04 CYCLICAL AND STRUCTURAL CHALLENGES FOR BANKS

This is a translated version of the original German-language chapter "Banken vor zyklischen und strukturellen Herausforderungen", which is the sole authoritative text. Please cite the original German-language chapter if any reference is made to this text.

KEY MESSAGES

↘ The low profitability of euro area banks is mainly due to structural and bank-specific factors. In the protracted low interest rate environment, banks are facing further challenges.

↘ High risks in the real estate sector and the looming increase in risks in the event of a recession justify further macroprudential measures.

↘ Digitalisation is bringing new market participants into the banking business, calling traditional business models into question and giving rise to additional risks.

SUMMARY

The **profitability of European banks** is **low** in international comparison, which is partly due to poor cost efficiency. In the ongoing consolidation process banks have lost importance in the financial sector, while **non-banks** are playing an increasingly important role.

The profitability of German banks is particularly low, due not least to the poor performance of Landesbanken and the big banks, which have lost market shares in the lending business to savings banks and credit cooperatives. Econometric analyses show that the profitability of European banks has been **primarily** affected by **bank-specific factors** in recent years. Economic growth and the slope of the yield curve also play a role.

Banks' low profitability poses **risks to financial stability**, because it hampers the build-up of equity and provides incentives to take excessive risks. Although banks have become more resilient in recent years, an increase in risks is likely in the event of a recession, and there is also the threat of procyclical amplification by the financial system. There are already signs of significantly elevated risks in the real estate sector. The supervisory authorities should **counteract this without delay** by means of macroprudential measures, such as increasing capital requirements for real estate loans.

Digital, platform-based business models are gaining importance in the financial sector. FinTechs currently primarily operate as cooperation partners to banks. But the potential **market entry of BigTechs** could cause disruptive developments. BigTechs could initially enter the market via payment services, before offering additional financial services like investment products or loans. However, strict regulation has been a barrier to market entry for new participants up to now.

It is up to policymakers to **adequately regulate the risks** presented by the business activities of new market participants without unnecessarily hampering innovation. Despite their low profitability, banks need to make the necessary investment in the future viability of their business models in order to avoid a vicious cycle of lacking competitiveness and a downward trend in profits. An integrated European banking and capital market could underpin the scaling of digital business models.

I. LOW PROFITABILITY, FUNDAMENTAL STRUCTURAL CHANGE

368. The **profitability of European banks** has come under increasing **pressure** over the past few years. Even before the financial crisis, banks in the European Union (EU) had relatively low profitability compared to other countries. The reasons for this are mainly structural. Due to the prolonged low interest rate environment, banks are facing additional challenges, and the economic slowdown will likely further increase the pressure on banks.

369. **Low profitability** basically indicates functioning competition within the banking sector. It can also be the result of a low-risk business strategy. However, it may pose risks to financial stability, because it **hampers the build-up of equity** and thus also the possibility of increasing loss absorption capacity, and provides incentives for **excessive risk-taking**. ⬊ ITEMS 397 FF. There is also the danger that it could delay necessary investment in the future viability of business models, which would cause European banks to fall behind in international competition with other banks and non-banks. This is why low profitability is posing **cyclical and structural challenges** for the European banking sector.

370. There are already **signs of increasing risks** to financial stability, particularly in the real estate market. The supervisory authorities should address these risks promptly with **further macroprudential measures**, in order to curb credit growth. In Germany, these could include an increase in sectoral risk weights for real estate loans, a further increase in the countercyclical capital buffer, or a restriction on loan-to-value (LTV) ratios.

Given the **slowing economic activity**, a future rise in corporate insolvencies and loan defaults is to be expected. Whereas **loan loss provisions** and **non-performing loans** (NPLs) have **declined** at many banks in recent years, this trend is now likely to reverse. This will be compounded by the application of the new IFRS 9 accounting standard, which requires recognition of expected rather than incurred losses. An increase in the **risk weights** used in internal models is also likely. If in the future constrained lending threatens to amplify the economic downturn, it is important to lower the countercyclical capital buffer **without undue delay** in order to counteract **procyclical effects**.

371. Long-term, structural challenges are another factor. Many sectors of the economy have undergone a **fundamental structural change** in recent years due to digitalisation, which is evident in the growing significance of platforms. This increasingly **calls into question** existing **business models** in the financial sector. The relative position of banks within the financial sector was previously weakened by the financial crisis, with structural developments now likely to exacerbate this trend. By the same token, the importance of investment funds and insurance companies has increased, while new market participants and market-based forms of financing are only gradually gaining significance.

372. The **German banking sector** has been undergoing a structural change for many years, which is manifesting itself in an ongoing process of consolidation. The **larger institutions** – the big banks and Landesbanken – have **lost market share** in the lending business to smaller banks, development banks and foreign banks since the financial crisis. In fact, the market structure of the German banking sector differs significantly from those of many other European countries, which are dominated by individual large institutions.

373. **FinTechs** are currently acting as cooperation partners rather than competitors for banks, and are raising the capacity for innovation and the efficiency of the bank business. **Regulatory sandboxes** could be considered in order to boost innovation. However, the principle of a **level playing field** should be preserved. Large technology companies (**BigTechs**) could trigger a disruptive development. These might be more capable than traditional banks to offer digital platforms for banking business and thereby increase the **scalability of business models**. Payment services could be their gateway to banking business. The contentious proposal of creating the "Libra" digital currency points in this direction. ↘ BOX 11 The major relevance of payment systems for the stability and functionality of the financial system means that policymakers are required to ensure that **adequate regulation** is in place for such new business areas.

374. Traditional banking business will also increasingly be based on **digital platforms** in the future. Size is an important factor in the development of such platforms, which is why the cooperation of various financial institutions at European level would be reasonable in order to make better use of the benefits of scale. Segmented banking markets stand in the way of such developments. For this reason, it is important to **develop a European banking and capital market** by removing barriers to cross-border activities (GCEE Annual Report 2018 items 533 ff., 547 ff.).

II. BANK PROFITABILITY UNDER PRESSURE

375. The European banking sector has a relatively **low level of profitability** in international comparison. The differences already existing before the financial crisis have become more pronounced since then. This development is due in part to reduced cost efficiency. Neither the ongoing **consolidation process** nor the growing concentration have been able to reverse this trend. At the same time, non-banks, such as investment funds and insurance companies, have gained importance. In Germany, the big banks and Landesbanken, which display a particularly low profitability, have lost market share in the lending business. Econometric analyses show that the profitability of EU banks has been primarily affected by bank-specific factors in recent years. GDP growth and the slope of the yield curve also played a role.

1. Low cost efficiency of European banks

376. In comparison to the period before the global financial crisis, the **profitability of banks** in many countries has **decreased**. In Europe it is far below the pre-crisis level, measured by the return on equity (ROE), which is partly due to increased capital requirements. But the return on assets (ROA) has also noticeably declined.
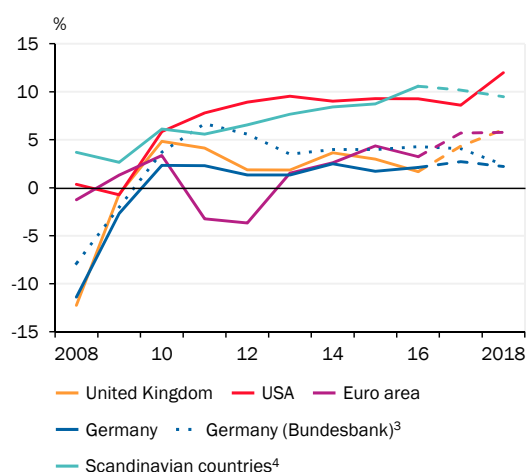
The profitability of **banks in the euro area** has developed **weakly** compared to banks in the United States and the Scandinavian countries, which managed to improve their return on equity more quickly after the financial crisis. ↘ CHART 57 LEFT The picture is similar for the return on assets. The difference in profitability is **not only** a **result of the financial crisis**, as banks in the euro area were already less profitable than their US and Scandinavian counterparts before the crisis (ECB, 2018), which points to **structural differences**. However, the differences have become more pronounced since the financial crisis, probably not least due to the crisis in the euro area. For many euro area banks at present, **return on equity** is likely to be **below the costs of capital** – which according to surveys are around 8 % to 10 % (EBA, 2018a).

377. But there is a high level of **heterogeneity** even **within the euro area**. For instance, the profitability of German banks was lower than in the euro area as a whole (with the exception of 2011 and 2012). ↘ CHART 57 LEFT The **lower profitability of German banks** is due in part to features of the national accounting standards (Barkow, 2019), because creating reserves in accordance with § 340f
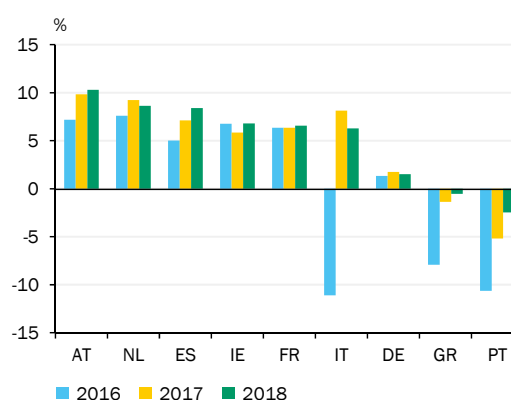
↘ CHART 57

Banks' return on equity[1]

International comparison of all banks[2]

Comparison of significant banks within the euro area[5]

Legend (left chart): United Kingdom — USA — Euro area — Germany — Germany (Bundesbank)[3] — Scandinavian countries[4]

Legend (right chart): 2016 — 2017 — 2018

1 – Profits after taxes as a percentage of average equity. 2 – Shown by dashed lines from Q4 2017 to indicate that methodological changes implemented in Q4 2017 could affect the comparability of data over time for Germany, the euro area, the Scandinavian countries and the United Kingdom. 3 – Profits after taxes as a percentage of average equity (including the fund for general banking risks) of all categories of banks in accordance with Deutsche Bundesbank's statistics on banks' profit and loss accounts. 4 – Denmark, Finland, Sweden. 5 – Return on equity of banks supervised by the Single Supervisory Mechanism (SSM). Return on equity in the fourth quarter of each year. AT-Austria, NL-Netherlands, ES-Spain, IE-Ireland, FR-France, IT-Italy, DE-Germany, GR-Greece, PT-Portugal.

Sources: Deutsche Bundesbank, ECB, Federal Deposit Insurance Corporation, own calculations

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and § 340g of the German Commercial Code (*Handelsgesetzbuch* – HGB) is considered an expense and reduces the reported profit. The profitability of German banks is therefore higher when the corrected data of the Deutsche Bundesbank is used. However, it has still been below the return on equity of banks in the euro area as a whole since 2015, and has been declining considerably since 2011. ↘ CHART 57 LEFT
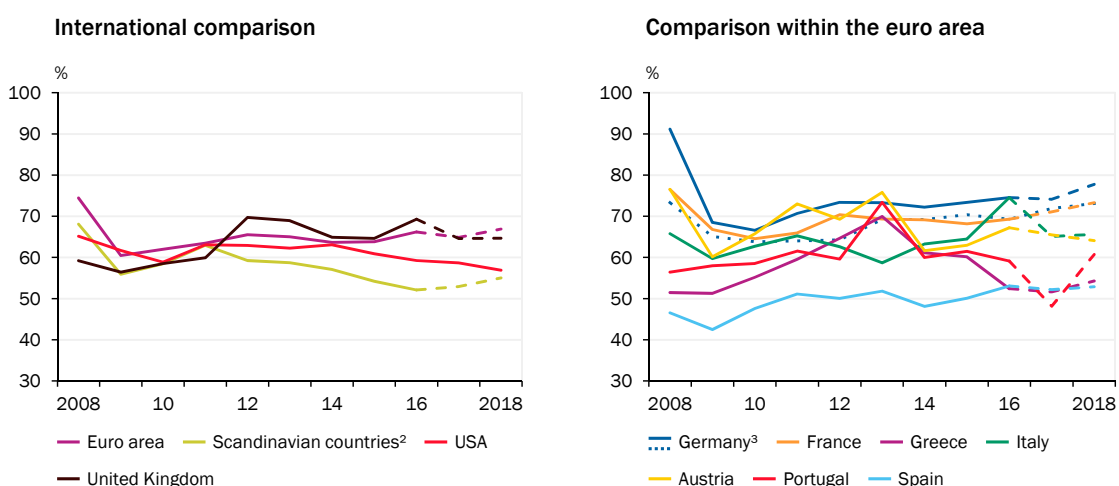
The situation is similar for banks supervised by the Single Supervisory Mechanism (SSM) due to their significance to the national or European financial system. For example, **significant credit institutions** in **Germany** have **particularly low profitability** compared to banks in other large euro area countries. The return on equity of banks in Greece and Portugal remains negative. ↘ CHART 57 RIGHT

378. One reason for the low profitability of euro area banks is **poor cost efficiency**. In international comparison, banks from the euro area – similarly to banks from the United Kingdom – have reported **high cost-income ratios**, defined as administrative expenses in relation to operating income, in recent years. ↘ CHART 58 LEFT The high figures for euro area banks mean that they have to spend comparatively more on average in order to generate their income. A comparison of the cost-income ratios within the euro area shows that it has worsened for banks in all considered countries since 2009. The differences in ratios between the countries are particularly noticeable; whereas the consistently low cost-income ratios of Spanish banks suggest high cost efficiency, **German banks** have reported the **highest cost-income ratios** since 2014. ↘ CHART 58 RIGHT

379. The **operating income** of banks in all observed countries with the exception of France has fallen since 2009. However, there are differences in the changes to

↘ CHART 58
Cost-income ratios[1]

International comparison — Euro area, Scandinavian countries[2], USA, United Kingdom

Comparison within the euro area — Germany[3], France, Greece, Italy, Austria, Portugal, Spain

1 – General administrative expenses in relation to operating income. In addition to the sum of net interest income and net commission income, this includes the net result from the trading portfolio or from financial transactions (until 2009) and the other operating result. Shown by dashed lines from Q4 2017 to indicate that methodological changes implemented in Q4 2017 could affect the comparability of data over time for all countries except the United States. 2 – Denmark, Finland, Sweden. 3 – The blue dotted line shows the general administrative expenses in relation to the operating income of all groups of banks in accordance with Deutsche Bundesbank's statistics on banks' profit and loss accounts.

