EUROPEAN CENTRAL BANK
EUROSYSTEM

Occasional Papers Series

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Capital requirements: a pillar or a burden for bank competitiveness?

No 376

Contents

Abstract

This paper examines the relationship between capital requirements, capital ratios and bank competitiveness – measured as profit efficiency. Using data envelopment analysis techniques, profit efficiency scores were estimated for a sample of listed significant institutions directly supervised by the European Central Bank. In calculating the scores, use was made of rich supervisory data on bank-specific characteristics and capital requirements, in addition to macroeconomic variables. The findings revealed that capital requirements do not have a statistically significant effect on profit efficiency. The insignificant relationship also held true when capital requirements were broken down into microprudential and macroprudential requirements. For capital ratios, the relationship with profit efficiency was linearly statistically insignificant, but did display a statistically significant non-linear relationship that followed an inverted U-shape: profit efficiency rose with capital up to a threshold (estimated at a common equity tier 1 ratio of around 18%), after which further increases curbed profit efficiency. These findings were robust to a wide battery of robustness checks, including an extension of the sample to unlisted banks and the use of different efficiency measures and of various methods to control for confounding factors. These results underscore the need for policymakers to ensure that banks remain resilient, maintain strong capital ratios and manage risk well. In addition, they point to the intricate link between bank capital, regulation and competitiveness, contributing to the ongoing debate about the European banking sector's ability to support economic growth and innovation.

Keywords: financial stability, bank profits, macroprudential policy, capital buffers

JEL codes: G21, G28

Non-technical summary

This study examines whether bank capital requirements and capital ratios affect the cross-sectional competitiveness of banks in the euro area. Competitiveness was measured on the basis of profit efficiency – defined as a bank's ability to convert inputs (such as funding and staff costs) into output (income). The analysis was motivated by the ongoing policy debate in which the banking industry often contends that high capital requirements undermine the ability of banks to compete. The concept of competitiveness is, however, multi-faceted and rigorous empirical evidence on the link between capital regulation and bank efficiency is still limited. To examine this link more closely, an analysis was conducted using supervisory data for a sample of euro area listed significant institutions (SIs) directly supervised by the European Central Bank (ECB) over a period running from the first quarter of 2019 to the last quarter of 2024. The analysis estimated profit efficiency scores and investigated their relationship with the levels of both capital requirements and capital ratios. Profit efficiency scores were estimated by applying a data envelopment analysis (DEA) technique, while capital requirements and capital ratios were captured by the overall capital requirement (OCR) ratio and the common equity tier 1 (CET1) ratio respectively.

The results revealed no statistically significant association between capital requirements and profit efficiency for the underlying sample of euro area banks. This finding remained robust when capital requirements were broken down into their microprudential and macroprudential components, when the analysis was extended to unlisted banks and when alternative efficiency metrics were applied. Overall, these results suggest that current capital requirements are not a key determinant of euro area banks' ability to generate profits efficiently. They also point to a non-linear (inverted U-shaped) relationship between capital ratios and profit efficiency: while increases in CET1 ratios improve efficiency among less capitalised banks, excessively high capital ratios are associated with lower profit efficiency. Importantly, the current capital requirements for the banks in our sample were substantially below the level of the CET1 ratio that maximises banks' profit efficiency, which again suggests that the requirements are not a constraining factor.

Overall, the findings do not support the view that capital regulation undermines bank competitiveness. Moreover, for less capitalised banks, strengthening capital positions is associated with improved profit efficiency. Specifically, higher capital ratios were shown to reduce both bank funding costs and the volatility of earnings – an indicator of financial resilience – pointing to the role of sound regulation in supporting both the stability and long-term competitiveness of the banking sector.

1 Introduction

1.1 Motivation and objectives of the paper

While bank regulation and supervision have traditionally been focused on ensuring a sound and stable banking sector, there have been discussions recently on whether they should also seek to support banking sector competitiveness.[1] A peculiar characteristic of the debate is that the term 'competitiveness' is often not well-defined and thus remains somewhat blurred. Representatives from the banking industry usually associate it with the level of capital requirements or with regulation more broadly, arguing that overly stringent requirements hinder EU banks' competitiveness and ultimately constrain economic growth.[2] By contrast, in literature on industrial organisation and strategic management, competitiveness is treated as a multi-faceted, relative, and inherently complex concept that is usually measured by applying quantitative indicators relating to concentration, entry and exit barriers, economies of scale and efficiency, or on the basis of qualitative information relating to knowledge-based resources and managerial capabilities.[3] Noting these operational challenges for measuring the concept, this paper seeks to contribute to the debate by empirically estimating the relationship between the stringency of regulation and euro area banks' competitiveness.

The paper investigates whether capital requirements and capital ratios affected bank competitiveness in the sample considered, competitiveness being measured on the basis of banks' ability to generate profits efficiently. For the purposes of this study, profit efficiency was defined as a bank's ability to produce the maximum output (profit) feasible given its inputs (costs). We started this part of the analysis by using DEA techniques to estimate efficiency scores for a sample of euro area listed SIs that made it possible to assess how far banks were from the efficient frontier.[4] To determine whether higher capital requirements and/or higher capital ratios impair the profit efficiency of banks in the euro area, panel data estimations were conducted by regressing the profit efficiency scores on banks' capital requirements – the OCR ratio – and on the capital ratios themselves. The

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1 For example, the UK Prudential Regulation Authority was recently given a new secondary objective, requiring it to facilitate *"(a) the international competitiveness of the UK economy (including in particular, the financial services sector […]), and (b) its growth over the medium to long term"* (see, for example, the article entitled "Our secondary objectives" on the Bank of England website). In the EU, Mario Draghi's report on "The Future of European Competitiveness" (Draghi, M., 2024) has reignited the debate, highlighting the fact that Europe lags behind the United States and China in key sectors, such as artificial intelligence, digital platforms, electronics, electric vehicles, and renewable energy. Stringent EU regulations have been cited as a major barrier to innovation and, consequently, competitiveness. Although not in focus of the original report, the debate soon also extended to the banking sector.

2 For example, a report by Oliver Wyman for the European Banking Federation (Oliver Wyman, 2023) argues that euro area banks face a more stringent and more complex capital framework than their US counterparts, contributing to their weaker competitiveness. The report estimates that easing capital requirements and streamlining supervision could unlock capacity for an additional €4 trillion in bank lending, potentially boosting economic growth across Europe.

3 For pioneering studies on firms' competitiveness, see Mason, E. S. (1939), Porter, M. E. (1985) and Ghemawat, P. (1986).

4 Refer to Section 3.2 for details about the DEA and the profit efficiency estimation.

analysis relied on ECB supervisory data for bank-specific variables and ECB data warehouse sources for country-specific information. It included a broad range of bank- and country-specific control variables and accounted for concerns related to potential endogeneity (reverse causality) between capital requirements, capital ratios and profit efficiency.

From a conceptual perspective, the relationship between bank capital requirements, capital ratios and profit efficiency is potentially ambiguous. On the one hand, agency costs hypotheses postulate that bank management may not always act to maximise profit efficiency, given that it often has incentives to pursue strategies that are at the expense of shareholders or debtholders (Jensen and Meckling, 1976). For instance, managers may invest in riskier projects with uncertain returns or undertake the selection of inputs and outputs based on certain preferences, rather than with a view to maximising the bank's value (Mester, 1991).[5] Moreover, limited liability, coupled with safety nets (such as deposit insurance), may incentivise banks' to take on excessive risks (Keely (1990); Demirgüç-Kunt and Detragiache, 2002), with negative implications for bank performance in the medium term.[6] Higher capital ratios may mitigate these agency problems by increasing shareholders' "skin in the game" – that is to say, the amount of equity at risk in the event of bank failure (Esty, 1998). Indeed, the possibility of contingent liability strengthens shareholders' incentives to improve risk management practices and to monitor borrowers more effectively (Dagher et al., 2016) and may, in turn, enhance asset quality and ultimately boost bank performance. On the other hand, if the Modigliani-Miller theorem[7] does not hold true in practice, tighter capital requirements may increase banks' cost of funding, exerting downward pressure on profitability and profit efficiency in the short term. However, lower profitability might also incentivise banks to explore new, more innovative investment opportunities, potentially expanding their production frontier and improving efficiency over time (Grigorian and Manole, 2006).

Capital requirements may also affect bank efficiency in terms of the quantity and quality of lending, as well as asset portfolio allocation. On the one hand, introducing binding regulatory capital requirements may reduce aggregate lending in the short term, with potential negative repercussions for a bank's ability to generate profits efficiently. On the other hand, it might lead to improvements in loan quality, which, in turn, would contribute positively to efficiency (Kopecky and VanHoose, 2006).[8] Moreover, stricter capital requirements might motivate banks to substitute loans with alternative forms of assets (VanHoose, 2007). This might affect banks' profit efficiency, given that different asset portfolios will generate different returns and will require different resources for their management. While this raises the question of whether a portfolio of different assets can be managed efficiently, a diversified

5 In the context of the saving and loans (S&Ls) crisis of 1980s and 1990s, Mester (1991) shows that mutual S&L institutions operated at diseconomies of scale. This inefficiency is interpreted as evidence of non-value maximizing behaviour on the part of S&L managers.

6 This occurs because limited liability protects bank owners and managers from the full consequences of their risky decisions, while safety nets shield depositors from potential losses.

7 The Modigliani–Miller (1958) theorem posits that, under perfect capital markets with no taxes, bankruptcy costs, or informational frictions, a firm's value is independent of its capital structure.

8 In a theoretical model, Kopecky and VanHoose (2006) finds that imposing stricter capital requirements reduces total lending but enhances aggregate loan quality.

asset portfolio may, in fact, improve and stabilise earnings, with a positive impact on bank profit efficiency in the long term (Chiorazzo et al., 2008).[9] Given the various potential channels, the impact of capital requirements and capital ratios on profit efficiency is ultimately an empirical question and one that we analyse in this paper.

1.2 Summary of the results

Focusing on a sample of listed credit institutions directly supervised by the ECB, our analysis found that the level of capital requirements does not have an impact on bank profit efficiency. Econometric estimates revealed a statistically insignificant relationship between banks' OCR and their profit efficiency in our cross-section. This finding holds true even after controlling for a comprehensive set of bank- and country-level characteristics, as well as for unobserved bank-specific effects and time-varying factors that could affect profit efficiency. The result remained robust when capital requirements were broken down into their microprudential and macroprudential components – measured by the total supervisory review and evaluation process capital requirement (TSCR) and the combined buffer requirement (CBR) respectively. Contrary to certain claims made by the banking industry, this finding suggests that the current level of capital requirements does not appear to be a key determinant of euro area banks' competitiveness, as measured by profit efficiency. Instead. the analysis highlights several other drivers of profit efficiency. Among bank-specific factors, larger institutions, banks with higher asset quality and those with a more retail-oriented business model tend to have higher profit efficiency. At the country level, stronger industrial productivity is positively associated with bank profit efficiency.

The analysis also revealed an inverted U-shaped relationship between bank capital ratios and profit efficiency that has a non-linear concave pattern. While the linear association between the capital ratio and profit efficiency is statistically insignificant, meaningful non-linearities were detected. For banks with relatively low capitalisation, increases in capital ratios were associated with improved profit efficiency, but only up to a CET1 ratio of around 18%. A potential factor explaining this is that higher capital ratios reduce agency costs, resulting in lower earnings volatility and in lower funding costs as a result of this lower volatility being recognised by external funding providers. Further econometric analysis revealed, indeed, that a one-percentage point increase in the CET1 ratio led to a four-basis point reduction in banks' interest expenses and a five-basis point reduction in the standard deviation of return on assets (RoA) – a measure of earnings volatility. When the CET1 ratios exceed 18%, additional capital appears to reduce profit efficiency, banks with capital ratios of over 25% tending to have lower profit efficiency. This may reflect excessive risk aversion, with banks sacrificing profitable lending opportunities in favour of maintaining overly conservative balance sheets. Alternatively, it may stem from other idiosyncratic bank factors that were not observable in the data considered here.

[9] Focusing on a sample of Italian banks, Chiorazzo et al. (2008) finds that a shift from interest to non-interest income activities has positive and statistically significant effects on bank performance.

These results held true when subjected to a wide battery of robustness checks, including extension of the sample to unlisted banks, the use of different measures of efficiency and controlling for confounding factors. Extending the sample to include unlisted banks did not alter the results: the relationship between capital requirements and profit efficiency remained statistically insignificant.[10] The robustness of these conclusions was also confirmed using an alternative, accounting-based efficiency metric – the cost-to-income ratio. Finally, in line with the approach adopted by Behn et al. (2024), the wave of macroprudential tightening measures that began in early 2022 was used to test whether a significant increase in capital buffer requirements affects profit efficiency. Under this scenario too, no statistically significant impact was found among the sample banks.

