A silent revolution. How central bank statistics have changed in the last 25 years

RICCARDO DE BONIS and MATTEO PIAZZA[*]

Abstract:

This work provides a comprehensive overview of the giant leap made by European central bank statistics over the last quarter century. We illustrate, first, the work that led to a brand-new set of central bank statistics for the implementation of the common monetary policy in the euro area and the underlying rationales. We then focus on the most significant developments brought up by the global financial crisis and by the institutional changes that accompanied it. The final part looks at challenges lying ahead for official statistics, namely, how to deal with digitalization and globalization, and how to obtain better data on income and wealth distribution.

"Mr. Duisemberg … what data will you be looking at … for the euro zone in order to gain a better assessment? What are the key data?" Question addressed to the first ECB President during the press conference on October 1st, 2001

1. Introduction

All central banks collect statistics for carrying out their institutional functions—monetary policy, supervision of financial intermediaries, safeguarding financial stability and oversight of the payment system—and publish some or most of these data, to respond to the public demand for transparency and accountability.

Behind this broad similarity, the scope of statistics collection may be quite different among central banks, depending on the mandate of each institution, on the role attributed to data in

---

the decision-making process and on other institutional and cultural traits. Bholat (2013) recalls how the then Governor of the Bank of England reacted to the Radcliffe Committee Report (1960), which was light in terms of monetary policy recommendations but keenly advocated that the Bank collect more data and publish more statistics. He replied that "a central bank is a bank, not a study group" (Bholat, 2013, p. 185). Bholat adds that far from being an outlier, this reaction reflected a common preference among central bankers at that time for parsimonious data collection.

Already at that time, however, the Bank of Italy was following a different road, as "[s]tatistical collection was conceived as closely connected with the needs of economic analysis from the outset" (Visco, 2015). Following the Great Depression, the Bank started to collect banking statistics in the second half of the 1930s. As Director General of the Bank of Italy since 1960, Paolo Baffi gave a boost to banking and financial statistics (Baffi, 1957). The Central Credit Register was created in 1963; the production of the Financial Accounts started in 1964 (De Bonis and Gigliobianco, 2005) and the Survey on Household Income and Wealth (SHIW) started in 1965 (Signorini, 2015; Baffigi et al., 2016).

Institutional and economic developments over the last quarter of a century, however, have increased commonalities among central bank statistics. The start of the single monetary policy in 1999 led, under the banner of harmonization, to what has been called "a silent revolution" (Domingo Solans, 2003) in the statistics collected by the central banks in Europe. In the first part of this work, we illustrate this transformation and the results achieved by the Eurosystem – the European Central Bank and the National Central Banks of the countries that have adopted the euro – in harmonizing the monetary, banking and financial statistics necessary for conducting the single monetary policy. As only homogeneous statistics allow proper aggregations for the euro area and meaningful comparisons across countries, the set of harmonized statistics has been gradually enriched over the years. In this context, the old claim by Leontief (1971) that non-comparable data are unnecessary rings particularly true.

A second driver for transformation, about a decade later, was the change in the institutional architecture for micro and macroprudential supervision. The Banking Union, especially the creation of the Single Supervision Mechanism, provided an obvious impulse to the harmonization of supervisory statistics.

Worldwide, an important driver of statistical transformation was the global financial crisis, which erupted in 2007. While European countries were well equipped overall – although still with some unsatisfied information needs – data gaps were more relevant in several other countries and where a global picture was needed, as cross-border data sharing was almost non-existent. Efforts were concentrated on two main issues: (i) collecting more granular data to better account for the heterogeneity among economic agents; and (ii) filling data gaps for financial stability analyses arising from the financial crisis in the context of the G20 Data Gaps Initiative (FSB-IMF, 2009, 2016).

Overall, the last quarter of a century has undoubtedly been a success story for central bank statistics in Europe, but one should not be lulled into complacency as new challenges loom ahead, driven by digitalization, globalization, and the issue of income and wealth distribution. We discuss these aspects in the last part of this work where we outline what the impact of these developments on official statistics could be.

Accordingly, this paper is split into three parts, where we adopt different perspectives reflecting the varying nature of the developments over the last 25 years. The evolution of central bank statistics since the start of the preparatory work for the third stage of the

Economic and Monetary Union up until the start of the financial crisis was driven by the clear aim of gradually building up the information blocks for the implementation of the common monetary policy. This path is accounted for in paragraphs 2-5. By the time the financial crisis erupted, the contours of the new harmonized monetary and financial statistics had largely been finalized or were at least at an advanced stage of preparation. The second part therefore adopts a different perspective by zooming in on the most significant developments triggered by the financial crisis and by the institutional changes that accompanied it (part 6). The final parts looks at the most pressing challenges lying ahead for official statistics (part 7) while part 8 concludes.

2. The harmonization of monetary and banking statistics

> "*Nothing is more important for monetary policy than good statistics*".
> *A. Lamfalussy* (*1996*)

The Treaty on European Union assigned 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 gave the new institution the responsibility of defining the statistics necessary for the conduct of monetary policy, assigning the collection of data to the national central banks.

The main task of the preliminary work carried out by the EMI was the harmonization of statistics required for the construction of monetary and credit aggregates (Bull, 2004). Friedman's (1968) famous Presidential Address to the American Economy Association popularized the view that central banks should try to reach a steady growth in some monetary aggregate (Mankiw and Reis, 2018, assess the impact of this address on the evolution of macroeconomic thinking). The popularity of monetary aggregates in policymaking has grown since the 1980s: the Federal Reserve's anti-inflationary policy, inaugurated by Chairman Paul Volcker in October 1979, while confirming the Fed's statutory dual mandate was driven by the thesis that inflation is a monetary phenomenon in the long term, and that price stability is a key objective for the central banks to pursue. As noted in Rossi: (2010) "*The Bank of Italy's Annual Report* presented on 31 May 1993 contained the first direct reference to the final goal of price stability, never before stated explicitly".

Many central banks gradually began to use and publish aggregates regularly referring to various definitions of money: M1, which usually includes the currency held by the public and transaction deposits at banks, and M2, which includes M1 and other bank deposits.

The EMI's focus on monetary aggregates was also strongly influenced by the tradition at the Bundesbank (Constâncio, 2018), arguably the central bank in Europe with the best performance in keeping inflation under control after World War II.

Central banks also analyze credit aggregates due to the influence of loans on the real economy.[1] This is a tradition dating back to Schumpeter (1912) and corroborated since the

---

[1] Bernanke and Gertler (1995) explain, however, why credit aggregates may not necessarily be a good measure of the impact of monetary policy on credit. "The term 'credit channel' is something of a misnomer; the credit channel is an enhancement mechanism, not a truly independent or parallel channel. Moreover, this nomenclature has led some authors to focus—inappropriately, in our view—on the behavior of credit aggregates".

1980s by the literature on 'the credit channel'. The idea, which originates from the work of Mishkin (1978), Bernanke (1983) and Bernanke and Blinder (1988), is the existence of three activities in the economy: money, securities, and loans (while in the IS-LM diagram there are only currency and securities). A tightening of monetary policy – a rise in interest rates policy – produces a decrease in aggregate demand not only through the monetary channel – because the agents replace currency with securities – but also through a contraction of credit and/or an increase in its cost. Bernanke and Gertler (1995) explain that central banks may affect the costs of external funds in credit markets via two possible channels (both considered as part of the credit channel): the balance sheet channel ("broad lending channel") stresses the potential impact of changes in monetary policy on borrowers' balance sheets and income statements while the bank lending channel ("narrow lending channel"), per its name, focuses on the impact of monetary policy on loan supply by commercial banks.

Monetary policy has real effects because firms are not able to replace bank loans with other forms of financing, such as bonds or equities: there is a failure of the Modigliani- Miller theorem. While Friedman had argued the existence of a link between money and nominal GDP – suggesting this relationship as a factor in the interpretation of the Great Depression – Bernanke has shifted the emphasis on the relationship between credit and GDP. Similarly, financial stability is also deemed to be deeply influenced by credit development (BIS, 2014).

Against this background, it was not surprising that Central banks agreed on the necessity to collect complete bank balance sheets but when the EMI was established in 1994 European banking statistics resembled the Tower of Babel. Across countries, there were differences in the definition of banks and the classifications of balance sheet items, even in the case of deposits and loans. The coverage of statistics was heterogeneous: some countries collected data from the whole population of banks, while others relied on samples, with different degrees of representativeness. The frequency of statistics was not uniform; most prospective member states compiled monthly statistics but several others only had quarterly data. The timeliness for reporting data to the central banks also varied: some central banks were able to publish monetary and credit aggregates in less than 30 days from the reference date, while others could only complete the process after more than a month. Not surprisingly, the definitions of money and the money-creating sector also diverged. On top of that, the EMI was also working in a situation of uncertainty about the data to be collected, as the definition of the monetary policy strategy had to wait for the birth of the ECB in June 1998. So, harmonization was needed but in which direction precisely?

