RDD) and contrast financed firms just above the financing threshold in the Law 488 ranking with non-financed firms just below that threshold. Second, we construct a comparison group that mirrors the time-series pattern of the treated group before the programme took place. This group comprises firms for which the deviation with respect to the average investment growth rate of the treated firms is minimized. A central focus of the paper is to evaluate to what extent the impact of Law 488 is biased by time- and cross sectional-substitution. We deal with the former by using a long time series of post-intervention observations and the latter by restricting the estimates to firms that compete in geographically bounded markets or otherwise close to each other in their industrial distance.

Figure 8.1 Treated and controls in the Law 488 Ranking



Source: Bronzini and de Blasio (2006).

When compared with the pool of firms that applied for Law 488 grants without being financed, we find that financed firms initially increased their investments. The increase takes place in the second year of the treatment. However, we also find evidence of intertemporal substitution. In the years following the programme, the investment activity of the financed firms slows down significantly compared with that of the rejected firms. Finally, the impact of Law 488 is more pronounced when the size of the market where the firms compete is small or when the firms are close in their industrial distance. This suggests that financed firms might have crowded out their non-financed competitors. Overall, these results cast some doubts on the effectiveness of Law 488.

8.3. Public collateral

Public guarantee schemes (PGSs) aim at supporting firms' access to bank credit by means of providing publicly funded collateral. PGSs are typically targeted to small and medium enterprises (SMEs), which are the type of firms most likely to suffer from credit constraints. These programmes, widespread in both developed and developing countries, have experienced a dramatic surge in popularity in the aftermath of the global financial crisis and, more recently, during the economic crisis triggered by the COVID-19 pandemic.

PGSs might allow constrained firms to access credit, and risky but creditworthy firms to get larger financing at a lower cost. PGSs also provide benefits to banks, allowing them to share their credit risk and save on regulatory capital (see, for instance, Regulation EU No 575/2013 of the European Parliament and of the Council, 26 June 2013). These features of the scheme are very appealing in a situation in which credit risk is very high and the capital requirements for the banks are increasing. Compared with other types of programme (such as direct lending, co-funding, interest rate subsidies), PGSs might allow public agencies to increase bank financing to the private

sector by using relatively low initial outlays. However, these effects might fail to materialize. If the firms that receive the guarantee are those that would have been financed anyway, there would be no impact on private sector access to credit. Moreover, the scheme might enhance adverse selection and moral hazard because of the limited liability mechanism, increasing the likelihood of bad loans. Under these unfortunate circumstances, a lack of effectiveness of the programme would go hand in hand with a very high cost of the scheme for the public finances. All in all, whether the PGSs are effective in supporting firms' access to credit is an empirical question.

De Blasio et al (2018) evaluates the effectiveness of the Italian PGS, named the 'Fondo di Garanzia' or Guarantee Fund (the Fund). During the global financial crisis, interventions under the Fund has been massive: from 2009 to 2014, loans for a total of €54 billion were guaranteed. Our aim is to assess the impact of the public guarantees on SME's access to credit, in terms of both the amount of loans obtained by firms and the level of interest rates charged by banks. Moreover, we analyse the effects of the programme on the firms' probability of default. Finally, we study the "second round" effects of the guarantees in terms of spurring investments, growth of sales or financing working capital; these effects depend on how the beneficiary SMEs make use of the financial resources obtained with the support of the Fund.

The Fund has an eligibility mechanism that allows a credible identification strategy. Since the eligibility of the firms to benefit is assessed through a scoring system based on balance-sheet observables, we are able to estimate the impact of the scheme at the threshold for eligibility by using a regression discontinuity design (RDD). Our results suggest that the Fund has a positive effect on bank loans to firms, but no impact on the interest rate charged by the banks. They also underscore that the scheme affects positively the likelihood that subsidized firms will become unable to repay their loans. Moreover, no effect is found for firm investments and sales. Our findings suggest that the extra finance made available by the scheme has been mostly used to finance working capital, such as inventories and trade credit.

8.4. Regional aid

EU regional policies are a prominent example of place-based (or location-based) policies, interventions targeted to specific areas and aimed at enhancing their economic performance. Whether these policies should be put in place is a topic that has been receiving increasing attention in the last years among policymakers. EU regional policies, financed structural funds, mainly target disadvantaged areas and use a significant fraction of EU budget (€277 billion, 27 per cent of the budget, in the programming period 2007-2013). Expenditures under the structural funds include both investments (transport or telecommunications infrastructures, outlays for innovation, energy, the environment) and labour market programs (aimed at reducing unemployment and increasing skills and social integration). The bulk of structural funds expenditure (€213 billion in 2007-2013) flows to Objective 1 regions (renamed Convergence in the 2007-2013 programming period), which are EU NUTS II regions whose GDP per capita is less than 75 per cent of the EU average. The aim of structural funds is to increase long-term growth of those regions lagging behind.

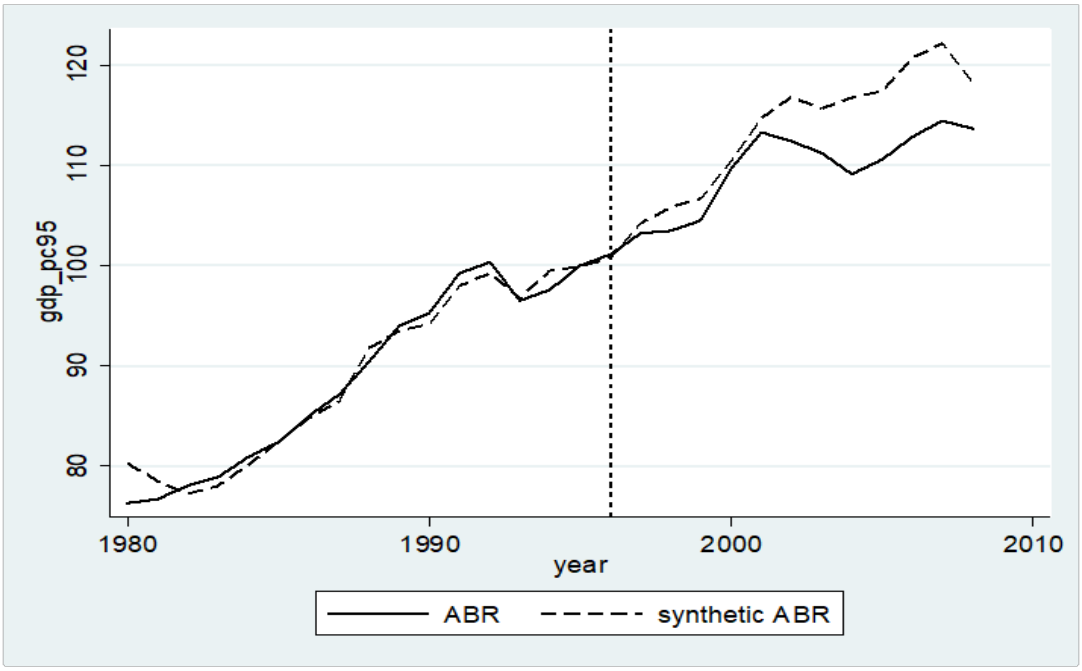
Recently, credible causal estimates pointed out the effectiveness of the Objective 1 programme to spur GDP growth in the European regions, even though a high regional

heterogeneity prevails (Overman and von Ehrlich, 2020). While these findings are very important, one can argue they are not sufficient to support the EU's cohesion policy: EU transfers may have positive short-run effect on regional economies without triggering a self-sustaining faster growth path. Barone et al (2016) assesses whether the Objective 1 policy enables treated regions to exit poverty traps and/or to trigger endogenous growth mechanisms.

Our research question, besides being interesting in an academic perspective, is also high in the policy agenda. For instance, the World Bank recently underlined this issue by distinguishing between treatment and cure: "A treatment is an instance of treating someone, say, medically. A cure ends a problem. Sometimes, the treatment is a cure. Other times, it just keeps the problem under control without curing it: if you remove the treatment, the problem comes back" (Ozler, 2014). In this respect, our paper analyses what happens when the treatment is removed. Therefore, it evaluates whether the programme represents a case in which, by quoting Ozler (2014), the treatment is the cure. We do so by analysing what happens when the programme finishes. We study the unique case of the Italian southern region of Abruzzi that is the only EU region that after being treated for a period (1989-1996) exited the programme (from 1997 onward) without any transitional support (what is now known as phasing-out). In particular, we compare the GDP per capita in Abruzzi after the funds associated with the Objective 1 programme lapsed with those which would have been observed would the treatment had been continued. The counterfactual pattern is estimated with the synthetic control method. The donor pool includes the other treated Southern Italian regions for which the intervention was not interrupted.

Our results (Figure 8.2) illustrate that after the end of the programme, the GDP per capita in Abruzzi showed a weaker growth pattern than that in the counterfactual case: about 10 years after the end of the programme, the GDP per capita in Abruzzi was 5 per cent lower than in the counterfactual scenario. This finding is statistically significant and robust to a number of sensitivity checks. However, this result might not be enough to state that the policy has not generated endogenous growth: if the intervention implies both a contemporaneous impact and an endogenous growth (or permanent) effect, our exercise sheds light only on the former because the latter is shared by both Abruzzi and the donors. However, to disentangle the two components, we show that our estimated effect for the end of the treatment is of the same order of magnitude of those estimates in the literature on the overall effect of the policy (i.e. contemporaneous impact + permanent component), thus indicating that there will be a complete reversal. All in all, we conclude that the treatment has not been the cure.

Figure 8.2 - GDP trends when the programme terminates



Source: Barone et al. (2016).

8.5. Political connections

Recent literature has documented that politicians do favour some targeted places by means of pork-barrel transfers, asymmetric public good provisions (e.g. infrastructures), and location of state-owned enterprises (SOEs). However, much less is known about the consequences of regional favoritism in terms of economic growth. In particular, two relevant research questions remain unanswered. First, whether the growth in gains persists after the end of the connection and, if not, whether there is a reversal in the level of economic fortune. This is important to understand whether the greater benefits of regional favouritism can permanently change the development trends of such regions. Second, what are the allocative distortions induced by hometown bias. Indeed, while all the existing literature assumes that favouritism implies some form of misallocation, it might also be the case that politicians have private information on the local development potential of their birthplaces (e.g. in terms of higher agglomeration economies), a case in which targeting public intervention to birthplaces would be output-enhancing including at a national level.

Barone et al (2020) complements the existing literature documenting the effects of regional favouritism in a developed country and provides evidence regarding the persistence of the benefits from connections and the allocative bias induced. In our analysis, we exploit the peculiar Italian institutional background between the end of WWII and the fall of the Berlin wall. At the beginning of this period, known in journalistic and political jargon as the First Republic, a completely new political system emerged: the end of the Fascist dictatorship led the way to a political system grounded on five political parties sharing an anti-communist stance and ruling for the whole period. The stability of such a scenario was essentially dependent on the Cold War and

on the fear that the Italian Communist Party, the strongest among Western countries, could win regular elections and come into power. Then, during the first part of the nineties, this system suddenly collapsed. The fall of the Berlin wall made the Communist threat obsolete, mitigating the political pressures to keep the ruling parties in power. Shortly after, a massive judicial investigation into political corruption of the governing parties induced a sharp change in the political elites.

Against this historical background, we investigate the impact of political connections on population growth at city level. We select population as the dependent variable because it reflects economic growth in small areas and has the advantage of being available and consistently measured over a long estimation window. Then, we define the set of powerful politicians as prime ministers and leaders of the five parties in power between 1948 and 1992 and investigate whether municipalities in their areas of birth experienced stronger population growth over the forty-year period of the First Republic with respect to untreated municipalities with similar characteristics at the beginning of the period. Table 8.1 provides the list of powerful politicians and the connected municipalities. Particularly, we focus on small and medium-sized cities, to avoid potential confounders influencing population growth in large metropolitan areas, such as rural-urban migration, human capital spillovers, etc., and regress changes in population between 1951 and 1991 against a treatment dummy and a vector of municipal characteristics observed in 1951. Our findings indicate the existence of a sizeable connection premium, equal to 8 per cent over 40 years (18 per cent of the standard deviation of the dependent variable). The impact is larger in municipalities that are connected to politicians who were elected members of Parliament over a longer period and closer to the municipalities of birth of these politicians.

Table 8.1 - List of connected municipalities

Name	Party	Role	Year birth	Municipality	Province	Region	Area
Altissimo Renato	PLI	Party leader	1940	Portogruaro	Venezia	Veneto	NE
Biasini Oddo	PRI	Party leader	1917	Cesena	Forlí-Cesena	Emilia-R.	NE
Biondi Alfredo	PLI	Party leader	1928	Pisa	Pisa	Toscana	CE
Cappi Giuseppe	DC	Party leader	1883	Castelverde	Cremona	Lombardia	NW
Cariglia Antonio	PSDI	Party leader	1924	Vieste	Foggia	Puglia	SO
Chiostergi Giuseppe	PRI	Party leader	1889	Senigallia	Ancona	Marche	CE
Colombo Emilio	DC	Prime minis.	1920	Potenza	Potenza	Basilicata	SO
Cossiga Francesco	DC	Prime minis.	1928	Sassari	Sassari	Sardegna	SO
De Gasperi Alcide	DC	Both	1881	Pieve Tesino	Trento	Trentino-A A.	NE
De Mita Ciriaco	DC	Both	1928	Nusco	Avellino	Campania	SO
Fanfani Amintore	DC	Both	1908	Pieve Santo Stefano	Arezzo	Toscana	CE
Forlani Arnaldo	DC	Both	1925	Pesaro	Pesaro-Urbino	Marche	CE
Gonella Guido	DC	Party leader	1905	Verona	Verona	Veneto	NE
Goria Giovanni	DC	Prime minis.	1943	Asti	Asti	Piemonte	NW
Jacometti Alberto	PSI	Party leader	1902	San Pietro Mosezzo	Novara	Piemonte	NW
Mancini Giacomo	PSI	Party leader	1916	Cosenza	Cosenza	Calabria	SO
Mondolfo Ugo Guido	PSDI	Party leader	1875	Senigallia	Ancona	Marche	CE
Moro Aldo	DC	Both	1916	Maglie	Lecce	Puglia	SO
Nenni Pietro	PSI	Party leader	1891	Faenza	Ravenna	Emilia-R.	NE
Nicolazzi Franco	PSDI	Party leader	1924	Gattico	Novara	Piemonte	NW
Orlandi Flavio	PSDI	Party leader	1921	Canino	Viterbo	Lazio	CE
Pella Giuseppe	DC	Prime minis.	1902	Valdengo	Biella	Piemonte	NW
Piccioni Attilio	DC	Party leader	1892	Poggio Bustone	Rieti	Lazio	CE
Reale Oronzo	PRI	Party leader	1902	Lecce	Lecce	Puglia	SO
Romita Giuseppe	PSDI	Party leader	1887	Tortona	Alessandria	Piemonte	NW
Rumor Mariano	DC	Both	1915	Vicenza	Vicenza	Veneto	NE
Scelba Mario	DC	Prime minis.	1901	Caltagirone	Catania	Sicilia	SO
Segni Antonio	DC	Prime minis.	1891	Sassari	Sassari	Sardegna	SO
Simonini Alberto	PSDI	Party leader	1896	Reggio nell'Emilia	Reggio nell'Emilia	Emilia-R.	NE
Sommovigo Amedeo	PRI	Party leader	1891	La Spezia	La Spezia	Liguria	NO
Tambroni Fernando	DC	Prime minis.	1901	Ascoli Piceno	Ascoli Piceno	Marche	CE
Tanassi Mario	PSI PSDI	Party leader Party leader	1916	Ururi	Campobasso	Molise	SO
Terrana Emanuele	PRI	Party leader	1923	Ardore	Reggio di Calabria	Calabria	SO
Vigorelli Ezio	PSDI	Party leader	1892	Lecco	Lecco	Lombardia	NW
Villabruna Bruno	PLI	Party leader	1884	Santa Giustina	Belluno	Veneto	NE
Zaccagnini Benigno	DC	Party leader	1912	Faenza	Ravenna	Emilia-R.	NE
Zoli Adone	DC	Prime minister	1887	Cesena	Forlí-Cesena	Emilia-R.	NE

Notes - Political parties: *DC* - Christian Democratic Party; *PSI* - Socialist Party; *PRI* - Republican Party; *PSDI* - Social-democratic Party; *PLI* - Liberal Party. List of Italian regions included in each geographic area: *North-West (NW)* includes Valle d'Aosta, Piemonte, Liguria and Lombardia; *North-East (NE)* includes Trentino-Alto Adige, Veneto, Friuli-Venezia Giulia and Emilia-Romagna; *Centre (CE)* includes Toscana, Marche, Umbria and Lazio; *South (SO)* includes Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia and Sardegna.

