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A SILENT REVOLUTION
HOW CENTRAL BANK STATISTICS HAVE CHANGED IN THE LAST 25 YEARS

by 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 of a century. First we illustrate the work that led to a brand new set of central bank statistics for the implementation of common monetary policy in the euro area. We then focus on the most significant developments caused by the financial crisis and by the institutional changes that accompanied it. The final part looks at the challenges lying ahead for official statistics, namely how to deal with digitalization and globalization.

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1. Introduction[*]

All central banks traditionally 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 the statistical function 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 on banking (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 adds that far from being an outlier, this reaction reflected a common preference among central bankers at that time for parsimonious data collections.

The Bank of Italy followed a different road, as '[s]tatistical collection was conceived as closely connected with the needs of economic analysis from the outset' (Visco, 2015). Bonaldo Stringher was Director General of the Bank of Italy since 1900 and then its first Governor from 1928 to 1930. Stringher was a statistician and introduced in the Bank the idea of the importance of data for monetary policy (Signorini, 2017). 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, a former pupil of the professor of statistics Giorgio Mortara, gave a great 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-Gigliobianco, 2005) while the Survey on Household Income and Wealth (SHIW) started in 1965 (Signorini, 2015; Baffigi et al. 2016). A gradual enhancement of statistical data collection took place over the following decades, taking into account the needs of different users, with other significant milestones along the way. The integrated reporting scheme for statistics data collection (the 'Matrice dei Conti') was introduced in 1989 for banks and subsequently also for other financial intermediaries.

Institutional and economic developments over the last quarter of a century, however, have increased commonalities among central bank statistics. The statistical function of central banks in much of Europe was significantly transformed by a momentous institutional change (the creation of the euro area) that led, under the banner of harmonization, to what has been called 'a silent revolution' (Domingo Solans, 2003). 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 monetary, financial and external statistics has been gradually enriched over the years, with many of the financial subsectors envisaged in the system of national accounts - ESA 2010 - reporting harmonized data under an ECB Regulation. In this context, the old claim by Leontief (1971) that non-comparable data are unnecessary rings particularly true.

A second driver of statistical transformation came with the global financial crisis, starting in 2007. While European countries were well equipped overall - and the work already done during the harmonization process came in handy for quickly filling a significant part of the information gaps highlighted by the financial crisis – there were still unsatisfied information needs in other countries. Efforts were concentrated on two main issues: (i) collecting more granular (and harmonized) 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).

A final driver for transformation 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, also triggering a reflection on the potential for some streamlining of European data collection as a whole, along the lines drawn by the Bank of Italy more than thirty years ago (Signorini, 2018).

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 and globalization. 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.

This paper is accordingly split into three parts, where we adopt different perspectives, reflecting the different 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. In the first part, we follow these developments across the various monetary and financial statistics domains, focusing on the set-up stage but also providing a few sketches of the more recent evolution of each specific domain. 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. The final part looks at the most pressing challenges lying ahead for official statistics. More in detail, Sections 2-6 summarize the changes in banking statistics (the building block for monetary and credit aggregates), the new data collected on bank interest rates and on non-bank financial intermediaries and financial markets, and the progress achieved in the euro area's quarterly financial accounts. However, we will not examine the developments in the balance of payments (BoP) statistics, as responsibility for compilation of these statistics in Europe is split between national statistical institutes and national central banks. The standards for statistics on the transactions and positions between an economy and the rest of the world instead are defined in the BoP Manual by the International Monetary Fund.[1] We will discuss BoP statistics, however, when addressing the challenges that globalization poses to official statistics.[2]

Section 7 looks at the data needs triggered by the financial crisis, describing the statistical requirements produced by the new institutional architecture in Europe as well those defined as a global response to the crisis. We also discuss here the need for granular data, increased by the financial crisis,[3] and the main characteristics of the Household Finance and Consumption Survey (HFCS). Section 8 illustrates the main challenges that central bank statistics will face in the near future. Section 9 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

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[1] The sixth edition of the Balance of Payments and International Investment Position Manual (BPM6) was issued in 2008 and updated the fifth edition published in 1993. The overall framework of the fifth edition was still considered adequate, although the current edition obviously incorporates numerous improvements and updates.
[2] A detailed description is included in this [BoP Manual,](#) prepared by the Bank of Italy.
[3] https://www.ecb.europa.eu/press/key/date/2016/html/sp160706.en.html

