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The Short-Run Endogeneity of Bank Capital: Evidence from Global Banking Data

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Abstract

This SUERF Policy Note summarizes a comprehensive study on how banks manage their equity capital in the short run, particularly during periods of distress. The findings challenge the conventional assumption that bank capital is largely exogenous in the short run, meaning that banks cannot adjust their capital level in period t in response to distress, capital targets and/or growth opportunities in the same period. In contrast, our findings highlight the active forward-looking role of bank management in adjusting capital levels to meet these challenges, even in the short run. Hence, existing studies that treat bank capital as fixed in the short run tend to underestimate the ability of banks to adjust to changes in their operating environment such as changes to regulatory requirements or bank-specific distress.

Disclaimer: This policy note is based on Basel Committee on Supervision, Working Paper 46, July 2025. The views expressed in this note are exclusively those of the authors and must not be interpreted as those of the BCBS, the OeNB, the Bundesbank, the FDIC or the United States and the European Banking Authority (EBA).

Introduction

There is a substantial body of empirical literature on the relationship between bank capitalisation and the evolution of bank assets. Some of these papers aim at estimating the impact of capital requirements on the growth rate of assets (often lending to the private non-financial sector), as a proxy for the social costs of capital regulation. Other papers estimate feedback effects in macroprudential stress tests (see Section A1.1 in Appendix 1 of BCBS WP 46 for an overview and references). While these models vary along several dimensions, the underlying structure of their econometric specifications is similar and have the following generalized structure:[1] The growth rate of assets (e.g., loans to the private non-financial sector) of bank i in period t is a function of the capitalization (e.g., the CET1 ratio) of bank i in period t-1 plus a vector of control variables at the bank level and a vector of control variables that control for asset demand (e.g., macroeconomic variables).

This generalized structure implies that capital is exogenous in two dimensions:

First, it builds on the assumption that capitalization at the end of period t-1 can be used to identify the direction of causation from capitalization in t-1 to asset growth in period t. Capitalization in t-1 has an impact on asset growth in t, but (planned) asset growth in t has no impact on capitalization in t-1.

Second, it builds on the assumption that banks cannot adjust the capital level in period t. Consequently, banks would adjust to shocks (to capitalization) by adjusting asset growth. Both assumptions are revisited in BCBS WP 46 which we summarize in this SUERF Policy Note. It addresses the general research question: How do banks manage their equity capital in the short run and what effects does this have on their asset and liability structure, explicitly considering periods of bank-specific distress?

More specifically, we empirically study (1) whether banks take active measures to adapt capitalization via CET1 capital in any period t, and, if so, how this relates (2) to the bank's capitalization at the end of period t-1, (3) to bank-specific distress in period t, and (4) to asset growth in period t.

To investigate these questions, we adopt a two-step empirical strategy. First, we use a partial adjustment model to estimate each bank's target capital-asset ratio, providing a benchmark for identifying capital surpluses or shortfalls. Second, we apply a simultaneous-equation framework to analyse how banks manage their capital in response to these deviations, and how such actions influence the evolution of other balance sheet components.

The report contributes to the literature (1) by investigating the causal structure of the econometric specifications in a substantial body of empirical literature on the relationship between bank capitalisation and the evolution of bank assets, (2) by presenting an econometric specification that reflects the actual causal structure of that interaction, and (3) by taking into account the bank-specific implementation of the Basel III reform as an influencing factor for target capital-asset ratios. Finally, the report (4) develops an econometric specification for the study of bank balance sheet management that better captures its true causal structure and yields more accurate estimations.

The empirical analysis yields results that are highly relevant for understanding banks' short-run behavioural adjustments to exogenous shocks and the interaction between banks and the real economy. The results help improving evaluations of capital requirements. It also advances the modelling of second-round effects in macroprudential analysis and stress testing, as it requires these models to consider the short-run endogeneity of capital.