Source: Barone et al. (2020).

Our second finding is about persistence. The abrupt end of the treatment period in the first part of the nineties allows us to study persistence in the following 20 years, from 1991 to 2011. The difference in population growth between treated and control municipalities fades until it disappears, while the difference in levels of population accumulated in the previous forty years remains stable. This suggests that the benefits

provided by political connections are not permanent, even though the levels of population may be sluggish in reverting to their original path, probably because the capital stock created may depreciate quite slowly over time. This conclusion is reinforced by the existence of structural changes in the local economies of connected municipalities. We find that treated municipalities experienced improved economic prosperity at the end of the period: at the end of the First Republic, they showed greater industrialization (but not in the high-tech sectors), higher wages and employment rates. The downside was a toll on some private sector activity: the share of entrepreneurs out of the total number of workers was lower. Interestingly, after the connection ended, these structural differences slowly disappeared. Also, when investigating the mechanisms behind such results, we find that connected areas benefited disproportionally from the post-WWII development of the transport network and that state-owned enterprises were more likely to be located in their neighborhoods. Finally, after documenting the local advantages deriving from political connections, we completed the overall picture by turning to nationwide allocative considerations. Having favoured some areas at the expense of others does not necessarily point to economic inefficiency. For example, politicians might have better inside information about the existence of higher agglomeration economies in their hometowns. At the same time, the blocked political system and the fact that politicians were destined to remain in power for a long time might have favoured forward-looking political choices. Under these conditions, moving population and economic activity to connected places would have led to higher aggregate output. To check for this possibility, we tested whether connected cities displayed higher agglomeration economies. We found that this is not the case.

Suggested readings

Ozler B. (2014), Confusing a treatment for a cure, *The World Bank Blog* http://blogs.worldbank.org/impactevaluations/confusing-treatment-cure

Additional references

Barone G., F. David and G. de Blasio (2016), Boulevard of Broken Dreams. The ends of the EU funding, (1997: Abruzzi, Italy). *Regional Science and Urban Economics*, 60, 31-38.

Barone G., G. de Blasio and E. Gentili (2020), Politically connected cities: Italy 1951-1991, http://amsacta.unibo.it/6595/

Bronzini R. and G. de Blasio (2006), Evaluating the impact of investment incentives: the case of Italy's law 488/1992, *Journal of Urban Economics*, 60(2), 27–349.

de Blasio G., S. De Mitri, A. D'Ignazio, P. Finaldi Russo and L. Stoppani (2018), Public Guarantees to SME Borrowing. An RDD Evaluation, *Journal of Banking and Finance*, 96, 73-86.

Overman H. G. and M. von Ehrlich (2020), Place-Based Policies and Spatial Disparities across European Cities, *Journal of Economic Perspectives*, 34(3), 128-49.

9. International cooperation in official statistics
(M. Piazza)

9.1. Introduction

The origins of international statistical cooperation can be traced back to the immediate aftermath of World War II. The conceptual revolution in economics led by Keynes and the need for data to support policy decision on a broad range of issues were both key factors in the development of a system of national accounts, work for which the British economist Richard Stone later received the Nobel Prize in Economics.

Stone was also the driving force behind the definition of common standards and the preparation of compilation manuals for the system of national accounts that can be considered the first steps for international statistical cooperation. An early prototype work was concluded in 1947, providing the possibility of meaningfully comparing basic economic indicators – as, for example, GDP - across countries. The System of National Accounts has been updated several times since then, providing an international comprehensive conceptual and accounting framework for compiling and reporting macroeconomic statistics to then analyse and evaluate the performance of an economy.[65] The most recent update of the SNA was in 2008 (SNA 2008); a new updating process has recently started and will be completed in 2025.

A similar process has characterized the Balance of Payment statistics. The Balance of Payment Manual was first released by the International Monetary Fund in 1948; the sixth edition was released in 2009. More recently, a Handbook of Securities Statistics has been jointly developed by the Bank for International Settlements, the European Central Bank (ECB) and the International Monetary Fund (IMF).

These references make clear what has been a key factor behind international statistical cooperation, i.e. the attempt to provide data comparability across countries as well as to ensure data quality by providing common standards for the compilation of statistical aggregates.

Although several manuals and international statistical standards had been agreed and released over the years, the definition and production of statistical aggregates largely remained in the national domain until a couple of decades ago.

For Europe, the real breakthrough came with the adoption of the euro in 1999 as the common currency of 11 countries (now 19), including some of the largest economies in the world. Monetary policy was entrusted to a new central bank - the ECB - that needed a large and brand new set of statistical information to perform all its statutory tasks. An extensive harmonization programme was therefore launched five years before the turn of the century to prepare data suitable for aggregation across the future single currency area.

The Great Financial Crisis (GFC) that erupted in 2007 also provided an impulse for more international statistical activity as it showed that some countries still had significant information gaps in many areas and that in several domains, a global view was required to reach a full understanding of risks and developments. Moreover,

[65] A brief explanation of its basic function can be found here.

attaining such a global view requires much more than simply adding up national and regional components. It implies "connecting the dots" in a granular way, harmonizing information and removing double counting issues.

The impact of globalization on statistics has, however, gone further than the issues highlighted by the GFC. You will learn about the specific issues posed by this trend in the next section: suffice it to say here that it is also exerting a strong push toward further international cooperation in statistics (e.g. data sharing on the activities of multinationals).

In the rest of this section, we will mainly focus on the European statistics produced by central banks but we will also devote a specific section to the G20 Data Gaps Initiative - launched in 2009 to fill the information gaps highlighted by the GFC - as it provides a clear example of a common statistical initiative among the largest world economies.

9.2. ESCB statistics

As anticipated, the key driver that led to a change of paradigm in the statistical production in many European countries was the establishment of the European System of Central Banks (ESCB) and the launch of the common monetary policy, as new, harmonized statistics were needed to support the monetary policy of the ECB and the other tasks of the Eurosystem and the European System of Central Banks (ESCB).[66]

The first efforts were almost entirely focused on monetary policy: indeed, back in 1994, there was no harmonization of bank balance sheets across Europe, no harmonization of bank interest rates, no quarterly financial accounts and so on.

Harmonization was badly needed as it was simply not possible to run a common monetary policy by adding up existing national data, for several reasons.[67] Just to name a few, before the Economic and Monetary Union, some countries (e.g. Austria, Belgium, Netherlands) kept their currencies tightly pegged to the Deutsche Mark with little autonomy in deciding their monetary policy and therefore no need for a broad information set when taking policy decisions. Moreover, there were also adjustments to be made when moving to a European dimension, as the deposits of an Italian resident with a French bank may not be part of the money aggregates when considering France but they surely are when we come to consider the whole euro area. Finally, different strategies of monetary policy followed by countries were conducive to data needs that could substantively be different among jurisdictions.

The European Monetary Institute (the predecessor of the ECB) was therefore given a specific task ("it shall promote the harmonisation, where necessary, of the rules and practices governing the collection, compilation and distribution of statistics").

[66] The Eurosystem is the system of euro-area central banks responsible for conducting the single monetary policy. It comprises the European Central Bank (ECB) and the national central banks (NCBs) of the EU Member States that have adopted the euro. The European System of Central Banks (ESCB) is made up of the European Central Bank (ECB) and the national central banks (NCBs) of the EU Member States.

[67] A fascinating account of the long journey on which statisticians embarked in 1994 is found in Bull (2004). A more recent but shorter summary of these changes (and more generally of the evolution of central bank statistics over the last 25 years) is here: https://www.bancaditalia.it/pubblicazioni/qef/2020-0579/QEF_579_20.pdf

Harmonization affected banks' balance sheets, interest rates and several other domains and led to a common reporting population, frequency of data and timeliness.

Article 5.1 of the Statute of the European System of Central Banks and of the European Central Bank then foresaw that "in order to undertake the tasks of the ESCB, the ECB, assisted by the national central banks, shall collect the necessary statistical information either from the competent national authorities or directly from economic agents". In other words, the mandate for statistical data collection was not exclusively limited to monetary policy and indeed, after the initial set-up, the focus of European statistics gradually expanded, including, for example, financial stability data.

A whole new chapter in this regard was the establishment of the Single Supervisory Mechanism (SSM): the ECB and the national supervisors developed a common approach for collecting data from the European banking sector with the reporting frameworks defined by the European Banking Authority (EBA).

Needless to say, European economic statistics are not limited to those compiled by the ESCB: the responsibility for producing these statistics in Europe is shared between the ESCB and the European Statistical System.[68] In short/a nutshell, the ECB and NCBs are responsible for Monetary and financial statistics, International reserves, Effective exchange rates and Quarterly financial accounts. On the other hand, Eurostat and NSIs are responsible for all the other general economic statistics (e.g. GDP, Harmonized Index of Consumer Prices and so on).

In some cases, the responsibility remains shared between the ESCB and the ESS, as for example for statistics on the Balance of Payments (BoP), the International Investment Position (IIP) and the European accounts by sector (e.g. euro-area accounts).

Coming back to the ESCB's statistical production, the allocation of statistical tasks within the ESCB is defined by Article 5.2 of the Statute of the European System of Central Banks and of the European Central Bank that says that "[t]he national central banks shall carry out, to the extent possible, the tasks described in Article 5.1".[69]

A Statistical Committee (STC) is set up as the internal higher-level body for promoting cooperation among NCBs belonging to the ESCB. The technical work is done by working groups (WGs) and Task Forces (TFs), usually composed of members from all NCBs and the ECB. An important part of the work of these bodies is to ensure that the statistical data collections remain fit for use by policy makers and this task is carried out mainly by preparing and updating the legal texts that govern these data collections. Moreover, the ESCB legal framework played a key role in ensuring the harmonization process summarized above. It is therefore important to have a quick look at it.

[68] The European Statistical System (ESS) is the partnership between the statistical authority of the European Union, which is the European Commission (Eurostat), and the national statistical institutes (NSIs) and other national authorities responsible in each Member State for the development, production and dissemination of European statistics. Member States collect data and compile statistics for national and EU purposes. The ESS functions as a network in which Eurostat's role is to lead the way in the harmonization of statistics in close cooperation with the national statistical authorities. Regulation (EC) No 223/2009 on European statistics constitutes the legal basis for the preparation of the European statistical programme, providing the framework for the development, production and dissemination of those European statistics that are the responsibility of the ESS.

[69] The content of this article is recalled above in the text.

9.3. The ESCB legal framework

The legal framework for ESCB statistics has various layers. As mentioned, Article 5 of the ESCB/ECB Statute defines the statistical role of the ECB and NCBs and it applies to all EU member states. Council Regulation 2533/98 (as amended) defines the general scope of the reporting requirements, the confidentiality regime, the enforcement rules and also applies to non-participating Member States (i.e. countries that have not adopted the euro and are not part of the Eurosystem).

The main legal instrument for running statistical activity within the Eurosystem are the ECB Regulations as they are directly applicable to economic agents (the actual reporting population). As mentioned, they have been the main legal instruments used to implement harmonization in the different statistical domains under the ECB's responsibility. ECB Regulations are non-binding for non-participating Member States. Finally, ECB Guidelines are only binding for the NCBs of participating Member States.

There are currently 30 binding legal acts in force in the statistical fields, basically spanning all the domains under the ESCB's responsibility (e.g. monetary statistics, financial accounts, securities holding statistics, external statistics and payments statistics).

9.4. The ESCB's statistical production and dissemination

Based on Articles 5.1 and 5.2, the ECB, assisted by the NCBs, shall collect the necessary statistical information, either from the competent national authorities or directly from economic agents. In fact, it is the NCBs (and, in some cases, other national authorities) that collect data from banks and other entities in their countries and calculate national aggregates. The ECB compiles the aggregates for the euro area.

The deadlines for the transmission of data from the NCBs to the ECB are typically defined in the legal texts governing each specific data collection while the time frame for the transmission from the reporting agents to the NCBs depends on national arrangements. For monetary policy monthly data, for example, the transmission of the data to the ECB is due within 15 working days of the reference end-of-month date, while the BI has asked monetary and financial institutions (the reporting population for this specific set of data) to send data by 12 working days from the reference date.

Data production is a resource-intensive activity; just to give an idea of the order of magnitude of the efforts in the statistical field, the BI sends tens of thousands time series to the ECB each month. Before the data transmission, outlier detection and consistency checks are carried out. Further quality checks are conducted by the ECB.

Standards of data quality, a key factor for ensuring public trust in the ECB statistics upon which policy decisions are based, are defined and appropriately updated. Likewise, a specific legal framework to protect data confidentiality has been in place since the ESCB was founded.[70]

A wide range of statistics is made publicly available by the ECB, including via a dedicated website https://www.euro-area-statistics.org/: the most comprehensive source

[70] For further details on these issues, see the ECB webpage at: https://www.ecb.europa.eu/stats/ecb_statistics/governance_and_quality_framework/html/index.en.html

is its statistical data warehouse (https://sdw.ecb.europa.eu/). Many national statistics are also disseminated through national publications and data-warehouses (see chapter 12).

9.5. More recent developments

In recent years, the focus has gradually been shifting toward the collection of more granular data. Timely and granular data on an increasingly broad range of banking activities and the associated risks and exposures have indeed proved to be extremely useful, in particular during the financial crisis.

The introduction of new statistical products based on granular or individual data, and the enhancement of existing reference datasets and registers to support the integration of microdata platforms, are key for serving the needs of the ESCB and the European banking supervision authorities in a flexible and comprehensive way.

Granular information may reduce the burden on reporting agents and provide flexibility and agility for adapting to user needs. However, it also means a higher burden for the producers of statistics in terms of processing and quality assurance.

The first example of this work is the Centralised Securities Database (CSDB), i.e. a database that holds information on all individual securities relevant for the statistical purposes of the European System of Central Banks (ESCB). This means securities issued by EU residents; securities likely to be held and traded by EU residents; and securities denominated in euros whoever the issuer is and wherever they are held. The CSDB contains information[71] on millions of debt securities, equities and mutual fund shares/units issued by residents of EU Member States or by others. The work on the ESCB had already started at the turn of the century, involving all the NCBs as yet another form of international statistical cooperation, and the database went live in 2009. A second, related, example is the Securities Holdings Statistics (SHS), based on a data collection on a security-by-security basis. The SHS Group (SHSG) data collection provides information on the holdings of each security by individual banking groups.

The most prominent example of a granular database developed in recent years within the ESCB framework is AnaCredit, a dataset containing detailed information on individual bank loans in the euro area, harmonized across all Member States. "AnaCredit" stands for analytical credit datasets. The project was initiated in 2011 and data collection started in September 2018. It makes it possible to identify, aggregate and compare credit exposures and to detect associated risks on a loan-by-loan basis. At present, banks only report information on loans to corporations and other legal entities, mostly on a monthly basis. Data are treated according to strict confidentiality rules and are only accessible to specified categories of users and for the intended uses.

Another important ongoing development is the attempt to integrate statistical and supervisory requirements that could streamline the overall reporting process from banks to national and European authorities, ensure its quality and facilitate the integration of data management systems within European and national authorities.