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). The popularity of monetary aggregates has grown since the 1980s: the Federal Reserve's anti-inflationary policy, inaugurated by Chairman Paul Volcker, was driven by the recognition that inflation is a monetary phenomenon in the long term, and that price stability is a key objective for the central banks to pursue,[4] despite the fact that the Fed confirmed the dual mandate of its statute. Indeed, 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. As per the credit aggregates, central banks traditionally disseminate statistics on these aggregates due to the influence of credit on the real economy (in a tradition dating back to Schumpeter, 1912) and to the recognition of a similar influence on financial stability (BIS, 2014). The EMI's focus on monetary aggregates was also strongly influenced by the tradition at the Bundesbank (Constâncio, 2018), probably the central bank in Europe with the best performance in keeping inflation under control after World War II.

The complexity of this preliminary work cannot be underestimated: when the EMI was established in 1994, European banking statistics – which are the basic components of monetary and credit aggregates - resembled the Tower of Babel. Across countries, there were differences in the *definition of banks* 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 (the Bank of Italy even collected some selected items from banking balance sheets every ten days and it continues to do so) 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 for others the process took longer. Not surprisingly, the *definitions of money and the money-making 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

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[4] 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'.

policy strategy had to wait for the birth of the ECB.[5] 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-making sector. MFIs are institutions that collect deposits and/or close substitutes of deposits and that grant loans and/or invest in securities. MFIs include central banks, banks, money market funds and other institutions that collect deposits and 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 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 a bank is. This choice was also made possible by the joint decision of Eurostat and the European Monetary Institute in 1995 to identify MFIs as a separate institutional sector in the version of the European System of Accounts released that year (ESA 95).

Central banks were already largely disseminating information on their assets, as publishing financial statements is part of their accountability. Note that without data on central banks' balance sheets, the general public would have no idea of the size of some of the unconventional monetary policy measures adopted in the last few years, to give just one example. 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.

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 and statistical 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.

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[5] The harmonization of monetary and banking statistics was assigned to working groups attended by all interested central banks, which ended their activities in May 1998, just before the establishment of the European Central Bank in June 1998, and just six months before the launch of the single monetary policy in January 1999. The central banks of the ten countries that became members of the euro area at its launch began to submit harmonized statistics in July 1998, with back-data since 1995 to provide the ECB with at least some time series for policy analysis at its inception.

Finally, the definition of MFIs 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 relevant for monetary policy. Some examples are electronic money institutes and public institutions such as *Cassa Depositi and Prestiti* in Italy, *Kreditanstalt für Wiederaufbau* in Germany and *Caisse des dépôts et consignations* in France.

Monetary and credit aggregates are then achieved through the consolidation of MFI balance sheets, in particular by eliminating interbank positions and those between central banks, banks and money market funds.

The Eurosystem chose to collect the monthly balance sheets of MFIs with a coverage of at least 95 per cent of each country's banking total assets. Most countries, including Italy, opted for a full coverage of the reporting population. The deadline for national central banks (NCBs) for sending these data to the ECB was set at 15 working days after the reference date, marking a clear progress compared with most national situations. Deadlines for internal reporting from banks to NCBs were, instead, left to national discretion.

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). Details included the residence of the counterparty and quarterly information by currency and country that allow the international role of the euro and the degree of financial integration achieved in the euro area to be explored, a key objective of the European Union (for analyses of euro-area banks using these data see Affinito et al., 2003, and De Bonis et al., 2012).

Due to the historical reasons mentioned in the Introduction, Italy was well positioned for all this work. Since the end of the 1980s, banks were transmitting highly granular data to the Central Bank used for supervisory activity and for compiling statistical aggregates. Statistical returns included details on maturity, currency denomination, and counterpart sector and country, a richness of data that was unparalleled in most countries.

This was the original setup when national central banks started collecting MFI statistics in 1998. 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/sole proprietors) - 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). First, MFIs had to provide information on transactions (repos) conducted with Central Counterparties (CCPs). Second, consumer households and sole producers were identified

separately, in light of the relevance of the latter in many economies (including Italy). Third, 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. Finally, loans offered via credit cards were split into two parts: 'convenience credit', a deferment of payment for which the intermediary does not receive interest, and 'extended credit', on which the borrower often pays higher interest rates. New statistical requirements also included separate evidence to identify loans whose interest rate conditions are variable or, although fixed, can be modified in a given interval of time. This additional information provides users with a key element to assess the time potentially needed for policy rate changes to pass through to loan rates.