The EMI's first choice was to collect data from monetary financial institutions (MFIs), the intermediaries that defined the new money-creating 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 offer loans. When the common monetary policy started, MFIs held 60 per cent of the total assets of financial corporations in the euro area, while today their market share is around 45 per cent, mainly because of the contraction of bank assets following the global financial crisis and the euro-area debt sovereign crisis. The choice made by the Eurosystem to focus on the broader universe of MFIs, rather than on banks only, was aimed at keeping the (broad) boundaries of monetary and credit aggregates well under control and to avoid never-ending debates on the definition of what is a bank.[2]

---

[2] In some European countries banks are defined as those intermediaries which collect deposits from the public and grant loans to the economy; in other countries the focus of the definition is only on the supply of loans and therefore

Central banks were already largely disseminating information on their assets, as publishing financial statements is part of their accountability. Currency in circulation, moreover, is a traditional component of the narrow monetary aggregate M1 and the harmonization of central banks' asset and liability statistics made it easy to include this item in the European harmonized monetary aggregates. As of late, the importance of these data took on a very different dimension, since without them it would be difficult to get a grasp on the size of some of the unconventional monetary policy measures adopted in the last few years as well as on the emergency measures taken during the pandemic.

Money market funds issue shares that have a high degree of substitutability with bank deposits and invest in securities, making them a clear candidate for inclusion in monetary aggregates. The harmonization of the definition of money market funds was challenging however, mainly due to the presence of a large mutual funds industry in Luxembourg and Ireland, countries where regulatory standards have historically been less stringent than in other countries. Money market fund shares were in the end included in the reference aggregate for money in the ECB's monetary policy strategy, M3.

The reporting schemes for MFI statistics included many details: all main items of assets and liabilities on the balance sheet broken down by the broad sector classification of the counterparty (i.e. households, non-financial corporations, general government, other MFIs and other financial institutions) and its residence. Quarterly information on positions by currency and counterpart country allow monitoring the international role of the euro[3] and the degree of financial integration achieved in the euro area, a key objective of the European Union.

Additional details were included in 2003 relating to the purpose of loans to households—house purchase mortgages, consumer credit, or other financing (mainly loans to productive households)—and further enrichments took place in 2010 to improve the understanding of monetary policy transmission mechanism following changes in market functioning triggered by the financial crisis (ECB, 2011a). For instance, MFIs had to start reporting separate evidence of current account loans (overdrafts), an instrument that amounted to 12 per cent of total lending to non-financial corporations in the euro area: in Italy, the percentage was even larger, at 28 per cent, due to the large number of small businesses. New data also included information from MFIs on securitization flows to address the problems that these transactions were posing to financial stability—as proved, at least in the US, by the financial crisis—but also, from a statistical point of view, to measuring effective loan growth rates. The availability of data on loan securitizations and sales was essential to produce meaningful credit statistics (Jackson and Michalek, 2016).

---

leasing and factoring companies are also included in the population of banks. The definition of MFIs relies basically on the first definition and includes some intermediaries that - for historical or legal reasons - are not classified as banks in some European countries although they carry out similar functions—collecting deposits from the public and/or providing loans—and may be important for monetary policy. Some examples are electronic money institutes and public institutions such as Cassa Depositi e Prestiti in Italy, Kreditanstalt für Wiederaufbau in Germany, and Caisse des dépôts et consignations in France.

[3] It is estimated that between 30% and 50% of the value of euro banknotes was held abroad in 2019 (Lalouette et al., 2021).

3. Bank interest rates

> *"In a system that is working properly, there is a stable relationship between changes in the central bank's rates and the cost of bank loans for households and firms".*
>
> M. Draghi (*2012*)

The price conditions that banks apply to deposits and loans are important for the analysis of monetary policy transmission channels, for the supervision of intermediaries, for the analysis of competition and for financial integration. The harmonization of bank interest rates was more complex than that of bank balance sheets. While all central banks regularly collected bank balance sheet statistics, the problem for interest rates was not just heterogeneity: some central banks only carried out occasional surveys, some collected interest rates regularly but only on outstanding amounts, others only on flows, i.e. on new deposits collected from customers and new loans granted to the economy. Other crucial aspects, such as the statistical representativeness of the samples reporting the statistics or the definition of rates and related banking operations, were also markedly different across countries. As for the counterparties, information sometimes referred only to households, sometimes to non-financial corporations, and in a few cases to the total economy. This situation largely mirrored the policy framework of the central banks, as some of them used bank interest rates in assessing the transmission channels of monetary policy, while for others the emphasis was more on money and credit aggregates.

In January 2003, national central banks of the euro area started collecting from banks the data needed to report 45 monthly interest rates to the ECB (16 on deposits and 29 on loans; 14 rates relating to outstanding amounts and 31 to new business flows, such as the rate on new loans to households for house purchase). Rates were reported net of bank fees to better assess the effects of monetary policy but the ECB also collected the annual percentage rate of charge, which includes commissions and other charges, on consumer credit and loans for house purchase. Since the aim is to collect statistics on 'normal' prices applied to loans, interest rates statistics are computed by only taking into account performing loans; in other words, rates on bad debts and restructured were are excluded. The average harmonized interest rates on different instruments and maturities are obtained as the weighted average of the rates applied where weights are given by the associated volumes. Rates on new businesses provide a better indication of the current price conditions on loans and deposits. Since the end of 2014, moreover, it has been possible to distinguish between new contracts ('pure new business') and the 'renegotiations' of performing loans granted in the past. Renegotiations are particularly important in times of recessions, when firms are not able to respect the original conditions of loan contracts.

Data collection was gradually enriched in this case too. Since June 2010, the additional statistics provided details on the period of the initial fixing of interest rates, both in the case of housing loans and of loans to enterprises, enabling an assessment of how long households can count, on average, on the non-modifiability of the agreed interest rate on a loan. Separate evidence was introduced on interest rates on loans to producer households and on rates for credit card loans. Today, banking interest rate data include 198 time series relating to the interest rates applied to euro deposits and loans: 117 time series refer to interest rates while 81 time series refer to volumes.

Interest rate statistics proved extremely useful during the sovereign phase of the financial crisis for assessing the extent of the fragmentation of financial markets across the euro area: "[this fragmentation] made difficult the transmission of impulses coming from an accommodative monetary policy through adjustments in *interest rates on loans to households and firms by banks*. Interest rates do not have to be identical across the euro area, but it is unacceptable if significant differences arise because of the fragmentation of capital markets or the perception of a break-up of the euro area" (Draghi, 2012, italics added).

4. Data on non-bank intermediaries and financial markets

"The approach to reform recognizes that an effective financial system needs intermediation outside the traditional banking sector"
M. Carney (*2014*)

In the early years of the euro area, the Eurosystem understandably directed its efforts towards the collection of monthly balance sheets of banks, but long before the financial crisis highlighted the problems potentially arising from the (then) so-called shadow banking system, the euro area was already working towards collecting statistics on non-bank financial intermediaries. This interest stemmed at that time mainly from the need to control monetary and credit aggregates, as households and businesses can easily replace bank deposits and loans with instruments offered by other intermediaries: James Tobin was probably one of the first scholars to investigate the issue (Tobin, 1963). Although the importance of the non-bank financial intermediation system is smaller in Europe than in the United States, the financial crisis provided additional motivation for collecting data on the activities of these intermediaries (Bakk-Simon et al., 2012; FSB, 2011b, 2019).

Investment funds different from money market funds are the most important non-bank intermediaries in the euro area from a quantitative point of view. The data that NCBs send to the ECB include six categories of funds: equity, bond, mixed, real estate, speculative (hedge funds), and others. Statistics take into consideration, for the six categories mentioned, both open-end funds and closed-end funds (the latter also include venture capital companies and private equity funds: see Ponsart and Salvio, 2018).

Financial vehicle corporations engaged in securitization transactions (FVC), security and derivative dealers and financial corporations engaged in lending are all included among the broad category of 'other financial intermediaries'. As securitization was growing fast in the early 2000s (and in the United States, it was then a trigger of what became the global financial crisis), since the end of 2009, data on balance sheets of the vehicle securitization companies became available in the Eurosystem.

Non-bank financial intermediation also includes specialized financing companies—for instance leasing, factoring and consumer credit companies—and intermediaries specializing in securities dealing, either on their own account or on behalf of their customers, the most important example being the large Anglo-Saxon investment banks. The lack of urgency for the complete harmonization of statistics for these intermediaries was also due to their limited weight in the euro area, as well as their heterogeneous importance across countries. This may mirror the fact that the prevalence of the universal banking model in several countries brought

a substantial part of leasing, factoring or trading of securities on own account activities within the perimeters of commercial banks.

Last but not least, the financial sector also includes insurance corporations and pension funds. Insurance and pension funds play an important part in the financial sector with assets amounting to almost 20 per cent of the total sector as of end-2018. The importance of insurance and pension funds has been growing for years in connection with the ageing of the population, the difficulties of public pension systems, and the increased supply of financial products in competition with those offered by banks. In the euro area, around 30 per cent of households' financial assets were invested in insurance and pension funds in 2018, with a strong prevalence of the former over the latter, although with significant national differences (Bartiloro et al., 2012; Coletta and Zinni, 2013).

The Eurosystem also collects financial market statistics, in particular monthly data on stocks, gross issues and redemptions of listed securities and shares. Data are broken down by issuer sector—general government, enterprises, banks, insurance and other intermediaries— by security type (fixed/variable/zero coupon), and by maturity. We will come back to these data when illustrating the emerging importance of granular databases.

