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Supranational Rules, National Discretion: Increasing Versus Inflating Regulatory Bank Capital?

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Abstract

We study how banks use "regulatory adjustments" to inflate their regulatory capital ratios and whether this depends on forbearance on the part of national authorities. Using the 2011 EBA capital exercise as a quasi-natural experiment, we find that banks substantially inflated their levels of regulatory capital via a reduction in regulatory adjustments (without a commensurate increase in book equity and without a reduction in bank risk). We document substantial heterogeneity in regulatory capital inflation across countries, suggesting that national authorities forbear their domestic banks to meet supranational requirements, with a focus on short-term economic considerations.

I. Introduction

The new supranational framework introduced since the global financial crisis required banks to increase their regulatory capital ratios to enhance the safety and soundness of individual banks and the banking system as a whole. Capital ratios as a policy tool, however, have come under increased scrutiny. They are criticized for

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being too complex, too opaque, and for their calculation being subject to too much discretion (Haldane (2012), (2013)). While much of this debate has centered on the calculation of risk-weighted assets (RWAs) (in the denominator),[1] the calculation of regulatory capital (in the numerator) has received much less attention so far.

To calculate regulatory capital, banks must deduct numerous elements from their book equity (BE), which are considered to not increase a bank's capability to withstand unexpected losses (Basel Committee on Banking Supervision (BCBS) (2004), (2010), (2015)). These capital deductions, also called "regulatory adjustments (RAs)," are complex, large in magnitude, and provide banks with considerable discretion to inflate their regulatory capital without a commensurate increase in their BE.[2] The extent to which banks engage in such regulatory capital inflation likely depends on the leeway they are given by regulators. Since RAs are implemented differently across jurisdictions, they provide room for forbearance, with potentially adverse effects on financial stability (Acharya (2003), Morrison and White (2009)).

In this article, we study to what extent banks use changes in RAs to inflate their regulatory capital ratios and whether this depends on forbearance on the part of national authorities. Causally attributing changes in RAs to the objective of regulatory capital inflation is, however, empirically challenging. First, as the calculation of regulatory capital depends on the underlying structure of a bank's balance sheet, it is difficult to disentangle the use of discretion to increase capital ratios from changes in regulatory capital due to other endogenous balance sheet variations. Second, as the national implementation of a supranational framework is usually spread out over multiple years and policies, it is also difficult to investigate the role of incentives on the part of national authorities to engage in forbearance.

We address these challenges by exploiting the 2011 capital exercise, conducted by the European Banking Authority (EBA), as a quasi-natural experiment. The EBA capital exercise raised the minimum required core tier 1 (CT1) capital ratio from 5% to 9% for a subset of European banks at short notice, while leaving requirements unchanged for other European banks. Although the capital exercise was a uniform supranational intervention, national supervisory authorities (NSAs) were ultimately in charge of approving the measures by which banks intended to increase their capital ratios (EBA (2011a)). This empirical setting is therefore uniquely suited to study banks' regulatory capital inflation and the role of national authorities in facilitating such capital inflation. As these mechanisms generally play out over several years, they are usually difficult to identify. In contrast, the supranational EBA capital exercise took place over the course of less than a year, granted considerable discretion to national authorities, and only affected a subset of European banks, thereby constituting an almost ideal quasi-natural experiment.

[1]See, for example, Acharya, Engle, and Pierret (2014), Mariathasan and Merrouche (2014), Plosser and Santos (2018), and Behn, Haselmann, and Vig (2022) for the literature on banks' manipulation of RWAs.

[2]Importantly, increasing regulatory capital via a reduction in RAs can achieve more "bang for the buck" than a reduction in RWAs. For example, for a bank with a 9% regulatory capital ratio, a marginal 1-dollar increase in regulatory capital via a reduction in RAs increases the ratio as much as a marginal 10-dollar reduction in RWAs.

We first document the quantitative importance of RAs for the increase in capital ratios of capital exercise (CE) banks around the EBA capital exercise.[3] From 2010 to 2012, the average CE bank increased its CT1 capital ratio by 202 bps, out of which 80 bps can be attributed to a reduction in RAs (compared to 61 bps due to a reduction in RWAs and 60 bps due to an increase in BE).[4] Despite being prevalent in practice, this margin of adjustment has received little attention in the literature thus far.[5]

The empirical setting of the EBA capital exercise naturally lends itself to a difference-in-differences research design. In our empirical analysis, we therefore study the change in RAs of CE banks subject to an increase in capital requirements (our treatment group) relative to non-CE banks in the control group. Our main outcome variable of interest is the change in banks' RAs from 2010 to 2012 scaled by the 2010 level of banks' BE. We find that CE banks reduced their RAs by 11 percentage points relative to comparable non-CE banks. Consistent with weakly capitalized banks having a stronger incentive to engage in capital inflation to pass the EBA capital exercise, these results are stronger for banks with ex ante lower capital ratios. We further calculate a "shadow regulatory capital ratio" (BE over RWAs) and investigate how this ratio changed compared to banks' officially reported capital ratios (regulatory capital over RWAs). We find that CE banks would not have achieved a material improvement in their reported capitalization relative to control group banks if they had not inflated regulatory capital in the numerator.[6] These findings provide novel evidence on the importance of RAs as a margin of discretion to boost banks' capital ratios.

The main objective of the capital exercise was to bolster confidence in the banking system by ensuring that banks are sufficiently capitalized to withstand unexpected losses. Thus, an increase in regulatory capital ratios should, in principle, reflect an increase in a bank's safety and soundness. We therefore study the effect of capital exercise on market- and accounting-based measures of bank risk. We find that changes in the CDS spreads of CE banks did not significantly differ from the CDS spread changes of control group banks, neither around the announcement date of the capital exercise nor between the start and end date of the capital exercise. Moreover, we find a reduction in the *z*-score of weakly capitalized CE banks between 2010 and 2012 relative to the control group, suggesting that the increase in regulatory capital ratios of CE banks did not reflect an improvement in their safety and soundness.

[3]We adopt the following terminology: capital exercise (CE) banks are banks selected into the 2011 EBA capital exercise and therefore subject to the increase in capital requirements (treatment group); non-capital exercise (non-CE) banks are other European banks not selected into the EBA capital exercise and therefore not subject to the increase in capital requirements (control group).

[4]As explained in Section II.B, banks can increase their regulatory capital ratios along three different margins: Via a reduction in RWAs, via an increase in BE, or via a reduction in RAs.