New data also included information from MFIs on monthly and quarterly securitization flows to address the problems that these transactions were posing - for financial stability, as proved, at least in the US, by the financial crisis - but also, from a statistical point of view, for measuring effective loan growth rates. The availability of these data was essential to produce meaningful monetary and financial statistics, by correcting potential distortions arising from loan securitizations and sales (Jackson - Michalek, 2016).

New data included the counterparty sector and the debtor's residence, the securities linked to the securitizations held by the banks, the purpose of the loan sold (mortgages, consumer credit) and its duration. This phenomenon was also the object of a separate ECB Regulation (ECB/2013/40) aimed at collecting statistics on the assets and liabilities of financial vehicle corporations engaged in securitization transactions (see Section 4).[6]

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 - that were first conceived almost immediately after the euro-area statistical 'big bang' - was more complex than that

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[6] In January 2015, the entry into force of Regulation ECB/2013/33, following the transposition of the ESA2010, resulted in the reclassification of holding companies from the 'non-financial corporations' sector to the 'other financial institutions' sector. Moreover, since December 2017, banks' repurchased bonds have been excluded from the 'debt securities issued' on the liability side and 'securities other than shares' on the asset side.

of MFIs' balance sheets. While all central banks collected regularly 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 relevant 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; these data were collected based on definitions in two European Union Directives (Consumer Credit Directive and Mortgage Credit Directive). 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 loans 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. Interest rates on overdrafts are not included when computing data on "new businesses" but are included in the calculation of harmonized rates on outstanding amounts.

Data collection was gradually enriched in this case too: since June 2010, the total number of monthly interest rates time series has risen to 101 (87 on new transactions and 14 on stocks). The additional statistics provide, for example, 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 sole proprietors and on rates for credit

card loans. Today, MFI 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.

To ensure the representativeness of the rates statistics collected via a probabilistic sample, the ECB established precise criteria defined in the Regulation on MFI interest rates (MIR). They currently[7] prescribe that the minimum national sample size must be such that the maximum random error (in case of probabilistic sampling) and the synthetic[8] mean absolute error (in the case of the selection of the largest institutions within a stratum) are contained within pre-defined thresholds. In Italy, the sample is stratified according to the size and location of the intermediaries and included 72 banks as of mid-2018, covering 85 per cent of total deposits and loans. The intense methodological work carried out to ensure the representativeness of the reporting sample, to guarantee the continuity of the time series and to measure estimation errors provides further references to these statistics (Battipaglia and Bolognesi, 2003, Cau et al., 2006, Stacchini 2007, ECB 2017, and Liberati-Stacchini 2018).

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 MFIs, but long before the financial crisis highlighted the

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[7] Back in 2003, the minimum criterion was that the Eurosystem's national central banks must collect statistics from a sample of banks covering at least 75 per cent of deposits and loans or, alternatively, that sampling in individual countries should ensure that the sample error is contained in 10 basis points at a probability level of 90 per cent.

[8] The mean absolute error (MAE) depends on the volatility and magnitude of each interest rate series. 'Some series could have a higher MAE, which could be due indirectly to the magnitude of the interest rates, rather than to their relative level of dispersion. Moreover, since each individual series would have a different MAE, it could be very difficult to establish an overall boundary that would be representative for each particular country and series. In addition, series with a high MAE but a low volume might distort the overall interpretation. A possible solution for overcoming the problem of having an individual MAE for each particular series and at the same time providing a single MAE figure would be to construct a synthetic MAE by weighting each series by its respective volume and dividing it by its interest rate', ECB (2013).

problems potentially arising from the so-called *shadow banking system*, the euro area was already working towards collecting statistics on financial intermediaries other than MFIs. This interest stemmed at that time mainly from the need to control monetary and credit aggregates, as households and businesses can easily replace MFI deposits and loans with instruments offered by other intermediaries. Although the shadow banking system is smaller in Europe than in the United States, the financial crisis provided additional motivation for collecting data on the activities of non-banking intermediaries (Bakk-Simon et al. 2012; FSB 2011b, 2018).