Linked to globalization and to the activities of multinational enterprise (MNEs, see Section 7.2), there is now a renewed interest in some specific categories of other financial intermediaries, such as Special Purpose Entities (SPEs). SPEs are entities typically directly or indirectly controlled by non-residents with little or no employment, little or no physical presence and little or no physical production in the host economy. SPEs transact almost entirely with non-residents and a large part of their financial balance sheets typically consists of cross-border claims and liabilities. Their use has rocketed in a context of MNEs seeking to obtain benefits from different legal and tax regimes and may hinder the interpretation of macroeconomic statistics (IMF, 2018a). In particular, no data collection is usually available that could be used when SPEs are foreign entities and should therefore be recorded in the national accounts, in line with the application of the domestic residency principles of the System of National Accounts (BIS, 2019).

5. Financial accounts

The intellectual building of financial accounts can be attributed to Copeland (1952). Following the Great Depression, economists and statisticians agreed on the goal of creating modern national accounts, also aiming at improving the measurement of financial variables during the business cycle. Since 1955, the Federal Reserve has started to publish financial accounts regularly. Other national central banks have followed the same route, also exploiting the scientific stimulus provided by Tobin's contributions (see Tobin, 1952, 1961). As mentioned, Paolo Baffi, chief economist of the Bank of Italy in the 1950s (then Director General from 1960 to 1975, and Governor from 1975 to 1979) led the introduction of financial accounts in Italy. In 1963, Italy was thus one of the first countries in Europe to present financial accounts. Flows of funds quickly became an established tool for analyzing the economy in advanced countries in the 1960s and an essential piece of a triad that includes national accounts on the production and distribution of goods and services, and input-output tables.

Financial accounts allow us to study several facets of the financial system: the alternative ways of raising funds by non-financial enterprises; the debts, savings, and financial wealth of

households; the liabilities collected by general government; the financial assets and liabilities of intermediaries; and the relationships that the residents of a country have with the rest of the world.

Since 1995, Eurostat has published the annual financial accounts of the EU countries. These statistics have also been linked to the development of statistics for the purposes of the European monetary union. The European Stability and Growth Pact introduced a specific form of budgetary surveillance, based on close monitoring of the developments in government deficit and debt.

After the creation of the euro area, the ECB began to collect the quarterly financial accounts of the euro-area countries, designed as a cross-check between the two pillars of the monetary policy strategy: the pillar of economic analysis and that of monetary analysis (Papademos and Stark, 2010).

Based on data provided by central banks and national statistical institutes, the ECB and Eurostat have built integrated accounts for the euro area, making it possible to link real national accounts to financial accounts. Since 2007, the ECB has commented every quarter on the integrated euro-area accounts as they provide consistent information on the income, spending, financing and portfolio decisions of all economic sectors.

The financial crisis shed new light on the importance of monitoring financial flows and stocks not only for the conduct of monetary policy but also to try to ensure financial stability, whose soundness indicators are normally collected and commented using the financial accounts. Economic theory also underlined the need to come back to the analysis of the interactions between the real and the financial sectors of the economy (see Palumbo and Parker, 2009; Gonzalez-Paramo, 2009; Fano, 2011, De Bonis and Pozzolo, 2012, Be Duc and Le Breton, 2009; ECB, 2011b and 2012, OECD, 2017).

6. Then came the financial crisis ...

"More data certainly needs to be collected on the magnitude of these risks"
R. Rajan (*2005*)[4]

The developments described in the previous paragraphs followed a sort of 'organic growth', where harmonization firstly involved the data that were most important for monetary policy, expanding progressively to include non-bank financial intermediaries, in order of importance, survey data for households and enterprises and granular databases. This latter trend was already ongoing in the Eurosystem but went to a very different scale with the launch of the AnaCredit project. This process, gradual by design, took new impulse and accelerated with the financial crisis and the ensuing new data needs.

---

[4] This is an excerpt from the now famous Jackson Hole presentation in 2005, where Rajan warned about the build-up of risk in the financial system (Rajan, 2005).

6.1 New data needs: the European Systemic Risk Board and the Single Supervisory Mechanism

With the financial crisis, statistics of the European System of Central Banks further expanded their scope. The ECB Statistics Conference in April 2012 was tellingly devoted to the theme: *Central Bank Statistics as a servant of two separate mandates: Price stability and mitigation of Systemic Risk*.

A principal driver was the changing institutional landscape in the field of micro and macroprudential supervision with the design of new supervisory architecture,[5] consisting of three European supervisory authorities and a board for monitoring systemic risks.[6]

The definition of new statistics for macroprudential supervision was not easy. This was, perhaps from a purely conceptual point of view, even more challenging than in the case of monetary policy statistics, where at least there was an agreement on fundamental issues such as the ultimate objective of monetary policy and the role of central banks in a market economy. In the case of policies to prevent systemic risks, the theoretical framework was far less settled (Angelini et al., 2012; Buiter, 2012; Lim et al., 2011).

On the micro-side, the 2010 reform of the prudential supervision architecture with the creation of the European Banking Authority (EBA), the European Insurance and Occupational Pension Authority (EIOPA) and the European Securities and Markets Authority (ESMA), coupled with the Basel III package launched in the same year, also brought significant innovations to the statistical domain. On capital, liquidity and maturity transformation, the new Basel III rules were accompanied by harmonized data collection initiatives. The European Commission mandated the EBA to develop supervisory reporting requirements. The EBA financial reporting (FINREP) schemes and the common reporting (COREP) framework entered into force into 2014 and subsequently became the basis for the supervisory reporting envisaged in the Single Supervisory Mechanism launched the same year.

The supervisory banking statistics sent to the ECB contain information on banks designated as significant and less significant institutions and include information on the composition and profitability of balance sheets, capital adequacy and leverage, asset quality, funding and liquidity.

Two notable consequences of this reform package were the shared definition of non-performing loans across countries and data on banks' consolidated financial statements that, while essential for micro and macroprudential supervision, were still in limited use in some countries before these reforms.

On the other hand, full harmonization proved more challenging in this domain, as accounting principles and definitions at national level were often different and coordination among authorities was sometimes insufficient for such an ambitious objective. The use of supervisory data for statistical and economic analysis purposes is normal practice in central banks that are also responsible for the supervisory function. It is more complex in countries

---

[5] This new architecture followed the recommendations of the high-level expert group chaired by Jacques de Larosière and mandated by the European Commission to give advice on how to strengthen European supervisory arrangements in light of the failures of financial supervision exposed by the crisis.

[6] The European Systemic Risk Board (ESRB), the body responsible for controlling systemic risk, has been active since January 2011. The ESRB produces analyses of the financial system, reporting risk areas and making non-binding recommendations, to trigger corrective actions on a European or national basis. The data that the ECB provides to the ESRB contributes a quarterly set of quantitative and qualitative indicators of systemic risk in the EU financial system to its risk dashboard for macroprudential policy.

where banking supervision is not tasked to the central bank. In several countries in the euro area, regulatory and supervisory powers are attributed to public agencies other than the Central Bank, making coordination among all the players involved very complex and burdensome. From an analytical point of view, data on—once neglected—bank-specific characteristics such as capitalization, funding models, and securitization activities could be essential to understand what has been called "a new dimension of the bank lending channel" as such bank-specific conditions have been shown to impact on their loan supply (Gambacorta and Marques Ibanez, 2011).

6.2 A global financial crisis needed a global response: the G-20 Data Gaps Initiative

".. markets and policy makers were caught unprepared by events in areas poorly covered by existing information sources, such as those arising from exposures taken through complex instruments and off-balance sheet entities, and from the cross-border linkages of financial institutions".

FSB-IMF (2009)

While it is difficult to argue that more data would have prevented the financial crisis of 2007-2009, it can be more safely claimed, however, that the availability of more information would have undoubtedly facilitated the management of the crisis and the decisions of policymakers.

Based on this consideration and noting that the information needed often transcended domestic borders, the G20 called on the Financial Stability Board and the International Monetary Fund to analyze the information gaps, identifying priorities and suggesting steps to be taken (FSB and IMF, 2009, 2016; Heath and Bese Goksu, 2016). In the words of the FSB-IMF (2009), the crisis reaffirmed "an old lesson, good data and good analysis are the lifeblood of effective surveillance and policy responses at both the national and international levels".

Unsurprisingly, this was not the first time that economic and financial crises had led to a significant effort to improve available data: it already happened with the Great Depression of the 1930s and with the crisis in Asian countries in the 1990s[7] (which led, for example, to the introduction of Special Data Dissemination Standards by the IMF). The crisis and the massive public bailout measures set the stage once again for shifting the emphasis from the costs of new data to their benefits.

Information gaps were identified in three broad conceptual areas: build-up of risk in the financial sector, international financial network connections – i.e. bilateral exposures and links between intermediaries – and vulnerability of domestic economies to shocks (including the financial situation of households and enterprises).