[5]Financial consultancies still advice banks to use "more rigorous technical measures to […] improve regulatory capital – for example, by reducing capital deductions" and that "considerable opportunity lies in reducing other capital needs, including capital deductions (such as minority interests, goodwill, intangibles, and nonconsolidated investments)" (McKinsey (2017)).

[6]In principle, banks can also increase their capital ratios by reducing their RWAs or by increasing their BE, as discussed in Gropp, Mosk, Ongena, and Wix (2019). In Section VII.C, we further study the relation between regulatory capital inflation and changes in RWAs and BE, respectively.

During the EBA capital exercise, there was considerable heterogeneity in regulatory stringency across countries in Europe (Barth, Caprio, and Levine (2013), Nouy (2017), and Maddaloni and Scopelliti (2019)). Our results thus far suggest that exercising discretion in the calculation of regulatory capital is undesirable from a prudential point of view and was fully understood by market participants. Supervisors should therefore be wary of regulatory capital inflation. However, national authorities might choose to be lenient on their domestic banks for a variety of reasons: they might be prone to regulatory capture and have a tendency to be too soft on their national champion banks (Goodhart (2012), Schoenmaker (2012), Haselmann, Sarkar, Singla, and Vig (2018), and Bruno and Carletti (2019)); they might want to minimize disruptions to the financial system and the real economy caused by bank failures (Brown and Dinç (2011), Huizinga and Laeven (2012), and Walther and White (2020)); their actions might be constrained by political considerations and the electoral cycle (Brown and Dinç (2005), Bian, Haselmann, Kick, and Vig (2017)); or government interventions in the banking sector might be infeasible due to fiscal budget constraints (Martynova, Perotti, and Suarez (2019), Acharya, Borchert, Jager, and Steffen (2021)).

We document substantial heterogeneity across countries in the extent to which banks engaged in regulatory capital inflation, suggesting that forbearance at the national level played an important role. Consistent with our measure of capital inflation, we consider all forms of forbearance which increase a bank's regulatory capital without increasing its BE.[7] We collect evidence on several forms of forbearance on the part of national authorities, which helped their national CE banks to pass the supranational EBA capital exercise. National authorities acted as an underwriter for hybrid securities; they enacted regulations that allowed the devaluation of goodwill and intangible assets to be tax deductible; and they converted deferred tax assets (DTAs) into government-guaranteed tax credits. CE banks utilized these forbearance measures to inflate their capital ratios.

We next investigate the determinants of this observed cross-country heterogeneity in regulatory capital inflation. We find that capital inflation is more pronounced in countries where national supervisors wield more discretionary powers to exercise leniency toward banks and in countries were credit supply is expected to tighten. On the other hand, we find no evidence for regulatory capture of local authorities by their national champion banks, no evidence for political incentives due to upcoming elections, and only weak evidence for forbearance due to governments being fiscally constrained. While we caution against a strong causal interpretation of these results, given the limited number of countries in our sample, our findings are consistent with the notion that local economic circumstances incentivize national authorities to exert discretion and forbearance, with an eye on short-term economic considerations.

Several studies also exploit the 2011 EBA capital exercise as a quasi-natural experiment to investigate the effects of higher capital requirements on bank behavior. This previous literature focuses on lending and real effects (Gropp et al. (2019)),

[7]As discussed in Section VI and Section A9 of the Supplementary Material, this excludes outright government bailouts in the form of capital injections which increase a bank's BE but includes the underwriting of hybrid securities which do not count as BE.

bank risk (Bostandzic, Irresberger, Juelsrud, and Weiß (2022)), loan collateralization (Degryse, Karapetyan, and Karmakar (2021)), market-making activities (Haselmann, Kick, Singla, and Vig (2019a)), and firm productivity (Blattner, Farinha, and Rebelo (2019)). In contrast, this article focuses on banks' use of RAs to inflate their capital ratios and how this bank behavior differs across jurisdictions, thereby contributing to three different strands of literature.[8]

First, our article contributes to the literature on regulatory forbearance. Previous studies show that regulators and supervisors exercise forbearance by allowing non-compliance of banks with existing regulations (Huizinga and Laeven (2012)), by enforcing identical rules inconsistently (Agarwal, Lucca, Seru, and Trebbi (2014)), or by being less likely to close failing banks (Brown and Dinç (2011), Morrison and White (2013)), with potentially adverse effects on the real economy (Gropp, Ongena, Rocholl, and Saadi (2022)). Such regulatory forbearance may arise from regulatory capture (Goodhart (2012), Schoenmaker (2012), Haselmann et al. (2018), and Bruno and Carletti (2019)), the attempt to avoid disruptions to the real economy and the financial system (Brown and Dinç (2011), Huizinga and Laeven (2012), and Walther and White (2020)), political considerations (Brown and Dinç (2005), Bian et al. (2017)), and fiscal constraints preventing interventions in the banking system (Martynova et al. (2019), Acharya et al. (2021)). We contribute to this literature by studying forbearance explicitly in the context of national discretion. Our results show that national authorities exert discretionary leniency not only in the day-to-day oversight of banks, but also with regard to their own domestic banks' efforts to pass a supranational recapitalization exercise, akin to "window-dressing" around stress tests (Abbassi, Iyer, Peydró, and Soto (2020)). Moreover, by studying RAs as an important margin of discretion, we focus on a form of regulatory capital forbearance that has received little attention in the literature so far.

Therefore, second, our article also contributes to the literature on regulatory capital arbitrage. While a large literature documents how banks exercise discretion in the calculation of RWAs in the denominator of capital ratios (Acharya et al. (2014), Mariathasan and Merrouche (2014), Plosser and Santos (2018), and Behn et al. (2022)), the calculation of regulatory capital in the numerator has so far largely been neglected.[9] However, as our results show, RAs to bank capital provide banks with considerable leeway to inflate their capital ratios.

Finally, third, we contribute to the literature on centralized versus decentralized banking supervision and regulation (Dell'Ariccia and Marquez (2006), Calzolari, Colliard, and Lóránth (2019), and Carletti, Dell'Ariccia, and Marquez (2020)). Several studies show that local, national supervisors are more lenient than centralized, supranational supervisors in the day-to-day oversight of banks

[8]Our analysis builds on Gropp et al. (2019), who show that around the CE banks reduced their RWAs. In contrast, this paper provides novel evidence on the importance of RAs as a margin of discretion to boost banks' capital ratios and on the role of national authorities to provide such discretion. In addition, and as discussed in Section IV, we also use a regression rather than a matching approach to estimate the heterogeneous responses by banks and national authorities.