All in all, the results of the paper do not support claims that high capital requirements are hampering the competitiveness of euro area banks, as measured by profit efficiency. While no cross-jurisdictional comparisons were undertaken, the analysis suggests that capital requirements were not a main driver of profit efficiency in the cross-section of euro area banks examined. In addition, increases in capital ratios tended to be associated with higher profit efficiency, that trend only reversing for banks with CET1 ratios above 18%. Importantly, the capital requirements for the banks in the sample were, and still are, substantially below this level, with a median of around 11%. They were also substantially below the current level of capital ratios (a median of around 16%). Again, this suggests that capital requirements were not constraining banks' profit efficiency within the sample. The reforms that have been undertaken since the global financial crisis have therefore made the banking sector more resilient and improved banks' ability to fund the real economy in all phases of the financial and economic cycle,[11] while negative side effects, in terms of competitiveness, appear to be very modest based on the analysis. The corollary is that banking sector deregulation or more lenient supervision would compromise these achievements without generating substantial benefits, ultimately hampering bank competitiveness and endangering financial stability. By continuing to focus on ensuring sufficient resilience, supervisors and regulators are therefore contributing to growth and competitiveness in the long term.

The remainder of the paper is organised as follows. Section 2 provides a review of related literature on bank capital requirements and efficiency. **Section 3** presents the data for the analysis and the estimation of bank profit efficiency. **Section 4** introduces some of the stylised facts and descriptive evidence of bank efficiency for euro area banks and of the relationship between bank efficiency and capital requirements. **Section 5** sets out the results of the analysis, while **Section 6** reports on some of the robustness checks conducted. **Section 7** concludes.

10 The main analysis includes only 35 listed banks. The use of this relatively small sample is attributable to the need to include cost of equity in the estimation of profit efficiency. Arguably, the cost of equity can be accurately estimated only for listed banks.

11 See, for example, Basel Committee on Banking Supervision (2022) for a holistic evaluation of the Basel III reforms. As regards banks' ability to absorb shocks, see Couaillier et al. (2024), which shows that better capitalised banks are better equipped to withstand shocks without jeopardizing credit supply.

2 Related literature

Competitiveness is a multi-faceted, relatively, and inherently, complex concept, especially when applied to multi-dimensional organisations, such as banks. The concept of competitiveness is broad and can be applied to products, firms, industries or sectors, regions, nations and even commercial blocs. It has its root at the country level and, more specifically, in trade literature, which can be divided into two main streams. The first associates competitiveness with lower labour costs and favourable home-country policies (Brander and Spencer (1985); Krugman, 1986). The second highlights productivity and efficiency as catalysts for competitiveness and prosperity (Krugman (1990); Porter (1990); Krugman (1994); Delgado et al., 2012). At the firm level, the concept of competitiveness is central to strategic management (Porter (1985); Ghemawat, 1986) and to industrial organisation studies (Mason (1939); Bain (1956); Hansen and Wernerfelt, 1989). In industrial organisation studies, a firm's competitiveness is determined by factors such as concentration, entry and exit barriers, economies of scale and efficiency. In strategic management studies, however, priority is given to knowledge-based resources and organisational capabilities. Combining these last two theories, firms' competitiveness appears to be determined by tangible (financial ratios, productivity, efficiency, etc.) and intangible (human know-how and managerial capabilities) metrics of performance.

Extending these theories to the banking industry, bank competitiveness may be seen as a bank's ability, relative to its peers, to maintain or expand its market positions over time, efficiently allocate its resources, price its products, manage its risks and adapt to market changes. Building on the literature cited above, bank competitiveness can be split into three interconnected dimensions: the ability to compete, the capacity to sustain competition over time and the flexibility to adapt to changes in the competitive environment. The ability to compete reflects a bank's capacity, at a given moment, to meet customer demands in terms of product quantity, quality and pricing. In economic terms, this ability is often modelled through optimisation of a production function under a given set of constraints, those constraints typically reflecting access to key inputs, such as capital and labour, and their utilisation. Sustaining competition in the long term goes beyond immediate efficiency; it requires resilience and strategic foresight. A competitive bank must not only optimise its current operations, but also position itself to withstand market fluctuations, regulatory changes and technological disruptions. This long-term perspective points to the importance of prudential regulation, strong governance and sound risk-management practices. Finally, adaptability relates to a bank's capacity to reshape its production function – essentially changing the way it operates. This may involve investments in physical capital (for example, opening new branches or upgrading IT infrastructure), technological innovation (such as adopting AI-driven credit scoring models or blockchain technology), or enhancing human capital by investing in new skill sets and training programs. In this paper, bank competitiveness is measured by a bank's ability to generate profits efficiently, notably its ability to generate the maximum feasible output (profit) given the inputs

(costs) incurred. This relates to the first of the three dimensions mentioned above, namely the ability to compete.

Bank efficiency is typically estimated using two primary methodologies: DEA and stochastic frontier analysis (SFA). DEA is a non-parametric technique that applies linear programming to construct an efficiency frontier based on the best-performing banks. It assumes that any deviation from this frontier reflects inefficiency, but it does not account for random noise. In contrast, SFA is a parametric approach that estimates an efficiency frontier using econometric models. Unlike DEA, SFA incorporates statistical noise and requires the specification of a functional form, such as a Cobb-Douglas or Translog function.[12] Both methodologies can be applied for different types of efficiency metrics, that were the focus of the studies referred to below, including technical, cost and profit efficiency. Technical efficiency assesses how effectively a bank converts inputs (such as labour and funds) into outputs (for example, loans, fees and commissions). A bank is technically efficient if it maximises output, or minimises inputs for a given set of outputs. Cost efficiency assesses whether a bank minimises costs for a given level of output and input prices, while profit efficiency measures how well a bank maximises profits given its input and output prices. Unlike cost efficiency, profit efficiency considers both revenue generation and cost control, making it a more comprehensive measure that was thus also considered in this study. Overall, while literature on bank efficiency is plentiful, papers looking at the relationship between bank capital and efficiency are relatively scarce and yield inconclusive results.

Several studies find that well-capitalised banks and banks operating in countries with stringent capital adequacy regulation tend to be more efficient. Applying DEA, Grigorian and Manole (2006) examines 1,074 banks in transition economies between 1995 and 1998 and finds that well-capitalised banks have higher efficiency. Banker et al. (2010) likewise uses DEA to analyse South Korean banks from 1995 to 2005 and concludes that a higher capital adequacy ratio is positively associated with technical efficiency. Fiordelisi et al. (2011) employs SFA on a sample of 1,987 bank observations running from 1995 to 2007 and finds that higher capital ratios correlate positively with efficiency. Chortareas et al. (2012) conducts a DEA that studies 22 EU countries between 2000 and 2008 and reports that stronger capital requirements and supervisory frameworks enhance bank efficiency. Similarly, Barth et al. (2013) draws on a DEA that assesses 4,050 banks in 72 countries between 1999 and 2007 and finds that stricter capital regulation is marginally, but positively, associated with bank efficiency. Pessarossi and Weill (2015) uses SFA to analyse 100 Chinese banks over a period extending from 2004 to 2008 and concludes that higher capital ratios improve cost efficiency.

Conversely, some studies argue that higher capital levels may hinder efficiency, while others report mixed or weak evidence going in diverging directions, suggesting that capital requirements affect different efficiency metrics in disparate ways. Berger and Bonaccorsi di Patti (2006) investigates US

[12] The Cobb–Douglas production function assumes a log-linear relationship between inputs and output with constant elasticities of substitution, while the Translog function is a flexible second-order approximation that allows for variable elasticities of substitution and interaction effects among inputs.

commercial banks from 1990 to 1995 and finds that higher leverage, or lower capital, is associated with greater profit efficiency. Altunbas et al. (2007) uses SFA to analyse 15 European banking systems between 1992 and 2000 and find that less efficient banks tend to have more capital and take on less risk. The DEA conducted by Pasiouras (2007) examines 715 banks across 95 countries in 2003 and finds that stricter capital requirements generally enhance efficiency; however, when controlling for institutional factors, that positive effect disappears. Finally, Pasiouras et al. (2009), in applying SFA to 2,853 observations from 615 banks across 74 countries between 2000 and 2004, finds that higher capital requirements improve cost efficiency but reduce profit efficiency.

Much of the literature relies on broad capital measures that may not fully capture the effects of capital requirements on efficiency. Many studies, including Pasiouras et al. (2009), Chortareas et al. (2012), and Barth et al. (2013), use country-level capital regulation indices based on surveys rather than on bank-level data.[13] Others rely on simple capital ratios, such as the equity-to-assets ratio, that fail to account for the quality of capital (for example, CET1 capital) or specific regulatory requirements (such as the OCR ratio or capital buffer requirements). To address these gaps, the current analysis employed more refined, bank-level measures of capital, encompassing the CET1 ratio as well as regulatory capital requirements, such as the OCR, the total supervisory review and evaluation process (SREP) capital requirement and the CRB. By leveraging detailed supervisory data, this study seeks to provide a more precise analysis of the impact of capital requirements on bank efficiency.

[13] For example, indices capturing the stringency of capital requirements in these papers were based on positive responses to the following eight questions:
1) Is the minimum required capital asset ratio risk-weighted in line the Basel guidelines?
2) Does the ratio vary with market risk?
3-5) Before minimum capital adequacy is determined, which of the following are deducted from the book value of capital:
a) market value of loan losses not realized in accounting books?
b) unrealized losses in securities portfolios?
c) unrealized foreign exchange losses?
6) Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities?
7) Can the initial or subsequent injections of capital be done with assets other than cash or government securities?
8) Can initial disbursement of capital be done with borrowed funds?

3 Data and methodology

3.1 Data

The analysis relied on supervisory data for listed banks directly supervised by the ECB and on country-level information. Bank balance-sheet and income-statement data were collated from two administrative databases: the common reporting (COREP) and financial reporting (FINREP) databases,[14] while country-specific characteristics were obtained from the ECB data warehouse. In contrast to other studies looking at bank efficiency that usually employ yearly data, this analysis used quarterly data and a time series spanning from the first quarter of 2019 to the fourth quarter of 2024. The final dataset comprised a sample of 35 listed SIs operating in ten euro area countries. **Table 3.1** indicates the number of banks by country falling within the initial sample.

Table 3.1 Number of euro area significant institutions in the sample by country

Country	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL
Number of banks	3	1	3	7	1	2	4	2	10	2
Number of observations	72	24	72	154	22	48	96	48	205	44

Source: ECB supervisory data.
Note: The country labels stand for the following countries: AT, Austria; BE, Belgium; DE, Germany; ES, Spain; FI, Finland; FR, France; GR, Greece; IE, Ireland; IT, Italy; and NL, The Netherlands.

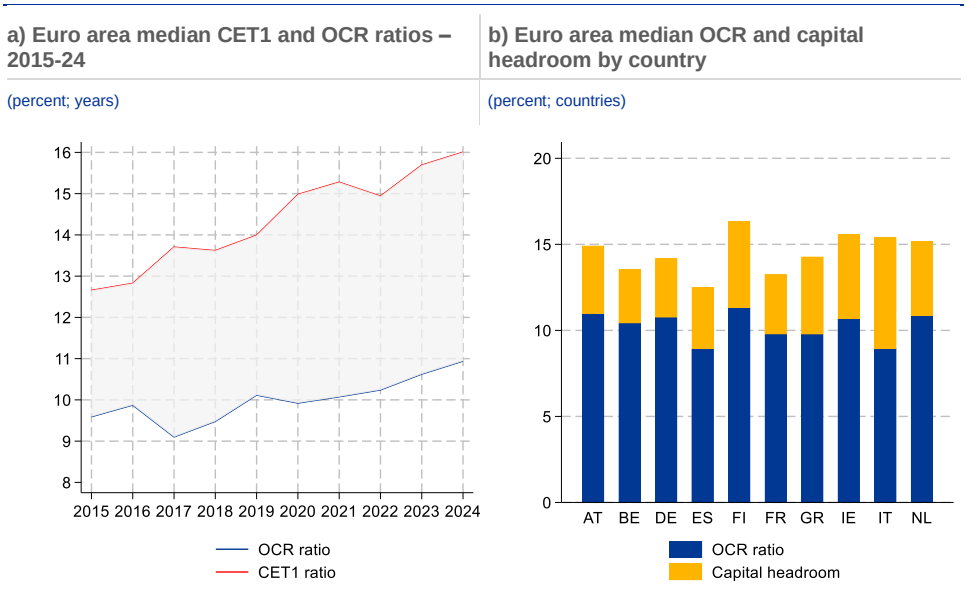
The analysis focused on a sample of listed SIs to ensure accuracy in the computation of bank profit efficiency. The reason for restricting the sample to listed SIs was threefold. First, it made it possible to ensure a proper estimation of bank profit efficiency by including banks' cost of equity, which can only be adequately estimated for listed banks (see Section 3.2 for details of the profit efficiency estimation). Second, it provided a comparable sample of banks in terms of size, given that capital requirements may affect bank profit efficiency differently depending on the size of the institution. Third, as explained in Maudos et al. (2002), DEA works particularly well in small samples. Nevertheless, in a robustness check, we extended the sample size to including non-listed banks, resorting to a simplified computation of banks' cost of equity. Moreover, to ensure data accuracy, a thorough cleaning process was performed to exclude extreme outliers and banks with missing values. Bank-specific characteristics were winsorised at the 1% and 99% levels to reduce the influence of extreme outliers. To avoid double-counting, balance-sheet

[14] COREP is the standardised reporting framework established by the European Baking Authority (EBA) to comply with the Capital Requirements Directive. It covers credit risk, market risk, operational risks, own funds and capital adequacy ratios. The FINREP reporting framework encompasses balance sheets, income statements, disclosures of financial assets and liabilities, off-balance sheet activities and non-financial instrument disclosures.

data were at the highest level of consolidation for the euro area (which, for banks, is solo, sub-consolidated or fully consolidated). In addition, to account for differences in business models, we eliminated banks specialised in asset management or consumer credit, custodians, development/promotional lenders and investment banks.[15]

Descriptive statistics of the two main variables examined in this study show that bank capital ratios have increased steadily in the last ten years, with the distribution varying across banking union countries. The median CET1 ratio has been on a constant upward trajectory since 2015, having risen from slightly below 13% in 2015 to around 16% in 2024. The increase in banking sector capitalisation in the banking union has coincided with higher capital requirements – in particular macroprudential capital buffer requirements – which went up by about 1.5 percentage points over the same period **(Chart 3.1, panel a)**. As a consequence, capital headroom (the difference between capital requirements and capital ratios, as depicted by the grey shaded area in Chart 3.1, panel a) has expanded from about 3 to 5 percentage points. Capital requirements and capital headroom have also been relatively consistent across countries, despite some differences, as shown in **Chart 3.1, panel b)**.