Non-bank intermediaries different from central banks and money market funds (that are part of the MFI sector as banks, see Section 2) can be broadly distinguished - following the classification in the European System of Accounts 2010 - into six categories (Table 1).

Table 1

S124	Non Money-Market Investment Funds
S125	Other Financial Intermediaries
S126	Financial Auxiliaries
S127	Captive financial institutions and money lenders
S128	Insurance Corporations
S129	Pension Funds

Data for some of these intermediaries are collected according to ECB Regulations (directly applicable to reporting agents) while other data are collected based only on ECB Guidelines (which are only compulsory for national central banks).

Investment funds different from money market funds are the most important non-bank intermediaries in the euro area from a quantitative point of view and their data are collected according to a Regulation (first approved in 2008 and then recast in 2013; ECB/2013/38). The data that NCBs send to the ECB include six categories of funds: equity, bond, mixed, real estate, speculative (hedge funds), and others. The statistics have a monthly or quarterly frequency, depending on the phenomenon examined, and consider, for the six categories mentioned, both open-end funds and closed-end funds (the latter also include venture capital companies and private equity funds; Ponsart and Salvio, 2018). In 2019 in the euro area, equity bonds had a market share of 27 per cent; bond funds accounted for 29 per cent, mixed funds for 25 per cent, real estate funds for 6 per cent, hedge funds for 4 per cent and the residual category for 9 per cent.

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, collected according to an ECB Regulation. In the euro area, as of end-2018, financial vehicle corporations had slightly less than 4 per cent of the total assets held by all the financial companies and equal to 8.5 per cent of those of non-bank intermediaries. About half of securitized loans have households as a counterparty sector while the share of corporate loans is 20 per cent (10 per cent in 2011). Finally, the special purpose vehicles report detailed information on the asset-backed securities issued.

As for 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 – data are collected according to an ECB Guideline. The lack of urgency for the complete harmonization of statistics for these intermediaries was also due to their limited weight in the euro area (less than 2 per cent of total assets among non-bank intermediaries as of end-2018), as well as their heterogeneous importance across countries. In turn, 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.

Financial auxiliaries consist of all resident corporations and quasi-corporations engaged primarily in activities closely related to financial intermediation but which do not themselves perform an intermediation role. They therefore have an ancillary role in the financial system.

As for captive financial institutions and money lenders, the revision of the system of national accounts in Europe, ESA 2010 (2013) expanded the definition of the financial corporations sector to include this new sub-sector, consisting of all 'financial corporations and quasi-corporations which are neither engaged in financial intermediation nor in providing financial auxiliary services, and where most of either their assets or their liabilities are not transacted on open markets'.[9]

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

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[9] This subsector includes, for example, legal entities such as trusts, estates, or brass plate companies; holding companies that hold controlling positions in the equity of a group of subsidiary corporations and whose principal activity is owning the group without providing any other service to the businesses; SPEs that qualify as institutional entities and raise funds in open markets to be used by their parent entity; and sovereign wealth funds, if they are classified as financial corporations.

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). In turn, insurance corporations and pension funds are also important institutional investors in the euro area: as of end-2018, their asset portfolio included debt securities (42 per cent), mutual fund shares (25 per cent), shares and other equity (10.6 per cent). The total assets of pension funds, at €2,600 billion, as of end-2018, were about one third of those of insurance companies and were also invested primarily in investment funds shares (47 per cent) and debt securities (26 per cent). The liability side, not surprising, is mainly made up of insurance technical reserves (76 per cent, of which 69 per cent reserves for life insurance) and pension entitlements (91 per cent), respectively for insurance and pension funds.

The Eurosystem collects quarterly statistics on both insurance and pension funds, covering the main asset and liability items. The development of insurance statistics is an interesting twist in the history of euro area monetary and financial statistics: after a first phase, where data from insurance and pension funds were collected together based on an ECB Guideline, it was decided to collect data under a Regulation, as for the other main financial sub-sectors, starting with insurance corporations. Responsibility for these statistics moved from Eurostat to the ECB. However, in order to minimize the reporting burden on the insurance industry, the ECB Regulation entered into force in 2014 (ECB/2014/50), which allowed national central banks to derive the necessary statistical information, as far as possible, from data reported for supervisory purposes under the EU's Solvency II framework. As some additional data were needed for statistical purposes, over and above the supervisory requirements, the regulation also included the 'ECB add-ons'.