Monitoring risk in the financial system requires better statistics about phenomena such as leverage, maturity transformation, credit default swaps, structured products, and securities. Analyzing connections between international financial networks required the collection of new data on Global Systematically Important Financial Institutions or G-SIFIs, as well as on non-bank intermediaries, cross-border transactions, portfolio investments and international

---

[7] On the American financial accounts and the information needs induced by the crisis, see Eichner et al. (2010).

banking activity (CGFS, 2012). Collecting data on these global intermediaries was also a way to force them to a better management of internal information, as during the crisis it became apparent that on average they found it very difficult to have a comprehensive view of their exposures (e.g. in derivatives) and their funding needs (BCBS, 2013). The Lehman Brothers crisis and its repercussions showed that between the end of 2008 and early 2009, central banks and supervisory bodies were able to reconstruct the links between large financial institutions only with delays and with great difficulty. Bilateral positions on the interbank market, the use of risk transfer instruments and the cross-underwriting of securities and derivatives between institutions were not well known (Haldane, 2009). Matrices showing bilateral exposures, a sort of microeconomic financial accounts, were advocated for the first 50 or 100 global intermediaries (Cecchetti et al., 2010). It took several years but, thanks to the efforts of central banks and supervisory authorities led by the FSB, granular and timely data are now available on the activities and mutual relationships of Global Systemically Important Banks, or G-SIBS (FSB, 2011a and Tracy, 2016).

The third set of information on which progress was needed concerned the vulnerability of domestic economies: sectoral accounts, government finance statistics and residential and commercial real estate data were priorities in this regard. Sectoral and financial accounts make possible an assessment of the economic situation of institutional sectors: indicators such as the ratio of household debt to disposable income, firms' debt-to-GDP or loan-to-GDP ratio are widely used to provide early warnings on the condition of financial systems. The procedure for excessive macroeconomic imbalances, introduced in Europe after the crisis (European Commission, 2012) considers, among other indicators, the annual flow of credit to the private sector and the size of private sector debt (Borio and Drehmann, 2009; Rose and Spiegel, 2009). While Europe was already in a good position on this front—as all EU nations produce financial accounts—other countries are making remarkable progress in producing information on institutional sectors.

While the first phase of the Data Gaps Initiative (DGI) was largely devoted to setting up a conceptual framework for data collection in some areas, the objective of its second phase (2016-2021) was to implement "the regular collection and dissemination of *comparable*, timely, *integrated*, high quality, and *standardized* statistics for policy use" (FSB-IMF, 2016, italics added by authors). It is recognized that the growing economic and financial interconnection across countries may require global data coverage for key players and markets (such as Global Systemically Important Financial Banks; *non-banking financial intermediation*, formerly designated as *shadow banking* (FSB, 2019)). For over-the-counter-data (OTC) the emphasis was on the preparatory work that could potentially lead to the development of a mechanism to aggregate and share OTC derivatives data from trade repositories at global level (FSB-IMF, 2016).

To simplify a little, the assessment of the structure and interconnections in the global financial network requires setting up databases with a wide reach and therefore a common effort by central banks (and other authorities) to collect consistent data. Indeed, a sometimes overlooked aspect of the DGI is the importance of its international dimension: the global nature of most financial activities is an aspect that one can no longer disregard, even from the national authorities' point of view. According to BIS research, for example, most major national banking systems booked the majority of their foreign assets outside their respective home countries. Similarly, for many large emerging market economies, the outstanding stocks of international debt securities on a nationality basis far exceed those on a residence basis. Interconnectedness

and potential spillovers are widespread phenomena: subsidiaries of global systematically important institutions may account for large shares of the financial markets in countries, including G20 countries, that are not the headquarters of any of these institutions. The concentration of risk in some markets easily propagates across markets and countries and monitoring it may be of pressing interest not only for home jurisdictions.

Recognizing the added value of international cooperation in the statistical domain and also stimulated by the data gaps highlighted by yet another crisis—this time the COVID-19 pandemic—the Italian G20 presidency in 2021 promoted a discussion on a possible new G20 initiative. If endorsed, it could address emerging data needs, in particular by providing comprehensive climate change and sustainable finance statistics and harnessing the wealth of data produced by the private sector, as further discussed below.

6.3 The rise of granular information

> *"Looking at the details beyond the aggregates enriches our understanding of economic phenomena and at the same time increases our flexibility to respond to unexpected policy needs, contributing to even better statistics".*
> *M. Draghi* (*2016*)

Other important data-related lessons drawn from the crisis were: (a) that attention should be paid to distributions within the aggregates and (b) that for this aspect additional data and analysis were needed (FSB-IMF, 2009, Tarashev et al., 2009). Differences across countries, economic sectors and within sectors—i.e.   among individual households, financial intermediaries, and non-financial corporations—produce different responses to economic shocks and policy measures. Aggregate statistics may therefore prove insufficient in some cases for a thorough assessment of economic developments: a textbook example is credit growth that may reflect strong growth opportunities or a deterioration in lending standards and excessive risk taking. Having granular information available on individual firms—for example from central credit registers and central balance sheet offices—may offer valuable information for assessing credit developments and informing policy decisions. Another concrete example were the concerns raised around credit developments, during the double-dip recession that hit Italy between 2008 and 2013, which took various forms: that they were not strong enough to sustain the recovery, or that they were masking forms of zombie lending and so on. Analyses carried out at the Bank of Italy were able to investigate in detail all these aspects by taking advantage of granular data, showing, for example, that loan growth was sustained for firms in a good financial position and much weaker or negative for over-indebted firms.

European developments moved in the same direction. The experience gained by the Bank of Italy in running its survey on household income and wealth in the 1960s was largely transposed onto the debate that culminated with the launch of the Eurosystem Household Finance and Consumption Survey (HFCS) in 2010.

The HFCS is a harmonized sample survey of the wealth, income and consumption of euro-area households conducted on a voluntary basis by the national central banks (NCBs).[8] The survey provides information on households' behavior, creating a better understanding of the transmission mechanisms of monetary policy and an assessment of households' financial conditions. The survey also collects other information in order to analyze households' economic decisions. The HFCS collects information on real assets and their financing, other liabilities and credit constraints, private businesses, financial assets, intergenerational transfers and consumption at household level. Additional questions relate to individual households, such as the demographics for all members of the family, employment, future pension entitlements and income. The information included in the survey is an essential building block for distributional indicators on the household sector.

A stronger move towards granular data was the analytical credit datasets project (AnaCredit) launched in 2011. Starting from September 2018, detailed harmonized information on all individual bank loans granted in the euro area to non-financial corporations, with a threshold of just €25,000, is being reported to the ECB and is now available to national central banks across Member States.

Collecting granular information on credit and credit risk had potential uses across several areas of central banking, including monetary policy analysis and operations (risk and collateral management), financial stability, economic research and statistics. There is a list of more than one hundred business cases for AnaCredit data in the sphere of the ESCB's tasks (Israel et al., 2017)

It is a genuine paradigm shift triggered by the need to "move beyond the aggregates", as the eighth *ECB Statistics Conference* was aptly entitled. More granular information means more analytical capability as well as the possibility to quickly satisfy the information needs of users.

Before addressing loans, granular data collection focused on securities: the ESCB has security-by-security data on both issuance (the Centralized Securities Database) and holdings (in the Securities holdings database). Worldwide holdings of securities by all banking groups under the ECB's direct supervision have been reported in the latter database since September 2018.[9]

Granularity also provides an opportunity for a more comprehensive view of global markets. In some fields, attaining such a 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. Harmonization and granular data provide a unique opportunity in this direction but call for a much higher level of data sharing, with all the difficulties this raises, as further discussed below.

---

[8] Each participating institution is responsible for conducting the survey but the European Central Bank (ECB), in conjunction with national experts, coordinates the whole project, ensuring the application of a common methodology, and then pooling and controlling the country data, as well as disseminating the survey results and microdata through a single access gateway. The survey relied on about 62,500 and 84,000 interviews (conducted in 15 and 20 European countries) respectively for the first and second wave: anonymized microdata from these waves have been available to the researchers since April 2013 and December 2016 respectively. The fieldwork for the third wave took place in 2017 and the data were disseminated in Spring 2020. A list of works using the HFCS is available on the HFC Network website at the ECB.

[9] The CSBD project started in 2002 and the SHSDB in 2013. Other granular databases include money market statistical reporting (MMSR, started in 2016) - that includes transaction-by-transaction data on a daily basis from more than fifty large banks in four different segments of the euro money market - and the €STR – euro short-term rate – a project that started in 2019. At EU level, transaction-by-transaction data are available on derivatives transactions (EMIR) and on securities financing transactions (SFTR).

7. Challenges ahead

So far, we have explored the phenomena that have dictated the shape of European central bank statistics over the past quarter of a century. In this final section, we explore the trends that seem to pose the most daunting challenges for official statistics in the near future: digitalization, globalization and distributional accounts. The first two phenomena are closely related—at least in the sense that the scale of globalization has been accelerated by digitalization—but we will address them separately as they pose distinct problems to statisticians.

7.1 Digitalization and big data

"… central bankers have not exactly been at the forefront of the big data revolution".
S. Lautenschläger (2018)

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 and the second to the ability of current statistics of keeping track of the digital economy.

Big data,[10] also labelled unconventional data, can benefit macroeconomic and financial statistics in at least three ways (Hammer et al., 2017): (i) by answering new questions and producing new indicators; (ii) by reducing time lags in the availability of official statistics and by enabling timelier forecasting of existing indicators; and (iii) as an innovative data source in the production of official statistics. Examples of all three uses are already available, although with different degrees of development: forecasting macroeconomic variables, analyzing public sentiment and expectations with related indicators, using scanner data to build price indices and so on. Moreover, as stressed by Ghirelli, et al. (2019), new tools linked to big data analytics can be used by official statistics to process structured microdata, especially to enhance their quality—a process that is already ongoing at national central banks.