[9]Using data on U.S. commercial banks, Orozco and Rubio (2021) show that banks use accounting tools, such as abnormal loan loss provisions and realized gains and losses on available-for-sale securities, to exceed regulatory capital thresholds.

(Agarwal et al. (2014), Haselmann, Singla, and Vig (2019b), and Colliard (2020)). We add to this literature in multiple ways. Beyond just documenting the greater leniency of local supervisors, we show that a substantial tightening of supranational rules, such as the 9% CT1 requirement during the 2011 EBA capital exercise, triggers heterogeneous responses by banks in different jurisdictions. To address this concern, one of the main objectives of the EU Single Supervisory Mechanism (SSM), introduced in 2014 after the end of our sample period, was to harmonize supervisory practices. Although significant progress has been made in this regard, national authorities in Europe still have substantial room for national discretion (Nouy (2017)).

II. Institutional Background

A. The 2011 EBA Capital Exercise

The 2011 capital exercise, conducted by the EBA, was announced on Oct. 26, 2011, and required 61 European banks to reach and maintain a 9% CT1 capital ratio by the end of June 2012. This constituted an economically significant increase compared to the previously required 5%. Banks' inclusion into the capital exercise was determined by a country-specific selection rule based on bank size. Within each country, the EBA included "banks in descending order of their market shares by total assets," such that the exercise covered "at least 50% of the national banking sectors in each EU Member State in terms of total consolidated assets as of end 2010" (EBA (2011b)). As the selection procedure was based on total assets as of year-end 2010, it was not influenced by bank-specific events in the months leading up to the exercise. Both the timing and the magnitude of this increase in capital requirements were unexpected. The capital exercise came only a few months after the EU-wide stress test in June 2011 and was described as a "quick-fire regulatory health check" (Halstrick and Framke (2011)). The Financial Times reported that the 9% requirement was "well beyond the current expectations of banks and analysts" (Atkins, Jenkins, and Spiegel (2011)).

Although the EBA capital exercise was a uniform supranational intervention, NSAs were ultimately in charge of approving the measures by which banks intended to increase their capital ratios (EBA (2011a)). Banks were asked to submit their recapitalization plans to their respective NSAs, outlining how they intended to reach the set targets. The EBA did not specify enforcement actions related to their recommendations on how banks had to be recapitalized. This resulted in considerable discretion for NSAs and room to exercise forbearance regarding the approved measures taken by banks to reach the required capital ratio.

The EBA capital exercise did not coincide with other changes in capital requirements for European banks. In particular, the EU only started with the gradual introduction of Basel III in 2013 (Capital Requirements Directive IV). There are two potentially confounding regulatory events during our sample period: the ECB's long-term refinancing operations (LTRO) program in Dec. 2011 and the announcement of the Outright Monetary Transactions (OMT) program in July 2012. However, CE banks and non-CE banks were both eligible to participate in the LTRO and were both affected by the OMT. Moreover, although the LTRO provided liquidity to

Eurozone banks especially in Italy and Spain (Carpinelli and Crosignani (2021)) and the OTM constituted a "stealth recapitalization" of banks in GIIPS countries (Acharya, Eisert, Eufinger, and Hirsch (2019)), neither of the two programs affected banks' RAs.[10]

B. Regulatory Capital, Book Equity, and Regulatory Adjustments

Just like banks' RWAs for regulatory purposes differ from book assets for financial reporting purposes, regulatory capital differs from BE. This difference originates from the distinct objectives of financial reporting and prudential regulation. While the aim of financial reporting is to provide information about the economic performance and condition of businesses, the objective of prudential regulation is to promote the safety and soundness of banks and the banking system. The underlying principles of financial reporting and prudential banking regulation are therefore not always aligned (BCBS (2015)).

A bank's BE mainly comprises common share capital and retained earnings. RAs to bank capital aim to reconcile the two approaches and deduct certain elements from BE which are considered less effective in absorbing losses. Examples include goodwill and intangible assets, unrealized gains and losses on available-for-sale securities, and DTAs.[11]

A bank's regulatory common equity tier 1 (CET1) capital ratio is defined as CET1 capital over RWAs, with CET1 capital in the numerator being calculated by deducting RAs from BE:[12]

$$\text{CET1\_CAPITAL\_RATIO} = \frac{\text{CET1\_CAPITAL}}{\text{RWA}} = \frac{\text{BE} - \text{RA}}{\text{RWA}}. \tag{1}$$

Thus, banks have three margins of adjustment to increase their regulatory capital ratios: They can either increase their levels of BE (by issuing common equity or retaining earnings), they can reduce their RWAs (e.g., by cutting lending), or they can, if feasible, reduce RAs. While the first two margins have been studied extensively in the literature, the margin of RAs has received little attention so far.

During the capital exercise, the EBA recommended that "banks should first use private sources of funding to strengthen their capital position to meet the required target, including retained earnings, reduced bonus payments, [and] new issuances of common equity" (EBA (2011a)). In the final report on the capital

[10]Since both the LTRO and the OMT primarily benefited banks in Italy, Portugal, and Spain, the effect of these regulatory interventions should, if at all, work against finding our results, as banks from these countries now had less incentives to inflate their regulatory capital.

[11]Table A1 in Section A1 of the Supplementary Material details the calculation of regulatory CET1 capital via the application of RAs to BE according to the official Basel disclosure template (BCBS (2011)). The table illustrates the complexity of the rules governing the calculation of regulatory capital. Table A2 in Section A2 of the Supplementary Material further provides the example of the regulatory capital balance sheet of the Italian bank Intesa Sanpaolo.

[12]While the EBA capital exercise used core tier 1 (CT1) capital as the relevant definition of regulatory capital, the Basel III framework uses common equity tier 1 (CET1) capital. Although "the two concepts are not that far removed conceptually […] they are somewhat different in the detail" (EBA (2011c)). We further discuss the differences between CT1 and CET1 capital in Section A1 of the Supplementary Material.

exercise, however, the EBA stated that "other mitigating measures directly impacting banks' capital position [stemming] from lower deductions from CT1 capital (e.g., depreciation/disposal of goodwill and intangible assets)" (EBA (2012)) amounted to 25.5 billion euros, a significant amount compared to the 50 billion euros of core capital raised by EBA banks with a capital shortfall. This is consistent with anecdotal evidence from banks' annual reports. For example, Deutsche Bank reported in its 2012 financial report that its "Common Equity Tier 1 (formerly referred to as Core Tier 1) capital increased to EUR 38.0 billion from EUR 36.3 billion" and that "the increase in […] Tier 1 capital primarily reflected reduced capital deduction items" (Deutsche Bank (2012)).