Sources: Deutsche Bundesbank, ECB, Federal Deposit Insurance Corporation, own calculations

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key components. **Net interest income** has **decreased** in all countries compared to 2009. While the decline was small in Spain, the banking sectors in Germany, France and Austria recorded a larger drop in net interest income, with the largest being observed in Greece, Italy and Portugal. In some cases, banks were able to offset this decline with an **increase in net commission income**, which rose between 2009 and 2018 in Germany, France, Italy, Austria and Spain. In contrast, however, net commission income declined considerably in Greece and Portugal.

There were also differences in the development of **administrative expenses**. These declined in Greece, Italy, Austria and Portugal, but as operating income declined even more, the cost-income ratio increased. The banking sectors in Germany, France and Spain, on the other hand, reported an increase in administrative expenses. The deterioration of the cost-income ratios of German banks is therefore due to the increase in net commission income not compensating for the decline in net interest income and the increase in administrative expenses.

2. Structural change in the European financial sector

380. There have been noticeable **shifts in market structure** in the European financial sector. The **importance of banks** in the euro area has **declined** since the global financial crisis. ↘ CHART 59 Whereas banks have lost market share over the past thirteen years, particularly in Germany, Ireland, Luxembourg and the Netherlands, the **importance of non-banks**, especially money market and investment funds, insurance companies and pension schemes, has increased in many countries. Moreover, non-banks are increasingly active in the lending business. In 2018, the volume of loans in the euro area from non-banks to

↘ CHART 59

Structure of the financial sector in selected euro area member states[1]
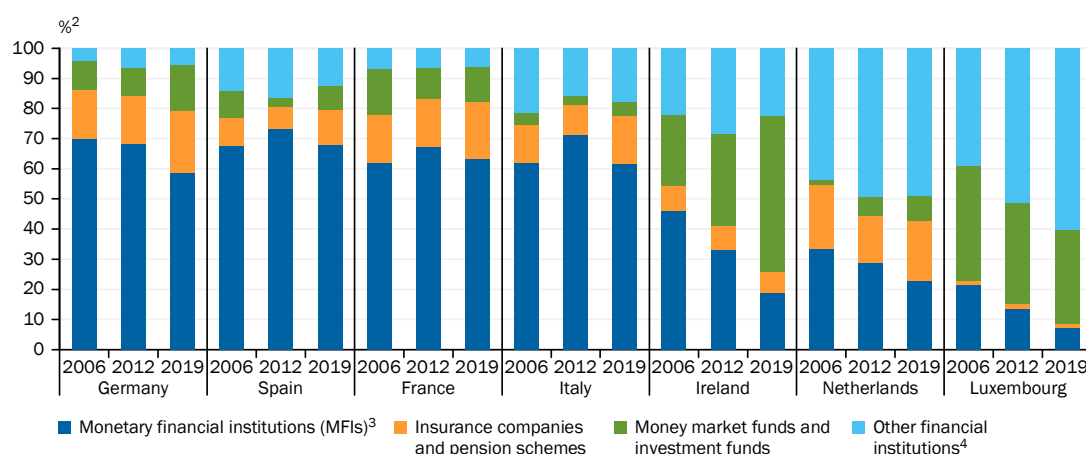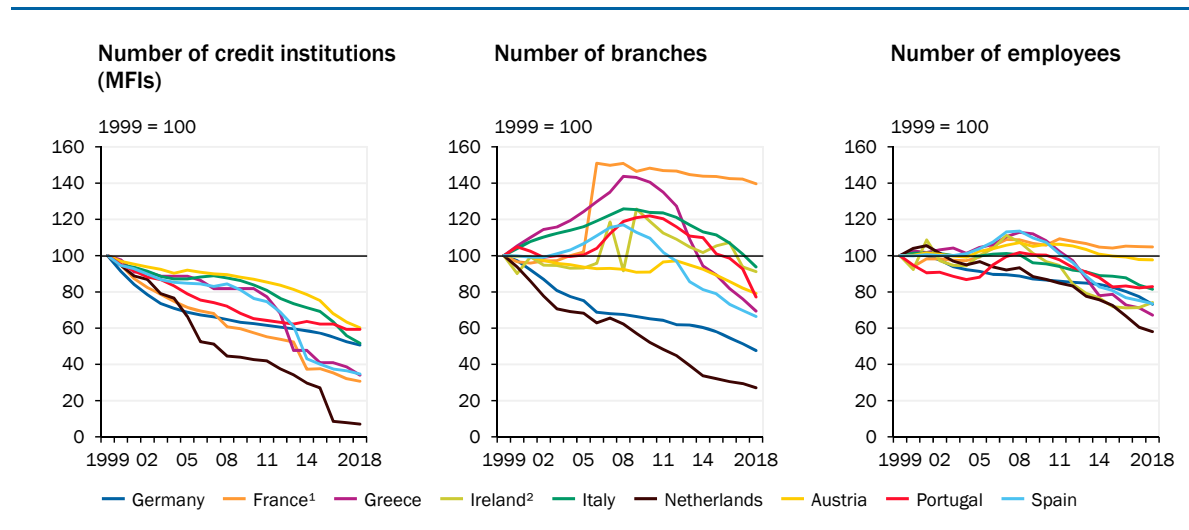

1 – As of Q1. 2 – Share of financial assets from the financial accounts prepared in accordance with the ESA 2010. 3 – Excluding money market funds and central banks. 4 – Other financial institutions (excluding investment funds) comprise the sectors S.125, S.126 and S.127 in accordance with the ESA 2010. These sectors include financial institutions which a) engage in financial intermediation by incurring liabilities that do not take the form of means of payment, deposits or investment fund units (e.g. financial leasing and factoring companies), b) are not themselves financial intermediaries but carry out activities in their principal function that are closely related to financial intermediation (e.g. financial and securities brokers), c) financial institutions that do not engage in financial intermediation or related activities and whose receivables and liabilities are not generally traded on the free market (e.g. special purpose vehicles that raise funds for their parent companies and provide other financial services exclusively to group companies).

Sources: ECB, own calculations

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↘ CHART 60

Structure of the banking sector in selected euro area member countries

| Number of credit institutions (MFIs) | Number of branches | Number of employees |

1 – The sharp increase in the number of branches in 2006 is likely due to the first-time inclusion of the branches of Banque Postale, founded on 1 January 2006. 2 – No consistent data series for the number of credit institutions in Ireland.

Sources: ECB, own calculations

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households and non-financial corporations was more than double the average of 2014 to 2017 (ECB, 2019a). This increasingly turns non-banks into competitors of banks in their core business.

381. Noticeable **consolidation processes** are taking place within the euro area banking sector. The decline in the number of **credit institutions** began long before the financial crisis. CHART 60 LEFT The number of **branches** has evolved differently across countries. It rose in Greece, Italy, Portugal and Spain until the crisis, and started to decrease only thereafter. In Germany and the Netherlands, the decline began before the financial crisis and is particularly pronounced ↘ CHART 60 CENTRE; there, the density of branches is also much lower than in many other European countries, primarily in the Netherlands. The banking sectors in Greece, Ireland and Spain have reported extensive adjustments in the number of **employees**, and despite an interim increase, there has been a larger reduction in employees in those countries than in the German banking sector. In contrast to the rapid reduction in branches, the **reduction in staff in the German banking sector** was **relatively moderate**. ↘ CHART 60 RIGHT

382. The ongoing consolidation in the banking sector is reflected in a **higher concentration**. The often used CR5 concentration ratio (combined share of the five largest banks in a country in terms of total assets), and Herfindahl index (sum of the squared shares of all banks in terms of total assets) indicate that **concentration in the German banking sector** is still **low** compared to other euro area countries. ↘ CHART 61 However, these measures ignore that savings banks and credit cooperatives are not competitors within their respective group due to their "regional principle", which implies that the intensity of competition in the German banking sector is likely overestimated. Considering the savings banks and credit cooperatives each as a single institution produces significantly higher concentration ratios (CR5 would be 68 % as opposed to 29 % for 2018), which are likely closer to the actual intensity of competition.

Concentration measures

Herfindahl index¹

CR5²
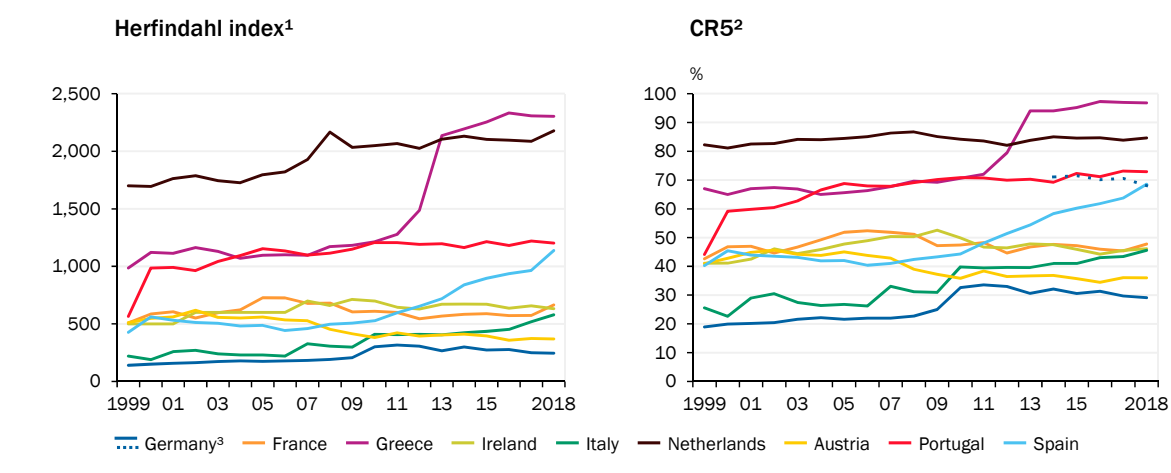
1 – Measure of the concentration of banking business (based on total assets). It is calculated by adding the squares of the market shares of all credit institutions in the banking sector of a country. 2 – Share of the five largest banks in terms of total assets of all banks in a country. 3 – The increase in concentration measures for Germany in 2010 is primarily due to the increase in total assets, particularly at the big banks, as a result of the German Accounting Law Modernisation Act (BilMoG). The dotted line in the right chart shows the share of the five largest banks in the total assets of all banks in Germany, provided that the aggregated annual financial statements of the Bundesverband der Deutschen Volksbanken und Raiffeisenbanken (BVR) and the Deutsche Sparkassen- und Giroverband (DSGV) are used.

Sources: BVR, Commerzbank, Deutsche Bank, DSGV, ECB, KfW, own calculations

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383. Alternatively, **Europe** could be viewed as a single banking market. This approach shows **concentration** in the European banking sector to be rather **low**, despite the observed increase. For example, a CR5 calculated in this way for the year 2016 produces a value of 26 % for the EU and 33 % for the euro area. These are considerably lower than those for the United States (47 %) and Japan (60 %).

3. Special features of the German banking sector

384. The German banking sector is characterised by its special structure known as the **three-pillar system**. The most important bank groups are firstly commercial banks, which include the big banks, regional banks and branches of foreign banks, secondly public sector banks, comprising savings banks, Landesbanken and development banks, and thirdly, credit cooperatives. These bank groups have **different business models** (GCEE Expertise 2008 items 144 ff.). Savings banks and credit cooperatives dominate in retail banking outside metropolitan areas. Commercial banks and Landesbanken are primarily involved in loans to larger corporates. Only a small portion of banks operate capital market business – in particular the big banks, Landesbanken and branches of foreign banks. In the past, foreign banks often operated in niches in Germany, such as consumer lending, but are now increasingly active in other business areas.

385. There have been **major shifts** within the German banking sector in recent decades. The share of the Landesbanken in the total assets of all banks fell considerably after the financial crisis, while the share of development banks rose. The market share of branches of foreign banks has also risen remarkably. ↘ CHART 62 TOP LEFT However, the development of **total assets** has been affected by excep-

tional factors, such as the entry into force of the German Accounting Law Modernisation Act (*BilMoG*), which requires trading book derivatives to be recognised as of December 2010, causing a jump in the balance sheets of larger institutions. The precise composition of the different groups also changes over time.

In **lending** to non-banks, there has been a remarkable increase in the market shares of savings banks and credit cooperatives, whereas Landesbanken and the big banks have lost market share. ↘ CHART 62 TOP RIGHT In the long term, there has been a significant loss in market share for Landesbanken and the big banks in the area of corporate loans in particular; it has almost halved for both groups since 2000. ↘ CHART 62 BOTTOM RIGHT As regards **deposits**, we can see that commercial banks have gained market share particularly in a longer-term comparison, while the market share of public sector institutions has contracted. ↘ CHART 62 BOTTOM LEFT So the larger institutions have lost market share in the lending business, but actually gained in deposit business.