However, the use of big data raises several conceptual challenges, relating to their quality, stability, representativeness, and access to data as well as practical challenges relating to their security and confidentiality. The implications may be even wider than those brought by these challenges: the digital footprint left by individuals on the Internet creates a situation where official statisticians may no longer be the depositary of the most comprehensive information, at least on households. Due to their role as a quasi-infrastructure for the digital economy, each of the major big data companies (usually identified as GAFAM, acronym for Google, Apple, Facebook, Amazon, and Microsoft) "knows its users in most of the following dimensions: personally identifying information, including physical characteristics; social contacts; geographical location; employment; beliefs, opinions, and preferences; and actions performed while online" (Biancotti-Ciocca, 2019). One recurrent suggestion to maintain the role of official statistics given the growing production of 'statistical' information from the private sector, is to enhance the quality, transparency and dissemination of official statistics. Unconventional data will not substitute official statistics but will provide incentives to improve them.

---

[10] The usual characterization of big data relies on the 3 Vs: volume, velocity, and variety. Additional Vs have been proposed and two of them may be relevant for the use of big data in official statistics: veracity, and volatility.

Unsurprisingly, the discussion about these sources of data became even more pressing during the Covid-19 pandemic when some of the traditional sources for official statistics (e.g. surveys) could no longer be tapped, due to the containment measures put in place, or were not timely and comprehensive enough to keep track of the rapidly evolving situation (Biancotti et al., 2021a). In turn, digitalization was accelerated by the containment measures causing further measurement challenges.

Indeed, the second impact of digitalization relates to the fact 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 get under-measured if statisticians fail to adapt their existing processes and/or to keep up with the pace of innovations. This has also fueled the debate on the productivity slowdown, as some have argued that this slowdown could be an artefact created by an under-measurement of the digital economy (not picked up in GDP and productivity figures). Some critics claim that only a few traces of the ongoing digital transformation can be found in statistical outputs while others reply that while digitalization has created significant challenges both for conceptual treatment and measurement, most of what we perceive as the digital economy seems to be recorded in accounting frameworks, although they are not separately identifiable. In practice, there is no precise definition of either the digital economy or the digital sector. The lack of industry and product classification for internet platforms and associated services complicates the measurement of the impact of digitalization (IMF, 2018b).

The issues raised can be both empirical and conceptual (Ahmad et al., 2017). Empirical aspects relate to the need for keeping track of activity by moving through digital intermediary platforms and cross-border flows: as we will discuss in more detail in the following section, digitalized services can be 'located' wherever may be most fiscally advantageous, which poses challenges for the measurement of international trade, especially services. There is also the issue of the correct assessment of prices and volumes: for price statistics, compilation challenges refer to improving quality adjustment procedures for ICT goods and services, the timely inclusion of new digital product varieties and suppliers in the detailed indexes, and the timely inclusion of new digital products in the basket and weighting structures of the high-level index. Conceptual aspects refer to the need to account for consumers producing the services they need themselves, via digital platforms, and the correct computation of free products and services. Conceptually, this is not a new problem as it bears many resemblances with old-standing debates (for instance how to deal with unpaid household activities: see Fenoaltea, 2019).

7.2 Globalization

'It's complete bullshit… it's "Alice in Wonderland economics'
Irish economist C. McCarthy, commenting on the
figures on Irish GDP in 2016, The Economist, July 16, 2016

Total world trade in goods and services increased from 41 per cent of world GDP in 1993 to 61 per cent in 2008. A profound change in the way goods and services are produced and exchanged accompanied this increase, encapsulated by the international fragmentation of

production (global value chains) and the rise of multinational corporations. The implications are significant on both the economic and the statistical side.

The latter can be quickly summarized as follows (Moulton and van de Ven, 2018): (i) 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; (ii) producing information on global supply chains for understanding the value added associated with trade is complex and bilateral trade data is often misinterpreted; and (iii) the distinction between resident and non-resident units—a key aspect for national accounts—is fading (Tissot, 2016). Avdjiev et al. (2018) examine a number of crucial issues and examples relating to the tension between the traditional residence-based measurement system and the evolving nature of globalization.

The rising importance of intellectual property products, i.e. intangible productive assets, which have no clearly definable location and can be used in many places simultaneously within a firm, makes any measure of the location of production ambiguous, as stressed by Lipsey (2010). Phenomena such as offshoring, transfer pricing and corporate inversion may make it extremely difficult to compile official statistics and, in extreme cases, risk stripping statistics of any economic significance. Offshoring means that business processes are moved to another jurisdiction, either through the firm's own foreign subsidiary or to an unrelated firm through a contract agreement (outsourcing). Multinationals have substantial intra-group transactions in goods and services that cross the borders of national economies: the valuation of these transactions is known as transfer pricing and has a direct impact on the allocation of value added and GDP to countries. Corporate inversion relates to the practice of optimizing the location of global firms' profits by selecting the location of their headquarters and the location of their mobile capital assets (Zucman, 2015, Avdjiev et al., 2018, and Pellegrini et al., 2016).

Multinational enterprises allocate the receipts from IPPs and their royalties, with the purpose of avoiding or minimizing worldwide tax payments, setting up Special Purpose Entities to this end. This makes it complex to determine the economic ownership of IPPs, and therefore the allocation of the output and the use of these assets.[11]

The poster child for these issues was Ireland, where GDP went up by 26.3 per cent and GNI by 19 per cent in 2015, due to the relocation in the country in the first quarter of 2015 of a non-EU manufacturing company with the ensuing transfer of intellectual property capital. While the statistics were compliant with international standards SNA 2008 and ESA 2010, they were deeply affected by globalization: (i) the residential relocation of global firms' corporate structures to Ireland; (ii) the relocation of intangible assets (intellectual property); and (iii) the globalization of production processes. The results were deeply unsatisfactory for users, as vividly illustrated by the opening quote in this section. Tedeschi (2018) provides a comprehensive account of the Irish case and the dilemma it poses for statistics.

Even in less extreme cases than Ireland, and for much bigger countries, the impact on GDP might be substantial. Guvenen et al. (2018) concluded that reattributing earnings of US multinationals would have raised US GDP by about $280 billion, or 1.7 per cent in 2012, an amount offset by lower GDP in other countries if the income were attributed to those other countries. These effects also matter because these statistics are used for administrative

---

[11] Initiatives are taken to reconstruct this complex web of corporate structures as much as possible (e.g. by establishing large case units devoted to the study of MNEs, by favoring the sharing of data among interested countries) but the results are not easy to get (for example, data on intra-group transactions are difficult to single out making assessment of transfer pricing arduous.

purposes (Stapel-Weber et al., 2018), for example, in Europe for defining contributions to the EU budget (GNI) or for fiscal policy (the classic references are government deficit and debt/GDP). The solution adopted by Ireland was to produce supplementary statistics more appropriate to the measurement of domestic economic activity, in particular an adjusted level indicator of domestic economy (GNI*) with the removal of large and volatile items from GNI such as depreciation on foreign-owned domestic capital assets and retained earnings of re-domiciled companies.

Globalization and digitalization are two trends that bring to the forefront the issue of data sharing, with its several dimensions: from the most traditional one of enabling data sharing among Authorities—and sometimes even within the same authority, among different functions—to the sharing between Authorities of different countries to the sharing with researchers and the general public. Typically, in all these cases, several obstacles dictated by the legal and regulatory frameworks shaping the governance of these data may need to be addressed. This notwithstanding, data sharing is often crucial to achieve a comprehensive view of economic and financial phenomena. A concrete experience trying to overcome some of the cross-border obstacles is the International Network for Exchanging Experience on Statistical Handling of Granular Data (INEXDA), an international cooperative project of central banks, the ECB, Eurostat and national statistical institutes, with the support of the BIS. The overall aim is exchanging experiences on the statistical handling of granular data for research purposes: as part of the INEXDA network, the Bank of Italy set up a Research Data Centre[12] acting as the centralized point of access for the microdata that the Bank of Italy makes available to researchers and institutions, exclusively for research purposes.

Moreover, the proliferation of information generated by private actors pose a more general theme of access to these data, i.e. data sharing ceases to be a one-way process, from official producers of statistics to private users, and becomes a two-way process where Authorities start reflecting on the framework to access private data. Biancotti et al. (2021b) note that the wealth of data produced by the digital society (e.g. from user activity on online platforms or from Internet-of-Things devices) could help official statisticians improve the salience, timeliness and depth of their output. They provide, as an input for discussion, a set of principles under which the public and the private sector can form partnerships to leverage the potential of new-generation data in the public interest.

7.3 Distributional accounts

As mentioned in Section 7.2, the global financial crisis and the changes brought by globalization in many advanced economies have increased demand for granular information and, notably, for timely and consistent distributional information for the household sector. Whereas there has always been much focus on the stocks and flows taken from financial accounts, several initiatives have stressed the importance of looking at their underlying distributions. In 2009, an important step in this direction was the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz-Sen-Fitoussi Commission). In 2018, its successor, the High-Level Expert Group on the Measurement of Economic Performance and Social Progress, produced the reports *Beyond GDP – Measuring progress in a changing world and For Good Measure - Advancing research on well-being metrics beyond GDP* suggesting a move towards a broader dashboard of indicators that would reflect concerns such as the distribution of well-being and sustainability in all its dimensions.