Following an approach to reporting integration that has a well-established tradition at the BI, the ESCB has launched two important initiatives to this end: (i) the

[71] Information available for all NCBs (that contribute significantly to the CSDB maintenance and update) include data on securities (e.g. outstanding amounts, issue and maturity dates, coupon and dividend information, statistical classifications and so on), issuers and prices (market, estimated or defaulted) as well as on ratings (of the security, issuer, guarantor or issuance programmes).

development of a Banks' Integrated Reporting Dictionary (BIRD), with the contribution of representatives from euro-area commercial banks; and (ii) the establishment of an Integrated Reporting Framework (IReF). The first initiative aims to help reporting agents efficiently organize information stored in their internal systems and fulfil their reporting requirements[72] while the IREF aims to define harmonized primary reporting requirements across countries.[73]

Needless to say, this would constitute a further significant leap in statistical cooperation, and one that could hugely diminish, in a steady state, the reporting burden of the financial intermediaries, especially those operating across more than one country.

9.6. The financial crisis and the G20 Data Gaps Initiative

A further impulse to international cooperation came from the financial crisis, which highlighted significant data gaps, in many cases relating to difficulties in getting a full data picture across countries.

The most important information gaps that emerged during the crisis concerned complex structured products, off-balance sheet entities, trading books on banks' balance sheets, over-the-counter derivative markets and risks taken by non-bank financial intermediaries. Over-the-counter (OTC) markets and securitization markets, for example, represented significant exposures for financial institutions but relatively few data were available. Non-bank financial intermediation, known at that time as "shadow banking", was also strongly on the rise in several jurisdictions but little information was available for a full appraisal of the risks it implied.

Networks and interdependencies within and across financial systems were also bigger than expected and amplified the crisis and its impact on the real economy. This was partly due to the expansion in intermediation through unregulated channels and new instruments. Insufficient data on cross-border exposures and capital flows also hampered analysis of cross-country spillovers. Furthermore, a global view was required to interpret many financial and economic developments, and national/regional authorities ended up needing access to global data also to conduct their own domestic monitoring activities. Finally, aggregate data did not prove very useful in understanding the risks of contagion amongst large financial institutions and required institution-specific data, the sharing of which obviously raised sensitive issues.

To address this situation, the G20[74] launched the first phase of the Data Gaps Initiative (DGI-1) in 2009, which included twenty recommendations meant to meet the most pressing information needs with regard to financial stability. The FSB and the IMF coordinated the Initiative with the participation of all other major international organizations, working together in the Inter-agency Group on Economic and Financial Statistics (IAG),[75] and the G20 countries. Each recommendation had targets over the

[72] https://www.ecb.europa.eu/stats/ecb_statistics/co-operation_and_standards/reporting/html/index.en.html

[73] Primary reporting refers to the statistical returns from intermediaries to NCBs, secondary reporting to the returns from NCBs to the ECB.

[74] https://www.g20.org/about-the-g20.html

[75] All the major international organizations working in the statistical field are represented in the IAG (IMF, ECB, Eurostat, OECD, BIS, World Bank and UN Stats).

five-year horizon of the Initiative, with the IMF and the FSB providing annual Progress Reports to the G20 Finance Ministers and Central Bank Governors.[76]

In several cases, the work in the first phase had to develop conceptual frameworks in some areas where no data collections existed (e.g. individual data requested from Global Systemically Important Banks). In 2015, the DGI-1 was concluded, with several of its goals accomplished. A second phase of the Data Gaps Initiative (DGI-2) was then launched with twenty recommendations to be implemented by 2021, in this case with a focus on the regular collection and dissemination of reliable and timely statistics for policy use and with definitions of "core targets" and "more advanced ambitions" to reflect the different starting points of different jurisdictions, depending on the specific statistical domains. In fact, while the DGI-2 aims to lead the G20 economies to higher common statistical standards, a flexible approach is followed for the intermediate steps to achieve the targets. The twenty recommendations of the DGI-2 are summarized under three headings: (1) monitoring of risk in the financial sector; 2) vulnerabilities, interconnections and spillovers; and 3) data sharing and communication of statistics.[77]

As the DGI-2 is now approaching its conclusion, a discussion has begun on whether to launch a new data initiative that could build on the close collaboration among the participating economies and the international organizations, the peer pressure mechanism, and the explicit support from the G20 that were essential in addressing policy-relevant data gaps during this current DGI. If effectively launched, this new initiative would encompass efforts to improve information on climate change and related topics and on access to private and administrative sources of data.

The latter issue is particularly relevant to the production of official statistics, going forward. Digitalization has created a wealth of new data, including on previously unmeasured phenomena and COVID-19 showed the key importance of these data. Data produced by user activity on online platforms or from Internet-of-Things devices could help official statisticians improve the salience, timeliness and depth of their product, but an important share of these data is held by private companies. A legitimate question is therefore whether statisticians could find a way to use some of this information in the public interest as well, in addition to its use by the private companies that collected it.

Some initiatives for accessing private sector data for official statistics have been developed but so far they have been fragmented and mainly conducted within national boundaries: international cooperation in this domain could help by providing more clarity and certainty on possible approaches, while respecting the specificities of individual jurisdictions.

Suggested readings

De Bonis R. and M. Piazza (2020), A silent revolution. How central bank statistics have changed in the last 25 years, Banca d'Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 579.

[76] https://www.imf.org/external/np/seminars/eng/dgi/index.htm

[77] https://www.fsb.org/wp-content/uploads/Second-phase-of-the-G20-Data-Gaps-Initiative-DGI-2-First-Progress-Report.pdf

ECB, European statistics: cooperation between the European System of Central Banks and the European Statistical System https://www.ecb.europa.eu/pub/pdf/other/eb201507_article03.en.pdf?682de5202e75b5e6730b981995390742

Additional references

Biancotti C., O. Borgogno and G. Veronese (2021), Principled data access: building public-private data partnerships for better official statistics, Banca d'Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 629.

Bull P. (2004), The development of statistics for Economic and Monetary Union, ECB. https://www.ecb.europa.eu/pub/pdf/other/developmentstatisticsemu200406en.pdf

Heath R. and E. Bese Goksu (2016), G-20 Data Gaps Initiative II: Meeting the Policy Challenge, International Monetary Fund Working paper, https://www.imf.org/external/pubs/ft/wp/2016/wp1643.pdf

Information on the IReF and the BIRD is available here: https://www.ecb.europa.eu/stats/ecb_statistics/co-operation_and_standards/reporting/html/index.en.html

Israël J. M., V. Damia, R. Bonci and G. Wafte (2017), The Analytical Credit Dataset: A magnifying glass for analysing credit in the euro area, ECB, Occasional Paper Series, 187. https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op187.en.pdf

Materials from the Global Conferences of the Data Gaps Initiative can be found here: https://www.imf.org/external/np/seminars/eng/dgi/index.htm

The Progress Reports of the Data Gaps Initiative are stored here: https://www.imf.org/en/Publications/SPROLLs/g20-data-gaps-initiative#sort=%40imfdate%20descending

10. Globalization and the digital economy: the challenges for official statistics *(S. Federico)*

10.1. Overview

Globalization and the digital economy are two of the most prominent challenges for official statistics. These are two clearly distinct phenomena, which are, however, closely interconnected: think for instance about how the scale of globalization has been augmented by the technological innovations relating to digitalization. While they pose distinct challenges to statisticians, their interaction in particular may have a large impact on official statistics, leading to potentially large distortions and mismeasurement issues. Before discussing their statistical implications, it is useful to provide a short overview of these two phenomena, together with tentative definitions.

Globalization can be defined as the growing interdependence of the world's countries, economies and people, brought about by enhanced cross-border trade in goods and services, technology, and flows of investment, people and information.

The ratio of world trade in goods and services to GDP has risen considerably over the last few decades, reaching a peak in 2008. While the following decade was characterized by a slight retrenchment ("slowbalization"), international trade as a share of world GDP remains considerably higher than in previous historical phases of economic integration (e.g. the early 20th century). Moreover, two profound changes in the way goods and services are produced and exchanged have occurred in recent decades. First, there has been an increasing fragmentation of production at international level. This phenomenon goes under the name of "global value chains" (GVCs). A GVC emerges when production activities (design, raw materials, intermediate inputs, marketing, distribution and so on) are undertaken in different countries around the globe. GVCs now account for almost half of world trade. Second, there has been an increase in the global activity of multinational enterprises (MNEs). World markets are increasingly served by multinational enterprises whose production is carried out locally through subsidiaries. MNEs are estimated to account for about one third of world trade, and play a key role in several GVCs.

Financial globalization has also intensified significantly since the 1990s, as confirmed by the increase in global financial cross-border assets and liabilities (in proportion to world GDP). This trend reflects increasing cross-border portfolio investment in securities and equities, growing foreign direct investment (FDI) undertaken by MNEs and (at least until the 2008-09 global financial crisis) greater banking integration. The growth in financial globalization has involved both advanced and emerging economies, but has been exceptionally large in "financial centres" (e.g. Ireland, Switzerland, Netherlands, Cayman Islands and so on).

As regards the digital economy, a generally agreed definition is harder to find. A broad definition of the digital economy as something including all activities that use digitized data would encompass the vast majority of activities in the economy as a whole, as very few activities nowadays are completely independent from digitized data. A narrow definition would include "online platforms" (e.g., Google, Facebook, Alibaba) and "activities that owe their existence to such platforms" (including the

sharing economy, whose main components are peer-to-peer services: e.g. Airbnb or Uber), and therefore seems more useful as a starting point. A definition of the "digital sector", i.e. the producers at the core of digitalization, might also be useful, and would encompass online platforms, platform-enabled services, together with suppliers of information and communication technology (ICT) goods and services.

10.2. Impact on current statistical standards

Globalization and the digital economy may significantly affect the quality of official statistics. Their effects can be summarized in the following three categories: a) distortions in the measurement of real and financial linkages among countries; b) distortions in the measurement of key macroeconomic aggregates; and c) lack of visibility for new or emerging phenomena in the current statistical frameworks.

To understand the channels through which globalization and the digital economy affect statistics, it is useful to go through the main conceptual foundations on which international statistical standards and in particular three key principles are based: a) residence (where a unit is located); b) economic ownership (when a transaction takes place); and c) production (which inputs are used to produce the output).

The residence principle is needed to identify units that are part of the national economy and that therefore contribute to all the macroeconomic aggregates of a given economy. According to the 2008 System of National Accounts, "the residence of each institutional unit is the economic territory with which it has the strongest connection, expressed as its center of predominant economic interest". For corporations, the centre of economic interest is normally expected to be in the economy in which they are legally constituted and registered and where they are engaged in a significant amount of production of goods or services. A first implication of this definition of residence is that MNEs include units located in multiple countries (as part of the national economy of each country), i.e. their activity is recorded in the national accounts of each country in which at least one unit of the multinational enterprise is located.

The implementation of this principle faces two main challenges. The first is related to the pervasive use of empty corporate shells ("special purpose entities" or SPEs) by companies or even wealthy individuals. These units typically have zero or very few employees, no real business or production activities, but carry out holding activities, conduct intrafirm financing, or manage intangible assets. They are generally registered in financial centres such as Luxembourg, the Netherlands, Bermuda, the British Virgin Islands, Singapore and so on. Although they have little or no real activity, SPEs might have large external financial activities, leading to distortions both in the aggregate size of FDI in selected economies as well as in its geographical distribution. For instance, due to the SPEs registered in its territory, Luxembourg, which has a population of 600,000, hosts as much FDI as the United States and much more than China. SPEs are also the reason why the main partner country for FDI in and out of Russia is a very small country such as Cyprus, which hosts SPEs owned by Russian nationals that are engaged in "round-tripping". At global level, it is estimated that almost 40 per cent of global FDI passes through these SPEs and can therefore be considered as "phantom FDI".

The use of empty shells resident in tax havens also has an impact on cross-border portfolio investment. Coppola et al. (2021) report the example of a large Brazilian company in the energy sector that raises money from US and EU investors.

However, the money is not directly raised by the parent company resident in the Netherlands but by financial conduits or shells located in the Cayman Islands. Being based on the immediate destination or source country, official statistics report the flow of money from US and EU investors to financial conduits in Cayman Island, while the actual exposure of US and EU investors to the Brazilian energy sector is not visible in official figures.

An additional challenge to the residence principle followed in the statistical standards arises from "company relocations" (also known as redomiciliations or corporate inversions). Some MNEs geographically relocate their country of legal residence, generally with a view to reducing their global tax liability. This strategy often involves an agreement between corporations in two countries: the MNE's parent company merges with a foreign corporation that is headquartered in a lower-tax country and the newly merged company becomes the parent company of the entire group. Usually only the legal incorporation of the company moves to the new country, with no change in the geographical allocation of headquarter functions, of top management or of the workforce. However, the change in residence might have a noticeable effect on the macroeconomic statistics, as financial assets and liabilities are also relocated to the new country, given the application of the residence principle. For instance, in the case of Ireland – one of the economies that are popular in hosting new parent companies, together with the Netherlands – the retained earnings of resident corporate inversions represented 11.0 per cent of the country's primary income receipts in 2014.

A second key concept in the statistical standards is related to "economic ownership". The 2008 SNA defines the economic owner of an asset as the party who has the risks (e.g. potential losses caused by damage, theft and so on) and rewards (e.g. right to use, rent out or generate income). This concept is needed to determine when a transaction in goods or financial assets takes place. One issue with this principle is related to global production processes, which include goods sent abroad for processing (contract manufacturing). In this case, the manufacturing is undertaken by an entity ("processor") that does not own the goods and that is paid a fee by the "owner". Examples of contract manufacturing include assembly of clothing and electronics, labelling, packing and so on. The economic ownership of the goods does not change (i.e. it remains with the owner), so no merchandise transaction is recorded between the processor and the owner, while the fee is recorded as a manufacturing service. The implication is that goods can be shipped from one country to another and back, but no goods transaction is recorded in national and balance of payments accounts because there is no change in economic ownership.

Even more serious issues for official statistics are caused by intangible productive assets (e.g. blueprint, patent and know-how), which can be used in many places simultaneously and have no clearly definable location. MNEs often set up the aforementioned SPEs in tax havens to reallocate royalties, licence fees, or more generally profits. This makes it complex to determine the economic ownership of intellectual property products (IPPs), and therefore the allocation of the output and the use of these assets.

Intangible assets also create issues for the application of a third key concept in the international statistical standards, i.e. production. According to the 2008 SNA, production is an activity, carried out under the responsibility, control and management of an institutional unit, which uses inputs of labour, capital, and goods and services to

produce outputs of goods and services. Traditionally, intangible capital was largely used where it was produced. Now instead it can be easily relocated abroad by MNEs. This has obvious implications for macroeconomic statistics. GDP consists of the remuneration for the input of labour and for the input of capital (both tangible and intangible); if the location of intangible capital is to some extent arbitrary, then the measurement of GDP (value added generated with the contribution of various inputs, including intangible capital) also becomes to some extent arbitrary.

10.3. Distortions of key macroeconomic aggregates

The poster child for the dramatic impact that globalization and digitalization may have on official macroeconomic statistics was Ireland. In July 2016, the Irish statistical institute reported real GDP growth of 26 per cent and real GNI growth of 19 per cent for the year 2015. These figures generated many reactions from the press: for instance, the *Financial Times* wrote that "The Irish have written some notable works of fiction — James Joyce and Flann O'Brien produced imperishable classics. Now there is a new addition to the national oeuvre — the official narrative of the country's economy". Many economists also criticized the official figures, including Paul Krugman ("Leprechaun economics") and Colm McCarthy ("it's Alice in Wonderland economics"). However, the statistics were fully compliant with international standards SNA 2008 and ESA 2010, thus suggesting that the problem was in the international standards themselves, rather than in their implementation by the statistical institute.