386. The **consolidation process** in the German banking sector affected the different bank groups to differing degrees. The number of branches has fallen in all

↘ CHART 62
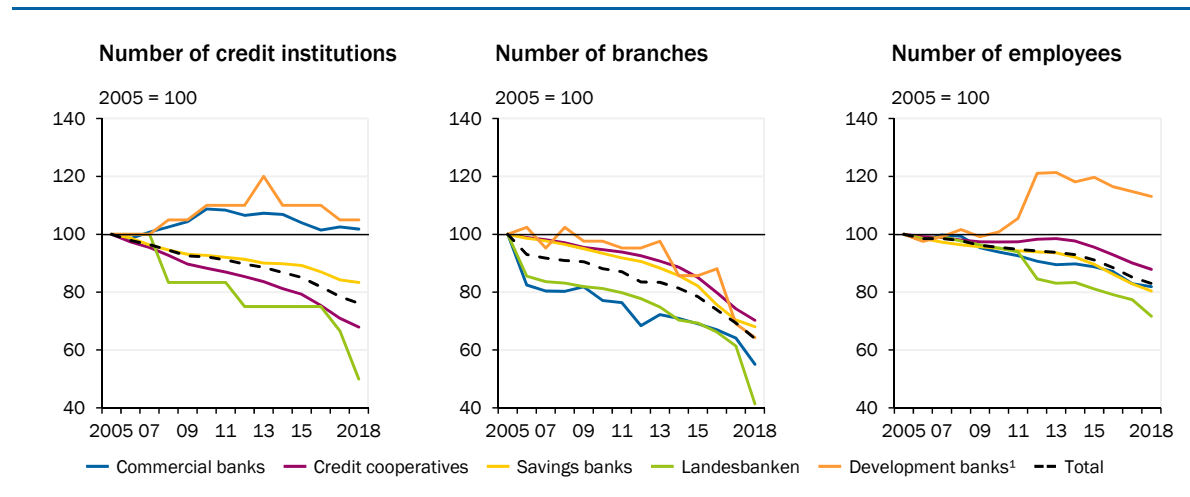
The three-pillar structure in German banking[1]
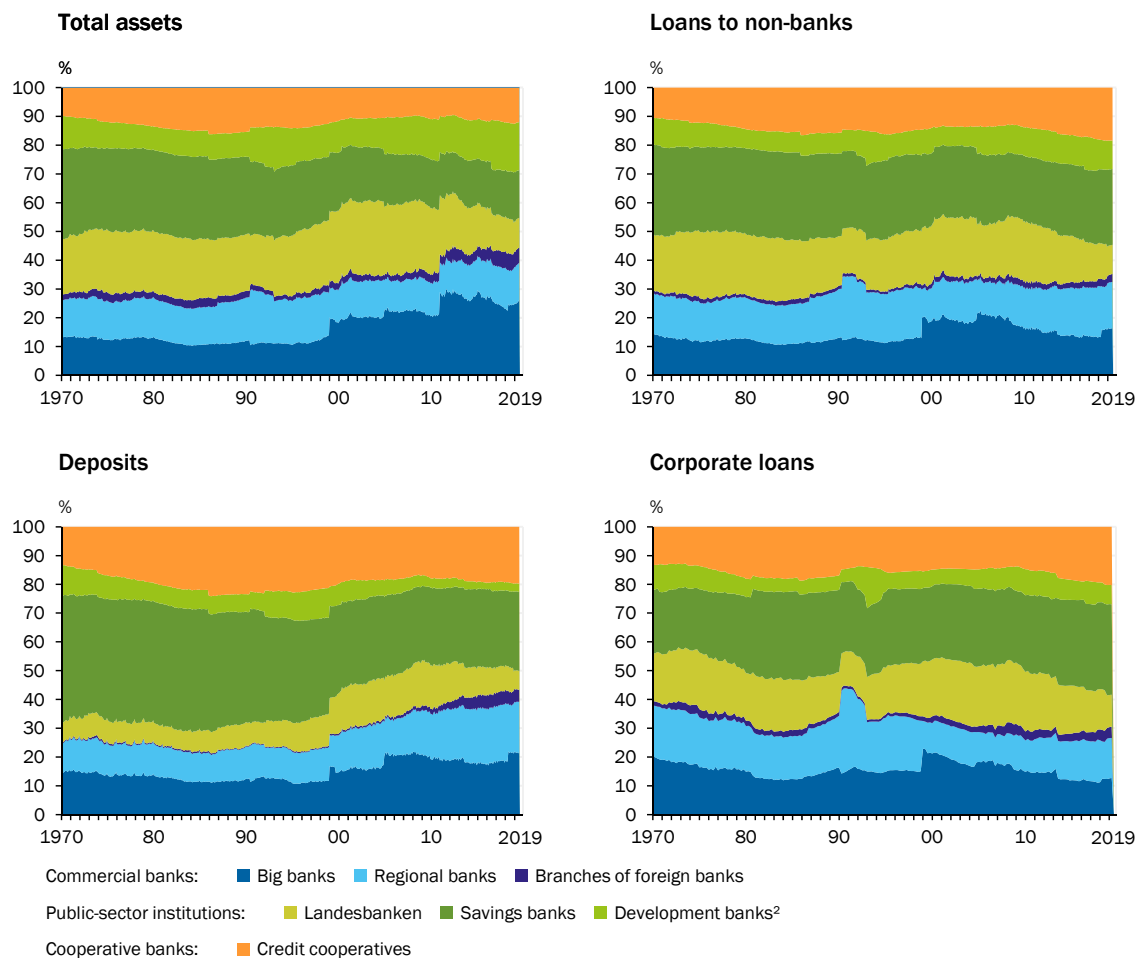
1 – Share of commercial banks, public-sector institutions and cooperative banks. 2 – Banks with special, development and other central support functions. Including DZ BANK AG Deutsche Zentral-Genossenschaftsbank as of July 2016.

Sources: Deutsche Bundesbank, own calculations

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↘ CHART 63

Structure of the bank groups in Germany

Number of credit institutions	Number of branches	Number of employees
2005 = 100	2005 = 100	2005 = 100

Commercial banks — Credit cooperatives — Savings banks — Landesbanken — Development banks[1] --- Total

1 – The groups "Banks with special tasks" and "Cooperative central banks" were merged for the entire time series, as in the category "Banks with special, development and other central support tasks" presented by the Deutsche Bundesbank since 2016. Portigon AG, which was founded for the liquidation of WestLB, is included from 2012.

Sources: Deutsche Bundesbank, own calculations
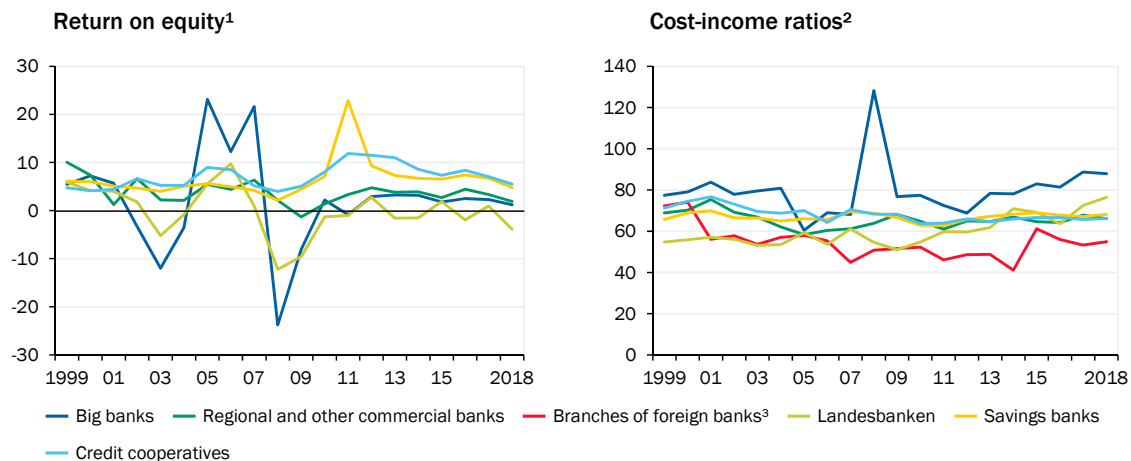
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groups. ↘ CHART 63 CENTRE The number of employees has also decreased, albeit to a lesser degree. The only group in which the number of staff has risen is development banks, although this is a result of a reclassification. ↘ CHART 63 RIGHT While the number of commercial banks has remained almost constant and that of development banks has risen slightly, the comparatively small cooperative banks and the Landesbanken experienced a particularly sharp decline in numbers. The number of savings banks has also declined. ↘ CHART 63 LEFT The decrease in the number of banks is not generally a result of market exit, but rather of **mergers**. The aim of mergers is often to realize economies of scale, but in the case of savings banks (Behn et al., 2016) and credit cooperatives, they are frequently a reaction to an institution falling into distress.

Savings banks and credit cooperatives realize economies of scale even without mergers, via the **networks** within their associations, as some services, such as the development of credit risk models or the provision of an IT infrastructure, are provided centrally. This enables these banks to be profitable despite their smaller size. However, the question is whether the institutions can continue to be considered independent from each other from a regulatory perspective if their **risks** are **increasingly correlated** due to the expanding scope of shared services.

387. A comparison of bank groups reveals **pronounced differences in profitability**. For instance, the return on equity of savings banks and credit cooperatives has been higher than that of the other bank groups since the financial crisis. The Landesbanken report the lowest profitability. ↘ CHART 64 LEFT The differences among bank groups are partly due to differences in cost efficiency. The **big banks** have by far the **highest cost-income ratios**, which have risen further in recent years. ↘ CHART 64 RIGHT Credit cooperatives, savings banks and Landesbanken report slightly higher cost efficiency, although their cost-income ratios are still high in international comparison. The cost-income ratio of the **Landes-**

↘ CHART 64

Return on equity and cost-income ratios of German bank groups

Return on equity[1]

Cost-income ratios[2]

— Big banks   — Regional and other commercial banks   — Branches of foreign banks[3]   — Landesbanken   — Savings banks
— Credit cooperatives

1 – Profits after taxes as a percentage of average equity. 2 – General administrative expenses in relation to operating income. In addition to the sum of net interest income and net commission income, this includes the net result from the trading portfolio or from financial transactions (until 2009) and the other operating result. 3 – No data available for return on equity.

Sources: Deutsche Bundesbank, own calculations

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banken has risen considerably since 2009, while cost efficiency has barely changed for the smaller institutions. It is also striking that branches of foreign banks report much lower cost-income ratios than the other bank groups. One likely reason for this observation is that some costs are not incurred at branch level, but at the foreign banks' headquarters.

388. The major earnings items of the bank groups also developed differently. There is **no** evidence of a **general erosion of net interest income**. Whereas this item has been somewhat higher for credit cooperatives and much higher for branches of foreign banks in recent years than before the financial crisis, it has remained almost unchanged for the savings banks. In contrast, **it has fallen considerably for the Landesbanken and the big banks**, although the figure remains relatively high for the big banks. CHART 65 TOP LEFT These changes are partly attributable to shifts in market share, market exit (particularly for Landesbanken) or market entry and business expansion (branches of foreign banks).

At the same time, the savings banks, credit cooperatives and big banks reported improved **net commission income**. ↘ CHART 65 TOP RIGHT However, the big banks have experienced a slight decline since 2015. Net commission income has fallen considerably for the Landesbanken and the branches of foreign banks, although the latter had previously experienced a swift increase.

389. As regards the main expense items, the savings banks and credit cooperatives have seen an increase in **staff costs** in the past few years, whereas this item has been declining for several years for the big banks following a sharp climb prior to the financial crisis. ↘ CHART 65 BOTTOM LEFT The sharp rise in staff costs for branches of foreign banks is due to the notable expansion of their business activities in Germany in recent years. However, the heterogenous development of **other administrative expenses** is particularly striking. This item includes depreciation, amortisation and write-downs, as well as consulting and auditing costs.

↘ CHART 65 BOTTOM RIGHT This item has risen considerably for the big banks in the past few years.