Chart 3.1 Euro area bank median CET1 and OCR ratios over time and across countries



Sources: ECB supervisory data and authors' calculations.
Notes: CET1 stands for common equity tier 1 and OCR for overall capital requirement. Panel a) plots both the median for the CET1 ratio (red line) and the median for the OCR ratio (blue line) over the period from 2015 to 2024. The light grey shaded area between the lines represents banks' capital headroom. Panel b) plots the average median for the OCR ratio (blue portion of the bar) and banks' capital headroom (yellow portion of the bar) over the same sample period and across the countries included in the sample.

[15] The Single Supervisory Mechanism (SSM) business model classification was applied. See Section 2.1, "*Classifications based on business model*" of the ECB document entitled "Methodological note for the publication of aggregated Supervisory Banking Statistics, third quarter 2020".

3.2 Bank profit efficiency estimation

This part of the analysis employed a two-step DEA to examine the relationship between bank efficiency, capital headroom and capital requirements. The DEA was used initially to assess the efficiency of banks within the sample. Subsequently, the efficiency scores derived from the first step were regressed on the capital requirements (OCR ratios) and capital ratios (CET1 ratios), while controlling for a comprehensive set of bank- and country-specific characteristics. Non-parametric approaches, such as DEA, were originally developed by Farrell (1957) and later refined by Charnes et al. (1978), Banker et al. (1984), Färe et al. (1985) and Coelli et al. (1999). These methods construct relative efficiency frontiers by enveloping[16] decision-making units (DMUs) – in this case, banks – with the "best practice" DMUs forming the non-parametric frontier. A notable advantage of DEA over parametric techniques, such as SFA, is its flexibility; DEA does not require the assumption of a specific functional form to characterise the economic production function, cost function or distance function. Consequently, the efficiency scores obtained through DEA are not affected by potential misspecifications of functional forms, allowing for a more accurate representation of the relationship between inputs and outputs.[17] Moreover, DEA's capacity to handle multiple inputs and outputs without the need for a predetermined functional relationship makes it particularly suitable for assessing the efficiency of complex organisations, such as banks. This flexibility is especially beneficial when assessing institutions with diverse operations and services, given that it allows for a more comprehensive and nuanced analysis of efficiency.

The selection of inputs and outputs in a DEA is particularly important for the construction of an efficient frontier. Existing literature identifies several approaches in this regard, including the intermediation, production, value-added and profit approaches. The intermediation approach, initially developed by Sealey and Lindley (1977), conceptualises banks as intermediaries that accept deposits and extend loans. Deposits are therefore considered to be inputs used to produce loans and other earning assets, which are then treated as outputs. This perspective has been widely adopted in studies measuring bank efficiency (see, amongst others, Berger and Mester (1997); DeYoung and Hasan (1998); Beccalli et al. (2006); Hsiao et al., 2010). Conversely, the production approach treats deposits as outputs alongside loans and other earning assets, viewing them as services provided by banks to their customers (Berger et al. (1987); Berger and DeYoung (1997); Devaney and Weber (2002); Glass et al., 2010). The value-added approach classifies assets and liabilities as inputs or outputs depending on their contribution to value creation; items that add value are considered to be outputs, while those that consume resources without adding value are treated as inputs (Berger and Humphrey, 1992). Finally, the profit approach employs revenue components as outputs and cost components as inputs, focusing on the profitability aspect of bank operations (Drake et al. (2006); Pasiouras et al., 2008). Each of these approaches

[16] In DEA, "enveloping" refers to the construction of a piecewise linear frontier that tightly wraps around the set of observed decision-making units.

[17] In contrast, SFA necessitates the pre-specification of a functional form, which may not always accurately capture the true production relationship, potentially leading to biased efficiency estimates.

offers a unique perspective on bank operations, and the choice among them depends on the specific objectives of the analysis.

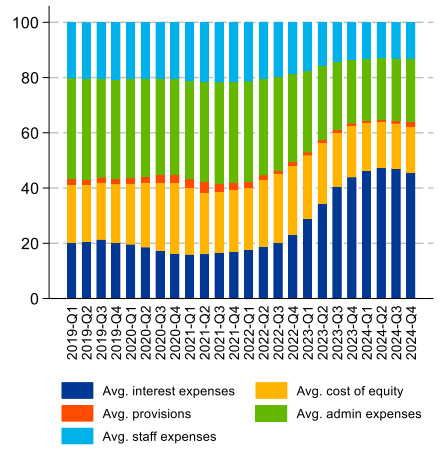
In the spirit of Drake et al. (2006), this analysis employed a profit-oriented DEA to assess bank efficiency. With this approach, banks are viewed as entities that convert inputs – such as labour and funding – into outputs – such as loans and fee-generating services – with the goal of maximising profits. A profit-oriented DEA classifies revenue components as outputs and cost components as inputs. Specifically, this analysis considered five input categories: administrative costs, staff expenses, provisioning costs, costs of equity and interest expenses.[18] **Chart 3.2** provides a breakdown of these inputs and outputs and their changes over time. **Chart 3.2, panel a)** shows that the share of interest expenses increased sharply from mid-2022, rising from less than 20% in 2021 to approximately 45% by 2024. This increase aligns with the monetary policy tightening that began in July 2022 and raised bank funding costs. While the share of the cost of equity remained relatively stable throughout the sample period, the share of staff and administrative costs saw a significant decline, particularly after the COVID-19 pandemic. The sharp increase in funding costs apart, this downward trend in the relative share of staff and administrative costs is also likely to reflect other factors, such as: (i) cost-cutting measures during the pandemic (for example, hiring freezes, staff reductions and automation initiatives), particularly given that branch usage dropped; and/or (ii) an acceleration of digital transformation, reducing the need for physical infrastructure and the associated personnel costs. **Chart 3.2, panel b)** shows a marked increase in the relative importance of interest income since the beginning of 2022 monetary tightening, as was to be expected.

[18] Data on bank cost of equity was provided by the Systemic Risk and Financial Institution Division of the European Central Bank Directorate Financial Stability and Macroprudential Policy. For more details about the computation of the cost of equity, see Altavilla et al. (2021).

Chart 3.2 Inputs and outputs for euro area banks broken down by costs and revenues

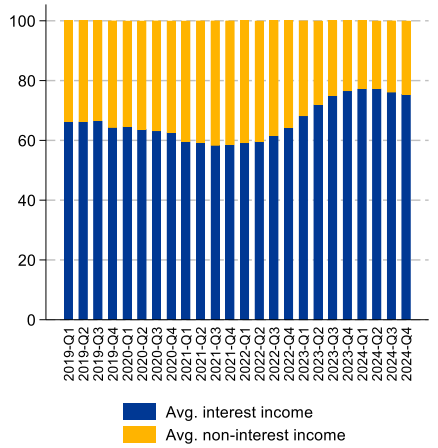
a) Euro area bank input composition by cost item – Q1 2019-Q4 2024

(percent; quarter)



b) Euro area bank output composition by revenue item – Q4 2019-Q4 2024

(percent; quarter)



Sources: ECB supervisory data and authors' calculations.
Notes: Panel a) provides a breakdown of inputs by cost item. All the items are scaled by total assets. Panel b) provides a breakdown of output by revenue item. All the items are scaled by total assets.

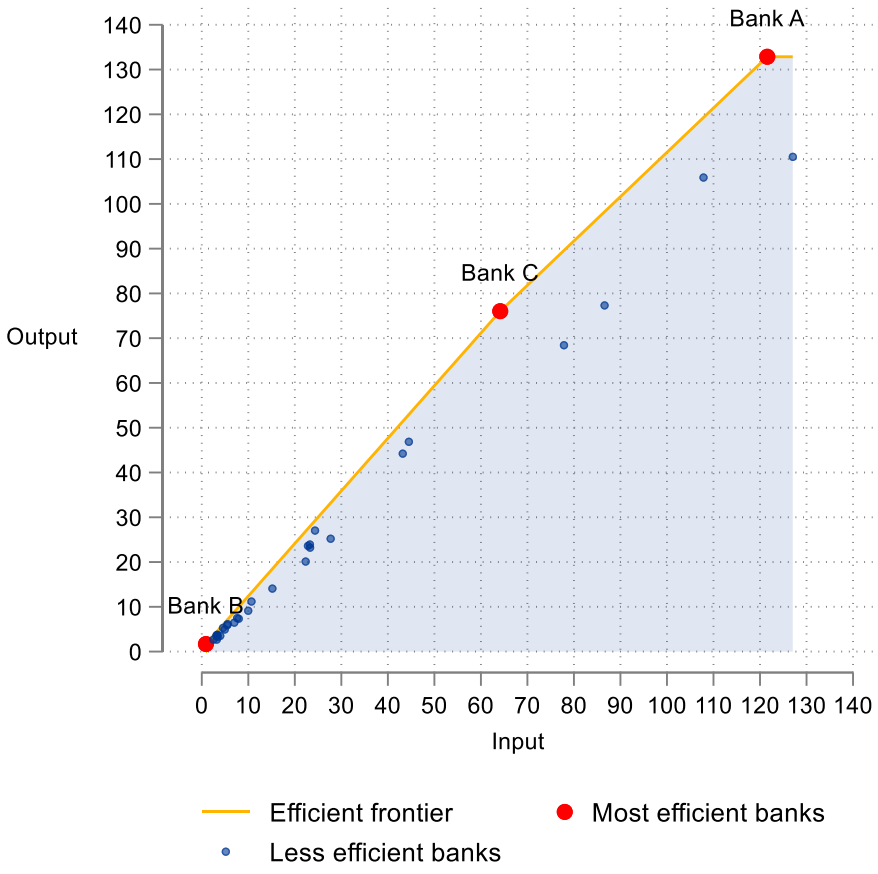
Banks operating at the efficient frontier are deemed to be fully profit efficient, producing the maximum feasible output given their inputs. Conversely, banks below this frontier exhibit inefficiencies (Chart 3.3). In **Chart 3.3**, Banks A, B and C are those operating at the efficient frontier, whereas the other banks fall below this threshold. Banks that are inefficient either require more inputs to produce the same output level as fully efficient banks or, in the worst case scenario, use more inputs to generate lower outputs compared with their more efficient counterparts.[19] In this regard, banks in the first section of the frontier – running from Bank B to Bank C – display increasing returns to scale, meaning that a proportional increase in inputs results in a more than proportional increase in outputs (as illustrated by the steep upward slope of the curve in this section). These banks therefore benefit from scale economies and become more efficient as they grow. This effect is considerably less pronounced for the banks in the section running from Bank C to Bank A, which exhibit almost constant returns to scale. Finally, the banks in the section running

[19] A DEA requires modelling choices to be made, such as the definition of an input- or output-oriented model and an assumption as regards constant or variable return to scale. In line with Drake et al. (2006), the efficiency scores derived from the DEA are obtained by using an input-oriented model. Coelli et al. (1999) mentions that an input-oriented DEA answers the following question: "*By how much can input quantities be proportionally reduced without changing the output quantities?*" (p. 137), while an output-oriented DEA provides the response to the following:" *By how much can output be proportionally expanded without altering the input quantities used?" (p. 137)*. As advocated in Banker et al. (1984), the current analysis employs variable return to scale, given that banks do not always function at an optimal scale and their efficiency can vary with size. However, sanity checks have been performed, and the results are similar using either an output-oriented DEA or constant returns to scale.