What happened in Ireland? A very concise explanation goes as follows (a comprehensive account of the Irish case and the dilemma it poses for statistics is found instead in Tedeschi, 2018). One large non-EU MNE relocated their economic activities (and more specifically their underlying intellectual property) to Ireland. Intellectual property was used in global production arrangements with contract manufacturers outside Ireland (but under these arrangements, economic ownership remained in the Irish affiliate of the foreign MNE). Production (outside Ireland) generated by the use of intellectual property now contributed to Irish GDP rather than to other countries' GDP. In summary, there was a combination of company relocation, intellectual property and global production arrangements. It was a perfect storm for official statistics, and a wake-up call for the entire statistical community.

The Irish case proved that even key macroeconomic aggregates may be hugely distorted. Yet even before the Irish case, many economists and statisticians were exploring the hypothesis of a mismeasurement of GDP due to the challenge of estimating the contribution of the digital economy. This debate was motivated by the puzzle of low productivity growth at a time of rapid technological change. The possible reasons for underestimation of GDP and productivity include: the proliferation of many new and free services (such as most social networks), whose value to the user might not be captured by official statistics; insufficient adjustment for quality change in constructing the deflators for digital products (e.g. consider the superior performance of brand new smartphones compared with slightly older products); gaps in measuring the sharing economy and activities of online platforms. Moreover, shifts of market production to outside the GDP boundary have been cited as a source of downward distortion in GDP in the digital age. Online information has reduced search and matching costs, and enabled households to substitute services that they produce for market services; for example, households can be their own travel agent. Free digital

replacements (such as Skype as a replacement for long distance calls) can also be viewed as enabling households to eliminate expenses via do-it-yourself production. Finally, the Internet enables volunteers to supply online content and open source software.

The debate is not settled yet. Most statisticians conclude that GDP mismeasurement due to the digital economy is limited and is unlikely to explain productivity and growth slowdown. However, there are studies pointing in the opposite direction: for example, Brynjolfsson et al. (2019) provide a range of estimates for the impact of incorporating Facebook into GDP, ranging from 0.04 to almost 0.5 percentage points per year on average from 2004. These are very large numbers, especially considering that Facebook is just one product.

10.4. The way forward

What are the solutions to the measurement issues caused by globalization and the digital economy?

As regards distortions in the measurement of real and financial linkages among countries, the solution envisaged by the statistical community usually involves a "pass-through" approach, i.e. you pass through intermediate countries (or entities) to capture the underlying economic linkages among countries. One example on the real side comes from the literature on GVCs. Let us take the example of an Italian company that exports an intermediate good (e.g. car brakes) to a German company, which then uses it in order to produce a final product (e.g. a luxury car) and export it to a third country (e.g. China). Bilateral trade statistics are based on the immediate partner country and therefore do not capture the economic linkage between China's demand for luxury cars and the production in Italy of an intermediate input which is embodied in luxury cars. However, drawing on global input-output tables, which report the value added by each country in the production of goods and services that are consumed in a given country, it is possible to measure to what extent an increase in the final demand in China for a given product affects Italy's exports and domestic value added. A second example on the financial side is given by the supplementary presentation of direct investment statistics, based on the ultimate investing country rather than the immediate investing country. The country of the ultimate investor is identified by proceeding up the immediate direct investor's ownership chain through the controlling links until an enterprise is reached that is not controlled by another enterprise.

Finding solutions to minimize the effect of globalization and the digital economy on the measurement of key macroeconomic aggregates is less straightforward. By simplifying the debate in the statistical community, one can identify four potential approaches (Moulton and van de Ven, 2008).

The first approach mainly argues in favour of putting more emphasis on indicators already existing within the framework of national accounts, i.e. better exploiting what can already be computed using the current concepts. Rather than focusing on GDP as the only measure of macroeconomic outcomes, there are various alternative indicators, already available in the current version of national accounts, which are potentially useful as indicators for the increased or decreased material welfare of residents in a national economy. For instance, Gross National Income (GNI) is a measure of the gross primary income earned by residents of a country, while Net National Income (NNI) also adjusts for capital stock depreciation. Net National

Disposable Income (NDI) further adjusts for net flows of current transfers with the rest of the world and includes the amounts of resources that are available to the economy for consumption or saving. The existing national accounts also measure the share of NDI that accrues to households; after adjusting for social transfers in kind, the Adjusted Net Disposable Income of Households is available.

A second approach remains within the boundary of SNA but puts forward new indicators, with adjustments that are aimed at dealing with the largest sources of distortion. This was the approach followed after the case (discussed above) of Ireland's GDP in 2015. The Economic Statistics Review Group, established in 2016 after the event, concluded that, while the Irish national statistical institute will continue to produce GDP, GNI and related measures in order to meet EU legislation requirements, "supplementary statistics that are more appropriate to the measurement of domestic economic activity are needed that will be comprehensible and stable over time". An adjusted level indicator of domestic economy (GNI*) was therefore proposed, where two large and volatile items are removed from the standard GNI (depreciation on foreign-owned domestic capital assets and retained earnings of redomiciled companies). The compilation of an adjusted balance of payments current account (CA*), an adjusted total domestic demand* and a modified Industrial Production index (IPT*) were also put forward. This solution provides a relatively easy fix to the distortions of key macroeconomic aggregates; the main drawback is that, if the sources of distortions differ among countries, different adjustments might be needed in various countries and the international comparability of these adjusted indicators would suffer.

The third method focuses on distortions caused by intangible assets, which as mentioned have no definite geographical location. Given that the accounting measures of intangible assets supplied by firms are biased by tax avoidance strategies, this method argues for discarding them and replacing them with imputed measures (Lipsey, 2008). For instance, the location of intangible assets might be assigned to the parent company, to the main location of management activity or on the basis of the location of the group's R&D activity. While there is a large degree of arbitrariness in the choice of the criterion for assigning the location of intangible assets, there are analogies with other imputations that statistical agencies already use, for instance when dealing with the geographical allocation of profits in multi-establishment firms, for the purposes of estimating regional GDP. To some extent, this option does not entirely go against the principles of current statistical standards, and has the benefit of focusing on one of the main sources of mismeasurement issues, i.e. intangible assets.

The fourth method is instead fully outside the boundary of SNA and argues in favour of developing nationality-based statistics, where the activities of the units of a group are consolidated at the group level. In other words, all units controlled by a group are considered as part of the nation where the group is headquartered (or where the ultimate controlling entity of the group is resident). For example, an Italian subsidiary of a German MNE is considered as part of Germany. This approach would facilitate the understanding of who makes underlying economic decisions, who takes on the final risk and who needs to hold sufficient buffers to cover potential global losses. It is also widely used in international banking statistics, where "consolidated" statistics indeed apply this nationality-based perspective, providing a perspective which is very useful and complements the one based on the residency approach ("locational" banking statistics). A reasonable approach would be to encourage the development of

nationality-based statistics in addition to the existing residence-based statistics, which remain essential for most analytical and policy purposes.

Finally, an additional challenge for official statistics is the lack of visibility for new or emerging phenomena in the current statistical frameworks. This issue is relevant to globalization: for instance, the activity of MNEs is not often visible in current macroeconomic statistics, and adding detailed breakdowns for MNEs in national accounts is being discussed among statisticians. For the digital economy, this issue is even more relevant, and the lack of a generally agreed definition already suggests the need to develop new frameworks and new statistical concepts to describe the phenomenon. Recent attempts in this direction include a tentative quantification of the size of the digital economy (IMF, 2018) and new guidelines for measuring digital trade transactions (OECD-IMF-WTO, 2020), including a definition of digital trade (as "all trade that is digitally ordered and/or digitally delivered", therefore including the purchase of a good or service via computer networks, transactions that are facilitated via online intermediary platforms:, and downloadable services and data flows that are digitally delivered).

Suggested readings

Moulton B. and van de Ven P. (2018), Addressing the Challenges of Globalization in National Accounts, paper presented at the CRIW Conference: The Challenges of Globalization in the Measurement of National Accounts.

Additional references

Brynjolfsson E., A. Collis, W. E. Diewert, F. Eggers and K. J. Fox (2019), GDP-B: Accounting for the Value of New and Free Goods in the Digital Economy, NBER Working Papers, no. 25695, DOI 10.3386/w25695, March.

Coppola A., M. Maggiori, B. Neiman and J. Schreger (2021), Redrawing the map of global capital flows: the role of cross-border financing and tax havens, forthcoming in *The Quarterly Journal of Economics*.

IMF (2018), Measuring the digital economy, Staff Report

Lipsey R.E. (2008), Measuring the Location of Production in a World of Intangible Productive Assets, FDI, and Intrafirm Trade, NBER Working Papers, no. 14121.

OECD, IMF and WTO (2020), Handbook on measuring digital trade, version 1.

11. Big data and official statistics *(J. Marcucci)*

"Information is the oil of the 21st century, and analytics is the combustion engine"
(Peter Sondergaard, Senior Vice President, Gartner)

11.1. Introduction

In his quote, Peter Sondergaard, the Senior Vice President of Gartner, states that information and data (and in particular big data) are the *new oil* of the 21st century, while analytics is the combustion engine. Data are everywhere and to use them efficiently one needs a series of techniques that elaborate them to reach the best data-driven decisions. In this chapter, you will see the definition of big data and the reasons why they are important for private and public companies alike. You will see some important examples of big data, starting from the Billion Price Project (BPP) at MIT to the Economic Policy Uncertainty (EPU) index by Baker, Bloom and Davis (2006). You will also see some very recent applications of big data to economics and finance using payments data or social networks like Twitter, which did help central banks and public authorities to have a real time gauge of the state of the economy in many countries, during the COVID-19 pandemic and the Great Lockdown (Gopinath, 2020). You will see how Twitter is used to compute a social mood index on the Italian economy by ISTAT, the Italian national statistical office and how it can be perused to compute inflation expectations. This is only a limited set of examples of big data applications for official statistics. With the ever-increasing availability of big data, combined with machine learning and artificial intelligence, the traditional statistics performed using costly surveys on individuals and businesses are going to be less important, unless they are combined with the timely results obtained using big data. Of course, all that glitters is not gold and even these new indicators coming from big data must be used with care, because there might be issues of representativeness, sampling, different kinds of biases and so on. However, in general, big data are here to stay and to become fundamental in the official statistics not only at the time of writing but also in the future.

The rest of this chapter is organized as follows. In section 2, we present a general definition of big data with a possible taxonomy. Section 3 gives some examples of big data in economics and statistics, while Section 4 draws some conclusion.

11.2. What are big data? A definition and a taxonomy

Big data is a relatively new concept that started in the computer science literature and was then used in almost every discipline. Figure 11.1 shows the Search Volume Indices (SVI) for the keywords "big data", "artificial intelligence", "FinTech", and "machine learning" as computed and downloaded by Google Trends (accessed on June 23rd 2021). We can observe that "big data" became a popular search term at the beginning of the 2010s. The keyword "artificial intelligence" was already heavily searched before the 2000s because it is an old concept that goes back to the 1950s, but it gained popularity with the recent advances in computing power and with the availability of massive amounts of granular data. Therefore, big data cannot be considered as just a buzzword but as a new world which should be explored and exploited both by private

companies, which want to know their customers better, and by public agencies, which are eager to understand how the economy is going to design the best policy actions.

Big data are the direct effect of digitalization and increased connectivity. A huge amount of data travels across the internet nowadays. As shown in Figure 11.2, in just sixty seconds, there are something like 1.3 million people logging in on Facebook, 19 million texts sent, 4.7 million videos viewed on YouTube, 400,000 Apps downloaded from Google Play and Apple store, 764,000 hours watched on Netflix, 4.1 million search queries on Google, 59 million messages sent on Messenger and WhatsApp, 190 million emails sent, 194,444 people tweeting, and much more.

One of the first definitions of "big data" was given by Snijders, Matzat and Reips (2012), who argue that big data is a loosely defined term used to describe data sets so large and complex that they become awkward to work with using standard statistical software.

The most well-known and popular definition was given by Berman (2013): "big data can be characterized by the **three Vs**: i) **volume** (large amounts of data), ii) **variety** (different types of data), and iii) **velocity** (constant accumulation of new data)". Big data represent a gold mine of useful and timely information for economists, statisticians and social scientists in general. Over the years, more "Vs" have been added to this definition. For example, V for value, because exploiting big data can give great value both to private companies and public authorities. Hussein (2020) counts up to fifty-six Vs to define the concept of big data.

Nevertheless, a more pragmatic definition of big data could be the following: there is a big data problem if the data to be used are too big to be processed by a single machine and/or the processing would take too long for a single machine. This kind of problem requires big data tools and techniques.

Figure 11.1: Search Volume indices from Google Trends (https://trends.google.com/trends/?geo=US) relating to keywords "big data", "artificial intelligence", "FinTech", and "machine learning"

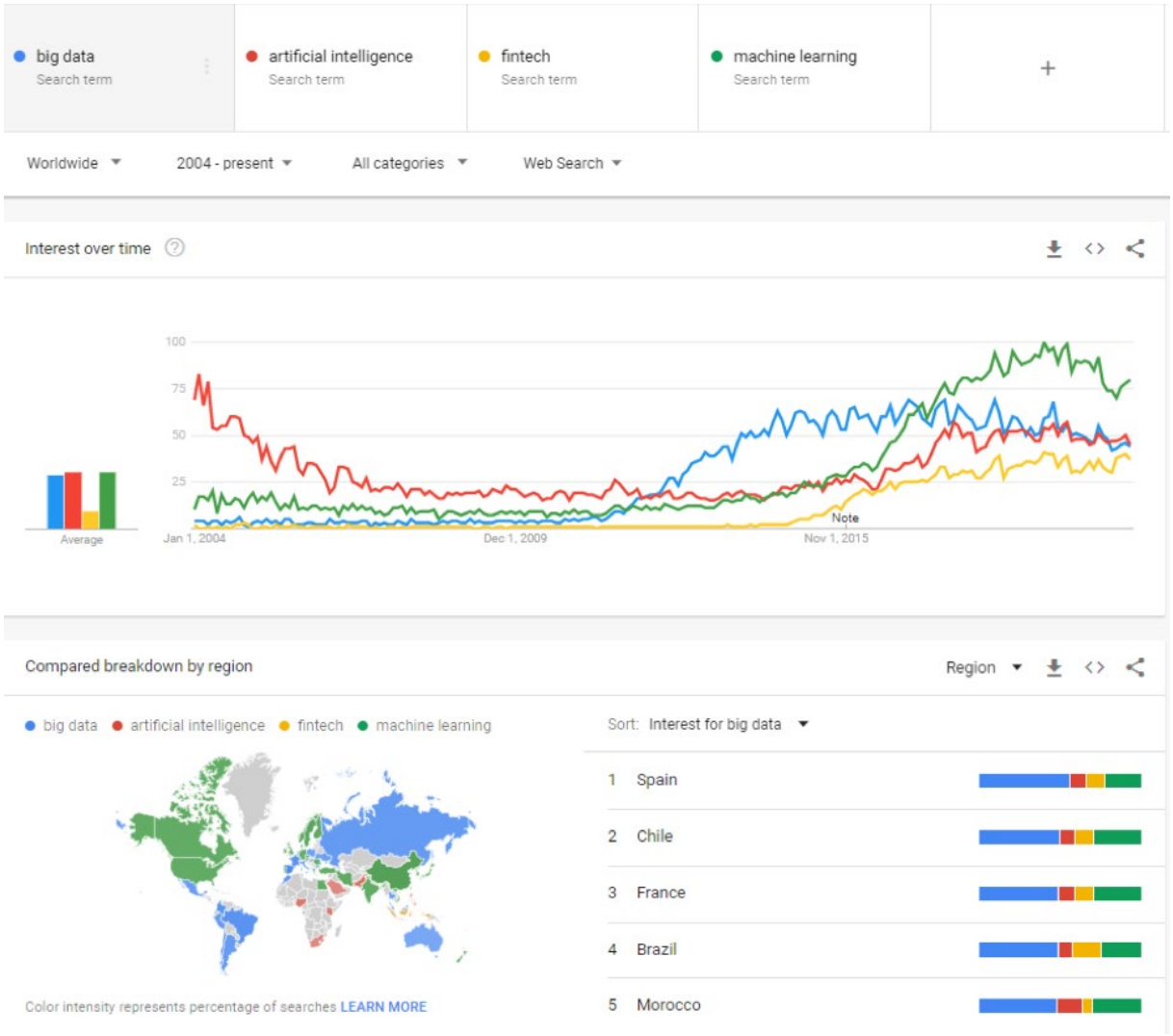
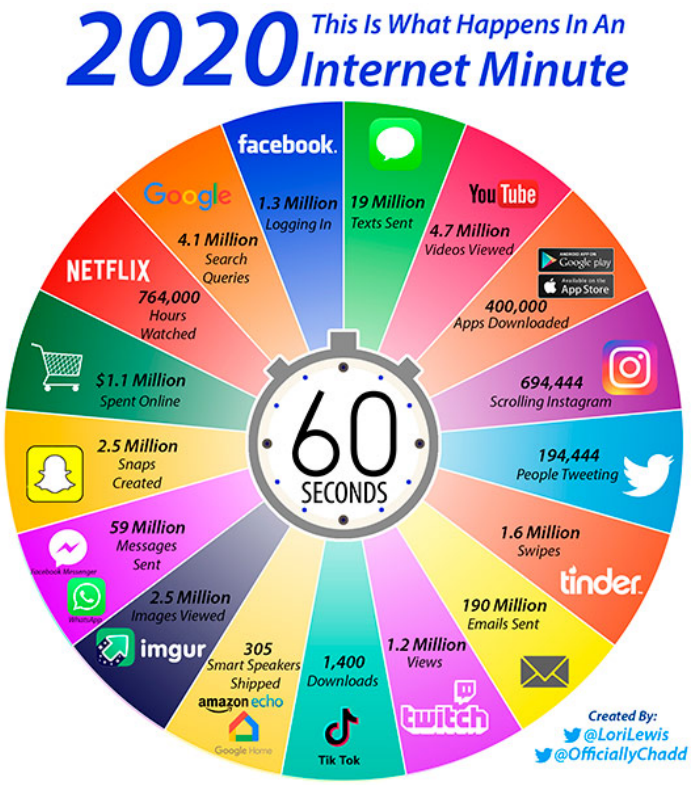


Figure 11.2: Source: Officially Chadd – Lori Lewis. What happened on internet in 60 seconds in 2020.