390. In view of the weak profitability, **further consolidation** may be **unavoidable** in the German banking sector. Mergers across pillars, which are not currently permitted, could be reasonable in some cases. Particularly in the case of Landesbanken, the question is whether their **business models are viable and sustainable**. Additional mergers accompanied by a withdrawal from activities for which a public sector remit is not obvious would be conceivable here. This could have a favourable effect on the earnings of other banks by reducing competition. The entire banking sector should pursue the digitalisation of business processes in order to **increase cost efficiency** and remain competitive (ECB, 2018). However, low profitability is hampering the necessary investments. ↘ ITEM 417

↘ CHART 65
Selected income and expenses by bank groups

Net interest income[1]

Net commission income[2]

Staff costs[3]

Other administrative expenses[4]

Big banks — Regional and other commercial banks — Branches of foreign banks — Landesbanken — Savings banks — Credit cooperatives
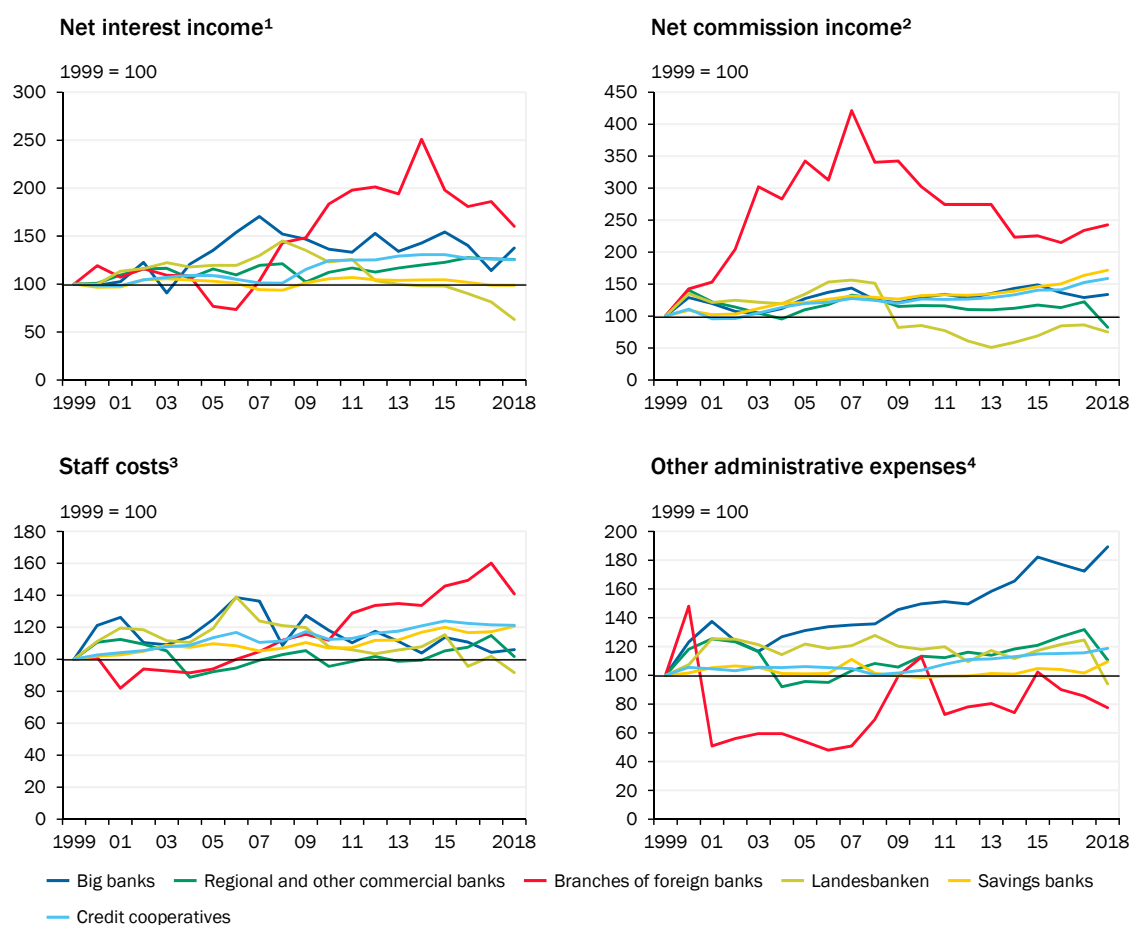
1 – Difference of interest income and expenses. 2 – Difference of commission income and expenses. 3– Wages, salaries, social security costs and costs relating to pensions and other benefits. 4 – Expenses necessary for business operations without directly being part of actual business. These include amortisation write-downs of intangible fixed assets and depreciation and write-downs of tangible fixed assets, consultancy and auditing costs, and costs for premises.

Sources: Deutsche Bundesbank, own calculations

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4. Determinants of bank profitability

391. The **profitability of banks** is determined by a large number of factors. One focus of recent discussions has been the effect of monetary policy on the profitability of banks. The business cycle is also likely to play a key role. In addition to **cyclical factors**, there is a range of **structural factors** that impact profitability, including a bank's size and the intensity of competition.

392. **Monetary policy** can affect earnings in the banking sector via the **level of interest rates** and changes in the **yield curve** (Samuelson, 1945; Flannery, 1981; Hancock, 1985; Deutsche Bundesbank, 2018). The **effects** are **not clear-cut** due to the many opposing factors. Some studies show that the **net interest margin** of banks is positively related to the slope of the yield curve as well as to the prevailing interest rate level (Alessandri and Nelson, 2015; Borio et al., 2017). However, Claessens et al. (2018) show that profitability has not fallen to the same extent as net interest margins, because banks were able to compensate for a portion of the decline in interest margins by reducing costs or expanding commission business. The effects on bank profitability increased as the low interest rate environment persisted. Altavilla et al. (2018) argue that the expansionary monetary policy did not adversely affect bank profitability, as negative effects on net interest income were compensated by **positive effects on loan loss provisions and non-interest income**.

393. Therefore, it remains to be seen how the **more expansionary monetary policy** will impact bank profitability. ↘ ITEMS 48 FF. The **reduction in the rate on the deposit facility** from −0.4 % to −0.5 % implies additional pressure for banks with high excess reserves, among them German and French banks (Darvas and Pichler, 2018). The European Central Bank (ECB) has, however, introduced a **tiered** system of **interest rates** to lessen the effects of negative rates on banks. Interest rates are 0 % on six times the minimum reserve requirements (ECB, 2019b). This could at least **partially compensate** for the **effects** of the deposit rate cut. Banks whose reserves do not exceed this threshold are completely exempted, while the overall effect for banks with very high excess reserves remains negative. The question is also raised as to whether an arbitrage opportunity has been created for some banks by the combination with the new targeted longer-term refinancing operations (**TLTRO III**) at negative interest rates (Koranyi, 2019). Overall, the effects of monetary policy on bank profitability are unlikely to change materially by these measures, as the **impact of negative rates** overall is too **small**. However, the introduction of tiering indicates that the ECB expects negative deposit rates to remain in place for some time.

394. The connection between **bank size** and their profitability is also under discussion. Early empirical studies using data from the 1980s for the United States concluded that **scale economies** can only be realised up to a relatively small bank size (Benston et al., 1982; Clark, 1988). However, more recent studies show that even large banks can achieve remarkable economies of scale (Wheelock and Wilson, 2012; Hughes and Mester, 2013). The differences between the results are attributable in part to the different methods used (DeYoung, 2010). In addition, they are likely due to a changing environment where fixed costs play a more

important role because of **stricter regulation** and **increased requirements on IT systems** (Mester, 2010; Laeven et al., 2016).

Early studies for small banks in Europe show a positive relation between bank size and economies of scale, although this could not be shown for larger banks (Vennet, 2002; Amel et al., 2004). In contrast, Beccali et al. (2015) find **economies of scale for European banks** of various sizes for the period from 2000 to 2011. They show that larger banks and those more active in capital market business achieve the largest scale economies. Huber (2019) on the other hand does not find any evidence of banks in Germany becoming more efficient as a result of increasing size due to consolidation.

395. Last but not least, **competition** is likely to have an effect on bank profitability (Gilbert, 1984; Berger et al., 2000). The level of competition may differ widely across market segments (Carbó Valverde and Rodríguez Fernández, 2007). The intensity of competition is affected both by new market participants entering the market and weak banks not exiting, which can lead to overcapacities in the banking sector (**overbanking**, Pagano et al., 2014).

396. **Econometric analyses** for EU banks between 2013 and 2018 suggest that profitability – measured by the return on assets – is **primarily** affected by **bank-specific variables** (Rutkowski, 2019). It is evident that banks with lower equity ratios, a higher share of non-performing loans, higher credit growth and a larger share of net interest income in total income have lower profitability on average. Bank size has no significant effect. As regards **country-specific variables**, GDP growth and the slope of the yield curve have a positive effect on profitability. The level of competition, however, has no significant effect. ↘ BOX 9

The analysis provides indications of **why German banks** have had **relatively low profitability** in recent years. For one thing, they have at best average equity ratios within the studied group. For another, they have shown an above-average increase in their lending activity. Moreover, interest-dependent business plays a key role for German banks.

↘ BOX 9

Analysis of the determinants of bank profitability

Whereas the analysis above is based on aggregate data, Rutkowski (2019) uses **bank-level** information to analyse the influence of bank- and country-specific factors on bank profitability measured by the **return on assets**. This study looks at a constant sample over time, comprising 298 European banks between 2013 and 2018. ↘ APPENDIX

The results of the regression analysis show that **primarily bank-specific factors** can explain the differences in profitability. ↘ TABLE 15 For instance, there is a statistically significant positive correlation between the equity ratio and the return on assets. Hence, well-capitalised banks were more profitable in the period assessed. A higher share of net interest income in total income had a dampening effect on profitability, as did a higher share of non-performing loans. Interestingly, stronger credit growth was also associated with weaker profitability, which indicates that rapidly expanding banks granted on average less profitable loans. Most of these effects are observable even in the GMM estimations, which take account of potential endogeneity of the explanatory variables; but the effects are of lower

statistical significance (see last two columns). There is no statistically significant correlation between a bank's size (measured by total assets) and its return on assets.

↘ TABLE 15

Determinants of bank profitability (extract)[1]

Explanatory variables (lagged)[2]	Dependent variable: return on assets					
	Random effects estimation	Fixed effects estimation	Random effects estimation	Fixed effects estimation	Arellano-Bond estimation	Blundell-Bond estimation
Lagged endogenous variable	0.556 ***	0.510 ***	0.562 ***	0.512 ***	0.504 ***	0.462 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Total assets	– 0.005	0.554	– 0.005	0.441	0.841	– 0.013
	(0.676)	(0.230)	(0.700)	(0.472)	(0.535)	(0.918)
Equity ratio	0.043 ***	0.078 **	0.058 ***	0.099 ***	0.142 *	0.082 **
	(0.000)	(0.017)	(0.000)	(0.007)	(0.096)	(0.016)
Share of NPLs	– 0.019 ***	0.000	– 0.020 **	– 0.007	– 0.010	– 0.021 **
	(0.001)	(0.998)	(0.014)	(0.679)	(0.813)	(0.047)
Credit growth	– 0.004 ***	– 0.004 ***	– 0.004 **	– 0.004 ***	– 0.006 **	– 0.005 ***
	(0.003)	(0.008)	(0.011)	(0.001)	(0.025)	(0.000)
Cost-income ratio	0.002	0.003	0.001	0.002	0.007	0.004
	(0.285)	(0.247)	(0.748)	(0.474)	(0.308)	(0.307)
Share of net interest income in total income	– 0.002	– 0.003 *	– 0.003 **	– 0.004 ***	– 0.005 ***	– 0.005 ***
	(0.105)	(0.093)	(0.015)	(0.003)	(0.002)	(0.000)
GDP growth	0.043 **	0.065 **	0.030 *	0.046 *	0.031	0.022
	(0.023)	(0.041)	(0.084)	(0.060)	(0.339)	(0.416)
Interest rate differential	0.065 **	0.127 *	0.006	0.029	0.094	0.027
	(0.043)	(0.071)	(0.821)	(0.653)	(0.490)	(0.729)
Interest rate differential * share of NPLs			0.001	0.003	0.009	– 0.000
			(0.627)	(0.640)	(0.382)	(0.970)
Interest rate differential * equity ratio			– 0.007	– 0.011	– 0.006	0.004
			(0.175)	(0.164)	(0.683)	(0.829)
Interest rate differential * cost-income ratio			0.001	0.001	– 0.001	– 0.001
			(0.227)	(0.699)	(0.454)	(0.527)
Interest rate differential * share of interest income in total income			0.002 **	0.002	– 0.000	0.003
			(0.032)	(0.253)	(0.965)	(0.271)
Test of joint significance[3]			11.81 **	3.15 ***	13.51 **	7.58
R^2 (within)	0.373	0.387	0.388	0.401		

1 – Random effects, fixed effects, Arellano-Bond and Blundell-Bond estimations for the period 2013–2018. The bank-specific variables were adjusted for their median values. The bank-specific variables are treated as potentially endogenous variables in the Arellano-Bond and Blundell-Bond estimations. Standard errors clustered at the bank level. P-values in parentheses. ***, **, * denote a significance level of 1 %, 5 % or 10 %, respectively. The table shows selected regression results. The full results and explanations of the variables used are provided in the appendix. 2 – In addition to the endogenous variable, lagged values are used for all explanatory variables. 3 – Test of joint significance of interest rate differential and all interaction terms.

Source: Rutkowski (2019)

Among the **country-specific variables**, the **GDP growth rate** has a statistically significant positive influence on the return on assets. The interest rate differential, which measures the difference between the yield of government bonds of the bank's country of domicile with a residual term of 10 years and the three-month interbank rate and is therefore a measure of the **slope of the yield curve**, has a positive effect on profitability in the baseline regressions. If the regressions are expanded to include **interaction terms** between the interest rate differential and bank-specific variables, the base effect of the yield spread and the coefficients of the interaction terms generally remain jointly significant. However, only in one of the regressions the interest rate differential has a significantly greater effect on banks with a larger share of net interest income in total income. The other coefficients of the interaction terms do not indicate that the effect of the interest rate differential on the return on assets depends on bank-specific factors. The level of competition does not have a statistically significant effect

either. This could be attributable to the fact that the CR5 measure for competition is relatively rough and only shows a slight variation over time within the period analysed. ↘ CHART 61 RIGHT

III. RISKS TO FINANCIAL STABILITY

397. The low profitability of banks may give rise to **risks to financial stability**, because it hampers the build-up of equity and at the same time creates incentives to take excessive risks. Although banks have become more robust in recent years, an increase in risks is likely in the event of a recession, due to increasing loan defaults. There is already evidence of significantly elevated risks in the real estate market. The supervisory authorities should **counter** these risks and possible procyclical effects **promptly** with suitable measures.