C. Incentives and Economic Mechanisms

Regulatory adjustments to BE intend to increase the quality of a bank's capital (BCBS (2015)) and a reduction in adjustments could therefore, in principle, reflect an increase in capital quality. On the other hand, banks faced with a sudden and substantial increase in capital requirements have strong incentives to boost their capital ratios without issuing costly equity or retaining earnings. If banks merely exploit discretion in the calculation of regulatory capital, their capitalization might improve "on paper" but without an associated improvement in safety and soundness.

While banks have an incentive to inflate their regulatory capital, national authorities might have an incentive to turn a blind eye or actively support such activities, thereby exercising forbearance. As documented in previous studies, national authorities are often keen on preserving their domestic national champions (Goodhart (2012), Schoenmaker (2012)), either because of regulatory capture or to ensure financial stability (Haselmann et al. (2018)). To avoid disruptions to bank lending and the real economy (Huizinga and Laeven (2012)), supervisors might decide to forbear failing banks, especially when the banking sector is weak (Brown and Dinç (2011)), as it was the case in Europe during the time of the capital exercise. Moreover, when national authorities are fiscally constrained, they might prefer to "kick the can down the road" (Acharya et al. (2021)) and exercise forbearance to postpone costly capital injections (Martynova et al. (2019)). The implementation of the Basel framework in Europe granted national authorities substantial discretionary powers to exercise leniency toward their domestic banks (Maddaloni and Scopelliti (2019)). Therefore, national authorities can play an important role in the extent to which banks are able to engage in regulatory capital inflation.

III. Data and Descriptive Statistics

A. Data

We use annual bank balance sheet data from the SNL Financial Company database. Our initial sample contains 61 CE banks and 494 non-CE European commercial and savings banks from the SNL Financial universe. We follow the sample construction procedure in Gropp et al. (2019) and exclude all subsidiaries of CE banks, non-CE banks, and foreign banks, all banks which were acquired during

the sample period, all banks which received capital injections during the pre-treatment period, and all banks with negative levels of equity. This sample construction procedure leaves us with a sample of 48 CE banks (our treatment group) and 143 non-CE banks (our control group). The pre-and post-treatment periods in our analysis are 2010 and 2012, respectively, the years immediately before and after the capital exercise. All outcome variables are winsorized at the 5% level to reduce noise from extreme outliers. For our bank risk analysis, we obtain price data on 5-year maturity CDS contracts on senior and junior bonds of European banks from Markit. During our sample period, CDS data are available for 45 CE banks and 11 non-CE banks.

B. Descriptive Statistics

We first document the extent to which reductions in RAs contributed to the increase in banks' capital ratios around the EBA capital exercise. Based on equation (1) in Section II.B, we decompose the change in a bank's CT1 capital ratio from 2010 to 2012 into contributions stemming from changes in BE, RWAs, and RAs.[13]

Graph A of Figure 1 illustrates the average contribution of each component to the increase in CT1 ratios from 2010 to 2012 for the 48 CE banks and 143 non-CE banks in our sample. The average CE bank increased its CT1 ratio by 202 bps, out of which 61 bps can be attributed to an increase in BE (30.2% of the overall increase), 60 bps to a reduction in RWAs (29.9%), and 80 bps to a reduction in RAs (39.9%). Thus, despite having received little attention in the literature so far, RAs to BE are an important margin along which banks can boost their capital ratios. In contrast, for the average non-CE bank, the increase in the CT1 ratio can exclusively be attributed to an increase in BE. As non-CE banks, on average, exhibited an increase in RAs and RWAs from 2010 to 2012, these margins even contributed negatively to changes in their capital ratios.

Panel A of Table 1 shows summary statistics and mean comparisons for CE banks and non-CE banks as of 2010, the year immediately prior to the capital exercise. Due to the capital exercise being carried out on the largest banks in each country, the average capital exercise bank is about 18 times larger than the average non-CE bank. We address potential identification concerns regarding bank size throughout our analysis and, in Section VII.B, conduct a number of robustness checks employing a matching estimation strategy.

IV. Empirical Strategy

To study whether banks use RAs to inflate their capital ratios, we exploit the 2011 EBA capital exercise as an exogenous shock to capital requirements and thus banks' needs to increase their regulatory capital ratios. Our main outcome variable of interest is the change in banks' RAs from 2010 to 2012 (around the EBA capital exercise) scaled by the 2010 pre-treatment level of banks' BE. Like Khwaja and Mian

[13]We calculate these contributions by first multiplying the 2010 to 2012 change in each component with the first order derivative of the capital ratio with respect to that component and then calculating the relative share of each contribution with respect to the 2010 to 2012 change in capital ratios. Section A3 of the Supplementary Material explains this calculation in more detail.

FIGURE 1

Decomposition of the Change in Regulatory Capital Ratios

Figure 1 illustrates the decomposition of the 2010 to 2012 change in the average core tier 1 (CT1) capital ratio into contributions attributable to changes in book equity (BE), regulatory adjustments (RAs), and risk-weighted assets (RWAs), for the 48 capital exercise (CE) banks (Graph A) and 143 non-capital exercise (non-CE) banks (Graph B) in our sample. The calculation of the individual contributions is explained in detail in Section A1 of the Supplementary Material.

(2008) and Gropp et al. (2019), we follow Bertrand, Duflo, and Mullainathan (2004) and take the difference of a single pre-treatment and a single post-treatment period to produce standard errors that are robust to concerns of autocorrelation.[14] We therefore estimate the following baseline difference-in-differences regression specification:

$$\frac{\mathrm{RA}_{i,2012}-\mathrm{RA}_{i,2010}}{\mathrm{BE}_{i,2010}} = \alpha+\beta\times\mathrm{CEB}_i+\delta\times(\mathrm{CEB}_i\times\mathrm{CT1\_RATIO}_{i,2010}) + \sum_k \theta^k X^k_{i,2010}+\gamma_c+\varepsilon_i, \quad (2)$$

where the dependent variable is the change in RAs around the capital exercise (between 2010 and 2012) scaled by the 2010 level of BE. Our treatment variable

[14]In Section A4 of the Supplementary Material, we replicate our results using a panel difference-in-differences methodology. Our results are robust to this alternative approach.