This SUERF Policy Note is structured along the following lines: Section 2 brings together insights from publications on the supervisory requirements on bank capital management, studies on their practical implementation at the bank level, and the academic empirical literature on bank capital management, especially in the presence of shocks. Section 3 describes the data we use. Section 4 presents the first step of our empirical approach, in which we use a partial

[1] The FRAME repository at the BIS contains 83 studies and 139 quantitative impact estimates from 15 countries and regions (www.bis.org/frame/cap_liq/overview.htm): e.g., BCBS (2010), Francis and Osborne (2012), Kolcunová and Malovaná (2019) and other studies referenced in Appendix A1.1 in BCBS WP 46.

adjustment model to estimate each bank's target capital-asset ratio that incorporates bank-specific characteristics, macroeconomic conditions, and the anticipation of Basel III regulatory changes. Section 5 explains our measure of management action on capital. Section 6 defines our bank-specific distress variable. Section 7 presents the second step in our empirical strategy. Section 8 summarizes our findings and discusses their implications for the assessment of the social costs of bank regulation and the impact of macro-financial feedback effects in macroprudential stress tests.

What does the literature say about bank balance sheet management?

This section brings together insights from the supervisory requirements on bank capital and balance sheet management, their practical applications at the bank level, and the academic empirical literature on bank capital and balance sheet management, especially in the presence of shocks. We seek empirical evidence of bank balance sheet management beyond the standard models and data which we review separately in Section A1.1 in Appendix 1 of the BCBS WP 46.

From our review of selected supervisory documents[2], we understand that banks are required to manage capital in an active, forward-looking manner under, both, business as usual and stress and to have capital plans in place that contain possible management action for capital under stress. Hence, banks must have the ability and the tools to adjustment their CET1 level also under stress.

From our review of banks' capital management in practice[3], we find that banks forecast their future capital requirements under, both, business as usual and stress (broadly) in line with the respective supervisory requirements regarding capital management. We also find that banks' adjustment to deviations from capital plans under stress takes place via a broad set of options, with changes of capital contributing most to the adjustment. Banks govern and implement their adjustment strategy via changes of Fund Transfer Prices (FTPs) and internal hurdle rates which affect the bank's pricing on the asset side (e.g. loan spreads) and on the liability side (e.g. deposit rates); and the respective quantities adjust endogenously.

From our review of the empirical economic literature[4], we conclude that banks actively adjust capital by capital increases, retained earnings and several other measures (such as asset sales, risk weight optimization, Non-Performing Loans reduction) also under stress. The combination of these measures is the outcome of an optimization problem in which a bank aims at minimizing its adjustment costs to adapt its balance sheet structure to the exogenous shock. The marginal adjustment costs across adjustment measures are likely to be influenced by bank-specific and macroeconomic variables.

Combining the three strands of literature, we draw the following conclusions regarding the generalized empirical specifications in (1): first, the assumption that capitalization at the end of period t-1 can be used to identify the direction of causation from capitalization in t-1 to asset growth in period t does not hold. The positive association between the two variables can be caused by two effects: first, banks increase capital more in period t-1 when they (expect/plan to) increase their risk-weighted assets more in period t. Second, banks that have a capital surplus in period t-1, may find it easier to grow their risk-weighted assets in period t. Capital in period t-1 and asset growth in period t are planned by the same bank staff/asset and liability committees at the same time. Balance sheets for period t-1 are published well into period t, so that bank balance sheets can take into account even unexpected developments well into period t. The second assumption – that banks cannot adjust the capital level in the short run (in period t) – is not supported by the literature, either.

These findings have two implications for our empirical analysis of balance sheet management. First, the forward-looking nature of the bank balance sheet and capital planning processes suggest a partial adjustment model for the adjustment of capital ratios to capital targets and to bank balance sheet management more broadly (Section 4). The

[2] BCBS (2019b), Board of Governors (2020), and European Central Bank (ECB) (2018, 2021).
[3] Bajaj et al. (2018), Cadamagnani et al (2015), ECB (2020), BCBS (2019a), Eidenberger et al. (2014).
[4] Inter alia, Berger et al. (2008), Black et al (2016), De Jonghe and Öztekin (2015), Dinger and Vallascas (2016) and Liu (2018).

combination of measures is likely to be bank-specific and depends on the macroeconomic environment. An empirical strategy can exploit these variations in the cross section and in the time dimension (panel data setting). Second, focusing on one measure of bank balance sheet adjustment (e.g., non-financial corporate loans) in isolation can be misleading. Instead, banks choose their specific combination of measures of asset-side and liability-side adjustments in a simultaneous and endogenous manner. An empirical strategy should therefore focus on simultaneous- equations models that take these interdependencies into account (Section 7).