1. Bank profitability and financial stability

398. The academic literature discusses various channels via which bank profitability can affect financial stability. In theory, **banks' risk-taking** depends on the level of profit margins and thus the **charter value**. Where margins are smaller, there is an incentive to take greater risks, as interest will not be paid in the event of a failure, but the higher income will be earned in the event of success (Jensen and Meckling, 1976). Inversely, high profits and therefore also charter value decrease the incentive to take high risks.

399. The intensity of competition has an impact on bank profitability, so there is a connection between **competition** in the banking system and financial stability. A higher level of competition in the banking sector generally increases welfare, because it increases economic efficiency and customers obtain better terms. However, unlike other economic sectors, a **high level of competition** in the banking sector can reduce welfare, as it can **adversely affect financial stability**.

Since greater competition reduces profit margins and thus also charter values, banks have an **incentive to take greater risks** (Marcus, 1984; Keeley, 1990; Hellmann et al., 2000; Allen and Gale, 2004; Repullo, 2004; Berger et al., 2009). For example, the deregulation of the banking sector in the United States during the 1970s and 1980s reduced the profitability of banks, which likely increased the incentives to take risky investment decisions (Keeley, 1990). There is empirical evidence for a positive relation between the concentration in the banking sector and financial stability (Beck et al., 2006). The theoretical result changes if **competition in the lending market** is considered instead of competition in the deposit market. A higher level of competition then leads to lower lending rates and therefore to reduced risk-taking on the side the companies financed (Stiglitz and Weiss, 1981; Boyd and De Nicoló, 2005). This hypothesis is also supported by empirical evidence that establishes a link between a lower lev-

el of competition or higher market concentration and risks to financial stability (Boyd et al., 2006; Schaeck et al., 2009).

400. Martinez-Miera and Repullo (2010) combine these two strands of literature by identifying a non-linear relationship between profitability and financial stability. They argue that, due to opposing effects, there is **an inverted U-shaped relationship** between **competition and stability**. For a low initial level, an increase in competition has a stabilising effect. However, at a certain level, this relationship inverts, and more intense competition destabilises the financial sector. Therefore, the assessment of a change in the intensity of competition is largely dependent on its initial level.

401. Moreover, market concentration in the banking sector could fuel the **too-big-to-fail problem** and therefore be detrimental to financial stability (Mishkin, 1999). This is because implicit government guarantees give systemically important banks an incentive to take excessive risks (Laeven et al., 2016; Dávila and Walther, 2019), which can even spread via competition effects to banks not subject to a state guarantee (Gropp et al., 2011).

402. The **risk-taking channel of monetary policy** provides an additional connection between bank profitability and financial stability (Borio and Zhu, 2012; JG 2015 Ziffern 387 ff.). According to this, an expansionary monetary policy would increase the risk appetite of economic actors and could in turn threaten financial stability (Altunbas et al., 2010; Delis and Kouretas, 2011). In an empirical study, Jiménez et al. (2014) show that a reduction in short-term lending rates results in an expanded supply of risky lending, particularly from poorly capitalised banks. In a sample of banks from the euro area and the United States, Maddaloni and Peydró (2011) find a link between lower short-term rates and less strict lending terms for loans to households and businesses. Heider et al. (2019) argue that negative rates on the deposit facility via a reduction of banks' capitalisation lead to reduced lending and increased risk associated with the granted loans by banks with a high proportion of customer deposits. In addition, it is not clear whether lower interest rates in what is already a very low interest rate environment would actually stimulate lending at all, as banks could be forced to restrict their lending due to lower capitalisation (reversal interest rate, Brunnermeier and Koby, 2019). ↘ ITEM 61

2. Mounting risks within the financial system

403. The economic slowdown in the euro area can be expected to translate into a further decline in bank profits, and could therefore increase risks in the financial sector. There are already signs of a weakened capitalisation of banks, as the **risk-weighted and unweighted capital ratios fell slightly** last year in the euro area. ↘ CHART 66 TOP LEFT This development is likely to continue in the event of a recession. On the one hand, an increase in loan defaults and thus larger impairments should be expected, thus affecting banks' capital. On the other hand, banks using **internal models** to determine risk-weighted assets (RWA) are likely to experience increased risk weights, which causes risk-weighted capital

ratios to decrease. This could result in **procyclical effects**, exacerbating the slowdown.

404. **Banks' risks** have **fallen** in most euro area countries in recent years. For instance, the **risk density**, the share of RWA in total assets, has decreased compared to 2008. German banks are an exception; RWA for them have remained constant following a decline until 2013 (Guthausen et al., 2019). But the risk density of German banks has noticeably increased due to a decline in total assets. ↘ CHART 66 TOP RIGHT The level of the risk density of German banks nevertheless remains far below that of banks in the former crisis countries. **Non-performing loans** (NPLs) have fallen significantly in recent years compared to total loans in all countries. Nevertheless, former crisis countries (with the exception of Spain) still report high levels. ↘ CHART 66 BOTTOM LEFT **Loan loss provisions** have decreased in the euro area – not least in Germany – in recent years, contributing positively to profits. CHART 66 BOTTOM RIGHT
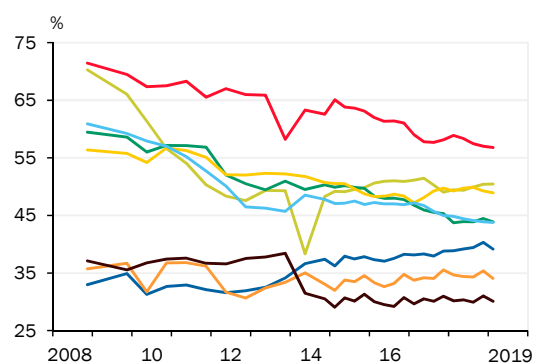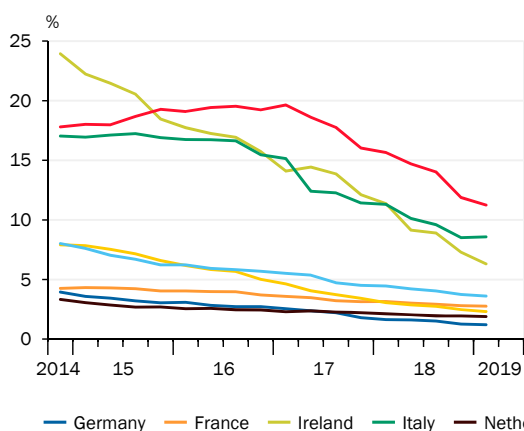
↘ CHART 66
Risk indicators of European banks

Risk-weighted and unweighted capital ratios in the euro area[1]

■ Risk-weighted capital ratio[2]   ■ Unweighted capital ratio[3]
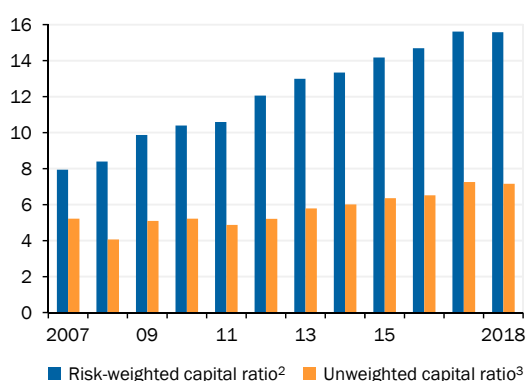
Risk density[4]

Non-performing loans[5]

Provisions for loan losses[6]

— Germany — France — Ireland — Italy — Netherlands — Austria — Portugal — Spain
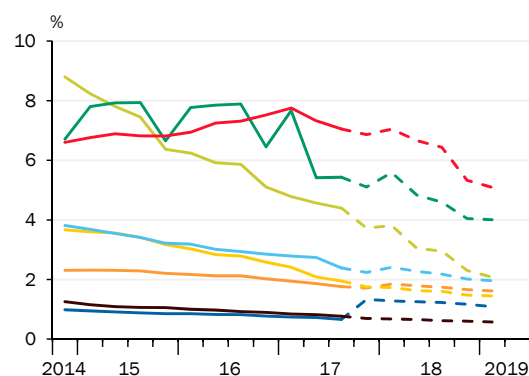
1 – Average value for euro area banks and bank groups. 2 – Tier 1 capital of a bank in relation to its risk-weighted assets. 3 – Total capital of a bank in relation to its total assets. 4 – Ratio of risk-weighted assets to total assets. 5 – In relation to total loans. 6 – Accumulated impairment in relation to gross debt instruments. Shown by dashed lines from Q4 2017 to indicate that methodological changes implemented in Q4 2017 could affect the comparability of data over time for all countries shown.

Sources: ECB, own calculations

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In the event of a recession, however, **increased risks are to be expected**, which would likely be reflected in increased risk-weighted assets, NPLs and loan loss provisions. This could have a major impact particularly on banks that still have large volumes of NPLs or low coverage ratios. Moreover, new regulations require provisions for future NPLs to be made earlier. Furthermore, the new **IFRS 9** accounting standard which came into effect in 2018 means that banks have to create provisions for expected loan losses more quickly, which can have a procyclical effect (ESRB, 2019a).
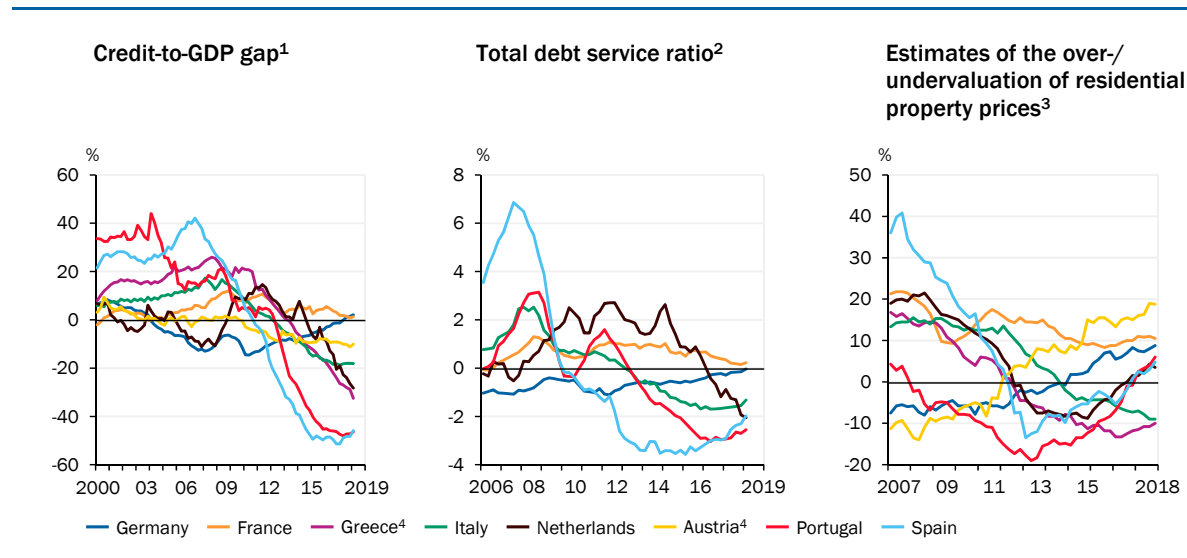
405. Improved capitalisation increases the resilience of banks to an impending rise in risks. An **increase in equity** is **difficult** for banks in the current environment. Low profitability limits banks' ability to accumulate capital by **retaining profits**. This connection is of particular relevance to public-sector banks in Germany, as profit retention is their primary method of capital accumulation. At the same time, weak profitability can make it difficult to **raise equity** on the capital market. The shares of many European banks are currently trading with a large discount to their book values (ECB, 2019a), which may be linked to their low profitability. Because of the low price-to-book ratio, it is expensive for these banks to raise equity on the market, as they have to accept a high dilution of existing shareholders' claims compared to the amount of new funds.

406. In the event of a crisis, banking supervisors would currently only be able to curb procyclical effects to a limited extent. **Countercyclical capital buffers** have only very hesitantly been raised in many euro area countries, such as **Germany**. The Federal Financial Supervisory Authority (BaFin) has **raised** the domestic countercyclical capital buffer rate **to 0.25 %** at the recommendation of the Financial Stability Committee. Banks have to meet this requirement by 1 July 2020 (BaFin, 2019a). One of the main reasons cited for this measure is the systemic risk due to underestimated economic risks with the danger of excessive increases in RWA. Although this additional capital requirement is to be met only next year, the buffer is likely to be already having a certain effect.

The risk density has been increasing already since 2013. ⬂ CHART 66 TOP RIGHT Overall, the question is therefore whether the countercyclical capital buffer in Germany was raised **too late** and **not far enough**. Given the low level, there is only limited scope to ease the buffer in order to counter procyclical effects. Only the capital conservation buffer offers additional leeway, although this would go along with restrictions on profit distribution, meaning that banks would possibly use the buffer too late.

407. The BaFin and the Deutsche Bundesbank published in September the results of the latest **stress test** of 1,412 less significant institutions (**LSIs**) not directly supervised by the ECB (Deutsche Bundesbank, 2019a). According to the stress test, the **return on assets**, which is already at a historically low level, is **likely to decline further** given the protracted low interest rate environment. In comparison to the low-interest survey conducted in 2017, it is evident that many banks were too optimistic in their planning, as they had expected a turnaround in interest rates sooner. The survey also indicates **elevated risk-taking**, which is reflected in an increased risk density and longer fixed interest rates.