TABLE 1

Summary Statistics

Table 1 provides summary statistics and mean comparisons for bank characteristics of 48 capital exercise banks (CEB) and 143 non-capital exercise banks (non-CEB). Panel A presents the following bank characteristics as of 2010: "Log TA," "CT1 Ratio," "Deposits/TA," "Loans/TA," "NII/Op.Rev.," and "Net Income/TA," which denote the logarithm of total assets, the core tier 1 (CT1) capital ratio, total deposits as a share of total assets, customer loans as a share of total assets, net interest income as a share of total operating revenue, and net income over total assets, respectively. Panel B presents the mean percentage changes in total book equity, regulatory adjustments, and regulatory CT1 capital from 2010 to 2012. All values in Panel B are winsorized at the 5% level. Both panels test for differences in means using Welch's *t*-test. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	CEB			Non-CEB			Δ Mean
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	
Panel A. Bank Characteristics as of 2010							
LOG_TA	5.26	5.21	1.46	2.00	2.21	1.58	3.27***
CT1_RATIO (%)	9.86	9.21	3.12	11.43	10.64	4.99	−1.57**
DEPOSITS/TA (%)	40.93	40.47	15.59	55.46	56.25	20.49	−14.53***
LOANS/TA (%)	56.73	60.03	15.65	66.53	70.59	17.72	-9.80***
NII/OP._REV. (%)	60.42	57.94	14.86	67.65	68.97	22.59	−7.23**
NET_INCOME/TA (%)	0.39	0.40	0.43	0.41	0.29	0.54	−0.02
Panel B. Change in Regulatory Capital and Bank Equity from 2010 to 2012							
ΔBOOK_EQUITY (%)	6.06	5.94	16.36	16.44	15.50	19.48	−10.37***
ΔREGULATORY_ADJUSTMENT (%)	−23.10	−10.78	56.02	12.52	9.53	74.89	−35.62***
ΔCT1_CAPITAL (%)	16.21	13.79	19.67	16.53	12.61	19.22	−0.32

CEB_i takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. As we expect weakly capitalized CE banks to have a stronger incentive to engage in regulatory capital inflation, we interact the treatment dummy with banks' pre-treatment capital ratios as of 2010. We control for the following bank characteristics X_i^k as of 2010: log total assets, CT1 ratio, customer loans as a share of total assets, depository funding as a share of total assets, net interest income as a share of operating revenue, and net income over total assets. Additionally, we include country fixed effects γ_c and cluster standard errors at the country level.

In our baseline analysis, we use a difference-in-differences regression approach rather than the matching approach employed by Gropp et al. (2019). In contrast to this previous study, our article focuses on the heterogeneous responses of banks (by their pre-treatment capitalization) and national authorities (by countries), which can be estimated more flexibly in a regression framework. In Section VII.B, we provide a robustness check for our main results which employs the various matching strategies from Gropp et al. (2019) and show that our results are robust to this alternative methodological approach.

V. Regulatory Capital Inflation

A. Univariate Results and Graphical Evidence

We first provide univariate descriptive statistics on how CE banks in our treatment group and non-CE banks in our control group adjusted their regulatory capital and BE around the capital exercise. Panel B of Table 1 reports the changes in total BE, RAs, and regulatory CT1 capital between 2010 and 2012 for the two groups of banks. CE banks increased their regulatory capital by on average 16.2% around the capital exercise, and therefore by about the same magnitude as non-CE

banks with 16.5%. This finding, however, masks important differences in how the two groups of banks achieved this. While non-CE banks increased their BE by 16.4%, CE banks did so by only 6.1%.[15] CE banks achieved their increase in regulatory capital to a substantial degree via a 23.1% reduction in RAs. Thus, for the average CE bank, more than half of the increase in regulatory capital stems form a reduction in RAs and not from an increase in BE. CE banks therefore achieved a similar increase in regulatory capital as non-CE banks, even though they increased their BE by 10.4 percentage points less.

The crucial identifying assumption of a difference-in-differences estimator requires that the outcome variable would follow a parallel trend for treated banks and non-treated banks in absence of the capital exercise. Figure 2 illustrates the differences in the change in RAs relative to 2010 between CE banks and non-CE banks over the period from 2008 to 2014. Prior to the capital exercise, there was no difference in the changes in RAs between the two groups of banks. Starting in 2011, however, there was a significant reduction in the RAs of CE banks relative to non-CE banks.

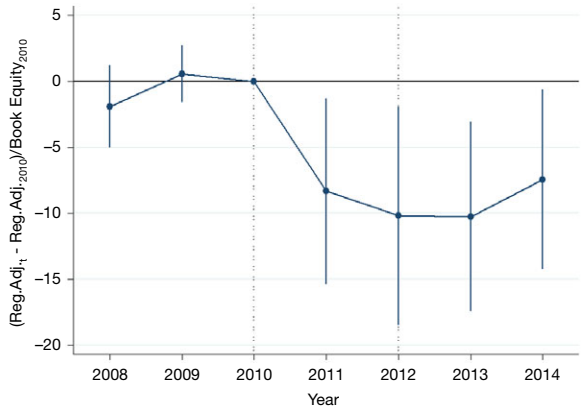
FIGURE 2

Changes in Regulatory Adjustments over Time

Figure 2 illustrates the mean differences in changes in regulatory adjustments between the 48 capital exercise banks (CEB) and 143 non-capital exercise banks (non-CEB) in our sample. The figure reports the coefficients δ^t alongside the corresponding 95% confidence intervals from the following regression specification:

$$\frac{RA_{i,t} - RA_{i,2010}}{BE_{i,2010}} = \sum_{t=2008}^{2014} \beta^t \times D^t + \delta^t \times (CEB_i \times D^t) + \varepsilon_{i,t},$$

where the dependent variable is the change in regulatory adjustments (RAs) between the year t and the base year 2010 scaled by the 2010 level of book equity (BE). The variable CEB_i takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. The variables D^t are a set of yearly time dummies, which take the value of 1 for year t, and 0 otherwise. The vertical dashed lines mark 2010 and 2012, the years immediately before and after the 2011 EBA capital exercise. Standard errors are clustered at the country level.



[15]The increase in non-CE banks' BE is likely driven by banks' incentives to recapitalize during the European sovereign debt crisis, consistent with countercyclical bank equity issuance (Baron (2020)). Unlike non-CE banks, however, CE banks faced additional regulatory pressure to increase capital ratios at short notice, making them likely more susceptible to resort to regulatory capital inflation.