The approach for pension funds followed a similar path four years later. To minimize the reporting burden for the industry, the European Insurance and Occupational Pensions Authority (EIOPA) and the ECB have cooperated closely to maximize on these overlaps when preparing the definitions, methodological framework and transmission format for both statistical reporting and supervisory reporting. This effort led to Recommendation ECB/2018/2, which also includes 'ECB add-ons', in this case for pension funds.

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 MNEs (see Section 8.2), 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 (Federal Reserve Board, 1959). 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 analysing 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). The production of quarterly financial accounts has been difficult, as in many countries, the underlying

information was missing or incomplete. Overall NCBs send more than 6,000 historical series relating to financial accounts to the ECB each quarter.

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).

The Eurosystem is ushering in the adoption of the 'from whom to whom' criterion, which allows us to identify not only the issuer but also the holder of a financial instrument. The rationale is that the potentially inflationary content of an expansion of financial instruments, such as deposits or bonds issued by banks, is different, according to whether their holders are households or non-financial corporations.

6.   Wrapping up: a silent revolution.

'It was the best of times, it was the worst of times'
C. Dickens (1859)

This summary, though long, helps to understand the range of dimensions in which harmonization in statistics has been carried out over the last 25 years and the profound impact that this choice has had, even for countries with developed statistical systems.

The Eurosystem has collected, analysed and made available to the public a large volume of new financial statistics, covering banks, central banks, money market funds, other investment funds, securitization vehicles, bank interest rates, financial accounts and financial markets: the *silent revolution* we mentioned in the Introduction. All these Eurosystem statistics, produced according to international standards, are required to satisfy high quality requirements.

To give an idea of the effort required, the time series transmitted by the Bank of Italy (as one of the euro area NCBs) to the ECB have progressively risen, from around 600 in 1998 to over 13,000 in 2011, to around 22,000 in 2020 and data dissemination to the general public has increased as well.[10]

7. Then came the financial crisis …

'More data certainly needs to be collected on the magnitude of these risks'.
(R. Rajan, 2005)[11]

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 the financial intermediaries in order of importance and survey data for households and enterprises. Two important additions to this design were: a) the financial crisis and the ensuing new data needs; and b) the development of granular databases, which was already ongoing in the Eurosystem but that went to a very different scale with the launch of the AnaCredit project.

7.1 New data needs: the ESRB and the SSM

With the financial crisis, the statistical function of the European System of Central Banks further expanded its 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 first and main driver was the changing institutional landscape in the field of micro and macroprudential supervision with the design of new supervisory architecture, consisting of three European supervisory authorities and a board for monitoring systemic risks. 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.

The European Systemic Risk Board (ESRB), the body responsible for controlling systemic risk, has been active since January 2011. The ESRB - to which the ECB provides a secretarial function,

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[10] The ECB normally presents aggregates referring to the euro area. National central banks disseminate data from individual countries to allow comparisons. An application is available on the websites of the ECB and the NCBs– euro area statistics - which enables comparison between the data of the individual countries and information on the euro area for hundreds of historical series. Data are also available in the Statistical DataWarehouse of the ECB. Italian data are available in the Base Dati Statistica application of the Bank of Italy.

[11] 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).

which extends to the collection of statistics - 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.

The ESRB has no statistical power vis-à-vis intermediaries - unlike national central banks and the ECB - and must go through complex procedures to obtain the data it needs, raising sensitive issues about the circulation of information among the ECB, NCBs, the EBA, the ESRB and national bodies responsible for supervision. Still, its recommendations may be conducive to the collection of new data as in the case of the Recommendation of the ESRB 'on closing real estate data gaps' (ESRB/2016/14).

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 the theoretical framework(s) were clear at least, with 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 less settled (Angelini, Nicoletti-Altimari and Visco, 2012; Buiter, 2012; Lim et al., 2011).