↘ CHART 67

Macroeconomic early warning indicators for selected euro area countries

Credit-to-GDP gap[1]	Total debt service ratio[2]	Estimates of the over-/ undervaluation of residential property prices[3]

Germany — France — Greece[4] — Italy — Netherlands — Austria[4] — Portugal — Spain

1 – Difference between the credit-to-GDP ratio and its long-term trend (calculated using a one-sided Hodrick-Prescott filter). 2 – Ratio of interest payments plus write-downs to income. Difference between country-specific five-year rolling averages. 3 – Average of the following four valuation methods: price-rent ratio, price-income ratio, asset pricing approach and Bayesian estimated inverted demand model. For details on the asset pricing approach, see the ECB's Financial Stability Report, June 2011, box 3. For details on the Bayesian estimated inverted demand model, see the ECB's Financial Stability Report, November 2015, box 3. 4 – No data available for the debt service ratio.

Sources: BIS, ECB, own calculations

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The **stress scenario of the stress test** shows a **clear decline in common equity tier 1** (CET1) by 3.5 percentage points. Nevertheless, the banks are relatively well capitalised even in the stress scenario. But it should be noted that the stress test results are only average values. It therefore cannot be ruled out that individual banks fail to meet capital requirement in the tested scenarios. Moreover, the stress test captures possible **systemic effects** only to a limited extent, which means that the actual effects on the banks could be significantly larger.

408. **Macroeconomic early warning indicators of financial crises** used by the Bank for International Settlements (BIS) (Aldasoro et al., 2018) show a **mixed picture**. The credit-to-GDP gap and the debt service ratio for most euro area countries are inconspicuous. However, in Germany, unlike in other countries, these indicators have been rising for several years, with the credit-to-GDP gap meanwhile slightly positive. ↘ CHART 67 LEFT AND CENTRE

Considerable risks are reflected in the **increased valuations** of many assets (ECB, 2019a). There is a risk of abrupt price changes that could endanger financial stability. The supervisory authorities are observing the rise in real estate sector prices with particular concern. There is evidence of an overvaluation for residential real estate in many member states. ↘ CHART 67 RIGHT Due to significant systemic risks in the medium term, the European Systemic Risk Board (**ESRB**) issued warnings in September to five member states and recommendations to six member states regarding the **risks in residential real estate** (ESRB, 2019b). The ESRB had already issued warnings to eight member states in 2016, only two of which have since undertaken sufficient action.

409. **Germany** received a **warning for the first time**. The reasons cited are overvalued house prices, particularly in cities, increased house price growth and the

fear of relaxed lending standards, with reference to significant data gaps. The **measures taken**, namely the activation of the countercyclical capital buffer, are only deemed **partially appropriate and partially sufficient**. Potential measures cited include the activation of further capital-based macroprudential tools as well as the activation of credit-related instruments (namely the LTV ratio) and the creation of a legal basis for income-based borrower-related instruments, which has long been advocated by the German Council of Economic Experts (GCEE Annual Report 2017 items 488 ff.; GCEE Annual Report 2018 items 690 ff.) Moreover, **data gaps** regarding lending standards for new loans are to be closed.

3. Addressing risks in a timely manner

410. Banking supervision should take appropriate measures to address the increasing vulnerabilities in the German banking sector. Given the growing risks in the German real estate sector, **further macroprudential measures** should be promptly taken to curb credit growth in line with the warning issued by the ESRB. This would mean, however, that banks would not be able to the same extent to expand volumes to compensate for the narrowing of interest margins.

411. **Further capital-related measures could be activated**, such as an increase in the sectoral risk weights for real estate loans or a further increase in the countercyclical capital buffers. **Credit-related measures** could also be considered, in particular a restriction on LTV ratios. In the future, in order to avoid procyclical effects, particularly the countercyclical buffer would have to be **released in a timely manner** if there is a risk of the economic slowdown intensifying because of constrained lending. Currently, there are no indications that this is necessary in Germany.

Moreover, the German Council of Economic Experts continues to call for strengthening the macroprudential toolbox by creating the legal basis for **income-related tools**, such as a limitation of the debt-to-income ratio (DTI ratio) or the debt-service-to-income ratio (DSTI ratio) (GCEE Annual Report 2017 items 488 ff.) Additional **data** is essential to enable an effective monitoring of lending standards.

412. The **design of** the **countercyclical capital buffer** in Europe should be reconsidered in order to ensure timely activation. The strong focus on the credit-to-GDP gap has not proven to be appropriate. It would make more sense to **steadily build up the buffer already at the start of the financial cycle upswing**, without having to take any further discretionary decisions. Otherwise there is a risk that the buffer is **systematically built up too late** (GCEE Annual Report 2018 item 696). The neutral level of the buffer should be well above 0 %, so that relaxation is actually possible if capital requirements excessively restrict lending during a crisis.

413. Banks' weak profitability should not be used **under any circumstances** as an excuse to **dilute** the planned further **regulations** in the revision of the Basel

Accord (Basel III). Proposals asking for inappropriate restrictions on banks' ability to generate income, such as a general ban on banks charging negative deposit rates, as discussed in Germany, should also be clearly rejected.

IV. DIGITAL TRANSFORMATION IN THE FINANCIAL SECTOR

414. The current phase of cyclical challenges is accompanied by equally profound **structural changes** in the banking sector. The **market entry of BigTechs** could entail disruptive consequences for the future viability of traditional business models. In addition to the tight earnings situation, shifts in the market for payment services and intensifying competition with new market participants could further exacerbate the pressure on incumbent financial services providers to adapt to an evolving industry landscape.
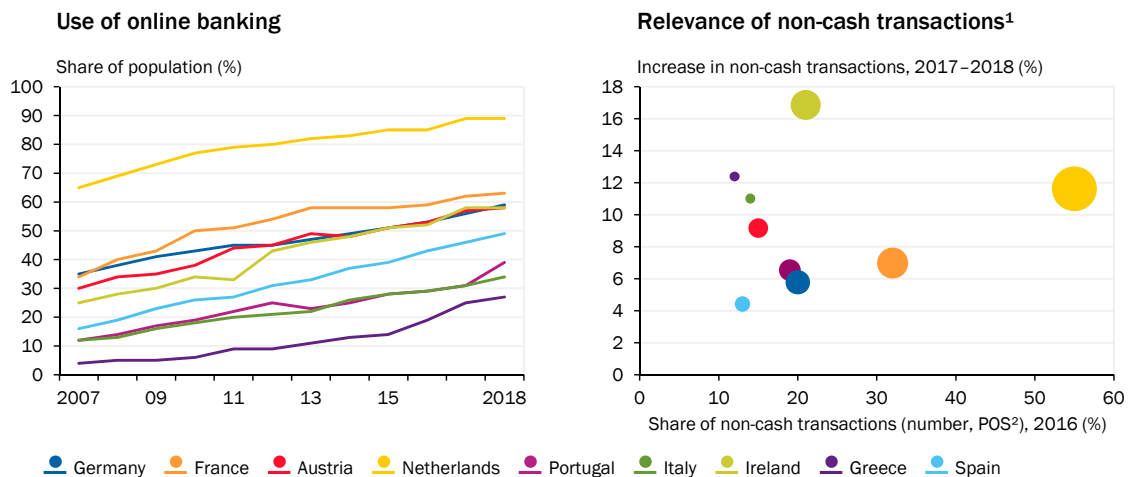
1. Disruption by new market participants

415. The demands placed on banking services have changed in recent years. The use of **online banking** has increased considerably across all European countries. ↘ CHART 68 LEFT At the same time, the relevance of **non-cash payment methods** in processing financial transactions is growing (Deutsche Bundesbank, 2019b; van Steenis, 2019). In this context, the settlement of payments via mobile devices is continually gaining in importance (**mobile wallet, e-wallet**). However, market shares and growth rates of non-cash payment methods differ substantially across countries. The Netherlands is the European leader in payment digitalisation, with Germany taking a middle position. ↘ CHART 68 RIGHT

416. Technological innovations in the financial sector have facilitated the **market entry of new competitors**. Market entrants include recently founded companies that offer user-friendly financial services tools using technology-based systems (**FinTechs**). In Germany, FinTechs are currently active, amongst others, in credit brokerage via crowdfunding platforms, the provision of automated financial advice (robo-advice), payment services, insurance (InsurTechs), as well as alternative payment methods (BaFin, 2016).

In addition, the importance of large technology companies (**BigTechs**) in the financial services industry is increasing, particularly in the United States and in China, as well as in several developing countries. BigTech business models are based on online platforms that combine **automated methods for big data analysis** with the network effects generated by their platform structure (Frost et al., 2019). Such **network effects** create **barriers to entry** resulting in high market concentration, particularly given the two-sided market structure (Rochet and Tirole, 2003; Rysman, 2009) and the scalability of business models.

417. Compared to FinTechs and BigTechs, an important competitive disadvantage of many German banks is their **outdated IT infrastructure**. The BaFin has em-

↘ CHART 68

Digitalisation in the financial sector: Online banking and non-cash payment methods

Use of online banking

Share of population (%)

Relevance of non-cash transactions[1]

Increase in non-cash transactions, 2017–2018 (%)

Share of non-cash transactions (number, POS[2]), 2016 (%)

● Germany   ● France   ● Austria   ● Netherlands   ● Portugal   ● Italy   ● Ireland   ● Greece   ● Spain

1 – Dot sizes reflect the number of non-cash transactions per capita in 2018. According to the definition of the European Central Bank, non-cash transactions include credit transfers, direct debits, card payments, e-money payments, cheques and other non-cash payment services. 2 – Point of sale (POS) refers to the place where goods or services are bought and paid for (Deutsche Bundesbank, 2018b).

Sources: ECB, Eurostat, own calculations

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phasised that German banks are lagging behind in modernizing their IT systems (BaFin, 2019b). In this context, banks could be caught in a **potentially self-reinforcing vicious circle**: Due to their low profitability, German banks do not have sufficient financial capacity to invest in IT infrastructure improvements. At the same time, continued reliance on outdated IT systems results in further competitive disadvantages and escalating cost pressures.
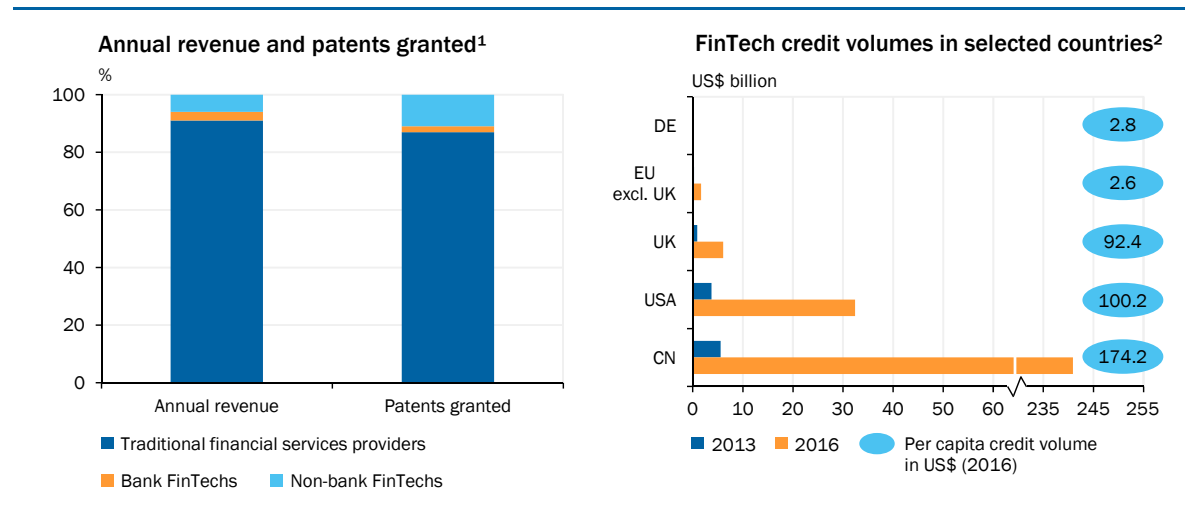
FinTechs as cooperation partners in the banking business

418. FinTechs currently play a **minor role** in the global financial system. In 2018, 91 % of total revenues in the global financial sector were generated by incumbent financial institutions while merely 6 % were attributable to FinTechs without a banking licence (IMF, 2019). At the same time, FinTechs without a banking licence filed 11 % of all patents granted in the financial sector, reflecting their capacity for innovation (IMF, 2019). ↘ CHART 69 LEFT As only a few FinTechs in Germany have applied for a banking licence to date, their role in the provision of deposit and loan services is currently limited. In other countries, FinTech credit volumes equally constitute only a small fraction of overall bank lending (BIS, 2018). However, it is noteworthy that **FinTech credit volumes** in Europe – with the exception of the United Kingdom – are **low** when compared to the United States or China (BIS, 2018). ↘ CHART 69 RIGHT

419. Incumbent financial institutions view FinTechs as significant competitors especially in payment and settlement services, followed by retail banking. Intensifying competition could thus contribute to declining revenues in banks' commission-based business in the future (EBA, 2018). But the potential for incumbents to be crowded out by newly emerging competitors appears to be limited. Instead, **cooperation** among market participants as well as **takeovers** of FinTechs by incumbent financial services providers are increasing. Based on a study by Dor-

↘ CHART 69
Global relevance of FinTechs

Annual revenue and patents granted[1]

%

Traditional financial services providers
Bank FinTechs
Non-bank FinTechs

FinTech credit volumes in selected countries[2]

US$ billion

2013 2016 Per capita credit volume in US$ (2016)

1 – Revenue data refer to 2018 and patent data to the number of patents granted until March 2019. 2 – FinTech credit volumes include loans offered via electronic (online) platforms that are not operated by banks. This definition encompasses all credit activity facilitated by platforms that match borrowers with lenders (peer-to-peer lenders, loan-based crowdfunders and marketplace lenders) and platforms that use their own balance sheet to intermediate between borrowers and lenders. DE-Germany, EU-European Union, UK-United Kingdom, CN-China.