Sample composition and descriptive statistics

We obtain confidential supervisory data from the Basel Committee's Quantitative Impact Study (QIS), which collects detailed financial and regulatory information from banks operating under the Basel II/III frameworks across the globe.[5] Maintained by the Basel Committee's Secretariat, the QIS database offers comprehensive and standardized data—including balance sheets, income statements, capital and liquidity ratios, and their underlying components. Its global coverage and rigorous data quality assurance make it uniquely well-suited to analyze how banks adjust to evolving capital requirements under Basel III.

The dataset used spans from June 2013 to June 2019, capturing the pre-Covid period at semi-annual frequency. This time frame reflects both the availability of key data and the implementation phase of Basel III reforms. To extend the sample size and improve robustness, missing data points are imputed using averages from surrounding periods, and banks with fewer than three years of continuous data are excluded. The resulting sample comprises 1,644 observations from 172 banks across 26 countries, representing a diverse range of geographies, sizes, business models, and legal forms. Retail and commercial banks make up the majority of the sample, and most banks are joint stock companies, although mutual and cooperative banks are also included.

A central focus of the dataset is the Common Equity Tier 1 (CET1) ratio, a key regulatory capital metric. During the sample period, reported CET1 ratios averaged 14.8%, well above the 4.5% Basel III minimum requirement. However, because Basel III was still being phased in, the analysis distinguishes between reported CET1 ratios and fully phased-in ratios that apply more stringent definitions. The difference between these—the "Basel III reform gap"—serves as a novel explanatory variable, capturing the extent to which banks still need to adjust to full compliance. The larger the gap, the greater the potential influence on a bank's future capital behavior.

To further investigate the determinants of banks' target capital ratios, the study includes a rich set of financial and macroeconomic variables. These include bank-level indicators such as the Liquidity Coverage Ratio (LCR), total assets (as a proxy for size), profitability (measured by net income to assets), trading and lending activity, and risk-weighted asset intensity. Country-level controls include filtered measures of GDP and inflation, changes in stock market capitalization, and sovereign credit default swap (CDS) spreads. Together, these variables allow for a nuanced analysis of how banks' capital management responds to regulatory change, internal characteristics, and external economic conditions.

How do banks manage their balance sheets to adjust their CET1 ratios towards their estimated targets in the short run?

In this section we explore how banks adjust their capital ratios over time to align with internal targets. The analysis begins by estimating each bank's target capital ratio—essentially, the level of capital a bank aims to maintain relative to its risk exposure. Because these targets are not directly observable, we use a well-established modelling framework, known as the partial adjustment model. This approach assumes that banks gradually move toward their target capital ratios rather than adjusting all at once, reflecting the real-world frictions and costs involved in raising or reducing capital.

[5] Refer to www.bis.org/bcbs/qis/ for details on the QIS dataset.

To estimate how quickly banks close the gap between their current and target ratios, we apply a dynamic panel estimation technique suited for the type of unbalanced international data used in the study. The results indicate that banks adjust only a fraction of the gap in each period—about 25% per year on average. This "stickiness" is consistent with previous findings and reflects the practical difficulties banks face in modifying their capital structure. The analysis also finds that banks with a larger gap between their reported capital ratios and the more stringent Basel III standards tend to reduce their ratios over time, signalling convergence toward the new regulatory expectations.

Importantly, the estimated target ratios are generally higher than the actual reported capital ratios, suggesting that many banks were still building up capital during the Basel III transition. The study compares these model-based estimates with publicly disclosed targets from a subset of global banks and finds them to be broadly consistent, reinforcing the validity of the methodology. Although there are challenges in comparing confidential and public data directly, the trends align: banks often report lower targets publicly than they likely aim for internally, possibly to maintain strategic flexibility.

We then explore how banks adjust specific balance sheet items—such as capital, loans, and securities—to help close the gap between actual and target capital ratios. We find that when a bank's capital ratio exceeds its target, the bank is more likely to slow down capital growth and increase risk-weighted assets, thereby rebalancing its ratio downward. In particular, banks appear to manage this action through securities classified as held-to-maturity, which can have regulatory advantages under certain accounting rules. The study also explores differences across bank groups and regions, finding that large, internationally active banks (Group 1) and European banks tend to show stronger and more consistent adjustment patterns.