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 (on the implementation of the rules, see Signorini, 2012). With the Capital Requirements Directive (CRD) IV, the European Commission mandated the EBA to develop Implementing Technical Standards (ITSs) relating to supervisory reporting requirements. The EBA Implementing Technical Standard for FINREP and COREP - respectively the financial reporting schemes and the common reporting 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 (Figure 1).[12]

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[12] The statistics are based on information collected in accordance with the Implementing Technical Standards (ITSs) on Supervisory Reporting laid down by European Commission Implementing Regulation (EU) No 680/2014 and the ECB Regulation on the reporting of supervisory financial information (ECB/2015/13).

Figure 1
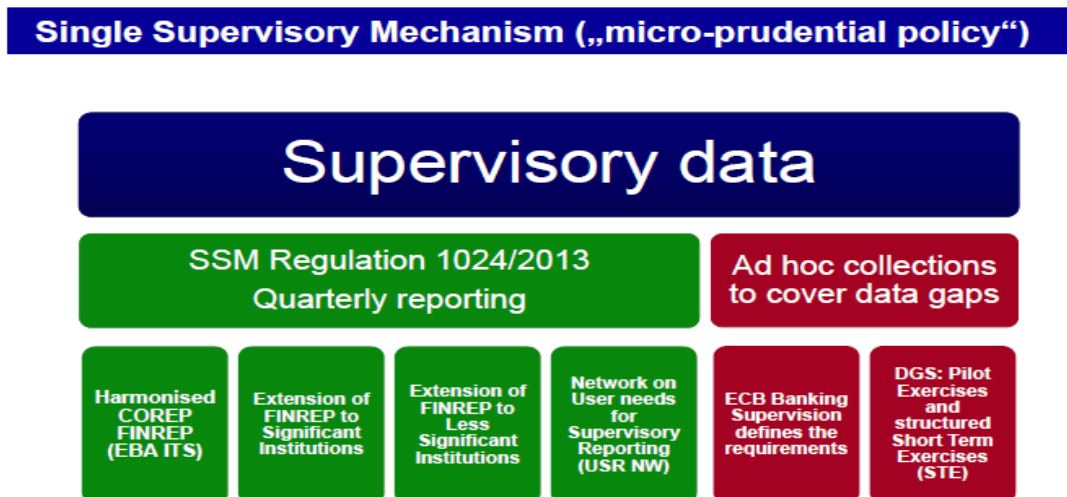
Source: ECB

The supervisory banking statistics sent to the ECB contain information on banks designated as significant and less significant institutions and include information on balance sheets' composition and profitability, capital adequacy and leverage, asset quality, funding and liquidity.[13]

Two notable consequences of this reform package were the common 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. Tellingly, different reporting schemes had to be developed for financial reporting (FINREP), depending on the accounting principles that reporting agents have to comply with in each jurisdiction.

The definition of a sizeable *corpus* of supervisory statistics at the European level, together with the increasing request for more granular data originating from the financial crisis (see Section 7.3), and the fact that national reporting schemes largely remained in force, raised the issue of how to lighten the reporting burden for the intermediaries, now that they were facing so many different requests (from different domains and at both the European and the domestic level). The Bank of Italy addressed this issue some thirty years ago at national level. As it collected statistics for all its institutional activities - monetary policy, banking supervision and monitoring of the payment system – in 1989, it decided to coordinate the information needs of the various functions, so as to ensure

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[13] The ESCB also maintains, in the *Register of Institutions and Assets* (RIAD), a map of banking groups in the euro area. The European Statistical System analogously maintains a register of industrial and banking groups in the *Euro Group Register*.

uniform management of statistical data via a unique reporting scheme and a common statistical dictionary (the 'integrated approach'). The objective was to ensure consistency in the definition of concepts and to avoid redundancy in the request for information from intermediaries as well as to provide banks with a solid information base for their managerial choices, an aspect that was not be taken for granted back then.[14]

An integrated approach is justified by the existence of complementarity among the different functions of a central bank.[15] The Bank of Italy's approach to the collection of statistics has proved successful and it has been followed, with some differences, by other countries. A model similar to the Italian one is also under development for the whole ESCB. As stated on the ECB's website, 'the long-term approach of the European System of Central Banks (ESCB) and its Statistics Committee (STC) to collecting data from banks aims to standardise, harmonise and integrate existing ESCB statistical frameworks, as far as is possible, across domains and countries. The main objective of this approach is to increase the efficiency of reporting and to reduce the burden for banks … [o]ne element of this strategic approach – the ESCB Integrated Reporting Framework (IReF) – aims to integrate banks' statistical reporting requirements. The other element – the Banks' Integrated Reporting Dictionary (BIRD) – aims to help reporting agents efficiently organise information stored in their internal systems and fulfil their reporting requirements'. A key obstacle in the pursuit of the integrated approach is related to the fact that 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.