---

[12] https://www.bancaditalia.it/statistiche/basi-dati/rdc/index.html?com.dotmarketing.htmlpage.language=1

The publication of the book by Piketty (2014) provided a further impulse to the analysis of distributive issues.

The G20 Data Gap Initiative has encouraged the production of distributional information on income, consumption, savings and wealth for the household sector (Recommendation 9). In 2016, Eurostat and the European Statistical System agreed in the Vienna Memorandum to work towards the same goal in close cooperation with the ECB, the ESCB and the OECD.

The compilation of household distributional results entails breaking down the aggregate measures for the household sector, as defined by the ESA, into more granular subsectors consisting of specific groups of households: these groups should take into account different breakdowns of income and wealth but also socio-economic characteristics such as job status and age. These distributional indicators should be consistent across income, consumption and wealth accounts, coherent with macroeconomic aggregates, and comparable over time and across countries.

The main microdata sources used to gather distributional information are sample surveys (see Section 7.3) and administrative records (see Yonzan et al., 2020 for an example of comparison between the two sources for top incomes). Such data are collected for different aims and generally display differences when compared with national accounts. These discrepancies should be reconciled in order to compute distributional indicators. A number of these differences can be relatively easily identified (e.g. definition of population and household sector, reference periods). Other issues may be more difficult to quantify and to adjust for: examples include different valuation concepts (self-assessment of surveyed households vs. international statistical standards adopted in national accounts), the effect of item non-response or response bias in the survey and the accuracy of some financial accounts' asset categories for which estimates are needed (e.g. unquoted shares held by households).

Distributional national accounts are still in their infancy. To date, only a few institutions produce official indicators relating to the distribution of household wealth. The Federal Reserve publishes the distribution of US household financial wealth using information from the Survey of Consumer Finances (SCF) and the financial accounts (Batty et al., 2019). Statistics Canada releases the Distributions of Household Economic Accounts (DHEA) using the Survey of Financial Security (SFS). The Australian Bureau of Statistics produces indicators of the distribution of the national accounts household income, consumption and wealth estimates, combining the macro-estimates and the ABS Survey of Income and Housing (SIH).

Besides these examples, various other projects are currently looking into the development of methodologies for compiling distributional results for specific parts of the sequence of accounts. For example, the OECD-Eurostat Expert Group on Disparities in a National Accounts framework (EG DNA) is focusing on income and consumption. Likewise, the scholars involved in the World Inequality Database (WID.world) started to study the distribution of income and are now extending the analysis to household wealth. In the euro area, the Expert Group on Distributional Financial Accounts (EG DFA, created by the STC) is trying to link Financial Accounts (FA) and Household Finance and Consumption Survey (HFCS). Results are expected by the end of 2022.

8. Conclusions

"Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?"
T.S. Eliot (1934)

Around 1995, the monetary and financial statistics of the countries that later joined the euro area differed profoundly. Differences existed in the population of the intermediaries that

produced the statistics, in the definition of the balance sheet aggregates, in the frequency of the statistics and in the deadlines for transmitting data to the central banks.

A quarter of a century later, the landscape has totally changed. Harmonized statistics are now routinely produced on the balance sheets of banks, central banks, money market funds, other categories of investment funds, financial vehicles, insurance corporations and pension funds. Surveys of bank interest rates on deposits and loans have also been harmonized and are an essential ingredient in monetary policy analysis and decisions. Quarterly financial accounts are available for euro-area countries. Granular databases are available for securities and, since 2018, for loans. In 2010, the first wave of the Household Finance and Consumption Survey (HFCS) was launched, and the third wave was completed in March 2020. In the last decade, the new supervisory architecture also brought significant changes in the statistics collected by central banks.

In the meantime, the 2007/2008 crisis highlighted the inadequacy of the information available for the prevention of systemic risk and the safeguarding of financial stability. On the impulse of the G20, the Financial Stability Board and the International Monetary Fund—together with all the main international organizations active in statistics (including the ECB and Eurostat) and with the key contribution of the G20 countries—coordinated the Data Gaps Initiative for filling the data gaps that emerged during the financial crisis in many different areas. More than ten years later, the second phase of the Initiative is concluding with significant achievements and a new Initiative is currently under discussion to deal with emerging data needs, also triggered by the information needs highlighted by the Covid-19 pandemic. Despite this progress, the agenda of Central Banks still includes challenging topics such as digitalization, globalization, and distributional accounts. Reliance on individual and granular data will increase, with the possible exploitation of administrative data and most probably of new sources—Big data—that will complement the classical sources of information for official statistics.

As Borio (2013) stated, "better statistics can no doubt be a big help in safeguarding financial stability; improvements are badly needed". That said, the main reason why crises occur is not a lack of statistics but the failure to interpret them correctly and to take remedial action. With all the benefits that better data may convey, one should not lose sight of the essential need for an interpretation of data.

Under a new guise, old debates about the role of data may resurface: discussing the role of measurement in physics, Thomas Kuhn, probably the greatest science historian of the 20th century, recalled Lord Kelvin's phrase placed on the façade of the Social Sciences building of the University of Chicago: *if you can't measure, your knowledge is scarce and insufficient*. Frank Knight, known mainly for the distinction between risk and uncertainty, quipped in retort that "if you cannot measure, measure anyhow" and that "when you can measure, your knowledge is also of a meagre and unsatisfactory sort" (on the controversy between Kelvin and Knight see Fischer, 2008). Knight thought that presenting economics and social sciences as disciplines related to natural sciences—where, according to Kelvin, measurement is essential—was a mistake. According to Knight, measurement is only an initial step in economic analysis. This explains why in central banks, statisticians interact with economists, legal scholars, historians and other experts. In this respect, interdisciplinarity remains crucial.

References

Ahmad N., J. Ribarsky and Reinsdorf M. (2017), "Can potential mismeasurement of the digital economy explain the post-crisis slowdown in GDP and productivity growth?" *OECD Statistics Working Papers,* November, Paris; OECD. Available at: https://www.oecd-ilibrary.org/docserver/a8e751b7-en.pdf?expires=1583394728&id=id&accname=ocid177425&checksum=5747E28680E929F37774C44493D16860

Angelini P., Nicoletti-Altimari S. and Visco I. (2012), "Macroprudential, Microprudential, and Monetary Policies: Conflicts, Complementarities and Trade-Offs", *Bank of Italy Occasional Paper,* n. 140, November, Rome: Bank of Italy. Available at: https://www.bancaditalia.it/pubblicazioni/qef/2012-0140/index.html?com.dotmarketing.htmlpage.language=1

Avdjiev S., Everett M., Lane P. and Shin H. S. (2018), "Tracking the international footprints of global firms", *BIS Quarterly Review*, March. Available at: https://www.bis.org/publ/qtrpdf/r_qt1803f.pdf

Baffi P. (1957), "Monetary Analysis in Italy", *IMF Staff Papers*, n. 5, February, Washington (DC): IMF.

Bakk-Simon K., Borgioli S., Giròn C., Hempell H., Maddaloni A., Recine F. and Rosati S. (2012), "Shadow Banking System in the Euro Area. An Overview", *ECB Occasional Paper Series*, n. 133, April, Frankfurt am Main: European Central Bank. Available at: https://www.ecb.europa.eu/pub/pdf/scpops/ecbocp133.pdf

Baffigi A., Cannari L. and D'Alessio G. (2016), "Fifty years of household income and wealth surveys: history, methods and future prospects", *Bank of Italy Occasional paper,* n. 368, Rome: Bank of Italy. Available at: https://www.bancaditalia.it/pubblicazioni/qef/2016-0368/index.html

Bartiloro L., Coletta M., De Bonis R. and Mercatanti A. (2012), "Household wealth in a cross-country perspective", in De Bonis R. and Pozzolo A. (eds.), *The financial systems of industrial countries. Evidence from financial accounts*, New York: Springer.

BCBS (2013), "Principles for effective risk data aggregation and risk reporting", *Basel Committee on Banking Supervision*, January. Available at: https://www.bis.org/publ/bcbs239.pdf

Batty M., Bricker J., Briggs J., Holmquist E., McIntosh S., Moore K., Nielsen E., Reber S., Shatto M., Sommer K., Sweeney T., and Henriques Volz A. (2019), "Introducing the distributional financial accounts of the United States", *Finance and economics discussion series divisions of research & statistics and monetary affairs,* Washington (DC): Federal Reserve Board, Available at: https://www.federalreserve.gov/econres/feds/files/2019017pap.pdf

Be Duc L. and Le Breton G. (2009), "Flow-of–funds analysis at the ECB. Framework and applications", *European Central Bank occasional paper series*, n. 105, Frankfurt am Main: European Central Bank, Occasional Paper Series. Available at: https://www.ecb.europa.eu/pub/pdf/scpops/ecbocp105.pdf

Bernanke B.S. (1983), "Non-monetary effects of the financial crisis in the propagation of the Great Depression", *American Economic Review*, 73 (3), pp. 257-276.

Bernanke B. S. and Blinder A. S. (1988), "Credit, money, and aggregate demand", *The American Economic Review*, 78 (2), *Papers and Proceedings,* May, pp. 435-439.

Bernanke B. S. and Gertler M. (1995), "Inside the black box: The credit channel of monetary policy transmission", *Journal of Economic Perspectives*, 9 (4), pp. 27–48.

Bholat D. (2013), "The future of central bank data", *Journal of Banking Regulation*, 14, pp. 185–194.