Finally, the robustness of the results is confirmed through several checks. The findings hold across different time periods, regional subgroups, and estimation methods, and are not sensitive to how missing data are treated. Even when extending the sample into the Covid-19 period—a time of unprecedented policy intervention and volatility—the broad patterns of adjustment still hold, though the speed of adjustment slows.

Measuring management action on capital

In this section, we explain how we measure management action on capital. Our measure of management action identifies the active generation of additional capital based on targeted management decisions. Moreover, it acknowledges the corporate finance literature on dividend smoothing. Under this view, banks aim at constant dividend payout ratios (dividend smoothing). Our definition is inspired by Berger et al (2008). Accordingly, the measure ignores the “passive” generation of additional capital: simply allowing those earnings in excess of smoothened payout ratios (in which we include share buybacks) to feed into CET1.

Our key measure of management action on capital is *MAC_3*. It is defined as the first difference of CET1 adjusted for the passive component of retained earnings. The latter is defined as (1 - average payout ratio with a margin of ± 20%) × profits after tax. If CET1 increases by just that amount, there is no management action on capital and *MAC_3* is zero. Our passive component of retained earnings corresponds to Berger et al’s (2008) “do-nothing payout ratio”. If the bank incurs losses and CET1 decreases by less than the loss, that difference is our measure of management action on capital.

The main motivation for our detailed definition of *MAC_3* is that previous studies on bank reactions to capital shocks (see endnote iii for references) show that banks use a broad range of measures to increase capital (incl. sales of assets and participations, adjustments of their distribution policies, CET1 issuances). Banks have substantial room for manoeuvre in the management of their P&L and balance sheets across several components (within the boundaries of the law, accounting standards, internal and external audits, as well as bank supervision and market discipline). The QIS data set does not and cannot capture all of these possible measures to increase CET1. Theoretically, the change of CET1 within any period should be largely equal to capital issuances plus retained earnings adjusted for changes of All

Other Comprehensive Income (AOCI)[6] and of the sum of regulatory adjustments. However, when we compare the first difference of CET1 with the sum of its components, we find a significant unexplained portion of the changes in CET1. This discrepancy suggests that there are additional factors or measurement errors that are not captured by the components that are included in QIS data, leading to an incomplete explanation of the changes in CET1. Hence, we suggest that MAC_3 is a comprehensive measure of management action on capital, as it accounts for these systematic variations.

We use two alternative, narrow measures of management action on capital for robustness checks: first, the reported issuance of CET1 plus current and lagged management action on retained earnings; second, the net capital issuance of CET1, additional Tier 1 and the gross issuance of Tier 2 capital (Tier 2 net issuance is unavailable) plus the management action component of retained earnings (if profits are positive). We include the issuance of AT and Tier 2 in the definition of management action on capital, because these issuances free up CET1 capital during the sample period.

Defining bank distress

We regard banks as under distress when their profits are significantly negative. The definition is neutral with respect to the source of the distress, inter alia, operational risk, credit risk and/or market risk. The dummy variable *s_prof_neg* is 1 when a bank incurs a loss of more than 5% of its CET1 capital in any observation period. Its frequency is 2.2% in our sample. Our definition of distress is plausible, as it corresponds well with periods of significant declines of the bank's stock price and increase of its CDS spread in the same observation period (see Table 9 in BCBS WP 46).

The calibration links the distress periods directly to CET1 – rather than, e.g. NPLs – so that banks are likely to be under some pressure to adjust their balance sheets. Our definition of bank distress is based solely on QIS data. As the QIS database is maintained on an anonymised basis, we cannot easily match outside data with the QIS data. Distress to profits is the main metric.

For robustness checks, we construct a continuous distress index using the following steps:

1. First, we calculate the current first difference of profits after tax and subtract the bank-specific mean first difference of profits.
2. Next, we divide this difference by the bank-specific standard deviation of first differences.
3. Then, we calculate the continuous index to capture the non-linear relationship between shocks to profits and its consequences on the balance sheet structure while maintaining the sign of the shock. This is done by squaring the distress index and multiplying it by the sign of the original distress index.
4. Finally, we normalise the range between -1 and 1 to make it more intuitive and tractable. This is achieved by subtracting the minimum index value from the current index value and then dividing by the difference between the maximum and minimum index values across the sample.

In this normalised index, the largest negative shock in the sample period features an index value of 1 and the smallest one an index value of -1.