7.2   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)

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[14] Signorini (2018) recalls that a key role in this passage to an integrated approach was played by the then Deputy Director General, Tommaso Padoa-Schioppa.

[15] The use of supervisory data for statistical and economic analysis purposes is normal practice in central banks, which are also responsible for the supervisory function. It is more complex in countries where banking supervision is not assigned to the central bank.

While it is difficult to argue that more data would have prevented the financial crisis of 2007-09, it can be more safely claimed, however, that the availability of more information would have undoubtedly facilitated the management of the crisis and the intervention of policymakers.[16]

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 analyse the information gaps, identifying priorities and suggesting steps to be taken (FSB and IMF, 2009, 2016; Heath - 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'.

Indeed, 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[17] (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. Analysing connections between international financial networks required the collection of new data on Global Systematically Important Financial Institutions or G-SIFIs,[18] as well as on non-bank intermediaries, cross-border transactions, portfolio investments and international banking activity (CGFS, 2012). 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

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[16] Borio (2013) summarizes this position as follows: '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'.

[17] On the American financial accounts and the information needs induced by the crisis, see Eichner, Kohn and Palumbo (2010).

[18] 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.

(Cecchetti et al., 2010). It took several years but, thanks to the efforts of central banks and supervisory authorities led by the FSB, very granular and timely[19] data are now available on the activities and mutual relationships of Global Systemically Important Banks, or G-SIBS (FSB 2011a, Tracy 2016). Some of these data will also be made available, with due respect for data confidentiality, to international financial organizations with a financial stability mandate such as the IMF, the FSB and the BIS.

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) take into account, 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) is to implement 'the regular collection and dissemination of *comparable*, timely, *integrated*, high quality, and *standardized* statistics for policy use' (FSB-IMF, 2016, italics added). 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); OTC data[20]). 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

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[19] A significant aspect that emerged with the crisis concerns the frequency and timeliness of reports. In some cases, the authorities have requested daily or weekly reports from the banks, with a delay of one, two or three days from the reference date. These innovations involve considerable revisions to the data management procedures of the banks.

[20] Here, the emphasis is currently 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).

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 ones, that are not headquarters to 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. Reaching a truly global view in statistics is, however, a daunting task as it may involve sensitive issues such as data sharing across borders.

7.3   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 - from central credit registers and central balance sheet offices, for example - 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.[21]

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[21] The results of these and similar analyses were routinely reported in the half-yearly *Financial Stability Report*.

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 to 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). The survey provides information on households' behaviour, 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 analyse 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.

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: anonymised 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.

A stronger move towards granular data was the AnaCredit project launched in 2011.[22] 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. User consultations brought a list

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[22] Before that, in order to improve monetary analysis, the European Central Bank decided in 2012 to request balance sheet data from *individual monetary financial institutions*. The NCBs have therefore provided the ECB with individual data from the main European banks as the exchange of confidential data within the European System of Central Banks (ESCB) is allowed for the performance of the ESCB's tasks as listed in the Treaty establishing the European Community.

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' (and beyond means..), to quote the title of the 8th Statistics Conference organized by the ECB in July 2016. More granular information means more analytical capability as well as the possibility to quickly satisfy the information needs of users but it also means that satisfying these needs does not trigger new data requests, with benefits for the reporting agents. It is obvious that these developments were also made possible by significant progress in the capability of central banks in collecting, checking and aggregating such a huge amount of information, taking advantage of advances in information technology.

Before addressing loans, granular data collection focused on securities: the ESCB now 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.[23]

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 will shortly be available on securities financing transactions (SFTR).

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.