Biancotti C. and Ciocca P. (2019), "Opening internet monopolies to competition with data sharing mandates", *Peterson Institute for International Economics Policy Brief*, n. 19-3, Washington (DC): Peterson Institute for International Economics. Available at: https://www.piie.com/publications/policy-briefs/opening-internet-monopolies-competition-data-sharing-mandates

Biancotti C., Rosolia A., Veronese G., Kirchner R. and Mouriaux F. (2021a), "Covid-19 and official statistics: a wakeup call?", *Bank of Italy occasional paper,* n. 605, February, Rome: Bank of Italy. Available at: https://www.bancaditalia.it/pubblicazioni/qef/2021-0605/index.html?com.dotmarketing.htmlpage.language=1

Biancotti C., Borgogno O. and Veronese G. (2021b), "Principled data access: Building public-private data partnerships for better official statistics", *Bank of Italy Occasional paper,* n. 629, July, Rome: Bank of Italy. Available at: https://www.bancaditalia.it/pubblicazioni/qef/2021-0629/QEF_629_21.pdf?language_id=1

BIS (2014), "The credit-to-GDP gap and countercyclical capital buffers: questions and answers", *BIS Quarterly Review*, March. Available at: https://www.bis.org/publ/qtrpdf/r_qt1403g.pdf

BIS (2019), "Are post-crisis statistical initiatives completed?", *IFC Bulletin*, n. 49, January. Available at: https://www.bis.org/ifc/publ/ifcb49.htm

Borio C. (2013), "The Great Financial Crisis: Setting priorities for new statistics", *Journal of Banking Regulation*, 14, pp. 306–317.

Borio C. and Drehmann M. (2009), "Assessing the risk of banking crises – revisited", *Bank for International Settlements Quarterly Review*, March. Available at: https://www.bis.org/publ/qtrpdf/r_qt0903e.pdf

Buiter W. (2012), *The role of central banks in financial stability: How has it changed?*, *CEPR Discussion Paper Series,* n. 8780, January, London: CEPR. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1988710

Bull P. (2004), "The development of statistics for economic and monetary union", *European Central Bank*, July. Available at: https://www.ecb.europa.eu/pub/pdf/other/developmentstatisticsemu200406en.pdf

Carney M. (2014), "The need to focus a light on shadow banking is nigh", *Financial Times*, June 15. Available at: https://www.ft.com/content/3a1c5cbc-f088-11e3-8f3d-00144feabdc0

Cecchetti S. G., Fender I. and McGuire P. (2010), "Toward a global risk map"*, Central Bank statistics: What did the financial crisis change*, Frankfurt am Main: European Central Bank, 19-20 October. Available at: https://www.bis.org/publ/work309.pdf

CGFS, Committee on the Global Financial System (2012), "Improving the BIS international banking statistics", *CGFS Papers*, n. 47, November, Basel: BIS. Available at: https://www.bis.org/publ/cgfs47.pdf

Coletta M. and B. Zinni (2013), "Insurance corporations and pension funds in OECD countries", *Bank of Italy Occasional Paper*, n. 165, June, Rome: Bank of Italy. Available at: https://www.bancaditalia.it/pubblicazioni/qef/2013-0165/QEF_165.pdf

Constâncio V., "Past and future of the ECB monetary policy", *Central Banks in Historical Perspective: What Changed after the Financial Crisis?*, Valletta: Central Bank of Malta, 4 May. Available at: https://www.ecb.europa.eu/press/key/date/2018/html/ecb.sp180504.en.html

Copeland M. (1952), "A study of moneyflows in the United States", *National Bureau of Economic Research*, New York.

De Bonis R. and Gigliobianco A. (2005), "The origins of financial accounts in the United States and Italy: Copeland, Baffi, and the institutions"*, Financial Accounts: History, Methods, the Case of Italy and International Comparisons*, Rome: Bank of Italy, 1-2 December. Available at: https://www.bancaditalia.it/pubblicazioni/altri-atti-convegni/2005-conti-finanziari/financial_accounts_proceedings.pdf?language_id=1

De Bonis R. and Pozzolo A. (2012) (eds.), *The financial systems of industrial countries. Evidence from financial accounts*, New York: Springer.

Domingo Solans E. (2003), "The importance of Eurostat for the monetary policy of the European Central Bank", *Academic meeting on the occasion of the 50th anniversary of the Statistical Office of the European Communities*, Luxembourg, 16 May. Available at: https://www.ecb.europa.eu/press/key/date/2003/html/sp030516.en.html

Draghi M. (2012), "The monetary policy of the European Central Bank and its transmission in the euro area", *Opening of the academic year 2012-2013, Università Bocconi, Milan*, 15 November. Available at: https://www.ecb.europa.eu/press/key/date/2012/html/sp121115_1.en.html

Draghi M. (2016), "Welcome address". *Eighth ECB Statistics Conference: Central bank statistics: moving beyond the aggregates*, Frankfurt am Main: European Central Bank, 6 July. Available at: https://www.bis.org/review/r160707c.htm

Eliot T. S. (1934), "The Rock", Faber & Faber.

European Central Bank (2011a), "Keeping the ECB's monetary and financial statistics fit for use", *ECB Economic bulletin*, August, Frankfurt am Main: European Central Bank. Available at: https://www.ecb.europa.eu/pub/pdf/other/art1_mb201108en_pp63-75en.pdf?7e224935ef4f64bcefd621dce21eb48b

European Central Bank (2011b), "The financial crisis in the light of euro area accounts: a flow-of-funds perspective", *ECB Economic bulletin*, August, Frankfurt am Main: European Central Bank, October. Available at: https://www.ecb.europa.eu/pub/pdf/other/art3_mb201110en_pp99-120en.pdf

European Central Bank (2012), "A sectoral account perspective on imbalances in the euro area", *ECB Economic bulletin*, August, Frankfurt am Main: European Central Bank, February. Available at: https://www.ecb.europa.eu/pub/pdf/other/mb201202_focus03.en.pdf

European Commission (2012), "Scoreboard for the surveillance of macroeconomic imbalances: envisaged initial design", *European Commission occasional paper*, n. 92, February, Brussels: European Commission. Available at: https://ec.europa.eu/economy_finance/publications/occasional_paper/2012/pdf/ocp92_en.pdf

Eichner M. J., Kohn D. L. and Palumbo M. G. (2010), "Financial statistics for the United States and the crisis: What did they get right, what did they miss, and how should they change?", *Finance and Economic Discussion Series, 2010-20*, Washington (DC): Federal Reserve Board. Available at: https://www.nber.org/books-and-chapters/measuring-wealth-and-financial-intermediation-and-their-links-real-economy/financial-statistics-united-states-and-crisis-what-did-they-get-right-what-did-they-miss-and-how

Fenoaltea S. (2019), "Spleen: The failures of the cliometric school", *Bank of Italy economic history working papers*, n. 44, March, Rome: Bank of Italy.

Financial Stability Board and International Monetary Fund (2009), "The financial crisis and information gaps", *Report to the G-20 finance ministers and Central Bank governors*, October. Available at: https://www.fsb.org/wp-content/uploads/r_091029.pdf

Financial Stability Board (2011a), "Understanding financial linkages: A common data template for global systematically important banks, *Financial Stability Board consultation paper,* October, Basel: Financial Stability Board. Available at: https://www.fsb.org/2011/10/r_111006/

Financial Stability Board (2011b), "Shadow banking: Strengthening oversight and regulation recommendations of

the Financial Stability Board, October, Basel: Financial Stability Board. Available at: https://www.fsb.org/wp-content/uploads/r_111027a.pdf

Financial Stability Board and International Monetary Fund (2016), The financial crisis and information gaps - Second phase of the G-20 data gaps initiative (DGI-2) First Progress Report, September. Available at: https://www.fsb.org/wp-content/uploads/Second-phase-of-the-G20-Data-Gaps-Initiative-DGI-2-First-Progress-Report.pdf

Financial Stability Board (2019), "Global monitoring report on non-bank financial intermediation 2018", February. Available at: https://www.fsb.org/2019/02/global-monitoring-report-on-non-bank-financial-intermediation-2018/

Fischer S. (2008), "The crucial role of statistics for central banks: Present and future", *A strategic vision for statistics: challenges for the next 10 years*, Frankfurt am Main: European Central Bank, 24 April.

Friedman M. (1968), "The role of monetary policy", *American Economic Review*, 58, (1), pp. 1-17.

Gambacorta L. and Marques-Ibanez D. (2011), "The bank lending channel: Lessons from the crisis", *Economic Policy*, 26 (66), pp. 135-182.

Ghirelli C., Peñalosa J., Pérez J. and Urtasun A. (2019), "Some implications of new data sources for economic analysis and official statistics", *Bank of Spain Economic Bulletin*, 2, May, Madrid: Bank of Spain. Available at: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=2ahUKEwiImOHk5oLoAhUz4KYKHSm1B7IQFjACegQIBhAB&url=https%3A%2F%2Fwww.bde.es%2Ff%2Fwebbde%2FSES%2FSecciones%2FPublicaciones%2FInformesBoletinesRevistas%2FArticulosAnaliticos%2F19%2FT2%2Fdescargar%2FFiles%2Fbe1902-art15e.pdf&usg=AOvVaw02ntAN7lTwu5LJ6IQ6aD0P

Gonzalez-Paramo J. M. (2009), "National accounts for monetary policy making: Reflections on the use of the Euro Area Accounts in the light of the financial crisis", *Eurostat conference national account,* Brussels: European Commission, 16 September.