B. Difference-in-Differences Results

While the graphical evidence in Figure 2 and the univariate descriptive statistics in Panel B of Table 1 are suggestive that CE banks exercised discretion in the calculation of regulatory capital, these changes could conceivably be driven by other bank-specific factors. Table 2 presents the estimation results of the difference-in-differences regression from equation (2) in Section IV. The first column provides the unconditional treatment effect of the capital exercise and shows that CE banks reduced their RAs by 10.2 percentage points compared to non-CE banks.[16] Since RAs are deducted from BE to calculate regulatory capital, the magnitude of this coefficient is to be interpreted as a 10.2-percentage-point increase in the amount of BE that counts toward regulatory capital. The second column additionally controls for 2010 pre-treatment levels of log total assets, CT1 ratios, deposits over total assets, loans over total assets, net interest income over total operating revenue, and net income over total assets. In this specification, CE

TABLE 2

Regulatory Capital Inflation

Table 2 presents the estimation results of the change in regulatory adjustments from equation (2) in Section IV:

$$\frac{RA_{i,t} - RA_{i,2010}}{BE_{i,2010}} = \alpha + \beta \times CEB_i + \delta \times (CEB_i \times CT1\_RATIO_{2010,i}) + \sum_k \theta^k X_i^k + \gamma_c + \varepsilon_i,$$

where the dependent variable is the change in regulatory adjustments (RAs) from 2010 to 2012 scaled by the 2010 level of book equity (BE). The variable CEB_i takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. We control for the following bank characteristics X_i^k as of 2010: log total assets, CT1 ratio, customer loans as a share of total assets, net interest income as a share of total operating revenue, depository funding as a share of total assets, and net income over total assets. γ_c denote country fixed effects. Standard errors are clustered at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: ΔREGULATORY_ADJUSTMENTS$_{2010-2012}$/BOOK_EQUITY$_{2010}$				
	1	2	3	4	5
CEB	−10.19**	−8.62*	−11.13**	−46.17***	−49.70**
	(3.95)	(4.54)	(5.02)	(11.68)	(16.93)
CEB × CT1_RATIO$_{2010}$				3.78***	3.82***
				(0.99)	(1.02)
CEB × LOG_TOTAL_ASSETS$_{2010}$					0.65
					(1.39)
LOG_TOTAL_ASSETS$_{2010}$		−0.10	0.24	−0.20	−0.31
		(0.64)	(0.85)	(0.83)	(0.73)
CT1_RATIO$_{2010}$		0.35**	−0.01	−0.11	−0.11
		(0.16)	(0.15)	(0.15)	(0.15)
(TOTAL_DEPOSITS/TA)$_{2010}$		0.07**	0.08*	0.07**	0.07**
		(0.03)	(0.04)	(0.03)	(0.03)
(CUSTOMER_LOANS/TA)$_{2010}$		−0.06	−0.12	−0.12	−0.12
		(0.10)	(0.11)	(0.10)	(0.10)
(NET_INT._INC./OP._REV.)$_{2010}$		0.03	0.01	0.00	0.01
		(0.04)	(0.06)	(0.05)	(0.05)
(NET_INCOME/TA)$_{2010}$		−0.48	−0.85	−1.60	−1.55
		(1.72)	(1.87)	(1.66)	(1.69)
Country FE			Yes	Yes	Yes
Adj. R^2	0.12	0.12	0.20	0.29	0.29
No. of obs.	191	191	188	188	188

[16]This unconditional coefficient is identical in magnitude to the 2012 coefficient depicted in Figure 2.

banks reduced their RAs by 8.6 percentage points compared to non-CE banks, alleviating concerns that our results are driven by either bank size, profitability, banks' business models, or funding strategies. The third column additionally includes country fixed effects and compares CE banks and non-CE banks within countries. In this specification, CE banks reduced their RAs by 11.1 percentage points relative to non-CE banks.

As we expect weakly capitalized CE banks to have a stronger incentive to engage in regulatory capital inflation, the fourth column of Table 2 includes the interaction of the CEB dummy with banks' pretreatment capital ratios.[17] Consistently, we find that a lower (higher) pre-treatment capitalization of CE banks leads to a significantly stronger (weaker) increase in regulatory capital inflation around the capital exercise. For CE banks, a 1-percentage-point-lower pre-treatment CT1 capital ratio is associated with an additional 3.8-percentage-point reduction in RAs. This result is consistent with both arbitrage-like behavior on the part of banks, which is more pronounced for weakly capitalized banks (Boyson, Fahlenbrach, and Stulz (2016)), and with forbearance on the part of national authorities, which are more likely to forbear weakly capitalized banks (Brown and Dinç (2011), Acharya et al. (2021)).

Finally, the fifth column of Table 2 examines whether banks' engagement in regulatory capital inflation is driven by bank size. Bigger banks tend to have, for example, more intangible assets and a larger trading book. This results in higher levels of RAs that can be adjusted to inflate regulatory capital ratios, providing large banks with more potential arbitrage opportunities to exploit. We find, however, that regulatory capital inflation of CE banks is not related to their size. The coefficient on the bank size interaction term is insignificant and, moreover, the magnitudes of the other coefficients do not change. This finding alleviates concerns that differences in bank size between CE banks and non-CE banks constitute a confounding factor in our analysis of regulatory capital inflation.[18]

The objective of the capital exercise was to restore confidence in the EU banking sector by improving the capitalization of the largest European banks. In its final report on the capital exercise, the EBA (2012) stated that "the vast majority of the banks involved in the EBA capital exercise show a CT1 [capital ratio], as of end of June, above the 9% […]," but also that "other mitigating measures directly impacting banks' capital position [stemming] from lower deductions from CT1 capital (e.g., depreciation/disposal of goodwill and intangible assets)" amounted to 25.5 billion euros, a significant amount compared to the 50 billion euros of core capital raised by EBA banks with a capital shortfall. To what extent was the increase in CT1 ratios of CE banks achieved by regulatory capital inflation as opposed to an increase in BE? To investigate this question, we calculate a shadow capital ratio defined as a bank's level of BE over its RWAs. This shadow ratio thus has the same

[17]Lubberink (2014) reports that low solvency banks in the United States report values of Tier 1 regulatory capital that exceed BE, benefiting from RAs to inflate their capital ratios.

[18]Table A3 in Section A4 of the Supplementary Material shows that our results also hold when using a panel difference-in-differences methodology. Moreover, Section A7 of the Supplementary Material provides further robustness checks regarding the heterogeneity of our results along various bank-level characteristics. We also show that the pre-treatment level of RAs, as a measure of "room for reduction," is associated with a stronger engagement in capital inflation.