from Bank A onwards show decreasing returns to scale: increasing inputs leads to a less than proportional increase in outputs (the efficient frontier is flat in that area).[20]

Chart 3.3 DEA euro area bank profit efficient frontier

(EUR billions; EUR billions)



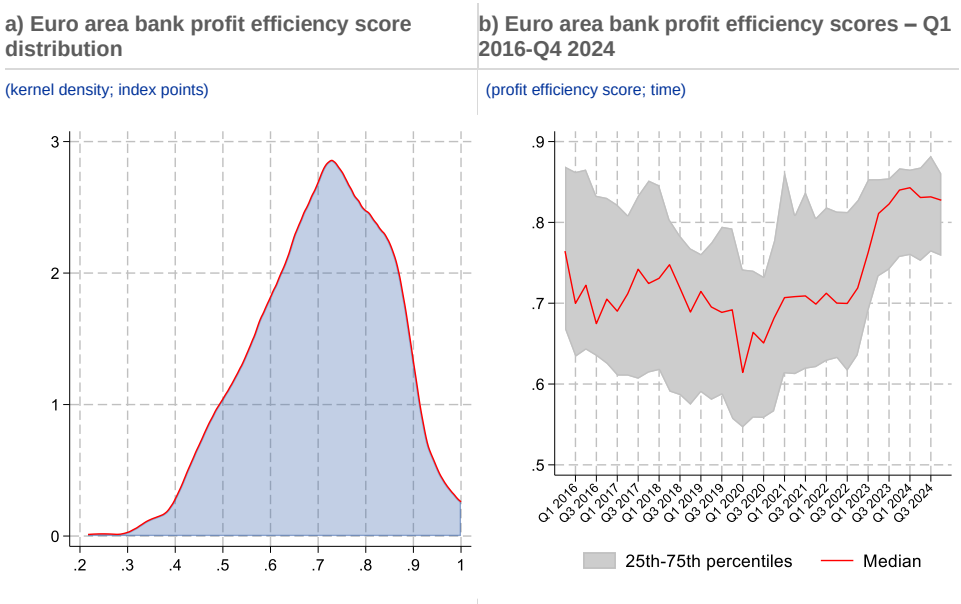
Sources: Supervisory data, authors' calculations.
Notes: Banks A, B and C (in red) are those operating at the efficient frontier. The chart shows the DEA profit efficient frontier and is based on a sample of 35 euro area listed significant institutions for the fourth quarter of 2024. The yellow line represents the efficiency frontier, while each dot represents a bank. For the purposes of the frontier, input is the sum of administrative costs, staff expenses, provisioning costs, equity costs and interest expenses, while output is the sum of interest and non-interest income.

The profit efficiency scores derived from the DEA model range from 0 to 1, with 0 indicating entirely inefficient banks and 1 representing those that are fully efficient. The profit efficiency scores revealed considerable heterogeneity across banks **(Chart 3.4, panel a)**. The mean profit efficiency score stood at 0.73, while the median was slightly higher at 0.74. This would seem to indicate that banks could, on average, enhance their profit efficiency by 27%, with the median bank

[20] The DEA profit efficiency frontier was estimated separately for each quarter between the first quarter of 2019 and the fourth quarter of 2024, making it possible for the set of benchmark banks (that is to say, the most profit-efficient) to vary over time. This approach accounted for potential shifts in market conditions, input/output prices and technology across quarters, ensuring that each period's efficiency evaluation reflected the contemporaneous performance landscape. The resulting quarter-specific efficiency frontiers were then combined to construct a panel dataset of bank-level profit efficiency scores over time.

having the potential to improve by 26%, in order to match their most efficient peers. It should be noted that a subset of banks showed pronounced inefficiency: approximately 10% had a profit efficiency score of 0.5 or lower, suggesting they would need to boost their profit efficiency by more than 50% to reach the frontier set by the best-performing banks. Efficiency scores were not only heterogenous across banks, but also varied over time. **Chart 3.4, panel b)** shows the changes in bank profit efficiency scores between the first quarter of 2016 and the fourth quarter of 2024, with the median being indicated in red and the interquartile range (25^{th}-75^{th} percentile) shaded in grey. Bank profit efficiency showed a degree of volatility between the first quarter of 2016 and the first quarter of 2020 and declined from about 0.75 to 0.70. This might have been driven by the low-interest rate environment having compressed margins and, as a consequence, hampered banks' ability to generate profit efficiently. The median profit efficiency reached its lowest point between the first quarter of 2020 and the fourth quarter of 2020, falling to 0.61. This is likely to reflect the COVID-19 shock, which hit banks' profitability owing to rising provisioning for loan losses (**Chart 3.2, panel a**), operational disruptions and general uncertainty. From 2021, profit efficiency stabilised and slowly recovered, hovering at around 0.70. This reflected the economic recovery and the rebound in lending activity, as well as support from fiscal and monetary policy measures such as government guarantees and moratoria. Finally, from late 2022, profit efficiency rose sharply, reaching a median of around 0.83 by 2024. This rise reflected the positive effects of monetary policy tightening on banks' interest rate margins.

Chart 3.4 Descriptive statistics – euro area bank profit efficiency scores



Sources: Supervisory data and authors' calculation.
Notes:. Panel a) shows the kernel distribution of the efficiency scores derived from the data envelopment analysis (DEA) conducted across the sample euro area banks over the sample period. Panel b) shows the distribution of the DEA profit efficiency scores over time. The red line represents the median, while the grey shaded area shows the interquartile range.

3.3 Econometric specification

In the second step of the analysis, the bank profit efficiency scores from the first step were regressed on bank capital requirements and capital ratios. This part of the analysis employed a bank-level panel data regression framework to explore the relationship between capital requirements, capital ratios and bank profit efficiency, regressing the latter on the first two. The capital requirement variable is the OCR, which represents the total CET1 capital that a bank is required to maintain. The OCR comprises both the minimum capital requirements – including the Pillar 1 and Pillar 2 requirements – and the CBR. The latter comes on top of the minimum capital requirements and encompasses various capital buffers: the capital conservation buffer (CCoB), the countercyclical capital buffer (CCyB), the systemic risk buffer (SyRB) and the buffers for global systemically important institutions (G-SIIs) and for other systemically important institutions (O-SIIs).[21] In a further analysis, the OCR was split into its microprudential and macroprudential components, namely the TSCR and the CBR. The capital ratio variable used in the regressions was the CET1 ratio.

3.3.1 Control variables

A thorough examination of the relationship between bank capital requirements, capital ratios and bank profit efficiency necessitates controlling for a range of bank-specific characteristics. Bank profit efficiency is affected by several factors extending beyond capital ratios and requirements, and these must be accounted for if reliable results are to be obtained. One key factor is the level of non-performing loans (NPLs). High non-perming loan ratios can undermine bank profit efficiency by imposing additional costs and managerial effort to monitor borrowers with deteriorating repayment capacity or to seize and manage pledged collateral (Berger and DeYoung, 1997). Bank size also plays a crucial role. Larger banks may benefit from economies of scale, operating more efficiently than smaller counterparts. They may also attract more skilled and experienced management, further boosting efficiency. Liquidity levels can have a twofold effect on efficiency. On the one hand, holding excess low-yielding liquid assets may hinder a bank's ability to generate profits, reducing efficiency (Chen et al., 2024). On the other hand, maintaining higher liquidity buffers can lower liquidity risk by contributing to greater stability and reducing the risk of bankruptcy, ultimately supporting bank performance. The degree of deposit reliance is another important determinant. A higher share of deposit funding could enhance efficiency, given that deposits tend to be a more stable and cost-effective funding source than market-based alternatives. Additionally, they come with fewer reporting and covenant requirements than traditional creditor financing, further supporting operational efficiency. Finally, the analysis controlled for banks' asset structure; this included the ratio of loans-to-total assets in order to measure balance-sheet loan intensity (Williams, 2012). On the one hand, given that loan production is relatively more costly than holding other assets (for example, securities), owing to the costs associated with effective screening and monitoring, an

[21] See Annex 1 for a detailed explanation of euro area banks' capital stack and their capital headroom.

inverse relationship between the share of loans and efficiency could be expected. On the other hand, loans are generally more profitable than other assets, and banks with a greater share of loans in their balance sheets may face additional management pressure to control credit risk, both of which may contribute to improving bank efficiency.

Country-specific characteristics may also play a role in shaping bank profit efficiency. Depending on the deposit channel of monetary policy (Drechsler et al., 2017), a tightening of monetary policy tends to raise lending rates more sharply than deposit rates, owing to banks' deposit franchises. All else being equal, this asymmetry means that the cost of funds – a key input – rises less than interest income – a key output – thereby boosting bank efficiency. Another influential factor is banking sector concentration, albeit its impact on efficiency is ambiguous. On the one hand, higher concentration can amplify market power, potentially reducing competition and hampering efficiency. This is in line with the so-called "quiet life hypothesis", which postulates that, under monopolistic conditions, bank management will have little incentive to leave its comfort zone and will forgo revenue for inefficiencies in the allocation of resources (Hicks, 1935). On the other hand, greater concentration may coincide with profit efficiency gains owing to economies of scale. Furthermore, increased concentration may strengthen a bank's market position and profitability, fostering diversification and incentivising prudent risk management by more secure banks (Demirgüç-Kunt and Levine, 2000). Macroeconomic conditions – such as economic growth and inflation – also affect bank efficiency. Industrial production reflects the cyclical state of the industrial sector and captures the broader economic environment in which banks operate. Stronger industrial production tends to boost demand for financial products and services, which can positively influence bank efficiency (Maudos et al., 2002). Inflation, by contrast, typically exerts downward pressure on efficiency by driving up input costs (such as wages, rent and technology expenses), putting a strain on banks' operational performance.

The current analysis employed a large set of bank- and country-specific characteristics to control for cross-bank and cross-country heterogeneity that could potentially affect bank profit efficiency, capital requirements and capital ratios apart. Specifically, the regression equation was as follows:

$$ProfEff_{it} = \alpha_i + \gamma_t + OCR[CET1]_{it-1} + X_{t-1} + \epsilon_{it}$$

On the left-hand side of the equation are the profit efficiency scores (*ProfEff*) derived as set out in **Section 3.1**. On the right-hand side, the two main variables considered are the OCR and CET1 ratios, which were introduced separately in the regressions. X is a vector of bank- and country-specific characteristics that may affect profit efficiency. In line with the discussion above, the analysis controls for measures of bank asset quality, size, liquidity, funding structure and asset structure. Asset quality and bank risk is proxied by the ratio of NPLs to gross loans, while size is computed as the logarithm of bank total assets. Liquidity was controlled for using the ratio of cash and central bank deposits-to-total assets. Bank funding structure was captured by the ratio of deposits to total assets. Asset structure was allowed for using the loans-to-total assets ratio. Differences in the macroeconomic environment across countries are accounted for by several variables: the slope of the yield curve, which

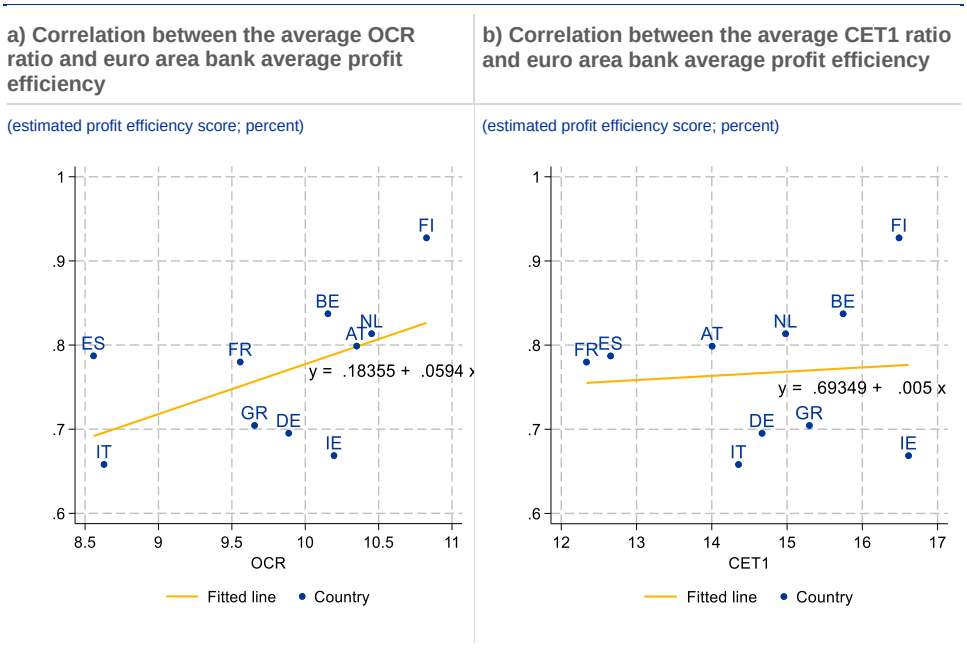
was computed as the difference between the three-month and 10-year government bond yield; the total assets banking sector concentration, which was constructed using the Herfindahl-Hirschman Index; the growth in inflation and the industrial production index. All the variables were lagged by one quarter to account for possible endogeneity with bank profit efficiency. Moreover, all the estimations included bank and quarter fixed effects. Bank fixed effects accounted for any time-invariant unobservable characteristics that may affect bank profit efficiency, such as managerial ability. Time fixed effects controlled for time-variant factors that affect bank profit efficiency, including technological enhancements and shocks such as the COVID-19 pandemic, but also the setting of monetary policy, which was common to our sample countries.