Guvenen F., Mataloni Jr. R. J., Rassier D. G. and Ruhl K. J. (2018), "Offshore Profit Shifting and Domestic Productivity Measurement", *mimeo*. Available at: https://fguvenendotcom.files.wordpress.com/2018/04/gmrr2018_v45.pdf

Haldane A. (2009), "Rethinking the financial network", *Financial Student Association*, Amsterdam, April. Available at: https://www.bis.org/review/r090505e.pdf

Hammer C., Kostroch D.C. and Quiros G. (2017), "Big Data: Potential, challenges and statistical implications", IMF Staff Discussion Notes, Washington (DC): IMF, September. Available at: https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2017/09/13/Big-Data-Potential-Challenges-and-Statistical-Implications-45106

Heath R. and Bese Goksu E. (2016), "G-20 Data Gaps Initiative II: Meeting the policy challenge", *IMF*, March. Available at: https://www.imf.org/en/Publications/WP/Issues/2016/12/31/G-20-Data-Gaps-Initiative-II-Meeting-the-Policy-Challenge-43760

IMF (2018a), "Final report of the task force on special purpose entities", October, Washington (DC): International Monetary Fund. Available at: https://www.imf.org/en/Publications/WP/Issues/2016/12/31/G-20-Data-Gaps-Initiative-II-Meeting-the-Policy-Challenge-43760

IMF (2018b), "Measuring the digital economy", *IMF policy papers*, April. Available at: https://www.imf.org/en/Publications/Policy-Papers/Issues/2018/04/03/022818-measuring-the-digital-economy

Israel J.M., Damia V., Bonci R. and Wafte G. (2017), *The analytical credit dataset. A magnifying glass for analyzing credit in the euro area*, ECB Occasional Paper, n. 187, April. Frankfurt am Main: European Central Bank. Available at: https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op187.en.pdf?f874f800842e7dbfd364fe4cfb7c60ea

Jackson C. and Michalek A. (2016), "Enhancing euro area data on loans to the private sector adjusted for sales and securitization", *Eighth IFC Conference on Statistical implications of the new financial landscape*, Basel, 8–9 September

Lamfalussy A. (1996), "The statistical requirements for monetary union", *European Monetary Institute*, July. Available at: https://www.bis.org/ifc/publ/ifcb43_h.pdf

Lautenschläger S. (2018), "20 years of ESCB statistics - past achievements and future challenges", *Ninth ECB Statistics Conference "20 years of ESCB statistics: What's next*, Frankfurt am Main: European Central Bank, 10 July. Available at: https://www.bis.org/review/r180719e.htm

Leontief W. (1971), "Theoretical assumptions and nonobserved facts", *American Economic Review*, 61 (1).

Lim C., Columba F., Costa A., Kongsamut P., Otani A., Saiyid M., Wezel T. and Wu H. (2011), "Macroprudential Policy: What instruments and how to use them? Lessons from country experiences", *IMF Working Paper,* n. 238, October, Washington (DC): International Monetary Fund. Available at: https://www.imf.org/external/pubs/ft/wp/2011/wp11238.pdf

Lipsey R. (2010), "Measuring the location of production in a world of intangible productive assets, FDI and intrafirm trade", *Review of Income and Wealth, International Association for Research in Income and Wealth*, vol. 56 (s1). Available at: https://www.nber.org/papers/w14121

Mankiw N. G. and Reis R. (2018), "Friedman's presidential address in the evolution of macroeconomic thought", *Journal of Economic Perspectives*, 32 (1), pp. 81-96.

Mishkin F.S. (1978), "The household balance sheet and the Great Depression", *Journal of Economic History,* 38, pp. 918-937.

Moulton B. and van de Ven P. (2018), "Addressing the challenges of globalization in national accounts" in *The challenges of globalization in the measurement of national accounts",* in Ahmad N., Moulton B., Richardson J.D., and van de Ven P. (eds.). Available at: https://conference.nber.org/conf_papers/f100570.pdf

OECD (2017), *Understanding financial accounts, in* Van de Ven P. and Fano D. (eds), November. Available at: https://www.oecd-ilibrary.org/economics/understanding-financial-accounts_9789264281288-en;jsessionid=bnqZ-iyZZilnc6oJvGty7HDI.ip-10-240-5-113

Palumbo M. G. and Parker J. A. (2009), "The integrated financial and real system of national accounts for the Unites States: Does it presage the financial crisis?", *America Economic Review, Papers & Proceedings*, 99 (2), pp. 80-86.

Papademos L. D. and Stark J. (2010) (eds.), *Enhancing monetary analysis*, Frankfurt am Main: European Central Bank.

Pellegrini V., Sanelli A. and Tosti E. (2016), "What do external statistics tell us about undeclared assets held abroad and tax evasion?", *Bank of Italy Occasional Papers*, n. 367, Rome: Bank of Italy.

Piketty T. (2014), *Capital in the twenty-first century,* Cambridge (MA): Harvard University Press.

Ponsart M. and Salvio A. (2018), "Investment funds in the euro area: an uneven dynamic since 2009", *Bank of France Bulletin*, 216/2, March-April, Paris: Bank of France. Available at: https://publications.banque-france.fr/sites/default/files/medias/documents/818140_bdf216-2_en_final_web.pdf

Rajan R. (2005), "Has financial development made the world riskier?", *Economic Policy Symposium - Jackson Hole, Federal Reserve Bank of Kansas City*, August. Available at: https://www.nber.org/papers/w11728

Rose A. K. and M. M. Spiegel (2009), *Cross-Country Causes and Consequences of the 2008 Crisis: Early Warning*, NBER Working Paper 15357, September.

Rossi S. (2010), "Aspects of Italian Economic Policy from the 1992-93 Crisis to the Crisis of 2008-09*",* speech at the study day in honour of Guido Maria Rey, Rome, 5 March. Available at: https://www.bancaditalia.it/pubblicazioni/interventi-vari/int-var-2010/en-rossi-050310.pdf?language_id=1

Schumpeter J.A. (1912), *Theorie der wirtschaftlichen Entwicklung*, Leipzig: Dunker & Humblot.

Signorini L. F. (2015), "Italian households' income and wealth*,* Opening address", *Conference on The Bank of Italy's analysis of household finances - Fifty years of the survey on household income and wealth and the Financial accounts*, Rome: Bank of Italy, 3-4 December. Available at: https://www.bancaditalia.it/pubblicazioni/interventi-direttorio/int-dir-2015/signorini_03122015.pdf

Stapel-Weber S., Konijn P., Verrinder J. and Nijmeijer H. (2018), "Meaningful information for domestic economies in the light of globalization – will additional macroeconomic indicators and different presentations shed light?", *NBER Working Paper*, n. 24859, Cambridge (MA): National Bureau of Economic Research. Available at: https://www.nber.org/papers/w24859

Tarashev N., Borio C. and Tsatsaronis K. (2009), "The systemic importance of financial institutions", *Bank for International Settlements Quarterly Review*, September. Basel: Bank for International Settlements. Available at: https://www.bis.org/publ/qtrpdf/r_qt0909h.pdf

Tedeschi, R. (2018), "The Irish GDP in 2016. After the disaster comes a dilemma", *Bank of Italy Occasional Paper*, n. 471, December, Rome: Bank of Italy. Available at: https://www.bancaditalia.it/pubblicazioni/qef/2018-0471/index.html?com.dotmarketing.htmlpage.language=1

Tissot B. (2016), "Globalisation and financial stability risks: is the residency-based approach of the national accounts old-fashioned?", *BIS Working* Paper, n. 587, October, Basel: Bank for International Settlements. Available at: https://www.bis.org/publ/work587.pdf

Tobin, J. (1952), "Monetary theory. Asset holding and spending decisions", *American Economic Review Papers and Proceedings*, 42, May.

Tobin J. (1961), "Monetary theory: New and old looks. Money, capital and other stores of values", *American Economic Review Papers and Proceedings*, 51, May.

Tobin, J. (1963), "Commercial banks as creators of money", in D. Carson (ed.), *Banking and Monetary Studies*, Richard D. Irwin III, Homewood.

Tracy J. (2016), "FSB working group on data gaps implementation*", Presentation at the 41st IOSCO Annual Conference*, Lima, May. Available at: https://www.iosco.org/library/annual_conferences/pdf/41/JosephTracyDATA-Workshop3.pdf

Visco I. (2015), "Fifty years of the survey on household income and wealth and the financial accounts", *conference on the bank of Italy's analysis of household finances - Fifty years of the survey on household income and wealth and the financial accounts,* Rome: Bank of Italy, 3-4 December 2015. Available at: https://www.bancaditalia.it/pubblicazioni/interventi-governatore/integov2015/Visco-SHIW-04122015.pdf

Yonzan N., Milanovic B., Morelli S., and Gornick J. (2020), "Drawing a line: Comparing the estimation of top incomes between tax data and household survey data", *Stone center on socio-economic inequality working paper series*,

n. 27, December, New York: Stone center on socio-economic inequality.

Zucman G. (2015), *The hidden wealth of nations. The scourge of tax havens,* Chicago: The University of Chicago Press.