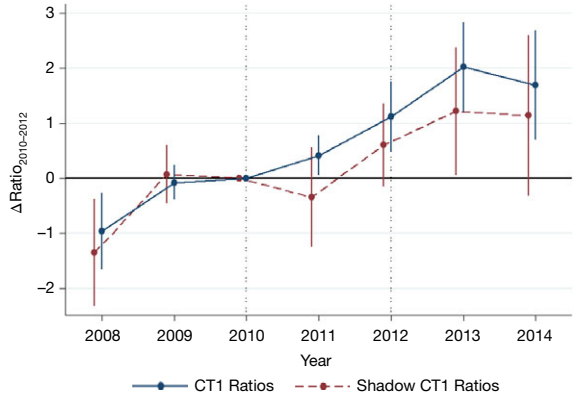
FIGURE 3

Regulatory Capital Ratios Versus Shadow Capital Ratios

Figure 3 illustrates the mean differences in changes in core tier 1 (CT1) capital ratios (CT1 capital over risk-weighted assets) and shadow CT1 capital ratios (total book equity over risk-weighted assets) between the 48 capital exercise banks (CEB) and 143 non-capital exercise banks (non-CEB) in our sample. The figure reports the coefficients δ^t alongside the corresponding 95% confidence intervals from the following regression specifications:

$$Y_{i,t} - Y_{i,2010} = \sum_{t=2008}^{2014} \beta^t \times D^t + \delta^t \times (\text{CEB}_i \times D^t) + \varepsilon_{i,t},$$

where the dependent variable Y is either the change in CT1 capital ratios between the year t and the base year 2010 (solid blue line) or the change in shadow CT1 capital ratios between the year t and the base year 2010 (dashed red line). The variable CEB_i takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. The variables D^t are a set of yearly time dummies, which take the value of 1 for year t, and 0 otherwise. The vertical dashed lines mark 2010 and 2012, the years immediately before and after the 2011 EBA capital exercise. Standard errors are clustered at the country level.



denominator as the regulatory CT1 capital ratio and only differs in terms of the capital definition used in the numerator.

Figure 3 illustrates the differences in the change in banks' regulatory CT1 ratios and shadow CT1 ratios relative to 2010 between CE banks and non-CE banks over the period from 2008 to 2014. Between 2008 and 2010, regulatory CT1 ratios and shadow CT1 ratios evolved similarly for CE banks and non-CE banks. Starting in 2010, however, the two ratios start to diverge. While CE banks significantly increased their regulatory CT1 ratios relative to non-CE banks in 2011 and 2012, there was no significant increase in terms of their shadow CT1 ratios.

We further estimate the regression specification in equation (2) with the changes in reported CT1 ratios and shadow capital ratios as the dependent variable, respectively. Table 3 reports the regression results of this analysis. The first three columns show that especially weakly capitalized CE banks significantly increased their reported CT1 ratios relative to non-CE banks around the capital exercise. However, as shown in columns 4–6, this is not the case for their shadow capital ratios.[19] All coefficients are statistically insignificant and considerably smaller in magnitude. Since the two ratios only differ in terms of the definition of capital used in the numerator (regulatory capital vs. BE), these results suggest that weakly

[19]Table A4 in Section A4 of the Supplementary Material shows that our results also hold when using a panel difference-in-differences methodology.

TABLE 3

Regulatory Capital Ratios Versus Shadow Capital Ratios

Table 3 presents the estimation results of the change in core tier 1 (CT1) capital ratios (CT1 capital over risk-weighted assets) and shadow CT1 capital ratios (total book equity over risk-weighted assets) from the following regression specification:

$$Y_i = \alpha + \beta \times \text{CEB}_i + \delta \times (\text{CEB}_i \times \text{CT1\_RATIO}_{2010,i}) + \sum_k \theta^k X_i^k + \gamma_c + \varepsilon_i,$$

where the dependent variable Y_i is either the change in the CT1 capital ratio (columns 1–3) or the change in the shadow capital ratio (columns 4–6) from 2010 to 2012. The variable CEB_i takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. We control for the following bank characteristics X_i^k as of 2010: log total assets, CT1 ratio, customer loans as a share of total assets, net interest income as a share of total operating revenue, depository funding as a share of total assets, and net income over total assets. γ_c denote country fixed effects. Standard errors are clustered at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable					
	$\Delta(\text{CT1\_CAPITAL/RWA})_{2010-2012}$			$\Delta(\text{BOOK\_EQUITY/RWA})_{2010-2012}$		
CEB	1.12***	1.00	3.21**	0.61	0.30	−0.16
	(0.31)	(0.74)	(1.28)	(0.36)	(0.71)	(1.38)
$\text{CEB} \times \text{CT1\_RATIO}_{2010}$			−0.24*			0.05
			(0.12)			(0.15)
$\text{LOG\_TOTAL\_ASSETS}_{2010}$		−0.01	0.02		0.01	0.00
		(0.18)	(0.18)		(0.26)	(0.26)
CT1_RATIO_{2010}		−0.09*	−0.08		−0.09	−0.09
		(0.05)	(0.05)		(0.06)	(0.06)
$(\text{TOTAL\_DEPOSITS/TA})_{2010}$		0.00	0.00		0.01	0.01
		(0.01)	(0.01)		(0.01)	(0.01)
$(\text{CUSTOMER\_LOANS/TA})_{2010}$		−0.01	−0.01		−0.02*	−0.02*
		(0.01)	(0.01)		(0.01)	(0.01)
$(\text{NET\_INT.\_INC./OP.\_REV.})_{2010}$		0.00	0.00		0.01	0.01
		(0.01)	(0.01)		(0.01)	(0.01)
$(\text{NET\_INCOME/TA})_{2010}$		0.80*	0.85*		0.45	0.44
		(0.45)	(0.43)		(0.34)	(0.34)
Country FE		Yes	Yes		Yes	Yes
Adj. R^2	0.07	0.17	0.18	0.01	0.07	0.07
No. of obs.	191	188	188	190	187	187

capitalized CE banks would not have achieved a material improvement in their reported capitalization without engaging in regulatory capital inflation.[20]

C. Financial Stability Implications

Since the prudential goal of higher capital requirements is to improve a bank's ability to absorb losses, any increase in capital ratios should be associated with an increase in bank stability. However, if capital ratios only improve "on paper," either due to managerial discretion (arbitrage behavior on the part of banks) or due to preferential regulatory treatment (forbearance on the part of national authorities), then the riskiness of banks should not improve and remain unaffected. We therefore

[20]In this analysis, the dependent variable is the change in the CT1 capital ratio from 2010 to 2012 and the set of control variables includes the CT1 capital ratio as of 2010. This might raise concerns that the statistical significance could emerge from a regression of this variable onto itself. Table A8 in Section A5 of the Supplementary Material provides a robustness check using all control variables as of 2009, showing that our results are robust to this alternative specification. We do, however, caveat that this robustness check might only partially address the issue due to the persistence of banks' CT1 capital ratios over time. To further alleviate this concern, we conduct two placebo tests in Table A11 in Section A6 of the Supplementary Material, showing that we do not find statistically significant coefficients in two placebo periods before and after the EBA capital exercise.