Sources: BIS, IMF

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fleitner and Hornuf (2016), 87 % of the banks surveyed in Germany cooperate with FinTechs and plan to continue to do so in the future.

Market entry of BigTechs into the banking business

420. The processing of payments has long played a **minor role** in shaping the overall corporate strategy of many German banks. As nowadays large volumes of transaction data can increasingly be put to commercial use, the processing of payments is gaining strategic importance. However, due to a considerably larger customer base and more powerful algorithms, non-domestic BigTechs currently have a **comparative advantage in linking and analysing customer data**. These factors could facilitate an entry into banking services in the medium term. Such a development would place further pressure on incumbent providers to adjust their business models and could have a disruptive effect on the industry. The establishment of the **European Mobile Payment Systems Association** (EMPSA) and plans for a joint **payment platform of German banks** (X-Pay) reflect the concern that companies based in the US or in China could outpace European financial services providers in the payment processing business.

421. While the share of large technology companies in the global market for non-cash transactions was still below 10 % in 2016, BigTech payment platforms processed 71 % of all mobile wallet transactions (Capgemini and BNP Paribas, 2018). In addition to innovative capability with regard to technology, the regulatory environment plays an important role for the expansion of BigTechs. Frost et al. (2019) show that the lending volume of BigTechs is higher in countries whose financial sectors are subject to less stringent regulation. Strict **regulation** therefore constitutes a **barrier to entry** for new market participants and protects incumbent financial services institutions from competition.

422. **BigTechs** could use their role as **intermediaries** in processing payments to offer their customers additional types of financial services. These services could include investment products and loans. ↘ BOX 10 To date, this type of market entry has primarily been observed in countries where the existing payments infrastructure is inadequate and the processing of payments via technology platforms compensates for deficits in the existing system for payment transactions (Frost et al., 2019). In the future, **BigTechs** can also be **expected** to **enter the market** in countries with well-functioning payment systems, as exemplified by the recent proposal to launch the digital currency Libra. ↘ BOX 11 But even if significant disruptions fail to materialize and BigTechs – like FinTechs – merely act as partners for incumbent financial services providers, it is likely that part of the profits generated by the traditional banking sector are transferred to large technology companies.

↘ BOX 10

BigTechs as financial services providers

The growing importance of non-cash payment methods has facilitated the **entry of large technology companies** (BigTechs) into the **market for payment and banking services**. At present, these market entrants primarily include BigTechs based in the US and China (e.g., Amazon, Apple, Google, Facebook and Ant Financial/Alipay, Tencent/WeChat Pay).

China is one of the world's fastest-growing markets for digital payments. Due to strong network effects and a low degree of fragmentation, the Chinese market exhibits an **oligopolistic structure**: with a market share of over 90 %, Alipay and WeChat Pay dominate the country's market for mobile payments (Financial Times, 2018a; Frost et al., 2019). In 2017, the volume of payments processed by BigTechs represented 16 % of China's GDP while the corresponding figure for the United States amounted to merely 0.6 % of US GDP (BIS, 2019a). In addition to mobile payments, Chinese BigTechs are continually expanding their presence in other business areas: Through its parent company Ant Financial, Alipay operates one of the world's largest **money market funds** (FSB, 2019).

BigTechs use a variety of strategies to enter the banking market. Some set up their **own banking business** by initially processing digital payments on their platforms and subsequently branch out by offering additional financial services. Another BigTech strategy for market entry is the pursuit of **cooperation agreements with incumbent institutions**. Due to regulatory complexity, a swift market entry into highly developed financial markets is generally only possible with the help of companies that already possess a functioning regulatory infrastructure and the corresponding licences.

Technology companies' entry into the market for financial services results in **advantages for customers**. Online payment platforms can be used to transfer money between individual users (peer-to-peer, P2P) with immediate payment confirmation, thus increasing the **efficiency of monetary transactions**. In the medium term, BigTechs could aggregate their existing client and transaction data to assess customers' creditworthiness and subsequently offer them **access to other financial services** such as loans or insurance products. This might result in improved financial inclusion, particularly in countries with inadequate credit rating systems and in which a substantial proportion of the population is excluded from financial services. Empirical evidence suggests that BigTechs can use their datasets to arrive at more accurate customer credit assessments than credit bureaus (BIS, 2019a; Frost et al., 2019). Finally, the market entry of BigTechs could stimulate competition by giving market participants access to a **larger number of financial services providers** to choose from, assuming that new competitors do not completely displace traditional financial institutions.

However, the expansion of financial and banking services provided by BigTechs also entails **risks**. Initial empirical analyses indicate that lending activity by BigTechs is greater in countries with less

regulated financial sectors, giving rise to risks in the financial sector (Frost et al., 2019). Due to network effects, large technology platforms could come to **dominate the market**, create high barriers to entry for competitors and exploit their market power to the detriment of consumers (BIS, 2019a). There is also a risk that the analysis of customer data using algorithms perpetuates discrimination against certain groups (National Consumer Law Center, 2014; U.S. Department of the Treasury, 2016).

The growing market power of BigTechs has resulted in a number of **regulatory interventions**. In Europe and the United States, these interventions have primarily targeted **data protection breaches** that were not related to firms' entry into the banking business (European Commission, 2017; Federal Trade Commission, 2019). In China, the relatively rapid expansion of BigTech banking activities has already had a direct impact on regulation. The Chinese government has obliged BigTechs to comply with a 100 % **minimum reserve requirement** by depositing customer funds with the Chinese central bank (Financial Times, 2018a; Bloomberg, 2019). In June 2018, the government also introduced new rules regarding the mandatory use of centralized, state-owned **clearing houses** (NetsUnion Clearing/China Union Pay) in June 2018 (BIS, 2019a).

2. Openness to innovation with adequate regulation

423. Due to the ongoing digital transformation in the financial sector, regulatory and supervisory authorities are confronted with a number of new challenges. The BaFin argues that the same type of business activity must be regulated in the same manner, regardless of whether it is carried out by a FinTech or a traditional bank (**level playing field**). This has resulted in FinTechs voicing concerns about excessive regulation and inadequately burdensome bureaucratic rules. Such restrictions could hamper financial innovation.

   Countries such as the United Kingdom, Singapore and Malaysia have created **regulatory sandboxes** (IMF, 2019), which grant young and innovative FinTechs a simplified regulatory framework for a limited period of time and thus facilitate market entry. So far, the German supervisory authority has strictly rejected such an approach. However, the introduction of such clearly delineated regulatory sandboxes should indeed be considered in order to promote financial sector innovation. Yet, the principle of a level playing field should, in essence, be maintained – for example by setting less stringent regulatory requirements for FinTechs only up to a certain business size or for a limited period of time.

424. Such regulatory initiatives should not result in new market participants gaining a significant competitive advantage, as it has occurred in the area of payment services following the introduction of the revised **Payment Services Directive (PSD2)**. This directive is intended to enable registered account information and payment initiation service providers to access financial institutions' account data via an online interface from September 2019 onwards (European Parliament, 2015; Deutsche Bundesbank, 2019b). This could benefit FinTechs and BigTechs as they enter the business of providing payment processing and banking services.

But the provisions contained in PSD2 lead to an **asymmetric treatment** of incumbent banks relative to new market entrants. Banks are not merely required to grant third-party financial service providers free access to their client data; they also have to unilaterally bear the considerable expenses associated with setting up and maintaining these interfaces. Under PSD2, incumbent financial institutions do not receive symmetrical access to data generated by new market entrants (Financial Times, 2018b). Nevertheless, the adoption of PSD2 represents a first step towards an **open banking standard**. This development could raise financial system efficiency and create new business opportunities for banks by establishing interfaces and facilitating access to data (Mersch, 2019).

425. New types of financial services such as the digital currency Libra could potentially entail **risks** that must be **regulated in an adequate manner**. ↘ BOX 11 Nevertheless, policymakers and regulators should continue to lend constructive support to the financial sector as it undergoes structural change. From a financial stability perspective, gradual structural changes are preferable to disruptive developments. This suggests that the activities of major potential financial services providers should be closely monitored such that requirements for regulation can be identified at an early stage.

↘ BOX 11

Digital currency Libra: Opportunities and risks

In June 2019, the Libra Association issued a White Paper to announce its initial plans for the **introduction of the digital currency Libra** (Libra Association, 2019). At the time of the announcement, the **Libra Association** was a consortium consisting of the Facebook subsidiary Calibra as well as 27 other member companies. Among others, its members include several venture capital funds and technology companies but currently no commercial banks. In October 2019, several of the initial project partners withdrew from the Libra Association. This group of companies included the payment services providers Visa, Mastercard, PayPal and Stripe as well as the online marketplace eBay.

Although the precise setup remains uncertain, several basic principles of the planned digital currency are already discernible. Libra is designed to combine the advantages of private cryptocurrencies with the economies of scale and network effects generated by a widely used technology platform. In contrast to Bitcoin, Libra is a **stable coin** and, as such, fully backed by assets with inherent value (the **Libra Reserve**). These assets are chosen to be both safe and liquid. They consist of bank deposits and short-term government bonds in the major currencies, namely the US dollar, the British pound sterling, euro and yen (Libra Association, 2019; Marcus, 2019). The digital currency's value will largely be based on the value of the underlying assets. This setup is intended to prevent the significant value fluctuations observable with cryptocurrencies like Bitcoin. The currency composition is to be determined in advance of the currency launch, and adjustments in the asset mix will be limited to situations in which market conditions change substantially (Catalini et al., 2019).

Libra is designed to be traded via a **network of authorised resellers** on exchanges where the digital currency can be converted into national currency. There is no plan to offer users the option of redeeming the currency directly through the Libra Association. Only resellers – which are supposed to act as intermediaries between users and the consortium – can trade directly with the Libra Association. Transactions are to be stored and authorised using the **Libra Blockchain**, a single data structure which is controlled by Libra Association members through a system of validator nodes.

Libra's launch offers the **opportunity** to use existing networks in order to raise the **efficiency of processing payments** in both the private and commercial domain, particularly in carrying out cross-

border transactions. This could result in lower fees and shortened transaction times. Libra could thus contribute to improved **financial inclusion**, particularly in countries with less developed financial systems. However, it is questionable whether Libra – as a digital currency and potential substitute for a savings account – can in fact remedy deficiencies in the area of financial inclusion. Surveys indicate that over 60 % of the world's 1.7 billion people without a bank account cite a lack of savings as an important reason for remaining unbanked (World Bank, 2018).

Whether Libra can be established as a **means of payment** largely depends on whether it in fact achieves stability in value (Deutsche Bundesbank, 2019c). This depends crucially on the value of the underlying assets and the feasibility of converting Libra into national currency. In this context, the currency's setup generates an **exchange rate risk** due to relative value fluctuations in the currencies that make up the underlying assets; it also entails a **default risk** affecting the value of the Libra Reserve, stemming from banks (in the case of bank deposits) or sovereign debtors (in the case of government bonds). In addition, this setup implies default risks from the issuer's side as well as **liquidity risks**, discussed below. Value fluctuations could cause changes in the currency's purchasing power and thus be detrimental to its role in smoothing individual consumption patterns (Cecchetti and Schoenholtz, 2019).

The Libra Association's proposal has thus far largely been met with **opposition**. Criticism of the currency project primarily relates to three areas: potential risks to financial stability, impacts on the effectiveness of monetary policy, and the danger of privacy law breaches in the context of pseudonymised transaction data, including the possibility of illegal payment transactions.

In the setup currently being discussed, Libra most closely resembles an exchange-traded fund (ETF) with physical replication and passive management rather than an open-ended investment fund – particularly given that resellers function as intermediaries between users and the Libra Association. This setup could entail **systemic risks to financial stability**. The role of resellers as intermediaries grants a certain degree of protection against run-like phenomena involving Libra Reserve assets. However, as in the case of ETFs (Pagano et al., 2019), there is a risk of deviations between the value of the underlying assets and the value of Libra. Such deviations could result in **fire sales**. The risk of a loss of confidence is particularly high as Libra Reserve assets are not fully liquid and Libra is not deemed to be a form of legal tender (Bofinger, 2019). This implies that Libra's liquidity could decline sharply during a financial crisis. If the Libra reserve withdraws large quantities of bank deposits or banks hold Libra themselves, such a crisis could quickly spread to the banking system. Moreover, there are **operational risks** which – due to the expected size – could have a significant impact on the entire payment system. Additional risks could arise if the currency's underlying assets were to be used in securities lending transactions, as is often the case for ETFs with physical replication.