The endogeneity of capital and RWA growth

In this section, we study the endogeneity of management action on capital and RWA growth[7] in a simultaneous-equations model. Our main hypothesis is that the growth rate of RWAs is systematically and significantly positively

[6] A complementary report published by our working group as BCBS WP (forthcoming) corroborates findings of the literature that banks actively manage their capital through the changes in balance sheet composition, shifting investment securities holdings between Held-to-Maturity (HTM) and Available-for-Sale (AFS).
[7] The BCBS WP 46 considered twelve balance sheet items in a single equation approach (see Table 12 for results). Based on the results, we focus on RWA growth in the simultaneous equations model.

associated with management action on capital and that management action on capital is systematically and significantly positively associated with the growth rate of RWAs. In the simultaneous equations model, the coefficient of the growth rate of RWAs in period t and the coefficient of management action on capital in period t are significantly positive.

The first equation of the system explains management action on capital in period t. It includes the second endogenous variable, the growth rate of RWAs in period t, and the following exogenous variables: the lagged distance of the bank's capital ratio from its target ratio (which we derive from the model estimates in Section 4); the change of its risk density; the dummy variable indicating bank-specific distress and the bank's return on assets.[8] The orthogonality condition holds, meaning that the change in risk density, profitability and bank-specific distress directly affect management action on capital and only impact the growth rate of RWAs through their influence on management action on capital.

The second equation of the system explains the growth rate of RWAs in period t. It includes the first endogenous variable, management action on capital in period t, and two sets of exogenous variables.

The first set of exogeneous variables incorporates several bank-specific variables, such as the measure of lagged capitalization and the share of the trading book exposure in total assets. The latter captures alternative, profitable investment opportunities or hedging activities. Furthermore, higher liquidity as measured by the LCR indicates a lack of profitable growth opportunities, as it suggests an allocation of deposit inflows to safer but lower-yielding High-Quality Liquid Assets (HQLA).

The second set of exogenous variables contains several variables to control for market-wide demand for bank assets, such as the change in the Hoddrick-Prescott-filtered real GDP, the slope of the yield curve and the lagged dependent variable. Higher economic growth is associated with higher loan demand. A steeper yield curve implies that longer-term rates are higher relative to short-term rates, likely increasing the financing costs for longer-term investments and decreasing the demand for loans to fund them. Furthermore, the change of the 5-year CDS spread of the bank's sovereign reflects market perception of the macro risk of the country in which the bank is headquartered. Higher macro risk can be associated with lower investment and demand for bank assets. In addition, higher sovereign risk often translates into higher marginal bank funding costs. Banks that face higher marginal funding costs are likely to charge higher internal fund transfer prices. Hence, they are likely to charge more for assets, which also affects demand for its assets. The orthogonality condition holds, meaning that the variables controlling for market-wide demand directly affect the growth rate of RWAs, as do the LCR and the share of the trading book in total assets. These variables impact management action on capital only through their influence on the growth rate of RWAs.

Table 12, in BCBS WP 46 reports the results for the baseline specification and the results for two robustness tests.

The results of the first equation, i.e. the regression for the determinants of management action on capital in period t, do not reject the first part of our main hypothesis: the coefficient of the growth rate of RWAs is significantly positive. The estimated coefficients of, both, lagged distance to target capitalization and profitability are significantly negative. The distress dummy is significantly positive. The change in risk density is not significant.

These results suggest that banks which encounter profitable growth opportunities take the necessary management action on capital to fund that growth. Conversely, banks that are better capitalized in period t-1 take less action on capital, as do banks that are more profitable. The latter can fund higher growth out of "normal" retained earnings (reflecting a "do nothing" strategy discussed in the section Measuring management action on capital). The diagnostic

[8] We run a single-equation model for the relationship between the dependent variable management action on capital and the growth rates of 11 balance sheet items (e.g., RWAs, retail loans, loans to the non-financial sector) with several robustness tests. Across balance sheet items and other tests, the specification is quite robust. The interaction between less comprehensive balance sheet items and management action on capital is mostly significantly positive but weaker than for more comprehensive ones. We attribute these differences to compensatory effects of balance sheet composition. Hence, we use RWA growth for the simultaneous equation systems. The robustness checks include estimates for the narrow definitions of management action on capital as dependent variables. Our model does not explain variations in these dependent variables.

statistics indicate that the model adequately captures the relationships between the variables and that the regression specification is well-suited.