The United Nations Economic Commission for Europe has drawn up a practical classification of big data, distinguishing among three main classes: i) **human-sourced information**, ii) **process-mediated data**, and iii) **machine-generated data**.[78]

In the first group, we can find all the data generated by human activities. For example, data from social networks (such as Facebook, Twitter, Tumblr and so on), blogs or comments, personal documents, pictures (think of Instagram or Picasa), video channels (such as YouTube), internet searches (think of Google Trends), mobile data content (such as text messages) or other user-generated data such as emails or maps. The second group is made up of process-mediated data, which comprises data processed by public agencies, such as medical records, or data processed by businesses, such as commercial transactions, banking records, e-commerce or credit card transactions. The third group relates to the Internet-of-Things (IoT) and to all those data generated by machines or sensors. For example, data from fixed sensors, such as weather or pollution sensors, traffic sensors, security images or videos. There are also data from mobile sensors, such as mobile phone location, car sensors or satellite images. Finally, data from computer systems, such as web logs or logs in general. Balzquez and Domenech (2018), who analyse non-traditional sources of social and economic data, provide another taxonomy. In particular, they consider: i) information searches, such as Google Trends data; ii) transaction data, which can be both financial (such as credit card data, retail scanners, e-banking) and non-financial (such as e-government or e-recruiting); iii)

[78] See the website https://statswiki.unece.org/display/bigdata/Classification+of+Types+of+Big+Data for more details.

information diffusion (such as corporate websites, apps, Wiki pages); iv) social interaction (such as social networking sites, opinion platforms or blogs); and v) non-deliberate data, where data are passively generated by the use of various means. This latter kind of big data can record: a) usage (such as web cookies or sensors), b) locations (such as GPS, GSM, Call Detail Records, Wi-Fi points), or c) personal data (such as profiles, forms, types of searches and purchases).

Given this kind of taxonomy, an issue that typically arises with big data is sampling. Traditionally a few data points are sampled, which are extremely valuable, but to do that you need a preconceived idea of the outcome and a known population. With big data and non-traditional data, one has all the data points and sampling is not needed or sometimes not possible. In this case, we usually say that ***N=all***. However, these large data sets are messy, incomplete, and often inconsistent. They usually require a lot of data wrangling and data munging to extract the right signal from an ocean of noise.

Big data for economic research can be publicly available or with restricted access. Among the former group, we can cite social media data, online news, web corpuses, Wikipedia, Google Trends, real estate data and so on. Among the latter group, we can include scanner data, credit card transactions, online browsing, cell phone data, internet search and advertising, health data and so on.

This new kind of data hides many potential opportunities both for private companies and for public institutions. Among them, we can remember the possibility of creating new, more detailed, and timelier statistics, as well as the possibility of producing forecasts, nowcasts[79] or early warning indicators.

We should also think of the distinction between traditional statistics and the new field of data science. Statistics is traditionally concerned with analysing primary data, also called experimental or made or designed data, which have been collected for statistical purposes to explain or check the validity of a specific hypothesis or theory. Briefly, statistics is a top-down approach, where the researcher wants to evaluate or test one hypothesis or a specific theory. Therefore, statistics is characterized by deductive reasoning and everything starts with a theory the researcher wants to test. On the contrary, data science is typically concerned with analysing secondary data, also called observational, found or organic data, which have been collected for completely different reasons. These found data are not usually under the control of the investigator. Typically, data science is characterized by a bottom-up approach, where the researcher tries to generate new ideas or new hypotheses starting from the data. It is inductive reasoning because data comes first. This approach is also called data mining, using a term coined in the 1990s to indicate knowledge discovery from data (or KDD), which is the process of discovering interesting patterns from massive amounts of data. As shown in Figure 11.3, which is taken from Connelly et al. (2016), made data can be experimental or observational and they are usually collected to investigate a fixed hypothesis or to address specific questions. Made data are typically small in size, not

[79] In economics, nowcasting is the prediction of the present, the very near future, and the very recent past state of an economic indicator. The term is a contraction of "now" and "forecasting" and originates in meteorology. It has recently become popular in economics, as the typical measures used to assess the state of an economy (e.g., gross domestic product, GDP) are only compiled by national statistical offices after a long delay with respect to the reference quarter, and are also subject to revisions.

very complex and highly systematic, and above all, they come from a known sample and a known population. Found data can be either administrative data or any other type of big data. These data are not collected for specific research purposes and can be very large and complex, as well as messy and multidimensional. The big difference between administrative data and big data is that for the former there is usually a known population and some form of sampling is possible. Instead, in the case of big data, the population is usually unknown and sampling can be difficult, even if it might lead to good results which avoid the usual challenges of storage and processing (see Liu and Zhang, 2020).

Figure 11.3: Made data vs administrative data vs big data. Source: Connelly et al. (2016).

Made Data Experimental	**Made Data** Observational (e.g. Social Surveys)	**Found Data** Administrative Data	**Found Data** Other Types of Big Data
• Data are collected to investigate a fixed hypothesis. • Usually relatively small in size. • Usually relatively uncomplex. • Highly systematic. • Known sample / population.	• Data may be used to address multiple research questions. • Data may be very large and complex (but usually smaller than big data). • Highly systematic. • Known sample / population.	• Data are not collected for research purposes. • May be large and complex. • Semi-systematic. • May be messy (i.e. may involve extensive data management to clean and organise the data). • Multidimensional (i.e. may involve multiple fragments of data which have to be brought together through data inkage). • Usually a known sample / population.	• Data are not collected for research purposes. • May be very large and very complex. • Some sources will be very unsystematic (e.g. data from social media posts). • Very messy / chaotic. • Multidimensional (i.e. may involve multiple fragments of data which have to be brought together through data linkage). • Sample / population usually unknown.

In the following sections we are going to analyse some examples of big data applications in economics and finance.

11.3. Some examples

The Billion Price Project

Cavallo and Rigobon (2016) explain the academic initiative of the Billion Prices Project (BPP), which is a typical example of how big data can improve statistics and empirical research in economics. The project started in 2007 at MIT, where the two professors started collecting online prices from hundreds of online retailers all around the world. The idea was to scrape the websites of the online retailers of more than 70 countries to build online measures of inflation. To be consistent, the authors only

scraped the websites of those retailers, which also had a brick and mortar store, because they randomly checked whether the online price was similar to the price consumers would pay at the regular store for the same product. Scraping online prices allows the authors to compute daily Consumer Price Indexes (CPI) for more than 70 countries around the world. As Figure 11.4 shows, the CPI computed from the national statistical office is essentially in line with that one computed using the BPP online prices for the USA. This is not the case for Argentina, where the two indices seem to tell different stories. In fact, Cavallo (2013) shows that while Argentina's government announced an average annual inflation rate of 8 per cent for 2007–2011, the online data suggested it was over 20 per cent, in line with the estimates of some provincial governments and local economists, and consistent with the results from surveys of household inflation expectations. The manipulation of the official price index in Argentina ended in December 2015, when a new government was elected.

Figure 11.4: The official CPI vs the BPP online price index for the USA and Argentina. From Einav and Levin (2014).

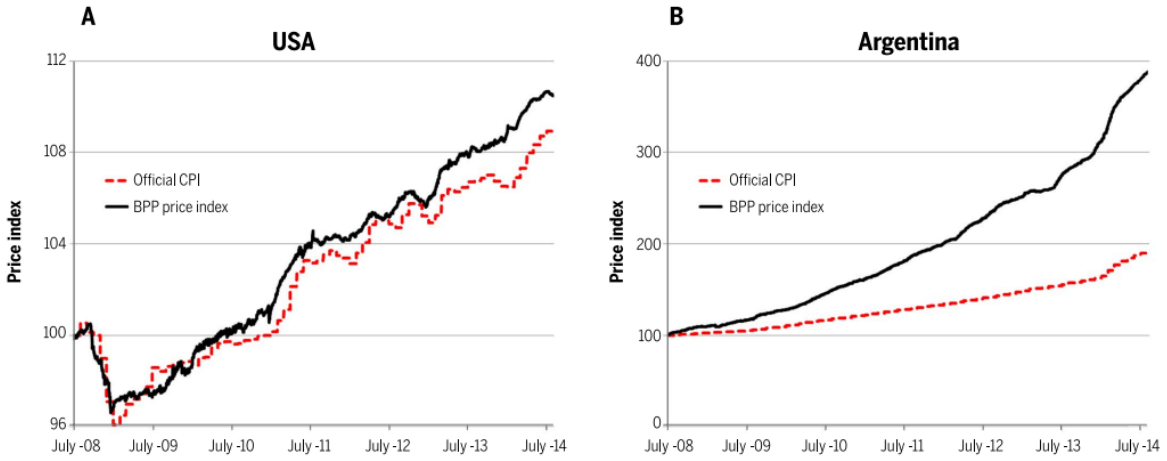


Fig. 2. BPP price index. Dashed red lines show the monthly series for the CPI in the United States (**A**) and Argentina (**B**), as published by the formal government statistics agencies. Solid black lines show the daily price index series, the "State Street's PriceStats Series" produced by the BPP, which uses scraped Internet data on thousands of retail items. All indices are normalized to 100 as of 1 July 2008. In the U.S. context, the two series track each other quite closely, although the BPP index is available in real time and at a more granular level (daily instead of monthly). In the plot for Argentina, the indices diverge considerably, with the BPP index growing at about twice the rate of the official CPI. [Updated version of figure 5 in (*18*), provided courtesy of Alberto Cavallo and Roberto Rigobon, principal investigators of the BPP]

The Economic Policy Uncertainty (EPU) index

To measure policy-related economic uncertainty, Baker et al. (2016) construct an index from newspaper coverage of policy-related economic uncertainty (Economic Policy Uncertainty index, EPU). For the United States, the newspaper-based EPU index is built using search results from 10 large newspapers (USA Today, the Miami Herald, the Chicago Tribune, the Washington Post, the Los Angeles Times, the Boston Globe, the San Francisco Chronicle, the Dallas Morning News, the New York Times and the Wall Street Journal). From these papers, the authors construct a normalized index of the volume of news articles discussing economic policy uncertainty. The authors count the

number of articles in each newspaper that contain at least one keyword from the three buckets of words:

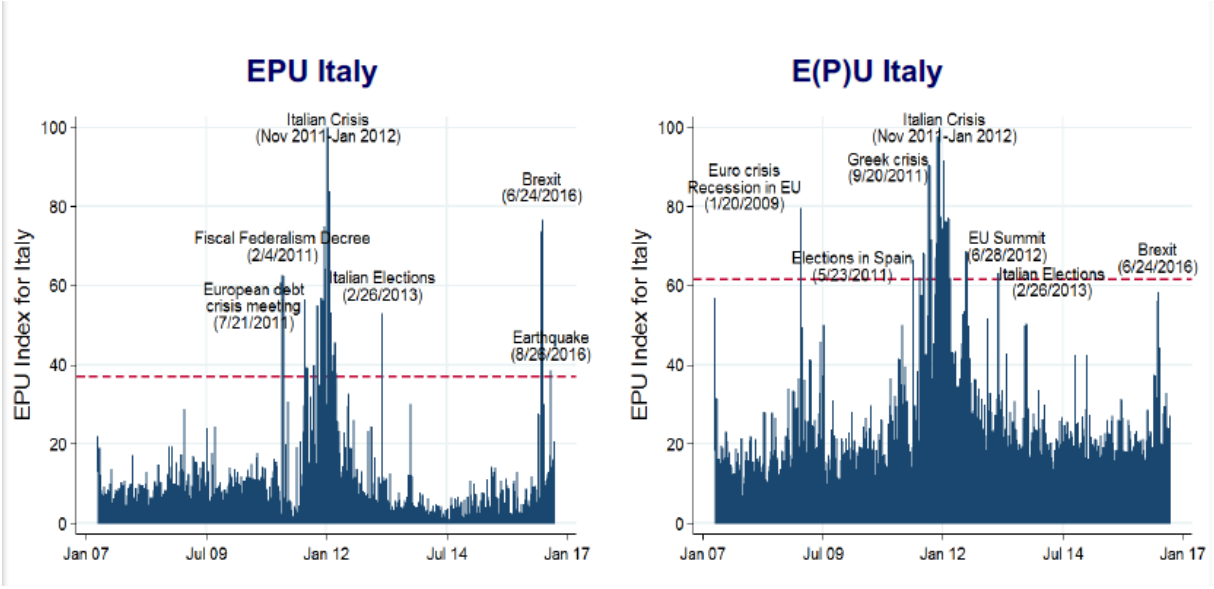
Economic (E) words: "*economic"* or "*economy"*;
Policy (P) words: "*Congress*" or "*Deficit*" or "*Federal Reserve*" or "*Legislation*" or "*Regulation*" or "*White House*" or "*Parliament*" or "*Government*" or "*Central Bank"* or "*Budget*" or "*Regulatory*" or "*the Fed*";
Uncertainty (U) words: "Uncertain" or "Uncertainty".

The authors then standardize the raw counts by the number of articles published in each newspapers and then set the average of the EPU index so that it is equal to 100 before 2011. This index can be freely downloaded from the www.policyuncertainty.com website and it is available at a daily frequency for the USA and the UK and at a monthly frequency for other G10 countries. Many authors have improved this index for different countries and more measures of uncertainty have been created: for example, Caldara and Iacoviello (2018) suggest a monthly index of Geopolitical Risk (GPR Index) counting the occurrence of words relating to geopolitical tensions in 11 leading international newspapers. The GPR index spikes around the Gulf War, after 9/11, during the 2003 Iraq invasion, during the 2014 Russia-Ukraine crisis, and after the Paris terrorist attacks.