Addressing legal barriers and confidentiality issues, sometimes deeply rooted in national legislation, is, at the same time, a key part of the work needed to achieve a comprehensive view of financial phenomena and an area where national statisticians tread uneasily, for various and often good reasons. International initiatives may be instrumental in this effort by favouring the sharing of best practices, innovative solutions and, more generally, by facilitating a broader discussion on these issues. The work done in the DGI with the endorsement of a recommendation devoted exclusively to data sharing[24] is a good example of this attempt. A concrete experience is the International Network

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[23] The CSBD project started in 2002 and the SHSDB in 2013.

[24] Recommendation 20 of the G-20 Data Gaps Initiative 2, led by the IMF and FSB, calls for 'G-20 economies … to increase the sharing and accessibility of granular data'.

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, with the overall aim of exchanging experiences on the statistical handling of granular data for research purposes.

With all the benefits that granular data may convey, one should not forget the possible pitfalls of an excessive reliance on them, above all to not lose sight of the essential need for an economic 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, joked about Kelvin's sentence, claiming that 'If you cannot measure, measure anyhow' and that 'when you can measure, your knowledge is also of a meagre and unsatisfactory sort'.[25] 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, often not decisive, in economic analysis. This explains why in central banks, statisticians interact with economists, legal scholars, historians and other experts. In this respect, interdisciplinarity is crucial.

8. 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 probably accelerated by digitalization - but we will address them separately as they pose distinct problems to statisticians.

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[25] The controversy between Kelvin and Knight is well-known (Fischer 2008).

8.1 Digitalization and big data

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[26] (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, analysing 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, work which 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 and even issues of interpretation of the results generated by the artificial intelligence. 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.

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[26] 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.

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.[27] 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, cross-border flows,[28] and the correct assessment of prices and volumes.[29] Conceptual aspects refer to the need to account for consumers producing the services they need themselves (via digital platforms)[30] and the correct computation of free products and services.

8.2 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

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[27] This has also fuelled 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).

[28] 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.

[29] 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.

[30] This is not a new problem as it dates back to how to deal with unpaid household activities.

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[31] may make it extremely difficult to compile statistics, which potentially threatens to strip official statistics of any economic significance in the most extreme cases. 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.[32]

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 shown by the quote heading this section. A comprehensive account of the Irish case and the dilemma it poses for statistics is found in Tedeschi (2018).

Even in a less extreme case 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 was attributed to those other countries. These impacts are also significant because these statistics are used for administrative purposes (Stapel-Weber et al., 2018),

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[31] *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 (Avdjiev et al., 2018).

[32] 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 favouring 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.

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.

Going forward, this tension is not going to recede. If standards, definitions, classifications, and therefore the resulting statistical data have to satisfy users' needs as much as possible, a much more pronounced use of international data sharing and deviation from accounting rules may be required, with all the political obstacles and the additional burden on reporting agents that this choice brings. The revision processes for the international statistical standards (SNA and BPM), just launched and due for conclusion in 2025, will include the multi-faceted impact of globalization among their priorities and may shed some lights on these thorny issues.

8.3 Distributional accounts

As mentioned in Section 8.3, 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).[33] 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, saving 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

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[33] 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 of its dimensions.

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. 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, i.e. 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, as well as the accuracy of some financial accounts' asset categories for which estimates are indispensable (classic examples are 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). The Bank of Italy is very active in this field, as well: it strongly contributed to the methodology for building distributional accounts currently discussed in the Eurosystem and it plans to publish distributional financial accounts in 2021, using an approach based on the use of administrative data – taken from the Central Credit Register, personal income tax data and cadastral records – integrated with the periodic findings of our Survey on Household Income and Wealth and with banking statistics on deposits (Cantarella et al, 2020).

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 end-2022.

9.   Conclusions

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. Time series sent each month/quarter by the Bank of Italy to the ECB have risen from about 600 to more than 22,000 in twenty years. Granular databases are available for securities (for both issuances and holdings) 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.

The 2007/08 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 coming to a conclusion with significant achievements. Finally, the banking union project introduced radical changes in the statistics collected for supervision. Despite this progress notwithstanding, the agenda of Central Bank statisticians 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.

'There are no facts, only interpretations', Nietzsche wrote. Harold Bloom, the late American literary critic, quoting Nietzsche claimed that there are no interpretations but only misinterpretations (and in that resides poetry). Statisticians basically try to reduce the space for possible interpretations (or misinterpretations), agreeing with the opinion of Bertrand Russell 'It is the mark of a truly intelligent person to be moved by statistics'.

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