The results of the second equation, i.e. the regression for the determinants of the growth rate of RWAs in period t, do not reject the second part of our main hypothesis. The coefficient of the second dependent variable, management action on capital, is significantly positive. Banks that take more management action on capital exhibit a higher growth rate of RWAs. The measure of capitalization is also significantly positive, indicating that banks with a smaller gap to their target can grow more. An increase in the banks' marginal funding costs decreases its RWA growth rate. Higher marginal funding costs are likely to increase the rates the bank can offer customers on the asset side, thereby reducing demand. The coefficient estimate of the share of the trading book in total assets is significantly negative. A flatter yield curve increases RWA growth. Real GDP growth, the LCR and the lagged growth rate of RWAs do not exhibit significant estimated coefficients. The diagnostic test suggests that the specification is reasonable.

The coefficients are plausible from an economic perspective. Management action of 1 percent of CET1 is associated with an increase of 68 basis points of the RWA growth rate. Similarly, a 1 percentage point higher RWA growth rate is associated with management action on capital of about 1 percent. A 1 percentage point lower distance of the bank's capital ratio from its target – say, the distance to target is -3.78% of the target rather than the mean of -4.78% - implies a higher growth rate of RWAs of about 10 basis points. (At the mean of the reported CET1 ratio (about 15% across banks and time), a 1 percentage point lower distance to target amounts to about 15 basis points of the CET1 ratio.) Similarly, it is associated with a 13 basis point lower management action on capital.

In addition, we conduct several robustness checks:

First, we replace the estimated measure of capitalization, the lagged distance of the bank's capital ratio from its target ratio, with the observed variable lagged CET1 ratio. The coefficients of the two endogenous variables remain significant and the signs are unchanged. In economic terms, the association between management action on capital and the growth rate of RWAs is somewhat lower. A 1 percentage point lower CET1 ratio implies a reduction of the growth rate of RWAs of 26 basis points.

Second, we replace the dummy variable of our distress measure with the continuous distress index. The results for the two endogenous variables are unchanged in terms of significance and magnitude. The continuous version of our distress measure is not significant, though.

Third, we estimate the simultaneous equation system for the subset of observations with management action on capital different from 0, only. The estimated coefficients are almost identical.

Fourth, we also estimate the simultaneous equation system with the interaction term of capitalization and the growth rate of RWAs. The estimated coefficient is insignificant while the other coefficient estimates remain broadly unchanged. Finally, we estimate the simultaneous equations system for the subsamples of large, internationally active banks (Group 1 with CET1 above EUR 3 bn) and smaller banks (Group 2), as well as for banks in Europe and the Rest of the World plus the Americas. The results are presented in Table 13 in BCBS WP 46. Across all sub-samples, the association of management action on capital and the growth rate of RWAs is robust: Their coefficients are significantly positive for all subsamples. For Group 1 banks, the coefficient of management action on capital in the second equation is lower than for the full sample; for Group 2 banks it is higher. For the regional subsamples, it is basically the same. We also estimated the simultaneous-equations system for the narrow definitions of management action on capital – outright issuance of CET1, AT1 and T2 plus retained earnings. Both measures have high mass around zero and the simultaneous equations model is not robust.

The results from the simultaneous equations system show that, in the full sample and across several robustness checks, our hypothesis is not rejected. Banks with higher RWA growth undertake more management action on capital and banks that take more management action on capital exhibit higher RWA growth.

Summary and implications

The report summarized in this SUERF Policy Note investigates how banks manage their equity capital in the short run, particularly during periods of distress. We analyse the relationship between bank capitalisation and the evolution of bank assets and investigate in detail the causal structure of such interaction. We use a comprehensive global data set.

We extended our literature review beyond the standard models reviewed in Appendix A1.1 of BCBS WP 46, as they usually build on the same causal structure. It finds that banks actively manage their capital levels in a forward-looking manner, even during periods of distress. This active management helps banks mitigate the impact of shocks and maintain balance sheet stability. The empirical literature also finds that banks adjust their capital levels in period t in response to unexpected growth opportunities and/or shocks in the same period.