4 Findings

4.1 Stylised facts

A preliminary country-level inspection of the relationship between bank capital requirements and profit efficiency revealed a positive relationship, while the relationship was flat and statistically insignificant for capital ratios. Banking sectors with an OCR of 8.5% – corresponding to the first quartile of the OCR ratio distribution – showed an estimated efficiency score of around 0.69, while for those with an OCR ratio of 10% – corresponding to the last quartile of the distribution – the estimated efficiency score was approximately 0.09 points higher, standing at around 0.78 **(Chart 4.1, panel a)**. In contrast, the relationship with the CET1 ratio was statistically insignificant, as shown by the flat fitted-value regression line in yellow in **Chart 4.1, panel b)**. Overall, this preliminary country-level evidence seems to suggest that higher capital requirements are associated with higher profit efficiency. However, the correlation between the OCR and profit efficiency is only marginally statistically significant. Moreover, to isolate the effect of capital requirements and ratios on profit efficiency, it is important to control for other confounding factors.

Chart 4.1 Country-level correlations between capital requirements, capital ratios and euro area bank profit efficiency

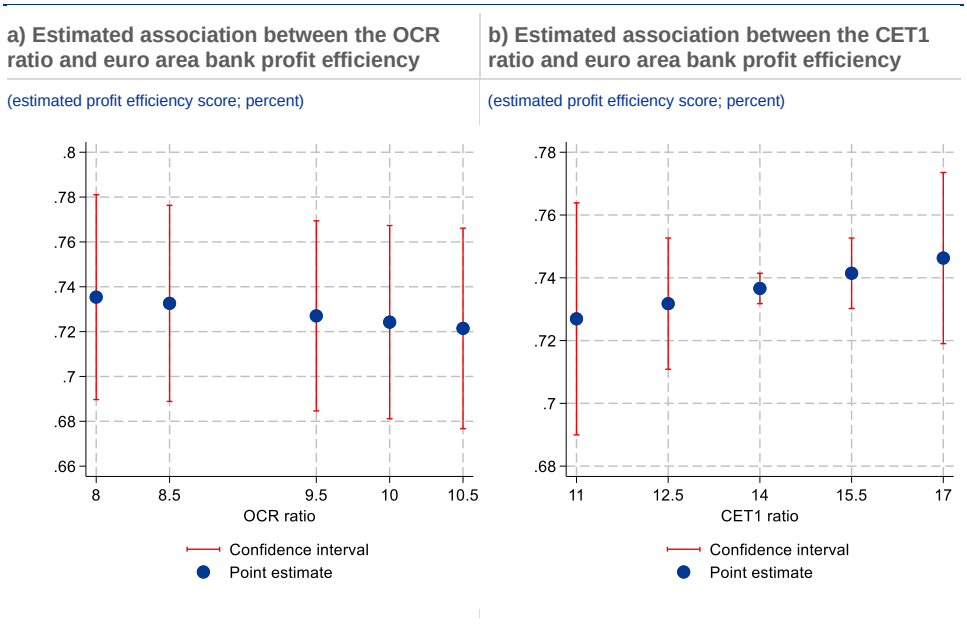


Sources: Supervisory data and authors' calculations.
Notes: OCR stands for overall capital requirement and CET1 for common equity tier 1. In both panels, each dot in blue represents a country included in the sample. The yellow solid line represents the fitted value. Panel a) displays the relationship between the average bank's OCR ratio and the average profit efficiency estimated by applying the data envelopment analysis (DEA) methodology. The econometric equation shows the linear regression results: y is profit efficiency, while x is the OCR ratio. 0.18 is the intercept, while 0.059 represents the effect of y (profit efficiency) following a one percentage point increase in the OCR ratio. Panel b) displays the relationship between the average bank's CET1 ratio and the average profit efficiency estimated by applying the DEA methodology. The econometric equation shows the linear regression results: y is profit efficiency, while x is the CET1 ratio. 0.69 is the intercept, while 0.005 represents the effect of y (profit efficiency) following a one percentage point increase in the CET1 ratio.

4.2 Bank-level analysis

The bank-level regression analysis found no statistically significant relationship between bank capital requirements, capital ratios and profit efficiency. Specifically, bank-level panel regressions conducted on a sample of listed SIs over the period from the first quarter of 2019 to the fourth quarter of 2024 showed no clear link between the level of the OCR and bank profit efficiency **(Chart 4.2, panel a)**. While the estimated relationship was negative, it was not statistically significant, as indicated by the overlapping confidence intervals of each point estimate. Similarly, the relationship between profit efficiency and the CET1 ratio was also statistically insignificant **(Chart 4.2, panel b)**, again illustrated by the confidence intervals largely overlapping for each point estimate. The lack of statistical significance suggests that variations in capital requirements or capital ratios do not systematically explain differences in banks' abilities to generate profits efficiently. In other words, some banks face relatively high capital requirements but are able to generate profits efficiently, others have relatively low capital requirements but struggle to perform efficiently – and vice versa – implying no consistent pattern in the data that would support a strong or stable relationship. This finding is therefore inconsistent with claims by the industry that high capital requirements in the EU are hampering banks' competitiveness.

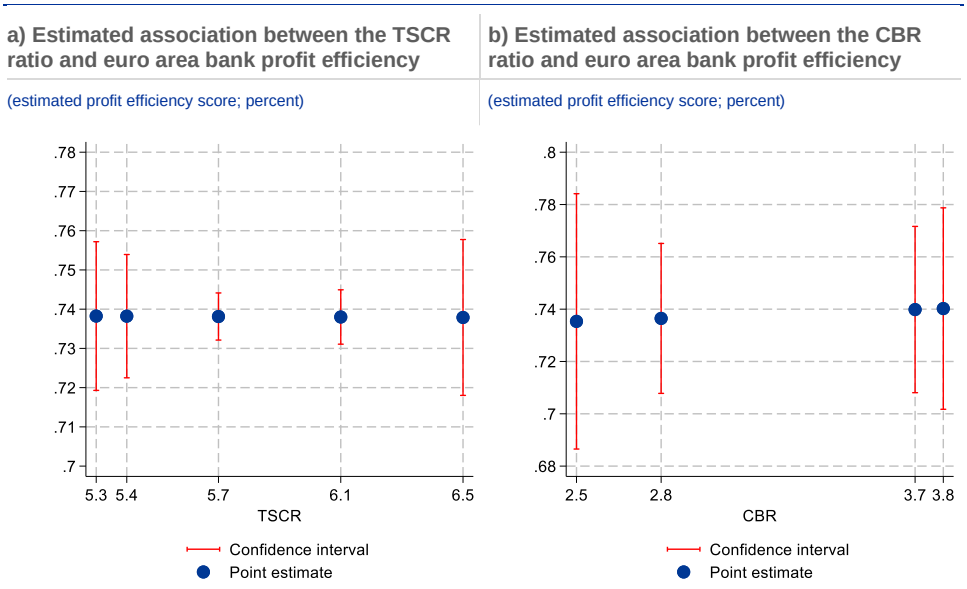
Chart 4.2 Capital requirements and capital ratios display no statistically significant association with euro area bank profit efficiency



Sources: Supervisory data and authors' calculations.
Notes: OCR stands for overall capital requirement and CET1 for common equity tier 1. Panel a) plots the estimated profit efficiency scores at different bank OCR ratio levels. Those levels are taken from the OCR ratio descriptive statistics; 8%, 8.5%, 9.5%, 10% and 10.5% correspond to the 10th percentile, 25th percentile, median, 75th percentile and 90th percentile of the OCR distribution respectively. Confidence intervals are reported at the 95% level. Panel b) plots the estimated profit efficiency scores at different bank CET1 ratio levels. Those levels are taken from the CET1 ratio descriptive statistics; 11%, 12.5%, 14%, 15.5% and 17% correspond to the 10th percentile, 25th percentile, median, 75th percentile and 90th percentile of the CET1 ratio distribution respectively. The regressions control for a large set of bank- and country-specific characteristics, which include: the logarithm of bank total assets, the non-performing loans ratio, the cash and cash at central bank-to-total assets ratio, the deposits-to-total assets ratio, the loans-to-total assets ratio, the industrial production index, the inflation rate, the slope of the yield curve and the total assets Herfindahl-Hirschman Index. All regressions include bank and quarter fixed effects.

Breaking down the OCR into microprudential and macroprudential capital requirements consistently showed a statistically insignificant relationship with profit efficiency. In this analysis, the OCR ratio was broken down into the TSCR ratio and the CBR ratio. The variation in the TSCR derived from changes in the Pillar 2 minimum capital requirements (P2R),[22] while variation in the CBR came from changes in the macroprudential capital buffer requirements, such as the CCyB, the (sectoral) systemic risk buffer (or (s)SyRB) and the O-SII/G-SII buffers. A breakdown of the OCR into microprudential and macroprudential capital requirements is useful in understanding whether the statistically insignificant relationship is observed for both types of requirements. This distinction matters because microprudential and macroprudential capital requirements serve different purposes. Microprudential requirements are intended to address institution-specific vulnerabilities, while macroprudential requirements aim to address systemic risks and preserve financial stability. The analysis found no evidence, however, that either component individually has a significant impact on profit efficiency **(Chart 4.3)**, reinforcing the conclusion that higher capital requirements – whether microprudential or macroprudential – are not inherently detrimental to banks' profit efficiency.

Chart 4.3 Micro- and macroprudential capital requirements display no statistically significant association with euro area bank profit efficiency



Sources: Supervisory data and authors' calculations.
Notes: TSCR stands for total supervisory review and evaluation process capital requirement and CBR for combined buffer requirement. Panel a) plots the estimated profit efficiency scores at different bank TSCR ratio levels. Those levels are taken from the TSCR ratio descriptive statistics; 5.3%, 5.4%, 5.7%, 6.1% and 6.5% correspond to the 10th percentile, 25th percentile, median, 75th percentile and 90th percentile of the TSCR ratio distribution respectively. Confidence intervals are reported at the 95% level. Panel b) plots the estimated profit efficiency scores at different bank CBR ratio levels. Those levels are taken from the CBR ratio descriptive statistics; 2.5%, 2.8%, 3.7% and 3.8%, correspond to the 25th percentile, median, 75th percentile and 90th percentile of the CBR ratio distribution respectively. Confidence intervals are reported at the 95% level. The regressions control for a large set of bank- and country-specific characteristics, which include: the logarithm of bank total assets, the non-performing loans ratio, the cash and cash at central bank-to-total assets ratio, the deposits-to-total assets ratio, the loans-to-total assets ratio, the industrial production index, the inflation rate, the slope of the yield curve and the total assets Herfindahl-Hirschman Index. All regressions include bank and quarter fixed effects. The TSCR regression controls for the level of the CBR, and vice versa for the CBR regression.

[22] See Annex 1 for a brief explanation of the P2R. For a more detailed explanation, see the article entitled "Pillar 2 requirement" published on the European Central Bank website.