The second strand of criticism concerns the potential existence of adverse effects on the **monetary policy transmission mechanism**. Existing private cryptocurrencies fulfil the basic functions of money only to a limited extent (GCEE Annual Report 2018 items 398 f.) Given its potential attractiveness as a method of payment and the large number of potential users, Libra could turn into a serious competitor of sovereign currencies that are not themselves used to back the currency. For currencies included in the Libra Reserve basket, this argument depends on the extent to which Libra serves as a substitute for these currencies. Cash and demand deposits held in national currencies could thus – to varying degrees – be replaced by the private currency Libra. On the one hand, large shares of the profits generated by money creation could therefore be shifted to the Libra Association, at the expense of sovereigns and banks. On the other hand, such a development could impair the **effective transmission of monetary policy measures** in these countries (GCEE Annual Report 2018 item 400), as monetary policy would only have a limited influence on Libra. Moreover, should a crisis occur, the Libra Association does not have access to the amount of **liquidity reserves** that would be required to maintain a smoothly functioning global payment system (Pistor, 2019). The responsibility for a

functioning payment system would thus remain under the purview of the respective national central banks, while the profits from money creation would partially accrue to the Libra Association.

The third area of criticism relates to the challenges associated with the processing and monitoring of Libra transaction data in line with the relevant legal provisions. This includes the difficulty of monitoring payment transactions to detect **illegal payments in the context of money laundering and terrorist financing**. The Libra Association argues that illegal transactions can be prevented by utilizing technologies such as machine learning to monitor payment flows (Marcus, 2019). Libra transactions therefore do not guarantee complete anonymity. In addition, representatives of several authorities have voiced concerns that the aggregation of information from social networks and personal transaction data could raise **data compliance issues** (ICO, 2019). Calibra has been tasked with ensuring the **separation between personal and financial data** in order to protect Libra users' data (Libra Association, 2019).

The risks described above raise the question of how an **adequate regulatory framework** for Libra could be designed. As the setup of Libra currently combines elements of a bank, an investment fund and a form of e-money, regulatory measures from all three areas ought to be used. It is also conceivable that regulatory requirements would be placed on the form of the underlying blockchain. Initially, Libra will be operated as a **permissioned blockchain** that does not allow unrestricted access (Libra Association, 2019). Such an infrastructure offers certain advantages relative to a public structure (Deutsche Bundesbank, 2019c). It would also be conceivable to oblige the Libra Association to hold collateral in the form of central bank money, thus reducing default risk. This would be in line with the approach taken in China where technology companies active in the payments and banking business are required to hold 100 % of customer funds at the central bank. ↘ BOX 10 However, this raises the issue of how Libra's operational costs would be covered in such a scenario; under the present proposal, all operational costs are to be financed by income generated from Libra Reserve assets. Such a regulatory requirement could thus result in higher costs for users and limit Libra's potential benefits in improving financial inclusion. Moreover, bank stability could be reduced if – particularly during a financial crisis – bank depositors were able to convert their money into Libra due to safety considerations. Under any circumstances, the intended use of Libra as a global payment instrument makes an **internationally coordinated regulatory approach** indispensable. Among other concerns, such an approach is necessary to prevent money laundering and other illegal transactions.

A potential approval of Libra could amplify the displacement of national currencies. Accordingly, the announcement of the Libra initiative has triggered a broad debate on the need to **issue a central bank digital currency** (CBDC). Experts argue that the issuance of a CBDC could – unlike in the case of private digital currencies – guarantee independent access to money and greater payment security (Deutsche Bundesbank, 2019c). But the issuance of a CBDC to private individuals could also result in a destabilising effect on the banking system, comparable to the effects of depositing customer funds in the form of central bank money (GCEE Annual Report 2018 item 403). Another argument for the issuance of a CBDC is the maintenance of a functioning monetary transmission mechanism. A study conducted by the Bank for International Settlements (BIS) shows that a large number of central banks are analysing the issuance of digital currencies internally (BIS, 2019b). Mark Carney (2019) has proposed a **synthetic hegemonic currency** (SHC) which could be issued by several central banks in a coordinated effort.

As a digital currency, Libra has the potential to increase the efficiency of cross-border payments. However, its proposed design raises many questions, particularly regarding the stability of value, financial stability, the functioning of the monetary transmission mechanism and strategies to deal with illegal transactions. Central banks should thus **scrutinize the potential launch of a CBDC** in order to be able to respond, if and when necessary, to emerging competition in the form of private currencies (GCEE Annual Report 2018 items 397 ff.).

426. The platform economy requires a **sufficiently large market** to achieve the necessary scalability of banking services. The individual domestic markets of the European countries are likely to be insufficient to achieve such scale. In an effort to develop joint platforms, cooperation between different financial institutions could be useful. Currently, the lack of regulatory harmonisation – for example in the area of consumer protection – is an obstacle that prevents the scalability of business models at a European level. The development of a **common European banking and capital market** is therefore an important political objective (GCEE Annual Report 2018 items 533 ff. and 547 ff.).

427. Due to increasing economies of scale in banking, **barriers to cross-border mergers at the European level** ought to be removed. In addition to inadequate regulatory harmonisation, such barriers relate to the customary practice of "ring-fencing" in the event of a crisis, i.e., the prevention of liquidity or capital leakage from subsidiaries to their parent companies abroad (GCEE Annual Report 2018 item 537). New rules relating to the internal allocation of bail-in-able liabilities (MREL) within the overall framework of European banking reforms are ill-advised because they further strengthen the possibilities for ring-fencing (König, 2019). In order to limit adverse effects on financial stability that arise from the creation of large European banks, it is necessary to apply particularly **strict regulatory standards to large institutions**, especially with respect to their capital buffers.

428. A strong banking sector is better able to cope with the structural challenges ahead. To this end, banks must **overcome** their **weak profitability** and find ways to carry out the **necessary investments to strengthen the viability** of their business models, notwithstanding current profitability headwinds. In some cases, this is likely to remain difficult without resorting to bank mergers. Moreover, non-viable banks should be allowed to exit the market, in an effort to prevent unnecessary delays in adapting to structural changes in the banking sector.

APPENDIX

Analysis of the determinants of bank profitability

429. Rutkowski (2019) examines, in an empirical analysis, the extent to which bank- and country-specific factors determined the profitability of European banks between 2013 and 2018. In this study, profitability of the respective bank is measured by its **return on assets**. The estimation equation for the regressions at bank level is as follows:

$$ROA_{ijt} = \alpha_i + \beta ROA_{ijt-1} + \gamma X_{it-1} + \delta Z_{jt-1} + \varepsilon_{ijt}$$

ROA_{ijt} is the return on assets of bank i from country j in year t, and ROA_{ijt-1} its lagged value. X_{it-1} contains the bank-specific lagged variables *total assets* (logarithm), *equity ratio* (ratio of equity to total assets), *share of NPLs (*ratio of non-performing loans to loans issued), *credit growth*, *cost-income ratio* (ratio of administrative expenses to operating income) and *share of net interest income in total income* (ratio of net interest income to total income). The source of data for bank-specific variables is Moody's Analytics BankFocus. Z_{ijt-1} contains the **country-specific lagged variables** *GDP growth rate*, *inflation* (percentage change in the GDP deflator), *interest rate differential* (difference in yield between government bonds with a 10-year residual maturity and the three-month interbank lending rate), and *CR5* (combined share of the five largest banks in terms of total assets of all banks). The sources of data for country-specific variables are the World Bank, Oesterreichische Nationalbank and the ECB. ε_{ijt} is the error term.

430. The sample used in the regressions is constant over time and only contains those banks for which all data for the years from 2013 to 2018 are available. The sample thus comprises 298 banks from 24 EU member states. To analyse the influence of bank-specific and country-specific variables on banks' profitability, **random effects and fixed effects estimations** are conducted. In contrast to the latter, random effects models treat individual, unobserved effects as random.

431. In order to assess whether the effects of the slope of the yield curve *(interest rate differential)* on profitability depend on bank-specific characteristics, the regression models are expanded to include **interaction terms** interacting the *interest rate differential* with bank-specific variables. The regression model is thus as follows:

$$ROA_{ijt} = \alpha_i + \beta ROA_{ijt-1} + \gamma X_{it-1} + \delta Z_{jt-1} + \theta \cdot yield\ spread_{jt-1} \cdot V_{it-1} + \varepsilon_{ijt}$$

V_{it-1} contains the share of NPLs, the equity ratio, the cost-income ratio, and the share of net interest income in total income.

↘ TABLE 16

Determinants of bank profitability[1]

Explanatory variables (lagged)[2]	Dependent variable: return on assets					
	Basis specifications		Estimations including additional interaction terms			
	Random effects estimation	Fixed effects estimation	Random effects estimation	Fixed effects estimation	Arellano-Bond estimation	Blundell-Bond estimation
Lagged endogenous variable	0.556 ***	0.510 ***	0.562 ***	0.512 ***	0.504 ***	0.462 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Total assets	– 0.005	0.554	– 0.005	0.441	0.841	– 0.013
	(0.676)	(0.230)	(0.700)	(0.472)	(0.535)	(0.918)
Equity ratio	0.043 ***	0.078 **	0.058 ***	0.099 ***	0.142 *	0.082 **
	(0.000)	(0.017)	(0.000)	(0.007)	(0.096)	(0.016)
Share of NPLs	– 0.019 ***	0.000	– 0.020 **	– 0.007	– 0.010	– 0.021 **
	(0.001)	(0.998)	(0.014)	(0.679)	(0.813)	(0.047)
Credit growth	– 0.004 ***	– 0.004 ***	– 0.004 **	– 0.004 ***	– 0.006 **	– 0.005 ***
	(0.003)	(0.008)	(0.011)	(0.001)	(0.025)	(0.000)
Cost-income ratio	0.002	0.003	0.001	0.002	0.007	0.004
	(0.285)	(0.247)	(0.748)	(0.474)	(0.308)	(0.307)
Share of net interest income in total income	– 0.002	– 0.003 *	– 0.003 **	– 0.004 ***	– 0.005 ***	– 0.005 ***
	(0.105)	(0.093)	(0.015)	(0.003)	(0.002)	(0.000)
GDP growth rate	0.043 **	0.065 **	0.030 *	0.046 *	0.031	0.022
	(0.023)	(0.041)	(0.084)	(0.060)	(0.339)	(0.416)
Inflation	0.042	0.095	0.038	0.079	0.109 *	0.123 **
	(0.336)	(0.143)	(0.380)	(0.185)	(0.092)	(0.033)
Interest rate differential	0.065 **	0.127 *	0.006	0.029	0.094	0.027
	(0.043)	(0.071)	(0.821)	(0.653)	(0.490)	(0.729)
CR5	0.000	– 0.011	0.001	– 0.004	0.007	– 0.019
	(0.838)	(0.460)	(0.490)	(0.796)	(0.779)	(0.374)
Interest rate differential * share of NPLs			0.001	0.003	0.009	– 0.000
			(0.627)	(0.640)	(0.382)	(0.970)
Interest rate differential * equity ratio			– 0.007	– 0.011	– 0.006	0.004
			(0.175)	(0.164)	(0.683)	(0.829)
Interest rate differential * cost-income ratio			0.001	0.001	– 0.001	– 0.001
			(0.227)	(0.699)	(0.454)	(0.527)
Interest rate differential * share of interest income in total income			0.002 **	0.002	– 0.000	0.003
			(0.032)	(0.253)	(0.965)	(0.271)
Constant	0.327 ***	0.438	0.406 ***	0.318	– 0.693	0.966
	(0.001)	(0.527)	(0.000)	(0.624)	(0.510)	(0.230)
Test of joint significance[3]			11.81 **	3.15 ***	13.51 **	7.58
Test of joint significance[4]			10.24 ***	0.16	0.92	5.77 *
Test of joint significance[5]			28.85 ***	3.78 **	2.97	23.31 ***
Test of joint significance[6]			2.49	0.55	1.04	1.20
Test of joint significance[7]			6.92 **	4.66 **	10.37 ***	16.20 ***
Coefficient of determination						
(within R^2)	0.373	0.387	0.388	0.401		
(overall R^2)	0.530	0.231	0.541	0.300		
Number of observations	1 788	1 788	1 788	1 788	1 552	1 788

1 – Random effects, fixed effects, Arellano-Bond and Blundell-Bond estimations for the period 2013–2018. The bank-specific variables were adjusted for their median values. The bank-specific variables are treated as potentially endogenous variables in the Arellano-Bond and Blundell-Bond estimations. Standard errors clustered at the bank level. P-values in parentheses. ***, **, * denote a significance level of 1 %, 5 % or 10 %, respectively. 2 – In addition to the endogenous variables, lagged values are used for all explanatory variables. Lagged endogenous variable: profit as a percentage of total assets of the previous period; total assets: total assets (logarithm); equity ratio: equity as a percentage of total assets; share of NPLs: NPLs as a percentage of loans issued; cost-income ratio: general administrative expenses as a percentage of operating income; inflation: percentage change in the GDP deflator; interest rate differential: difference between the yield of government bonds of the country in which a bank is domiciled with a 10-year residual maturity and the three-month interbank lending rate; CR5: share of the five largest banks in terms of total assets of all banks in a country. 3 – Interest rate differential and all interaction terms. 4 – Share of NPLs and related interaction terms. 5 – Equity ratio and related interaction terms. 6 – Cost-income ratio and related interaction terms. 7 – Share of net interest income in total income and related interaction terms.

Source: Rutkowski (2019)

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Moreover, to check the robustness of results, **dynamic panel models** are estimated that use values of explanatory variables lagged by one period as instruments. The bank-specific variables were treated as potentially endogenous variables in the Arellano-Bond estimation (Arellano and Bond, 1991) and the Blundell-Bond (Blundell and Bond, 1998) estimation. The maximum number of lagged values used as instruments for the potentially endogenous variables is limited to two. The test of the first difference of error terms for autocorrelation does not indicate that the models used are misspecified.

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