These findings suggest that the causal structure of the standard models is questionable: Rather than bank capitalization in period t-1 causing the (planned) growth rate of assets in period *t*, both variables are interdependent. Bank management determines the capital level at the end of period t-1 inter alia as a function of its asset growth targets. The final decisions regarding bank balance sheet management and profit distribution for period t-1 are often taken well into period t.

Regarding bank target CET1 ratios, the results of the partial adjustment model show that most banks operated below their estimated capital targets during the Basel III implementation phase, creating a positive impetus for increasing capital levels. This aligns with Basel III monitoring observations of rising capital ratios. However, some banks had targets below their reported capital ratios and used that room either to accelerate their Risk-Weighted Assets (RWA) growth or slow down Common Equity Tier 1 (CET1) growth. Our results reveal a strategic approach to capital management decisions aimed at restoring alignment with their targets.

Regarding the short-term endogeneity of capital, we analyze in a simultaneous equation approach how various measures of management action on capital are related to RWA growth and vice versa. Our findings show a significant and simultaneous relationship between management action on capital and RWA growth. Banks experiencing higher RWA growth rates take more management action on capital. This is particularly evident for banks facing tighter capitalization and banks that are under distress. Additionally, less profitable banks rely more on active capital measures due to limited capacity for management via retained earnings. At the same time, banks that take more management action on capital also exhibit higher RWA growth rates. The results hold across several robustness tests and subsamples.

This corroborates our conclusions from the literature review. It has profound implications for methods often used to estimate the social costs of bank regulation or the macro-financial feedback effects in macroprudential stress tests. Many existing studies treat bank capital as fixed in the short run. The structure of the underlying empirical specifications in these studies implies that capital is exogenous in two dimensions. First, it builds on the assumption that capitalization at the end of period t-1 can be used to identify the direction of causation from capitalization in t-1 to asset growth in period t. Capitalization in t-1 has an impact on asset growth in t, but (planned) asset growth in t has no impact on capitalization in t-1. Second, it builds on the assumption that banks cannot adjust the capital level in period t. Consequently, banks would adjust to shocks (to capitalization) by adjusting asset growth.

Our findings show that this generalized functional form is misspecified, its causal structure is wrong:

First, the specification is subject to reverse causality. Causation runs both ways from bank capitalization to asset growth and from asset growth to capitalization. Bank capitalization and asset growth are determined simultaneously and endogenously in a forward-looking manner. Therefore, they must be studied in a simultaneous equation setting.

Second, the identification problem cannot be solved by using the lagged value of capitalization which follows from the first observation.

Third, the specification is subject to an omitted variable bias. The model assumes that banks cannot adjust capital levels in period t. Hence, no variable to account for management action on capital in period t is included on the right-hand side of the generalized functional form. But the assumption does not hold. This confounding variable is systematically related to the endogenous variable asset growth in period t and to the exogenous variable capitalization in period t-1. A specification that omits this confounding variable yields biased and unreliable results. The effect of the omitted variable is incorrectly attributed to the included variables, i.e., capitalization in period t-1, distorting the true relationship between the independent and dependent variables. This omittance is likely to spuriously increase the impact of capitalization on asset growth, as banks with a tighter capitalization in period t-1 have higher management action on capital in period t which in turn is associated with higher asset growth rates.

Our findings suggest that these misspecifications tend to underestimate the ability of banks to adjust to changes in their operating environment such as changes to regulatory requirements or bank-specific distress. This is because banks adopt a proactive approach that helps them maintain balance sheet stability under distress. It also enables them to capitalize on profitable growth opportunities and navigate regulatory landscapes. By recognizing these complex dynamics including the endogeneity of capital, regulators can better understand and more effectively evaluate policy options.

These results are highly relevant for improving impact assessments of changes in bank capital regulation as well as for understanding banks' short-run behavioral adjustments to exogenous shocks and the ensuing macro-financial feedback effects. It requires the underlying models to consider the short-run endogeneity of capital.

While we are confident that our main findings are robust across several perspectives, more research is required to corroborate the results. First, more research is required on the measurement of management action on capital and its components. Second, more data is needed to control for aggregate and bank-specific demand in the analysis of bank asset growth. Third, a richer model of management action on capital should include more variables, such as regulatory and supervisory capital requirements, observed bank-specific capital targets and bank asset quality. Fourth, longer time series would improve the robustness of the results. Finally, more research is needed to understand the impact of mergers and acquisitions on bank capital management.

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