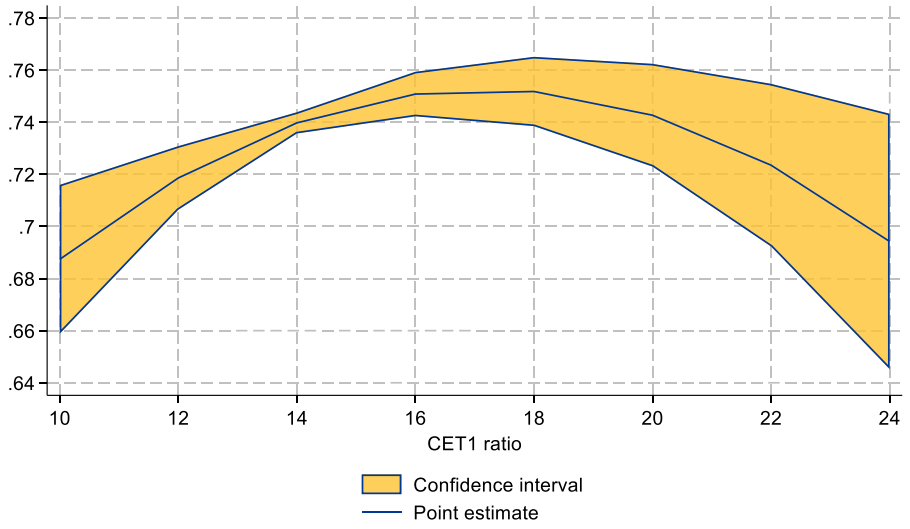
When accounting for non-linearities, the relationship between bank capital ratios and profit efficiency followed an inverted U-shape – it was positive and statistically significant up to a CET1 ratio of 18%, beyond which it was negative and statistically significant. A quadratic term for the CET1 ratio was included in the econometric analysis to see whether the relationship was non-linear. This test was important because imposing linearity on a non-monotonic relationship can lead to insignificant results, such as those shown in **Chart 4.2, panel b).**[23] Indeed, when accounting for possible non-linearities, the relationship was found to be concave **(Chart 4.4).** Specifically, the relationship was positive and statistically significant but followed an inverted U-shape relationship. Bank profit efficiency improved as the CET1 ratio rose – but only up to a point, estimated at around 18%. Beyond this level, further increases in capital ratios were associated with a decline in profit efficiency. The trend became even more pronounced for banks with very high CET1 ratio levels (above 25%). This suggests that for banks with low capitalisation an increase in capital improves profit efficiency, while the reverse is true for banks with very high capital ratios. It is likely that banks with low capital ratios benefit from more stability, lower funding costs and greater lending capacity – all of which support profit efficiency. Disproportionately high capital ratios may, however, reflect an overly conservative stance by banks, which may forgo profitable lending opportunities owing to excessive risk aversion. As a result, the profit efficiency of such banks may suffer. It should be noted, in this regard, that the estimated optimum of around 18% was higher than the sample median CET1 ratio of 16% in the fourth quarter of 2024 (**Chart 3.1, panel a**). Moreover, both of these ratios were substantially higher than the current median of capital requirements for the sample banks, which stood at around 11% in the fourth quarter of 2024. Again, this suggests that the current level of capital requirements is not a constraining factor for the profit efficiency of the banks within the sample analysed.

[23] A similar test was performed for the OCR but did show any non-linear relationship with profit efficiency.

Chart 4.4 The relationship between the capital ratio and euro area bank profit efficiency follows an inverted U-shape

Estimated non-linear association between the CET1 ratio and euro area bank profit efficiency

(estimated profit efficiency score; percent)



Sources: Supervisory data and authors' calculations.
Notes: CET1 stands for common equity tier 1. The chart plots the estimated profit efficiency scores (blue solid line) and a 95% confidence interval (yellow shaded area) at different bank CET1 ratio levels. The inverted U-shaped relationship is constructed by including a quadratic interaction term for the CET1 ratio variable in the econometric specification. The regressions control for a large set of bank- and country-specific characteristics, which include: the logarithm of bank total assets, the non-performing loans ratio, the cash and cash at central bank-to-total assets ratio, the deposits-to-total assets ratio, the loans-to-total assets ratio, the industrial production index, the inflation rate, the slope of the yield curve and the total assets Herfindahl-Hirschman Index. All regressions include bank and quarter fixed effects.

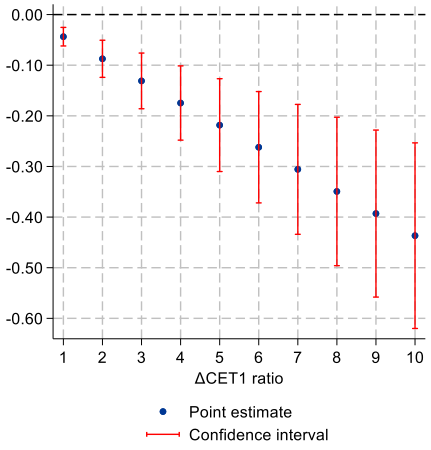
The initially positive association between bank capital and profit efficiency aligns with the broader academic literature, which identifies several channels through which higher capital ratios can enhance profit efficiency. First, banks with higher capital ratios are perceived by investors and depositors as being less risky, reducing their funding costs. Gambacorta and Shin (2018) finds that a one-percentage point increase in the equity-to-total assets ratio is associated with a four-basis point reduction in the cost of debt. All else being equal, cheaper funding means higher net interest margins and, consequently, greater profit efficiency. Second, higher capital levels curb excessive risk-taking, given that both managers and shareholders have more "skin in the game" and are incentivised to act prudently. This, in turn, reduces profit volatility and supports efficiency (Furlong and Keeley (1989); Acharya et al., 2016). Third, ample capital buffers enable banks to extend more loans without breaching regulatory requirements (Behn et al. (2024); Couaillier et al., 2025). This may increase revenues from interest income, supporting profit efficiency. Fourth, a solid capital position signals financial strength, making banks less vulnerable to adverse equity market reactions during periods of stress. This reduces the need for banks to scramble for additional capital in times of crisis (Demirgüç-Kunt et al., 2013). Finally, adequately capitalised banks face lower risks of regulatory or supervisory intervention, and of potential penalties, which may also enhance efficiency.

Empirical tests for the cost of funding and earnings volatility channels indicated that higher bank capital is, indeed, associated with lower funding costs and reduced earnings volatility. Specifically, we regressed two dependent variables on the CET ratio: the ratio of interest expenses to total assets and the standard deviation of RoA respectively, calculated over a three-quarters rolling window. The results showed a negative and statistically significant relationship in both cases. A one-percentage point increase in the CET1 ratio was associated with a decline in the interest expenses-to-total assets ratio of about four basis points **(Chart 4.5, panel a)** – a point estimate that closely aligns with the findings of Gambacorta and Shin (2018). Similarly, a one-percentage point increase in the CET1 ratio corresponded to a reduction in earnings volatility of about five basis points **(Chart 4.5, panel b)**.

Chart 4.5 Higher capital ratios lower euro area bank funding costs and earnings volatility

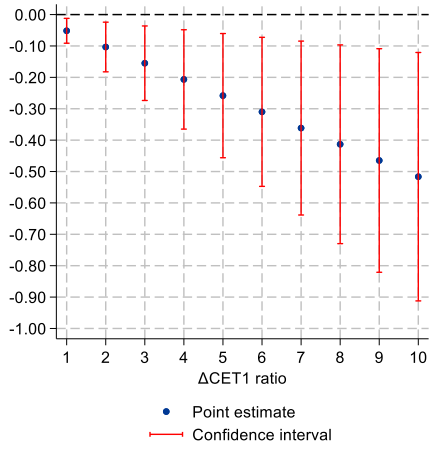
a) Estimated change in the interest expenses-to-total assets ratio following a one and up to ten percentage point change in the euro area CET1 ratio

(percentage points)



b) Estimated change in the standard deviation of RoA following a one and up to ten percentage point change in the euro area CET1 ratio

(percentage points)

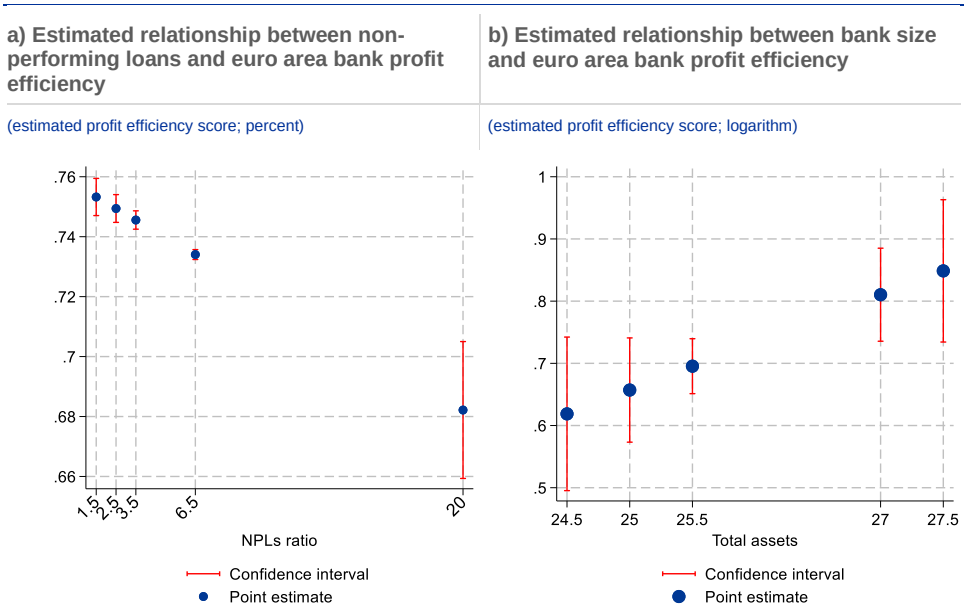


Sources: Supervisory data and authors' calculations.
Notes: CET1 stands for common equity tier 1. Panel a) shows the estimated impact of an increase in the CET1 ratio on the interest expenses-to-total assets ratio. The point estimates reflect an increase in the CET1 ratio ranging from one to ten percentage points. Confidence intervals are reported at the 95% level. Panel b) shows the estimated impact of an increase in the CET1 ratio on the standard deviation of the return on assets (RoA), computed based on a three-quarters rolling window. The point estimates reflect an increase in the CET1 ratio ranging from one to ten percentage points. Confidence intervals are reported at the 95% level. The regressions control for a large set of bank- and country-specific characteristics, which include: the logarithm of bank total assets, the non-performing loans ratio, the cash and cash at central bank-to-total assets ratio, the deposits-to-total assets ratio, the loans-to-total assets ratio, the industrial production index, the inflation rate, the slope of the yield curve and the total assets Herfindahl-Hirschman Index. All regressions include bank and quarter fixed effects.

Among the other bank-specific characteristics, asset quality, size and risk had a significant association with profit efficiency, while liquidity, funding structure and lending diversification by geography appeared to play no meaningful role. Asset quality – measured by the share of NPLs to gross loans – has a negative and statistically significant association with profit efficiency **(Chart 4.6, panel a)**. All other things being equal, banks with low NPL ratios (1.5% – corresponding to the 25th percentile of the NPL distribution) had an average profit efficiency score of around 0.75. In contrast, banks with high NPL ratios (6.5% – at

the 75th percentile) had a lower profit efficiency score of approximately 0.73. This suggests that banks with better asset quality are, on average, 2% more profit efficient. The negative relationship is likely to reflect the additional costs and managerial efforts that banks with high NPLs incur in monitoring for any deterioration in a borrower's repayment capacity or in managing pledged collateral. Bank size showed a positive, statistically significant and economically meaningful relationship with profit efficiency **(Chart 4.6, panel b)**. Larger banks, that is to say, banks with a logarithm of bank total assets equal to the 75th percentile of the total assets distribution (approximately €530 billion) had an estimated efficiency score of about 0.81. Conversely, the estimated efficiency score for smaller banks – banks with a logarithm of bank total assets equal to the 25th percentile of the total assets distribution (approximately €72 billion) – was much lower at about 0.66. This suggests that banks that are larger are, on average, 15% more profit efficient than those that are smaller. The efficiency advantage of larger banks may stem from economies of scale, better access to resources and funding cost advantages, as well as the ability to attract more talented and qualified management, all of which contribute to improved performance.[24]

Chart 4.6 Better asset quality and larger bank size are positively associated with euro area bank profit efficiency.