Ardizzi et al. (2019) compute a daily EPU index for Italy using both the news from the Bloomberg newswire and the tweets from the social network Twitter. They use news in English, which is more frequent on the Bloomberg newswire, with the usual EPU keywords in English in addition to the keyword "*ital**" to capture all the news relating to Italy, constructing a sort of external EPU. On the contrary, the E(P)U from Twitter is constructed by adopting the equivalent EPU keywords in the Italian language and getting rid of the 'Policy' component to keep a certain amount of tweets to compute the index. Tweets are in fact short (up to 140 characters until November 2017 and 280 afterwards) and keeping the (P) component in Italian greatly reduces the number of tweets used to compute the index. Figure 11.5 depicts the EPU index from Bloomberg news in English on the left and the E(P)U index computed from tweets in Italian on the right for the period from January 2007 to October 2016. We can see that major spikes in the uncertainty indices are due to political elections, Brexit, the sovereign debt crisis and other periods characterized by high uncertainty for the economy.

Ardizzi et al. (2019) investigate how private consumption and the preference for cash in Italy react to news about EPU on a daily basis. They find that daily shocks relating to EPU temporarily reduce the purchases through Point of sales (POS) with debit cards and increase ATM cash withdrawals. One thing to notice for debit card transaction data is that this kind of big data is characterized by a high degree of seasonality. In fact, recording the transactions made by all consumers shows that these data are characterized by different kinds of seasonal components, such as day-of-the-week (people buy more over the weekends), day-of-the-month (people buy more in the period of the month when they get paid), day-of-the-year (people tend to buy more during summer holidays, or Christmas holidays), fixed and moving holidays.

Figure 11.5: The EPU index computed from Bloomberg's newswire in English (left panel) and the E(P)U index computed from Twitter in Italian for Italy. From Ardizzi, Emiliozzi, Marcucci and Monteforte (2019).



Payment Card Transactions and COVID-19 lockdown effects on consumption

The recent Great Lockdown due to the COVID-19 restrictions has highlighted the importance of big data in the form of transaction data from debit and credit cards to gauge the economic conditions of a country. Many interesting applications were written during 2020 using data from FinTech apps, from private commercial banks or from card processors. As highlighted in the previous Section, payments data show a high degree of seasonality at a daily and intra-daily frequency, which must be taken account of when analysing such data. Carvalho et al. (2021) use high-resolution transaction data from BBVA (the second largest commercial bank in Spain), from credit cards (buyer side) and from Points of Sale (merchant side). They analyse more than 1.5 million individual transactions made since 2019 to show the effects of lockdown on expenditure in Spain. They show that the number of transactions made by Spanish nationals and non-Spanish persons dropped significantly during the lockdown, and the daily total expenditure also decreased substantially. During the lockdown, e-commerce increased with a higher level of online expenditure with respect to the previous year. In addition, in terms of market shares, around 60 per cent of the expenditure was for food, health and other services. Carvalho et al. (2021) also show the high level of granularity (up to the ZIP code) of these credit card data. In fact, they show that in some Spanish cities like Madrid, expenditure also changed with respect to the number of COVID-19 cases recorded in that district or in the neighbourhood.

Andersen et al. (2020) use data from around 860,000 individuals in Denmark and Sweden who are active customers at Danske Bank (the second largest bank in Scandinavia). They measure expenses incurred by credit cards, cash withdrawals, mobile wallets and settlement of online invoices, showing that in response to COVID-19, Danish customers reduced spending by 29 per cent, while customers in Sweden, where lockdown or other restrictions were not introduced, reduced spending by 25 per

cent. Therefore, even though there was no lockdown in Sweden as in most other countries, consumers behaved exactly like those in their neighbour countries, where lockdown was in place. This effect can be seen in particular when we look at expenditure by age group, where the biggest drop in spending for Sweden was recorded by the oldest age groups, i.e. 60-69 and 70+. In particular, this effect is more evident for expenditure on public transport, which reduced more in Sweden for elderly people.

Chen et al. (2021) use daily transaction data in 214 cities in China to study the impact of COVID-19 on consumption after China's COVID-19 outbreak in late January 2020. They use data from the China UnionPay Merchant Services Corporation, the largest bankcard acquiring and professional service supplier in China. Based on a difference-in-difference estimation, daily offline consumption fell by 32 per cent per city during a 12-week period. The effect was prevalent across cities and was of course more pronounced in the dining-and-entertainment and travel categories. The authors infer that China's offline consumption decreased by over 1.22 trillion RMB, or around 1.2 per cent of China's 2019 GDP, in the three months after the COVID-19 outbreak.

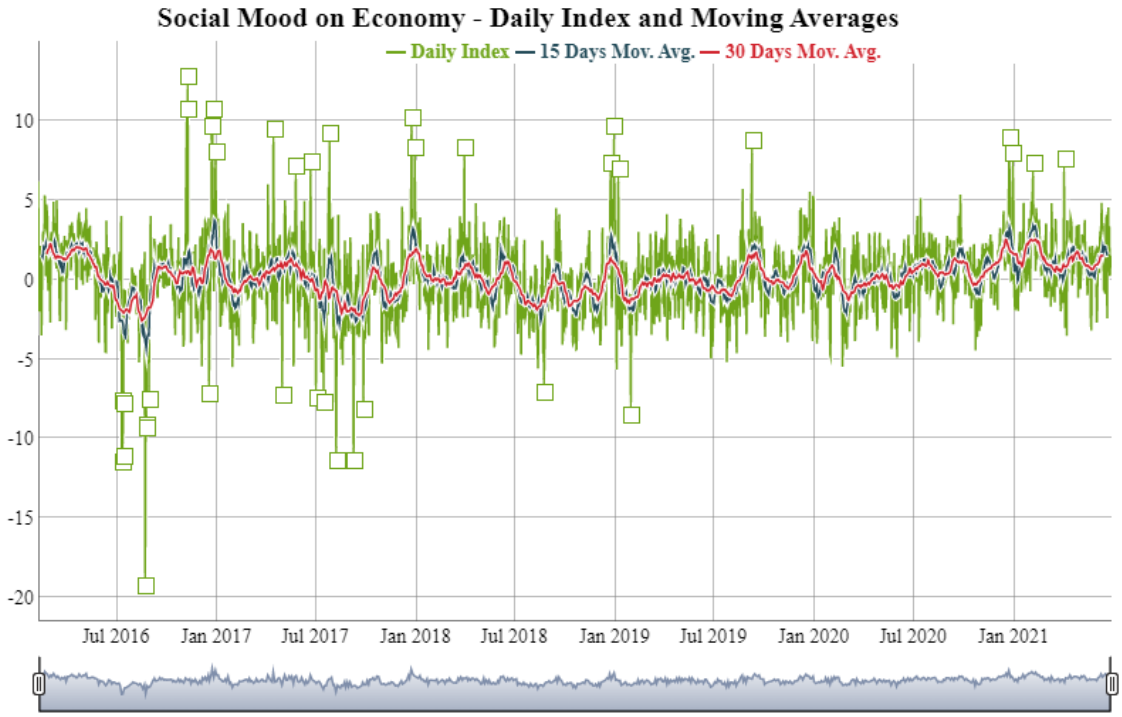
Bounie et al. (2020) use around 70 million card-related data and 1.77 million merchants from Cartes Bancaires, the French interbank network infrastructure for credit card payments. The authors analyse French consumer behaviour in response to a severe economic shock like the COVID-19 pandemic, using billions of French card transactions from January to April 2019 and 2020. They examine changes in consumer mobility, anticipatory behaviour in response to announced restrictions, and the contrasts between the responses of online and traditional point-of-sale (or off-line) consumption expenditures to the COVID shock. They track hourly, daily and weekly responses to the shock. The results, particularly at the sectoral level, suggest that recourse to the online shopping option somewhat diminished the overall impact of the COVID shock on consumption expenditure in France. The authors show the difference between before and after the lockdown in the distance travelled by cards between different POS. They also show a pronounced decline in the value and volume of expenditure after the lockdown in France. By using transaction data at an intra-daily frequency, they also show that during the lockdown, French consumers tended to spend more around lunch than before dinner, inverting the typical bimodal daily distribution of the transaction values as if every day was a Saturday. In fact, typically from Monday through Friday, consumers tend to spend more before dinner (highest peak) than before lunch (second highest peak), while during the weekends, they spend more before lunch. The authors also notice a kind of hoarding behaviour by French consumers, who bought a lot from grocery stores right before the introduction of the restrictions.

Social Mood on Economy

The Italian national statistical institute (ISTAT) produces a daily Social Mood on the Economy index using Twitter in the Italian language. In practice, the Social Mood index measures the daily sentiment with respect to the economy as recorded by Twitter. The index is built using samples of public tweets. In particular, ISTAT uses an average of 57,000 tweets in Italian every day using a special filter made of around 60 keywords relating to economics and business to build the index, which has been available since 10 February 2016. A subset of the keywords used to sample the tweets from the streaming API by Twitter is borrowed from the questionnaire items of the Italian Consumer Confidence Survey, a survey conducted monthly. The procedure

analyses the sentiment of the tweets each day, trying to filter out the noise due to unrelated tweets. For each tweet, a positive and negative sentiment score is calculated; tweets are then clustered according to their sentiment scores into Positive, Negative and Neutral tweets. The daily index is derived using a central tendency measure of the score distribution of tweets belonging to the Positive and Negative classes. Then the index is linearly transformed so that its long-run mean between February 2016 and September 2018 is zero. Finally, the index is cleaned so that off-topic tweets do not create unusual or inexplicable spikes. The index is a first step towards the use of big data by the Italian national statistical institute. Figure 11.6 shows how the index behaves over the sample period. Of course, during 2020, the moving averages recorded some lows and we can also see some positive and negative peaks relating to particular events.

Figure 11.6: The Social Mood on Economy daily index and moving averages at 15 and 30 days. Downloaded from https://www.istat.it/en/archivio/219600 in December 2021.



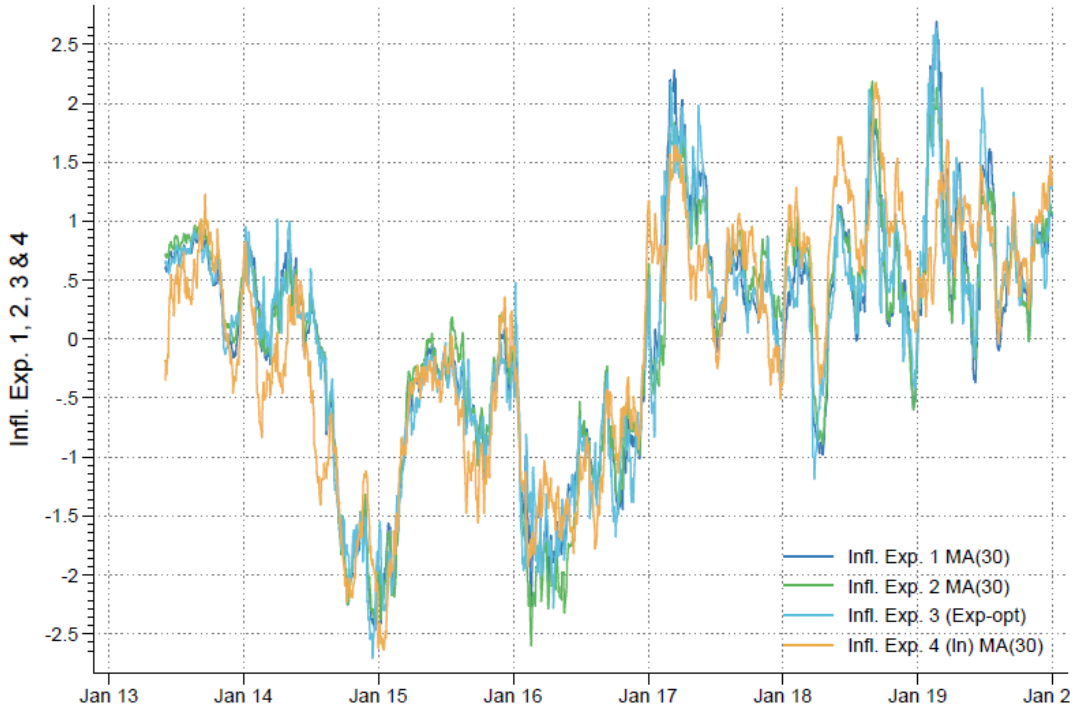
Eliciting Inflation Expectations from Twitter

Angelico et al. (2021) show how researchers can elicit inflation expectations using the Twitter social network. Inflation expectations play a crucial role in macroeconomics because they are key variables for understanding consumption and investment decisions, and they are also informative on the effectiveness of central banks' actions in the short and long term.

Current sources of expectations are the survey-based measures compiled by ISTAT that record the true expectations of a sample of consumers but are characterized by low frequency or market-based measures that are at higher frequencies but contain risk or liquidity premiums. The premise of the paper is to use tweets written in Italian to elicit inflation expectations. The authors gather all the 11 million tweets relating to

prices, inflation, deflation or cost of living for the period from June 2013 to December 2019, posted by around one million users. As many tweets contain "noise" due to commercials or advertisements, the authors adopt a three-step procedure where they adopt a Natural Language Processing (NLP) technique called Latent Dirichlet Allocation (LDA) to estimate the topics of the tweets written by each author. Then they select only those tweets that are related to the two topics of inflation or deflation dynamics, discarding the rest of the messages. Then, following the procedure used by ISTAT for the survey-based measures, the authors build two directional indexes (index Up and index Down) using both the keywords adopted to select the tweets and a manually-labelled set of bi-grams and tri-grams (i.e. groups of two or three words, respectively). Next they build the final indicator simply by subtracting the Index Down from the Index Up, adding some standardizations, smoothing and winsorizing or transforming everything into logs to smooth the spikes due to particular events, which are very popular on Twitter. Figure 11.7 shows the Twitter-based inflation expectation indicators derived using four different ways to standardize, smooth or winsorize the series. We can see that the four indicators are highly correlated and they give similar signals. The authors validate these indicators with respect to both survey-based and market-based measures. The Twitter-based indices are all highly and significantly correlated with the traditional measures of inflation expectations. According to an informativeness exercise, in the full sample, Twitter-based inflation expectation indicators provide additional information to predict the monthly survey-based measures even after controlling for the market-based indicators, for realized inflation, the Consensus forecasts and the lagged survey-based measures. The authors do some robustness checks by computing the indices for subsamples of authors too. In particular, they compute the Twitter-based inflation expectation indices for those users who are interested in economics or in the news business, finding that these indices are highly correlated with the general one and they convey similar information. This shows again the importance of sampling with big data to obtain the same information we can gather from all the data, thereby reducing the challenges due to storage and processing large data volumes. Finally, the authors present an out-of-sample forecasting exercise, where they forecast the monthly survey-based measures, using market-based measures and twitter-based indicators. They find that the latter significantly improve the forecasting ability of simple autoregressive models up to six months ahead.

Figure 11.7: Twitter-based inflation expectation indicators from Angelico et al. (2021).



Notes: Data are at daily frequency, from June 1, 2013 through December 31, 2019. The Twitter-based inflation expectations indicators are computed using the baseline dictionary of bi- and tri-grams and are all standardized.

11.4. Concluding Remarks

In this chapter, we have illustrated the importance and the usefulness of big data for official statistics, discussing some applications in economics and in statistics. Big data can be useful not only for central banks or for national statistical institutes, but also for private companies wishing to move towards more data-driven businesses.

Big data could have a great deal of potential for official statistics, and learning new statistical methods and machine learning techniques to extract the right signal from the noise of voluminous data can be important too.

However, there are some issues, such as privacy, representativeness and data protection that should be carefully addressed when dealing with individual and private data. It is important to highlight that collaboration among public and private institutions is the key for successful big data initiatives. Most data are in the hands of private companies, which should collaborate fruitfully with public institutions for the common good. Partnerships between different stakeholders such as government, academia, the private sector, central banks or national statistical institutes should always be encouraged.