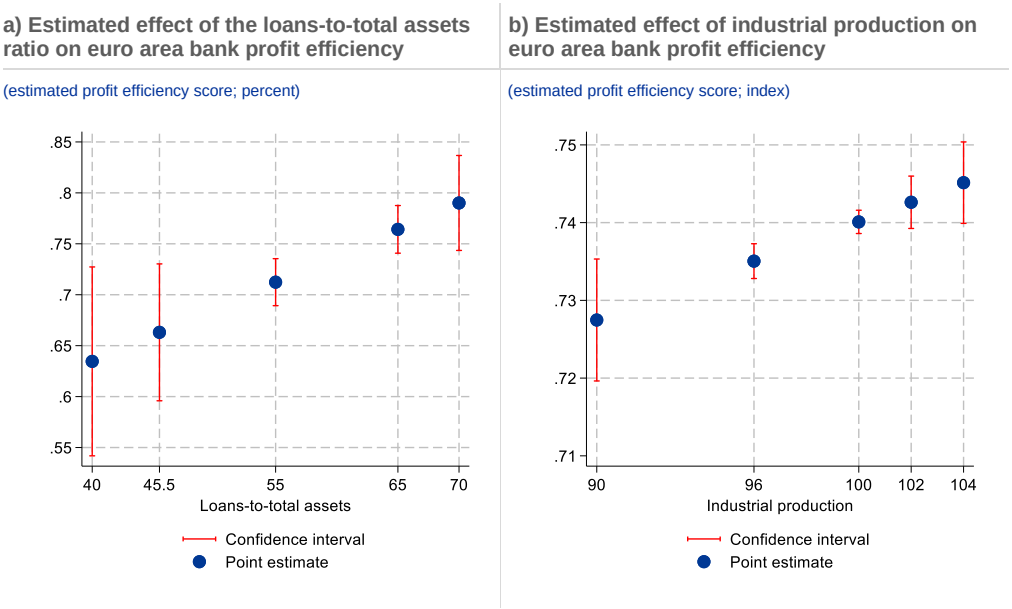
Sources: Supervisory data and authors' calculations.
Notes: Panel a) displays the estimated profit efficiency scores at different non-performing loans ratio levels. Those levels are taken from the non-performing loans ratio descriptive statistics; 1.5%, 2.5%, 3.5%, 6.5% and 20% correspond to the 10th, 25th, 50th, 75th and 90th percentile of the non-performing loans ratio distribution respectively. Confidence intervals are reported at the 95% level. Panel b) displays the estimated profit efficiency scores at different levels of the logarithm of bank total assets. The latter are taken from the logarithm of bank total assets descriptive statistics; 24, 25, 25.5, 27 and 27.5 correspond to the 10th, 25th, 50th, 75th and 90th percentile of the total assets distribution respectively. Confidence intervals are reported at the 95% level. The regressions control for a large set of bank- and country-specific characteristics, which include: the common equity tier 1 (CET1) ratio, the logarithm of bank total assets, the non-performing loans ratio, the cash and cash at central bank-to-total assets ratio, the deposits-to-total assets ratio, the loans-to-total assets ratio, the industrial production index, the inflation rate, the slope of the yield curve and the total assets Herfindahl-Hirschman Index. All regressions include bank and quarter fixed effects.

[24] Funding cost advantages may relate, at least in part, to bailout expectations with respect to systemically important institutions in the event of distress. For further discussion of this issue, see, for example, Financial Stability Board (2021).

A higher share of loans in banks' asset portfolios and stronger industrial performance also emerged as key drivers of bank profit efficiency. The asset structure – measured by the ratio of loans-to-total assets – had a positive and statistically significant association with profit efficiency **(Chart 4.7, panel a)**. Holding other factors constant, banks with a less retail-oriented business model (a loan-to-asset ratio of 45.5%, corresponding to the 25th percentile) had an average profit efficiency score of approximately 0.66. By contrast, banks with a more retail-oriented profile (a loan-to-asset ratio of 65%, corresponding to the 75th percentile) had an average efficiency score of around 0.76. This suggests that, on average, banks with a higher loan share are about 10% more profit efficient. While the operational costs entailed in loan origination are higher than those for alternative asset holdings – such as securities – owing to the need for screening and monitoring, loans typically generate higher returns. A greater share of loans should therefore translate into higher profitability, provided asset quality remains stable.

Among country-specific characteristics, industrial activity – as proxied by the industrial production index[25] – was also positively and significantly correlated with profit efficiency **(Chart 4.7, panel b)**. Stronger industrial performance is likely to support bank efficiency by stimulating credit demand, reducing loan defaults and fostering a more robust macroeconomic environment. While the descriptive analysis in Section 3.2 suggested that interest rate levels are a strong driver of profit efficiency, this could not be confirmed in our regression setup, given that monetary policy was unique to each of our sample countries and therefore absorbed by the time fixed effects.

Chart 4.7 Higher share of loans-to-total assets and strong industrial production are positively associated with euro area bank profit efficiency.



Sources: Supervisory data and authors' calculations.

[25] The industrial production index is a business cycle indicator that measures monthly changes in the price-adjusted output of industry. For more details, see the article entitled "Industrial production (volume) index overview" on the Eurostat website.

Notes: Panel a) displays the estimated profit efficiency scores at different loan-to-total-assets ratio levels. Those levels are taken from the loan-to-total-assets ratio descriptive statistics; 40%, 45.5%, 55%, 65% and 70% correspond to the 10th, 25th, 50th, 75th and 90th percentile of the loan-to-total-assets ratio distribution respectively. Confidence intervals are reported at the 95% level. Panel b) displays the estimated profit efficiency scores at different industrial production index levels. Those levels are taken from the industrial production index descriptive statistics; 90, 96, 100, 102 and 104 correspond to the 10th, 25th, 50th, 75th and 90th percentile of the industrial production index respectively. Confidence intervals are reported at the 95% level. The regressions control for a large set of bank- and country-specific characteristics, which include: the common equity tier 1 (CET1) ratio, the logarithm of bank total assets, the non-performing loans ratio, the cash and cash at central bank-to-total assets ratio, the deposits-to-total assets ratio, the loans-to-total assets ratio, the industrial production index, the inflation rate, the slope of the yield curve and the total assets Herfindahl-Hirschman Index. All regressions include bank and quarter fixed effects.

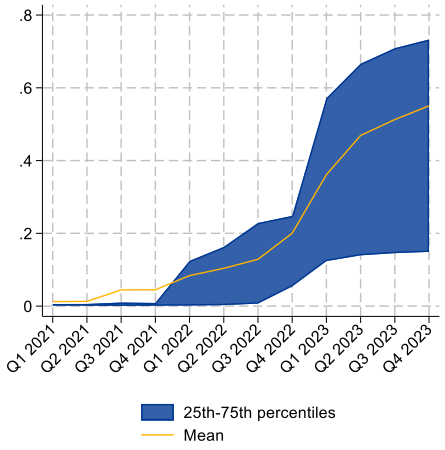
5 Robustness checks

The relationship between bank capital requirements and profit efficiency may be spurious and affected by endogeneity. Countries may activate or raise macroprudential buffers in response to financial overheating or to strong credit growth, both of which might be positively correlated with bank profitability. Where this is the case, higher profit efficiency may coincide with rising buffer requirements. The analysis found no evidence of any such mechanical positive correlation given that the relationship between capital requirements and profit efficiency is not statistically significant, and the approach adopted, which included lagged regressors, also accounted for such potential endogeneity. Nevertheless, the analysis drew on the approach advocated by Behn et al. (2024) and leveraged the significant macroprudential policy tightening wave that began in early 2022 to further address potential concerns. That wave reflected a notable shift in how macroprudential policy was conducted in the post-pandemic period. While capital buffer requirements were originally introduced to provide a direct response to business cycle fluctuations (Drehmann et al., 2011), many countries have raised capital buffer requirements as a precautionary measure against unexpected external shocks, such as the COVID-19 pandemic and geopolitical events (Behn et al., 2023). This shift has reduced concerns about policy endogeneity, given that the measures were less about reacting to economic or financial developments and more about bolstering resilience against future uncertainties. The macroprudential tightening was both economically significant, with the median and average cumulative CBR having increased by more than 40 and 50 basis points respectively since 2021 **(Chart 5.1, panel a),** and heterogeneous across banks **(Chart 5.1, panel b)**.

Chart 5.1 Significant and heterogeneous increase in the combined buffer requirements following the macroprudential tightening wave of early 2022 – impact on euro area bank profit efficiency.

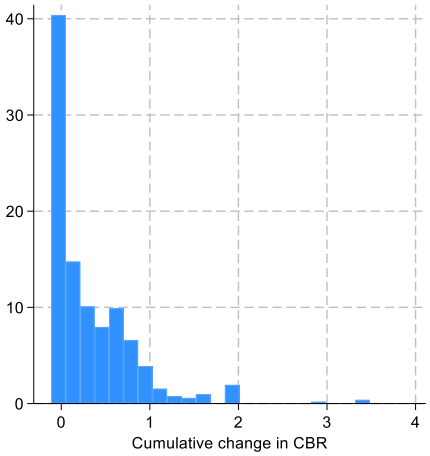
a) Euro area cumulative change in CBR – Q1 2021-Q4 2023

(percent; time)



b) Distribution of the cumulative change in CBR across euro area banks

(percent; percent)



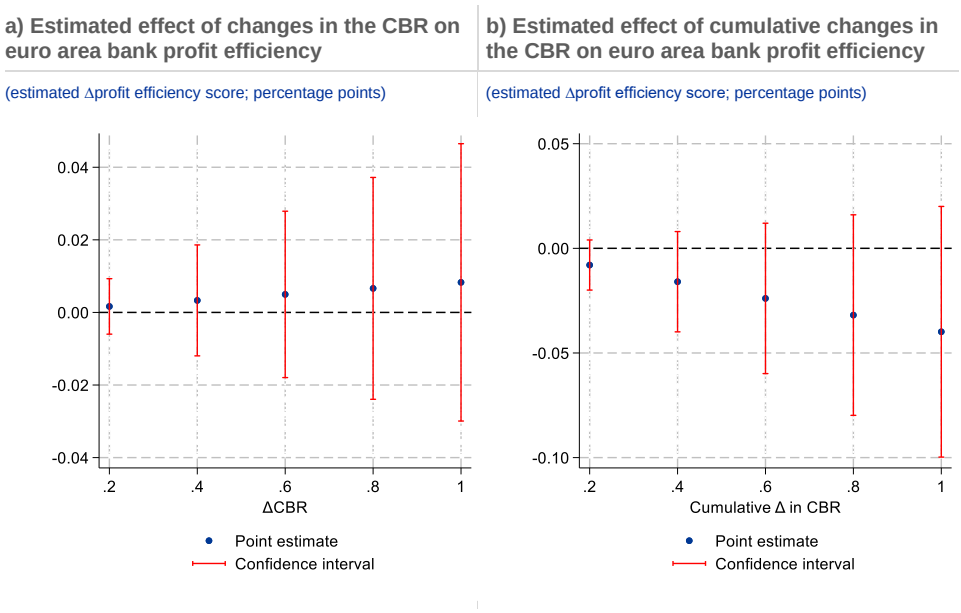
Sources: Supervisory data; authors' calculation.
Notes: CBR stands for combined buffer requirement. Panel a) shows the cumulative change in the CBR from the first quarter of 2021 to the fourth quarter of 2023. The solid yellow line represents the mean, while the blue shaded area shows the first and last quartile of the cumulative change in the CBR distribution. Panel b) displays the distribution of the cumulative change in the CBR across banks.

To explore whether the macroprudential tightening influenced profit efficiency, the analysis focused on a shorter sample, centred around the tightening wave, and employed two different variables to capture the increase in capital buffer requirements. Specifically, the analysis considered the period from the first quarter of 2021 to the last quarter of 2024 and tested for the impact of: (a) a change in the CBR, and (b) the impact of the cumulative change in the CBR on profit efficiency.[26] The change in the CBR can be considered to be a "flow" measure, given that it captures the quarter-on-quarter increment in capital buffer requirements; the cumulative change in the CBR is a "stock" measure, given that it records the extent to which the buffer requirement has increased since the start of the tightening wave. While a change in the CBR captures short-term effects on profit efficiency, the cumulative change in the CBR identifies longer-term effects. If both variables are statistically insignificantly related to profit efficiency, it can be assumed, with greater confidence, that substantial (and more exogenous) increases in capital buffer requirements do not affect profit efficiency. The results of the analysis revealed that the relationship between profit efficiency and changes in both the CBR and the cumulative CBR is statistically insignificant **(Chart 5.2)**, as shown by the fact that the confidence intervals always overlap at zero at each increase interval.[27]

[26] This restricted window is also used by Behn et al. (2024). The computation of the bank-specific cumulative change in the CBR is based on this shorter sample period.

[27] It is important to note that the 20-basis point changes are large given a standard deviation from the mean of 28 basis points for the change in the CBR and 47 basis points for the cumulative change in the CBR.