Suggested readings

Snijders C. C. P., U. Matzat and U. D. Reips, (2012), Big Data: big gaps of knowledge in the field of internet science, *International Journal of Internet Science*, 7(1), pp. 1-5.

Additional references

Andersen, A. L., E. T. Hansen, N. Johannesen and A. Sheridan (2020), Pandemic, Shutdown and Consumer Spending: Lessons from Scandinavian Policy Responses to COVID-19, Papers 2005.04630, arXiv.org.

Angelico C., J. Marcucci, M. Miccoli and F. Quarta (2021), Can we measure inflation expectations using Twitter?, Banca d'Italia, *Temi di Discussione (Working Papers)*, no. 1318, https://EconPapers.repec.org/RePEc:bdi:wptemi:td_1318_21.

Ardizzi G., S. Emiliozzi, J. Marcucci and L. Monteforte (2019), News and consumer card payments, Banca d'Italia, *Temi di Discussione (Working Papers)*, no. 1233.

Baker Scott R., N. Bloom and S. J. Davis, (2016), Measuring Economic Policy Uncertainty, *The Quarterly Journal of Economics*, Volume 131, Issue 4, November, 1593–1636, https://doi.org/10.1093/qje/qjw024.

Berman, J. J. (2013), Principles of Big Data: Preparing, Sharing, and Analyzing Complex Information, Morgan Kaufmann (Elsevier) Publisher.

Blazquez D. and J. Domenech (2018), Big Data sources and methods for social and economic analyses, *Technological Forecasting and Social Change*, 130, 99-113, ISSN 0040-1625, https://doi.org/10.1016/j.techfore.2017.07.027.

Bounie D., Y. Camara and J.W. Galbraith (2020), Consumers' Mobility, Expenditure and Online-Offline Substitution Response to COVID-19: Evidence from French Transaction Data, April 29. Available at SSRN: https://ssrn.com/abstract=3588373 or http://dx.doi.org/10.2139/ssrn.3588373.

Caldara D. and M. Iacoviello (2018), Measuring Geopolitical Risk, *International Finance Discussion Papers,* no. 1222, Board of Governors of the Federal Reserve System (U.S.).

Carvalho V.M., J.R. Garcia, S. Hansen, A. Ortiz, T. Rodrigo, J.V. Rodríguez Mora and P. Ruiz (2021), Tracking the COVID-19 crisis with high-resolution transaction data, *Royal Society Open Science* 8210218210218, http://doi.org/10.1098/rsos.210218.

Cavallo A. (2013), Online and Official Price Indexes: Measuring Argentina's Inflation, *Journal of Monetary Economics*, 60(2), pp. 152–65.

Cavallo A. and R. Rigobon (2016), The Billion Prices Project: Using Online Prices for Measurement and Research, *Journal of Economic Perspectives*, 30 (2): 151-78. https://doi.org/10.1257/jep.30.2.151.

Chen H. W. Qian and Q. Wen (2021), The Impact of the COVID-19 Pandemic on Consumption: Learning from High-Frequency Transaction Data, *AEA Papers and Proceedings*, 111: 307-11.

Connelly R., C. J. Playford, V. Gayle and C. Dibben (2016), The role of administrative data in the big data revolution in social science research, *Social Science Research*, Volume 59, pp. 1-12, ISSN 0049-089X, https://doi.org/10.1016/j.ssresearch.2016.04.015.

Einav L., J. Levin (2014), Economics in the age of big data, *Science,* 346.

Gopinath G. (2020), The Great Lockdown: Worst economic downturn since the great depression, *IMF Blog*, 14th April.

Hussein A.A. (2020) Fifty-Six Big Data V's Characteristics and Proposed Strategies to Overcome Security and Privacy Challenges (BD2), *Journal of Information Security*, 11, 304-328. https://doi.org/10.4236/jis.2020.114019.

Liu Z., and A. Zhang (2020), A Survey on Sampling and Profiling over Big Data, Technical Report ArXiv abs/2005.05079.

12. Data dissemination and the Research Data Center
(L. Bartiloro and E. San Martini)

12.1. The importance of data dissemination

The involvement of a central bank in statistics covers many areas, starting from production, focusing on analysis, and ending up with dissemination, both to the public and to other stakeholders. Dissemination is paramount to ensure that the information is capitalized on, and a correct dissemination guarantees access to all those who need it for various purposes. Sharing data and statistics also produces synergies with the other tasks of the central bank and can improve the quality of both the production of statistics and the dissemination process itself through feedback and constructive criticism.

Statistics dissemination is key to the reputation of the central bank: it makes it accountable for its data collection activity and transparent in its economic analysis. Finally, it fosters financial education, another task of a central bank.

The stakeholders of a central bank's data dissemination are numerous and different in many respects: they range from the general public, that may have no, or very few, financial competencies, to economists working for universities or national and international institutions. On the basis of the e-mails received by our "Statistical information" mailbox, 30 per cent of BI statistics users are students and researchers, 25 per cent are firms, 17 per cent are banks, 15 per cent are data providers and 11 per cent are other institutions. Data dissemination has to address different user needs and must therefore be rich and wide-ranging so as to provide timely and useful information to the whole audience, via the appropriate statistical and technological means.

Focusing on the data available for external researchers, central banks disseminate the statistics they produce, either derived from supervisory reports, surveys, or their own activity. Unless the data collected are strictly confidential (as may be the case for a subset of data from supervisory reports), all aggregated data can be disseminated as long as they have been produced by the central bank itself.

The bulk of data dissemination is made of macrodata, but granular information is also provided.[80] The borderline between micro- and macro data is continuously crossed by data producers, as macrodata are very often the aggregation of micro ones, with estimates and post-aggregation work sometimes impacting macro data to a significant extent, so that we cannot always conclude that macro data are just the aggregation of granular information.

The distinction between macro- and microdata matters in many important respects. Macrodata are often compliant with the statistical standards that are set for international comparisons with the goal of providing a harmonized picture of national economic dynamics. On the contrary, microdata are analysed for assessing the heterogeneity of agents' behaviour and conditions, and it may therefore be more suitable for this purpose to use definitions and evaluation methods that are different from those considered from a macro perspective for the same economic phenomenon. In general terms, data are collected and estimated depending on the information users want to extract from them, and this typically differs for micro- and macrodata. These

[80] Microdata and granular or elementary data/information are used as synonyms in this document.

concerns also matter for data dissemination, because among the objectives of data providers is that of making extremely clear to the user the information content of the data and the usage for which data are suitable or not. Most importantly, microdata dissemination has to manage confidentiality, as the statistical disclosure of individual data is subject to different limitations depending on the reference unit (mostly individuals, firms and banks). Yet confidentiality (which will be further discussed later on) is not the only concern. There are statistical and technical concerns too. As for the statistical ones, microdata require a different treatment in terms of data quality, comparability and usage. Measurement errors are not infrequent in granular data, and particularly so in survey data, where respondents may not fully understand the question, the unit of measure and how to evaluate a specific asset/liability. These concerns are usually dealt with by the data producers that clean the data before the final release. Nevertheless, when microdata are disseminated, users have to deal carefully with a pre-treatment and a full understanding (including the required use of weights) of the data, at the risk of detriment to the results of the economic analysis. Even if at first sight this is a concern for producers and users, data providers also play a role in helping users to understand in depth how to use microdata.

12.2. Different modes for different needs: narrative and data

An initial distinction in dissemination modes is between releasing raw data and creating a narrative. The latter is intended for the general public, the media and other non-specialized users in general, even if expert users also refer to it: it includes a significant share of the interpretation of the data itself, also thanks to the consistent and parallel reading of different indicators. On the other hand, raw data dissemination addresses the needs of economists, businesses (e.g. financial intermediaries, data providers, consulting firms and so on) and other institutions, national and international, which want to analyse the data by themselves, and have sufficient knowledge to do so.

The narrative is presented through news, publications and commented text in general, where the official interpretation is given alongside the main indicators. The most traditional way of publicizing the narrative of the central bank is through the Economic Bulletin, the Annual Report and the Financial Stability Report, together with the Working Papers. More modern ways may include different media, such as videos or other interactive experiences. The narrative, by necessity, deals with aggregations, selected for their relevance or required by specific guidelines (in the case of official statistics). It needs to be widely accessible and easy to understand, and also free from confidentiality issues.

An editorial production in-between economic publications and data dissemination is the Statistics series, which is made up of different PDF publications, one for each database produced by the BI. A large part of the series is devoted to banking statistics (Banks and Money: National Data; Banks and Financial Institutions: Credit Conditions and Risk by Sector and Geographical Area; Banks and Financial Institutions: Financing and Funding by Sector and Geographical Area and so on**)**, while the national accounts (Financial Accounts, Balance of Payments, Public Finances and so on) and survey data play an important role too (Survey on Household Income and Wealth, Survey on International Tourism and other business surveys). Other topics covered by the Statistics series are the payment system and the housing market. All Statistics series' reports have approximately the same structure, regardless of the

database/topic. The cover includes a short description of the main results/information content and one or more characteristic graphs or tables with the main indicators. The bulk of the Statistics series is the sequence of tables (published in PDF format, available for download, and often also as Excel files) and graphs describing the database, accompanied by a more or less detailed description. Methodological notes explaining the definitions of the variables, the composition of the indices and so on always conclude the reports. In 2020, there were about 300,000 downloads of the PDFs of the Statistics series.

Another way to access the BI's produced databases is through the Statistical database (Base Dati Statistica, BDS), where users can select and download a wide range of aggregated statistics (macro data and aggregations of microdata): it is a standard statistical data warehouse (similar to those of the ECB, Eurostat, and of other central banks), where all the information is presented following the corresponding Statistics series report, while additional features are offered, such as interactive graphs, dashboards (forthcoming in the BDS) and search engines, in order to support less expert users. In 2020, the BDS recorded 140,000 accesses and over one million interactions (data visualizations, data and metadata exports). Numerous links between the PDF publications of the Statistics series and the BDS are provided for ease of use, and methodological information, along with other necessary metadata, is provided and highlighted to prevent incorrect interpretations. Both the Statistics series publications and the link to the Statistical Database (BDS) are clearly presented in the Statistics section of the BI website.

Data dissemination is subject to the rules of accountability: it requires an advanced release schedule, a clearly stated revision policy and transparency in the event of accidents or other irregularities. Alerting systems, such as tweets or e-mail alerts, enhance the release schedule to ensure interested users are promptly updated. Revision policies are part of the methodological information and are always accompanied by news and appropriate notes when they happen, while incidents, corrections, service unavailability and other possible foreseen and unforeseen circumstances that deviate from the regular dissemination need to be swiftly signalled and publicized. A customer care service is also in place to address any further inquiries and provide assistance in both technical matters and statistical issues.

12.3. The increasing interest in microdata

Economists usually strive to have data with as much detail as possible in order to perform their econometric exercises and better understand economic phenomena. The use of granular data has been increasing over time, thanks to micro-founded macro-economic models becoming more and more popular, as well as to the integration of macrodata (aggregates) with micro-information (distributions and so on).

Elementary data can be disseminated to the public in different ways, depending on the confidentiality content of the information: a simple distinction is made between anonymized data published on the producer's website via Public Use Files (PUFs) for information with relaxed or manageable confidentiality restrictions, and data with restricted access to protect the anonymity of the respondents (persons, organizations, firms), for which specific safeguards have to be implemented. Confidentiality means that there is no way for a user to trace back the name of the reference unit (household,

firm, bank); it can be due to legal restrictions or to an agreement between data providers and respondents.

The BI started sharing microdata with external users early on; it has been collecting information from households since 1962, followed since 1974 by surveys on industrial and service firms. In due respect of the legal protection of personal data, ruled by national legislation before the European initiative (General Data Protection Regulation, GDPR), the results of these surveys have been made available for the research community since the early 1980s, with the provision of elementary data in various forms.

Similarly to what the ECB, Eurostat, other central banks and national statistical institutes collecting microdata do, the BI has always granted access to microdata for scientific purposes only.

12.4. The trade-off between utility and risk of re-identification

The core challenge in the dissemination of granular data is the balancing of the risk of re-identification with the utility associated with data analysis (see for example Schouten and Cigrang, 2003; Lane and Schur, 2010). The choice of the amount of risk that data providers accept in the name of utility depends on technical, organizational and legal issues. In general terms, the dissemination of BI's granular data must consider two different confidentiality safeguards, the legal protection of personal data (GDPR UE/2016/679) and the professional secrecy of information collected by the BI acting as a banking supervisory and resolution authority (Article 53 CRD IV and Article 84 BRRD). Professional secrecy does not apply to households' and firms' data, where data are only collected for research purposes. As for the legal protection, GDPR does not forbid the processing of personal data "for scientific or historical research purposes or statistical purposes", while providing "appropriate safeguards for the rights and freedoms of the data subject […]. Those safeguards should ensure that technical and organizational measures are in place in order to ensure, in particular, the principle of data minimization", according to which the producer should limit the collection (and the dissemination) of personal information to what is directly relevant and necessary to accomplish a specified purpose. The GDPR also foresees additional protection of sensitive data, which does not concern households' and firms' survey data as this type of information is not usually included in the BI's questionnaires.

In theory, a pre-defined amount of risk of re-identification can be admitted, but the BI has always aimed at avoiding as much risk as possible. Nevertheless, data dissemination of granular data has increased over time, depending on the improvement of the technological means that permit data usage by external researchers, while preserving confidentiality (Bruno, D'Aurizio and Tartaglia Polcini, 2008). Households' survey data are under the general protection of the GDPR, while GDPR rules do not apply to companies, therefore no limit exists, in theory, on the dissemination of firms' elementary data. However, the BI has chosen to not disseminate firms' granular data, because business surveys include information that companies may not want to disclose, such as expected turnover, investment plans and so on. The promise of this additional safeguard is crucial to preserving a high response rate, thus assuring the collection of precious and reliable information that would not be available elsewhere.

In order to minimize the risk of re-identification, safeguards of increasing degree can be put in place, depending on the confidentiality restrictions of the database. First of

all, direct identifiers have to be removed: this is a basic treatment, called *pseudo-anonymization,* which does not prevent re-identification when other information can be merged to trace the respondent. Anonymization prescribes, in addition, the removal or treatment of quasi-identifying variables: these are variables (such as date of birth for individuals, sector, number of employees, turnover, location for firms) that could allow the respondent to be identified, and therefore have to be either removed (thus reducing the information provided to users to a significant extent) or minimized (for example by substituting exact values with proxies indicating a range of possible values). However, when the units sharing the same quasi-identifiers are very scarce, this treatment cannot fully guarantee the anonymity of the information. A standard rule of thumb states that no information can be delivered when the reporting agent belongs to a cluster (sharing the same quasi-identifiers) with less than 3 units (Freiman et al., 2016). After implementing this gradually increasing treatment, the amount of information that can be made freely available to the public for downloading as a Public Use File (PUF) could be very poor with respect to the original database. This is why other dissemination modes are also used.

12.5. The available options for microdata dissemination

Together with Public Use Files (PUFs) for easy downloading on the website, other options for the dissemination of microdata include remote execution (BIRD, for the BI), laboratories (either safe rooms or virtual laboratories) and data visualization tools (web tabulators or interactive graphs and tables). In what follows, we will describe the different options, following the experience of the BI in microdata dissemination.

The Survey on Household Income and Wealth (SHIW) was begun in the 1960s to gather data on the incomes and savings of Italian households. From the beginning and up to the publication of the BI's Internet website, the dataset was made available on magnetic tapes and later on diskettes provided via ordinary mail to the researchers (usually universities) that requested them by letter. Since the late 1990s, with the first releases on the BI website, the household survey dataset has been made freely available on the website, and lately also earlier datasets have been included: datasets are now out for every single survey in full (also including data found in the monographic sections of the individual surveys) from the 1989 wave onwards, and in the historical archive from 1977.

For household survey data, as Italian law did previously, the GDPR states that individual data can be disseminated after data minimization. The BI therefore anonymizes households' information and does not include the variables that could allow indirect identification (birth date and place, residency, day and hour of interview and so on) in the datasets freely available in dedicated Public Use Files (PUFs) on the website. A PUF is a common choice for data for which anonymization and the exclusion of some (indirect) identification variable are enough to safeguard confidentiality.

Thanks to this easy access, households' survey data are widely used, as demonstrated by the numerous research papers that have been written over the years, and their use by some universities during training. The use of microdata is of course under the full and exclusive responsibility of the user, i.e. the BI does not provide any assurance about the adequacy of the methods employed by the researchers and the conclusions drawn from the analysis. At the moment, the user of a PUF file is not identified; in the near future, there will probably be a form to fill in on the web page, in

order to collect some basic information (the name of the researcher, institution or university affiliation, title of the research project and so on) before allowing PUFs to be downloaded.

With a view to providing researchers with as much as useful information as possible, alongside the archives for every single survey we deliver additional datasets with specific data adjustments. The first is a historical database containing data from 1977 onwards but only including the subsets of variables considered useful for longitudinal analyses, after having performed a number of adjustments: as the way questions are posed (and therefore variables and/or variables options) may differ over time, variables are ex-post harmonized, so that time series are continuous and longitudinal analyses can easily be performed by the researchers, without obliging them to prepare the dataset on their own before running the statistical computations.

The BI also delivers the Italian component of the Household Finance and Consumption Survey (coordinated by the ECB), adding some variables that are not included in the original SHIW dataset (such as, for example, gross income, which is estimated with a simulation model). For all datasets, the information needed for data usage (questionnaires for the latest waves, variables names, instructions for data usage and so on) are available in PDF format, while data are available in different formats (SAS, STATA, CSV).

The dissemination of business micro-data is not based just on anonymization, as this treatment does not fully safeguard the confidentiality of firms' data. The BI, instead, has adopted a remote processing system called BIRD (Banca d'Italia Remote access to micro Data) since 2008, which allows researchers to process elementary data, ensuring that individual information cannot be visualized. [81] [82] [83] [84]

Users must apply for authorization in order to gain access to the system. A form providing personal information (including a valid ID) as well as some details on the

[81] Another possibility for disseminating microdata could be the use of data confounding techniques. These techniques are not completely safe, however, because the algorithm used for confounding data could be identified. A further solution frequently adopted for data with high confidentiality restrictions is access to elementary data in a dedicated laboratory (also called a "data enclave" or "safe room") on the BI premises, where the computers do not allow the user to take away any data if not in an aggregated form, and laboratory employees check the results of the data processing and the non-violation of confidentiality restrictions. A laboratory, however, requires the researcher to go in person to the dedicated location.

[82] BIRD relies on the Lissy system of the Luxembourg Income Study, a project started in 1983 with the objective of opening up microdata from a large number of countries for comparative research. Lissy consists of a series of software components connected through one or more networks; these components work together to receive, process and return statistical elaborations. All the components of the system are physically separated and at no time is a user in direct contact with the data.

[83] The BI is not the only central bank or data provider allowing for data elaboration to be submitted remotely (see for example: Germany – Gesis - Leibniz Institute for Social Sciences, with MISSY; Netherlands – CBS, with Microdata Services; Sweden – National Statistical Institute, with MONA). See Schouten and Cigrang (2003) for a brief survey of other remote access systems worldwide.

[84] Available databases include: Survey of Industrial and Service Firms (since 1984); Business Outlook Survey of Industrial and Service Firms (since 1993); Survey on Inflation and Growth Expectations (since 1999); Italian Housing Market Survey - short-term outlook (since 2009); Survey on cross-border transactions in services by non-financial and insurance firms - direct reporting (since 2013); Selected items of banks' balance sheets (forthcoming).

research project for which data are needed is filled in. The user also signs a formal agreement that includes the privacy law and the deontological code.

Authorized users receive detailed instructions on how to submit programmes for processing. Further instructions for using BIRD, and information on available datasets and other useful documentation are all published on the BI website. The researchers carry out their statistical and econometric analyses without having direct access to the microdata by submitting source programmes in a supported format (Stata, SAS, R) by e-mail. Input and output are subjected to automatic and manual checks of their content and logic. After being validated, and if no violation occurs, the results of the calculations are sent back to users by e-mail.

A dataset with fake figures in semicolon-delimited ASCII format that replicates the internal structure of the original data from the Survey of Industrial and Service Firms (but contains randomly generated data) is available on the BI's website, so that researchers can test the editing of their codes before submitting them to BIRD.

Summing up, in order to prevent any violation of confidentiality restrictions, there are several firewalls at three different levels: user (users are identified, qualified and registered; registered mailboxes are whitelisted; outputs are monitored and archived; deontological code, privacy law, specific penalties); data (identifying variables are expunged from the datasets used for remote processing; extreme data are censored; stratification variables are collapsed); processing (forbidden to display individual data; keyword parser implemented with black lists and grey lists; particularly long and/or complex programmes are always reviewed manually; all submissions are reviewed manually).

12.6. The Research Data Center

Following the increasing interest of economists in microdata, in recent years BI has undergone a process aimed at improving the range and ease of access to microdata. This process brought about the creation of a Research Data Center (RDC) in 2019 to facilitate the way internal and external users access microdata, also increasing data availability and improving methodology. It is a single entry point for the external datasets used by the internal researchers and a single exit point for those produced for the external researchers. The RDC moreover manages the documentation and the permission for use of and access to every dataset.[85] Other tasks performed by the RDC are the creation of microdata datasets to be safely disseminated to external users.

The RDC web portal provides a comprehensive view of all databases already available as PUFs and in BIRD. In the near future, the RDC will also provide tools for data visualization, useful for non-expert users, either in terms of financial literacy, or in terms of knowledge of the characteristics of a specific database. Data visualization will include interactive graphs and dashboards, as well as a web tabulator, an easy to use

[85] This approach is common to other data providers. The Data without Boundaries programme for European data, which ended in 2015, noticeably supported this approach, to the point of listing a set of principles for access to elementary data (Schiller and Welpton, 2013).

device, available online, for performing tabulations from microdata in a personalized way.[86]

12.7. The international cooperation

Hand in hand with data dissemination to the public goes what is more properly known as *data exchange* because it is generally a two-way exchange between official statistics producers, national or international. Some international institutions (IMF, World Bank, OECD, Eurostat, ECB) act as hubs in the data exchange network, collecting data from many institutions and redirecting them to others, often adding the pooled statistics they assemble. The bulk of monetary and financial statistics go through the European Central Bank (ECB) and National Central Banks (NCBs) but some other companion statistics, such as Gross Domestic Product (GDP) or labour market statistics go through Eurostat and the various National Statistical Offices (NSOs). International organizations can require national authorities to provide specific indicators with due timeliness in order to perform their own research and statistical production on a bigger scale.

As the scope of the data exchanged has grown over the years, and thanks to the developing technology granting faster connections between physically distanced producers, a need for international standards has risen. Standards can be both statistical and technical. An important example of statistical standards is the System of National Accounts (SNA), which is continuously evolved and maintained by the United Nations, the International Monetary Fund (IMF), the World Bank, the Organisation for Economic Co-operation and Development (OECD) and the Statistical Office of the European Communities (Eurostat), and which details how national accounts statistics are to be collected and produced to ensure comparability across countries. They clearly and thoroughly specify things such as perimeter, methods of aggregation and classification and item definitions. Technical standards deal with the means of exchange, how to translate the rules set out by the statistical standards into structures and codes in order to make the exchange process automatic and checks and audits easier. Adherence to a technical standard may also be voluntary and there are still numerous different standards, but one of the most widespread is the Statistical Data and Metadata eXchange (SDMX). Both types of standards are maintained and updated through international collaboration, thus helping to establish a common language, best practices, mutual trust and resource sharing.

International cooperation is an important asset when dealing with big changes and crises situations. When the euro was born, for example, Member States had to convert all their statistics to the new currency, temporarily doubling the reporting burden. The possibility to have common guidelines and frequent exchanges helped them to face these difficulties. In more recent years, after the financial crisis, most organizations have felt the need to have more detailed data and in new domains to prevent a second crisis, so the new Special Data Dissemination Standard Plus (SDDS Plus) was born. Sharing tools, practices and technical standards like the SDMX helped

[86] A web tabulator can have some built-in firewalls in order to prevent the identification of a single respondent or of a small number of respondents in order to prevent risk of re-identification. Another possible solution consists in adding noise to each statistic in proportion to its sensitivity to the addition or removal of a single observation from the data, in order to cope more efficiently with the trade-off between privacy loss and accuracy (Chetty and Friedman, 2019).

countries in adhering to the new standard. In some cases, the SDMX standard may be mandatory.

A complex process, involving business experts, IT resources and data dissemination teams, is necessary to govern data dissemination and exchange in modern times, providing quality service to the community and to international stakeholders. The BI has designed a metadata-driven process, in seven steps, which aims at ensuring replicability, timeliness and reducing human error. It starts with a Design phase, realized by economists in collaboration with dissemination experts, which defines the formats, contents and destinations of the dissemination. Then the proper metadata structures are built in the Build phase with the support of specifically designed IT tools. Once a dissemination is built, it can be used for the routine release of updated data, starting with the Fill phase, in which the metadata structures drive the data extraction from the internal data-warehouse. In the next step, the data dissemination team packages the data into different forms, (Package phase), depending on the destinations. It uses the same data to create the publication, the updates for the statistical database and the SDMX files for data exchange, so that the contents of the different dissemination methods are aligned. Economists then perform the necessary Checks on the final output, and in the event that something is amiss, give instructions for correction by going back to either the "Fill" or the "Package" phase. Finally, the new data are automatically saved in the internal data-warehouse (Save phase) according to the metadata, and then released to the public or sent to the proper destination by the dissemination team, which interacts, when necessary, with communication experts.

In very different ways, microdata dissemination is also starting to be involved in international cooperation, and will probably be much more so in the near future. As we have said, no international standards have been set out yet for microdata compilation (with the exception of the harmonized European Household Finance and Consumption Survey) and dissemination. Nevertheless, discussions on this issue have begun in international fora (in particular within the G20), in particular following the COVID-19 pandemic, which saw increasing use of unconventional data, namely big data and more in general microdata from private businesses, together with the well-established interest in administrative data. An initial cooperation network was established in 2009, when the finance ministers and central bank governors of the G20 endorsed the first phase of the Data Gaps Initiative (DGI-1) to promote actions to close the data gaps that had come to light in the wake of the global financial crisis in 2008. During the DGI-1 process, data users and data compilers increasingly expressed the need for improving data sharing, particularly of granular data, in order to foster an understanding of global developments, for example with regard to risks and imbalances. Consequently, the second phase of this initiative (DGI-2) contains a new recommendation (II.20) promoting the exchange of (granular) data as well as of metadata. To help meet data users' and data compilers' demand for (granular) data sharing within the legal framework of the individual jurisdictions and to facilitate the implementation of Recommendation II.20 of DGI-2, a group of central banks established the International Network for Exchanging Experience on Statistical Handling of Granular Data (INEXDA).The ultimate goal of INEXDA is to facilitate the use by external economists of granular data produced by participating institutions for research and comparisons.

12.8. The way forward

Data dissemination will probably be further enriched in the near future. There are various goals of great interest for central banks. The first one is to enlarge the audience of both macro- and microdata users, also in order to improve financial literacy. This first goal could benefit from the adoption of more modern and immediate ways to communicate statistical information, including data visualization, thanks to the exploitation of updated data visualization software.

It is also important to strengthen international cooperation, particularly for microdata production and dissemination. We illustrated the strong interest of the international community supported by the G20. In practical terms, a possible initiative in this context could be the sharing of data among RDCs, starting from specific harmonized international databases (e.g. BACH, including firms' balance sheets).

The definition of international statistical standards for microdata could be more difficult, as surveys differ greatly among countries, even if surveyed phenomena are approximately the same. The common adoption of technical standards for data exchange could be easier (the forthcoming SDMX 3.0 could serve this goal well, as it includes a large range of dimensions, ideally suited for microdata).

As software and ways of learning and accessing information evolve fast and in depth, it is difficult to foresee what will happen in the field of data dissemination, but this is certainly a process that central banks and international organizations must focus on, constantly investing to offer greater opportunities to the public and to researchers.

Suggested readings

Bruno G., L. D'Aurizio and R. Tartaglia Polcini (2008), Remote processing of firm microdata at the Bank of Italy, Banca d'Italia, *Questioni di Economia e Finanza (Occasional Papers)*, no. 36.

Additional references

Chetty R. and J.N. Friedman, (2019), A practical method to reduce privacy loss when disclosing statistics based on small samples, America Economic Review Papers and Proceedings, Forthcoming.

Freiman M.H., B. Schar, K. Hasenstab and A. Lauger (2016), Evaluating a remote access system, Research Report Series. Center for disclosure avoidance research, US Census Bureau.

Lane J. and C. Schur (2010), Balancing Access to Health Data and Privacy: A Review of the Issues and Approaches for the Future, Health Services Research, Vol.45.

Schiller D. and R. Welpton (2013), Providing remote access to European microdata, Conference paper, NTTS.

Schouten B. and M. Cigrang (2003), Remote access systems for statistical analysis of microdata, Discussion paper n.03004, Statistics Netherlands.

13. List of the most frequently used abbreviations

APRC: Annual Percentage Rate of Charge
BAM: Bank and Money: national data
BI: Bank of Italy (Banca d'Italia)
BIRD: Bank of Italy Remote access to micro Data
BIRD: Banks' Integrated Reporting Dictionary
BoP: Balance of Payment
BOS: Business Outlook Survey of Industrial and Service Firms
BSI: Balance Sheet Items
CAPI Computer Assisted Personal Interview
CATI: Computer Assisted Telephone Interviews
CAWI: Computer Assisted Web Interviews
CCPs: Central Clearing Counterparties
CMFB: Committee on Monetary, Financial and Balance of Payments Statistics
COGIS: COmmissione per la Garanzia della qualità dell'Informazione Statistica (Commission on Quality Assurance of Statistical Information)
CSDB: Centralised Securities Database
EBA: European Banking Authority
ECB: European Central Bank
EMI: European Monetary Institute
EPSEM: Equal Probability SElection Method
ESA: European System of Accounts
ESCB: European System of Central Banks (ECB + NCBs)
ESS: European Statistical System (Eurostat + NSIs)
FDI: Foreign Direct Investment
FVCs: Financial vehicle corporations
FSB: Financial Stability Board
GDP: Gross Domestic Product
GDPR: General Data Protection Regulation
GNI: Gross National Income
GVC: global value chains
HICP: Harmonized Index of Consumer Prices
HH: Household
ICs: Insurance Corporations
IF: Investment Funds
IIP: International Investment Position
IMF: International Monetary Fund

IPPs: Intangible Personal Property
IReF: Integrated Reporting Framework
MFIs: Monetary Financial Institutions
MIP: Macroeconomic Imbalance Procedure
MIR: MFI Interest rates
MNEs: multinational enterprises
NA: National Accounts
NB: New Business
NCA: National Competent Authority
NCBs: National Central Banks
NDI: Net Disposable Income
NFC: Non-Financial Corporation
NNI: Net National income
NSIs: National Statistical Institutes
OECD: Organization for Economic Co-operation and Development
OFIs: Other Financial Institutions
OTC: Over-the-counter
RIAD: Register of Institutions and Affiliates Data
SHIW: Survey on Household Income and Wealth
SHS: Securities Holding Statistics
SIGE: Survey on Inflation and Growth Expectations
SIHM: Survey on Italian Housing Market
SISF: Survey of Industrial and Service Firms
SISTAN: Sistema Statistico Nazionale (National Statistical System)
SNA: System of National Accounts
SPEs: Special Purpose Entities
SRS: Simple Random Sampling
SSM: Single Supervisory Mechanism
STC: Statistical Committee