Chart 5.2 A tightening of macroprudential policy has no statistically significant effect on euro area bank profit efficiency



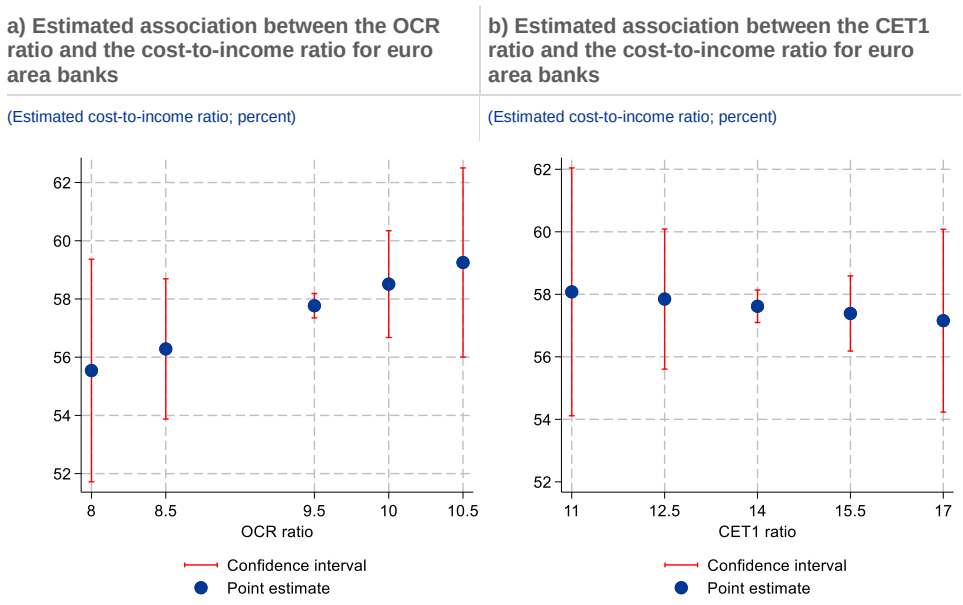
Sources: Supervisory data and authors' calculations.
Notes: CBR stands for combined buffer requirement. Panel a) plots the estimated change in the profit efficiency score at different CBR change levels. Confidence intervals are reported at the 95% level. Panel b) plots the estimated change in the profit efficiency score at different CBR cumulative change levels. Confidence intervals are reported at the 95% level. The regressions control for a large set of bank- and country-specific characteristics, which include: the logarithm of bank total assets, the non-performing loans ratio, the cash and cash at central bank-to-total assets ratio, the deposits-to-total assets ratio, the loans-to-total assets ratio, the industrial production index, the inflation rate, the slope of the yield curve and the total assets Herfindahl-Hirschman Index. All regressions include bank and quarter fixed effects.

For assessing bank performance, efficient frontier techniques have several advantages over traditional accounting ratios, such as the RoA or the cost-to-income ratio. Efficiency measures derived from methods such as an SFA and DEA are generally considered superior and more robust than simple accounting ratios, such as the cost-to-income ratio. As highlighted by Berger and Humphrey (1997), accounting ratios often lack a solid optimisation framework and fail to account for the complex trade-offs between inputs and outputs. By contrast, frontier techniques provide a more nuanced view by estimating the maximum attainable efficiency given a bank's specific mix of outputs and input prices. A simple correlation analysis showed a bank-level correlation between the efficiency estimates calculated for this current study and the cost-to-income ratio of about -0.5, implying that the two indicators are not fully related and may capture different dimensions of performance. Profit efficiency focuses on how effectively banks generate profits given their resources, while the cost-to-income ratio is a more static measure of cost management relative to income and does not fully allow for inputs such as the cost of equity or the quality of outputs.

As with the results for profit efficiency, there was no statistically significant relationship between capital requirements, capital ratios and the cost-to-income ratio. The coefficients for both the OCR and the CET1 ratio did not show any statistically significant association with the cost-to-income ratio **(Chart 5.2, panels a) and b)**. That said, the results were dissimilar with respect to the factors acting on bank profit efficiency and those affecting the cost-to-income ratio. For the

cost-to-income ratio, the most significant driver was the banking sector concentration variable. Banks operating in more concentrated banking sectors tended to have better cost efficiency.

Chart 5.3 Capital requirements and capital ratios have no statistically significant association with the cost-to-income ratio for euro area banks



Sources: Supervisory data and authors' calculations.
Notes: OCR stands for overall capital requirements and CET1 for common equity tier 1. Panel a) plots the estimated cost-to-income ratio at different OCR ratio levels. Those levels are taken from the OCR ratio descriptive statistics; 8%, 8.5%, 9.5%, 10% and 10.5% correspond to the 10th percentile, 25th percentile, median, 75th percentile and 90th percentile of the OCR distribution respectively. Confidence intervals are reported at the 95% level. Panel b) plots the estimated cost-to-income ratio at different CET1 ratio levels. Those levels are taken from the CET1 ratio descriptive statistics; 11%, 12.5%, 14%, 15.5% and 17% correspond to the 10th percentile, 25th percentile, median, 75th percentile and 90th percentile of the CET1 ratio distribution respectively. Confidence intervals are reported at the 95% level. The regressions control for a large set of bank- and country-specific characteristics, which include: the logarithm of bank total assets, the non-performing loans ratio, the cash and cash at central bank-to-total assets ratio, the deposits-to-total assets ratio, the loans-to-total assets ratio, the industrial production index, the inflation rate, the slope of the yield curve and the total assets Herfindahl-Hirschman Index. All regressions include bank and quarter fixed effects.

Expanding the sample to include unlisted SIs did not alter the main findings, and the relationship between capital requirements and profit efficiency remained statistically insignificant.[28] While including the cost of equity enhances estimation of the profit efficiency scores, it necessarily restricts the baseline analysis to listed banks only. To check for robustness, unlisted SIs were incorporated into estimation of the profit efficiency frontier by assuming a constant cost of equity of 10% of banks' own funds. To maintain comparability, institutions with non-traditional banking models – such as asset managers, consumer credit lenders, custodians, development/promotional banks and investment banks – continued to be excluded. This resulted in a sample of 84 SIs, a notable increase on the 35 listed banks analysed in the main specification. Five of the 84 banks operated at the estimated efficiency frontier, with the expanded sample capturing a broader representation of smaller institutions **(Chart 5.3, panel a)**. As in the baseline analysis, the coefficient

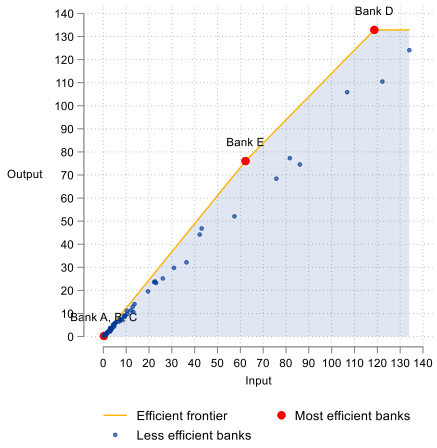
[28] The relationship between the CET1 ratio and profit efficiency is also statistically insignificant.

on the OCR remained statistically insignificant, reaffirming the absence of any measurable impact of capital requirements on profit efficiency **(Chart 5.3, panel b)**.[29]

Chart 5.4 The relationship between capital requirements and euro area bank profit efficiency is statistically insignificant even with an extended sample of banks

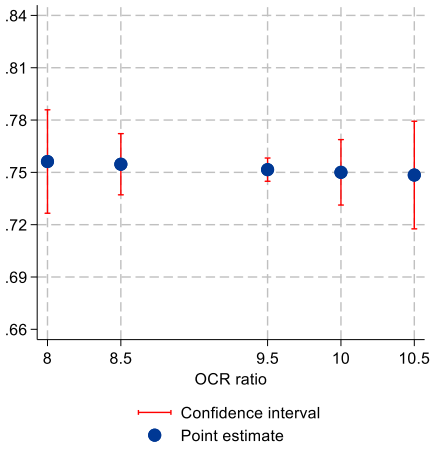
a) DEA profit efficient frontier for euro area banks

(EUR billions; EUR billions)



Estimated association between the OCR ratio and euro area bank profit efficiency

(Estimated profit efficiency score; percent)



Sources: Supervisory data and authors' calculations.
Notes: Banks A, B, C, D and E (shown in red) are those operating at the efficient frontier. OCR stands for overall capital requirements. Panel a) shows the DEA efficient frontier and is based on a sample of 84 significant institutions for the fourth quarter of 2024. The yellow line represents the efficiency frontier, while each dot represents a bank. For the purposes of the frontier, input is the sum of administrative costs, staff expenses, provisioning costs, equity costs and interest expenses, while output is the sum of interest and non-interest income. Panel b) plots the estimated profit efficiency scores at different OCR ratio levels. Those levels are taken from the OCR ratio descriptive statistics; 8%, 8.5%, 9.5%, 10% and 10.5% correspond to the 10th percentile, 25th percentile, median, 75th percentile and 90th percentile of the OCR distribution respectively. Confidence intervals are reported at the 95% level. The regression controls for a large set of bank- and country-specific characteristics, which include: the logarithm of bank total assets, the non-performing loans ratio, the cash and cash at central bank-to-total assets ratio, the deposits-to-total assets ratio, the loans-to-total assets ratio, the industrial production index, the inflation rate, the slope of the yield curve and the total assets Herfindahl-Hirschman Index. The regression includes bank and quarter fixed effects.

[29] In a further robustness check and given the small sample of banks used in the main analysis, we used bootstrapping methodologies to be sure of the reliability of the standard errors and confidence intervals reported in the charts presented in this paper. The results were not affected by this alteration.

6 Conclusion

This paper contributes to the ongoing debate about the relationship between bank regulation and competitiveness by examining whether higher capital requirements or capital ratios impair the profit efficiency of euro area banks. Against the backdrop of calls from the banking industry to ease regulatory capital requirements in order to foster competitiveness, the analysis provides no empirical support for the notion that stricter capital requirements undermine banks' ability to generate profits efficiently – a dimension of bank competitiveness that is commonly employed in the literature on this matter. Using supervisory data and applying econometric techniques to a sample of listed euro area banks over a period running from the first quarter of 2019 to the last quarter of 2024, the findings consistently showed that neither the OCR ratio, nor its microprudential and macroprudential components, were significantly associated with profit efficiency.

These results were robust across a wide range of model specifications, alternative measures of efficiency and extensions of the sample to unlisted banks. In addition, the recent wave of macroprudential buffer tightening did not affect banks' profit efficiency in a statistically significant manner. Interestingly, the analysis uncovered a non-linear, inverted U-shape relationship between capital ratios and profit efficiency. For banks with CET1 capital ratios below 18%, increases in capital ratios were associated with improved efficiency, which is likely to be due to a reduction in agency costs and in earnings volatility. Beyond this point, further increases in capital ratios appeared to be associated with diminishing efficiency, possibly owing to conservative lending behaviour or other idiosyncratic factors.

Overall, the findings challenge the argument that high capital requirements erode the competitiveness of euro area banks. While no cross-jurisdictional analysis was conducted, the findings suggest that capital requirements were not a main driver of profit efficiency in the cross-section of euro area banks examined. In addition, increases in CET1 ratios tended to be associated with higher profit efficiency up to levels of around 18%. A CET1 ratio of 18% is substantially above the current levels of both the CET1 ratio (at around 16% at the median in the fourth quarter of 2024) and the CET1 requirements (at around 11% at the median in the fourth quarter of 2024), confirming that the latter are not currently constraining profit efficiency for the banks in the analysis sample. Capital requirements serve a broader prudential purpose, however, and should support bank competitiveness in the long term, by ensuring sufficient resilience, enhancing banks' capacity to support credit provision across the cycle, mitigating excessive risk-taking and fostering sound risk management practices.

To summarise, the analysis underscores the importance of maintaining a strong regulatory and prudential framework. Calls for regulatory easing to boost competitiveness may be overlooking the medium and long-term downsides, in terms of resilience, financial stability and sustainable bank performance, and may be over-estimating the hypothetical competitive benefits.

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8 Annex

Annex 1: Euro area banks' capital stack

Banks must fulfil minimum requirements, which consist of a constant Pillar 1 element (8% of risk weighted assets, with at least 4.5% to be met from common equity tier 1 (CET1) capital) and by a bank-specific Pillar 2 requirement that is determined as part of the supervisory review and evaluation process (SREP) (with at least 56.25% to be met from CET1 capital). The sum of minimum own funds requirements and Pillar 2 requirements equates to the total SREP capital requirements (TSCR). The combined buffer requirement (CBR) is additional to the minimum capital requirements. Under the European framework, the CBR consists of the capital conservation buffer (CCoB), the countercyclical capital buffer (CCyB), the (sectoral) systemic risk buffer (or (s)SyRB) and capital buffers for systemically important banks (SIs), namely other systemically important banks (O-SIIs) and globally systemically important banks (G-SIBs). The sum of the TSCR and the CBR forms the overall capital requirement (OCR). In addition to the CBR, banks are also supposed meet the Pillar 2 Guidance (P2G). This is not strictly speaking a requirement given that it is not legally binding.

Capital headroom (called also the voluntary buffer or distance to CBR) is defined as the difference between a bank's capital ratio and its OCR. Dipping into the capital buffer requirements triggers automatic restrictions on dividend distributions, bonuses and coupon payments applying the maximum distributable amount mechanism and forces banks to communicate a capital recovery plan to banking supervisors.

Acknowledgements
We would like to thank Desislava Andreeva, Lorenzo Cappiello, Carsten Detken, John Fell, Maciej Grodzicki, Cosimo Pancaro, Anton van der Kraaij and Livio Stracca, as well as members of the European System of Central Banks Financial Stability Committee and its Macroprudential Policy Group for their valuable comments and suggestions. Feedback from colleagues in the ECB's Macroprudential Policy Division is also gratefully acknowledged. All errors and omissions are those of the authors.
The views expressed in the paper are those of the authors and do not necessarily reflect the views of the ECB or the Eurosystem.

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PDF ISBN 978-92-899-7498-1, ISSN 1725-6534, doi: 10.2866/3489809, QB-01-25-247-EN-N