TABLE 4

The EBA Capital Exercise and Bank Risk

Table 4 presents the estimation results for the following regression specification:

$$Y_i = \alpha + \beta \times \text{CEB}_i + \delta \times (\text{CEB}_i \times \text{CT1\_RATIO}_{2010,i}) + \sum_k \theta^k X_i^k + \gamma_c + \varepsilon_i,$$

where, in Panel A, the dependent variable Y_i is the 3-day cumulative CDS return around the announcement of the capital exercise on Oct. 26 (columns 1–4) and the change in senior and junior CDS spreads between Oct. 2011 and June 2012 (columns 5 and 6). In Panel B, the dependent variable is the change in banks' *z*-scores between 2010 and 2012. The variable CEB_i takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. We control for the same bank characteristics as in the previous tables. γ_c denote country fixed effects. Standard errors are clustered at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. CDS Spreads

	Dependent Variable					
	CDS Returns: Oct. 26, 2011				ΔCDS: Oct11–Jun12	
					ΔCDS^{SEN}	ΔCDS^{SUB}
CEB	−8.44*	6.41	4.90	−19.41	−38.98	62.89
	(3.92)	(6.78)	(6.90)	(41.03)	(130.33)	(240.51)
CEB × CT1_RATIO$_{2010}$				2.91	15.96	−2.47
				(4.88)	(17.89)	(24.25)
Bank-level controls		Yes	Yes	Yes	Yes	Yes
Country FE			Yes	Yes	Yes	Yes
Adj. R^2	0.03	0.28	0.44	0.46	0.68	0.68
No. of obs.	53	53	53	53	51	41

Panel B. Z-Scores

	Dependent Variable: ΔZ.SCORE			
CEB	−2.04*	−1.85	−1.25	−8.86***
	(1.17)	(1.12)	(1.92)	(2.50)
CEB × CT1_RATIO$_{2010}$				0.82***
				(0.21)
Bank-level controls		Yes	Yes	Yes
Country FE			Yes	Yes
Adj. R^2	0.02	0.05	0.20	0.21
No. of obs.	190	190	187	187

study the effect of the capital exercise on market- and accounting-based measures of bank risk.

We first investigate whether the capital exercise was associated with a change in the market's perception of bank risk. To this end, we conduct an event study analysis and examine the reaction of CDS returns of CE banks and non-CE banks in a 3-day time window around the announcement of the capital exercise on Oct. 26, 2011. The first three columns in Panel A of Table 4 show that the announcement of the capital exercise did not reduce the CDS spread of CE banks. Column 4 in Panel A tests for differences in the reaction of CDS returns between strongly and weakly capitalized CE banks. As the capital exercise aimed to improve the capital positions of weakly capitalized banks, we should expect their CDS spreads to shrink after the announcement (consistent with a reduction in bank risk). Column 4, however, shows that this interaction coefficient is insignificant. We further investigate the change in CDS spreads between the start date (Oct. 2011) and end date (June 2012) of the capital exercise. We do not find significant effects, neither on senior nor on junior CDS spreads.

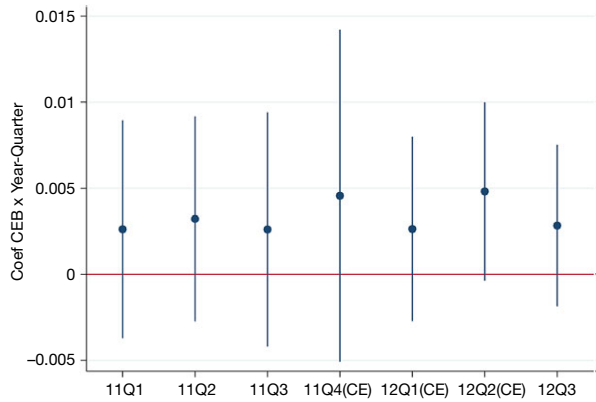
FIGURE 4

CDS Spreads of CE Banks and Non-CE Banks over Time

Figure 4 plots the estimated coefficients δ^t and the associated confidence intervals from the following regression specification:

$$\text{SENIOR\_CDS\_SPREAD}_{i,t} = \sum_{t=2011q1}^{2012q3} \delta^t \times (\text{CEB}_i \times D^t) + \gamma_{c,t} + \gamma_i + \varepsilon_{i,t},$$

where the dependent variable is the spread on 5-year senior CDS of bank i in quarter t. The variable CEB_i takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. The variables D^t are a set of quarterly time dummies, which take the value of 1 for quarter t, and 0 otherwise. Standard errors are clustered at the country level.



Finally, Figure 4 plots the estimated difference in CDS spreads between CE and non-CE banks for each quarter over the period from 2011Q1 to 2012Q3. The figure illustrates that the CDS spreads of CE banks and non-CE banks follow a parallel trend in the quarters before the capital exercise and do not significantly diverge during and after the capital exercise. In summary, we do not find any evidence that the capital exercise was associated with a change in the market's perception of bank risk.[21]

One drawback of this analysis is that CDS data are only available for a subset of 45 CE banks and 11 non-CE banks in our sample. Therefore, in Panel B of Table 4, we investigate an accounting-based measure of bank risk and estimate the regression specification from equation (2) with the change in banks' z-scores from 2010 to 2012 as the outcome variable. We follow Beck, Jonghe, and Schepens (2013) and calculate a bank's z-score as

$$Z_i = \frac{\text{ROA}_i + \left(\frac{E}{A}\right)_i}{\sigma(\text{ROA})_i}, \tag{3}$$

where ROA is the return on assets, E/A is the ratio of BE to total assets, and $\sigma(\text{ROA})$ is the standard deviation of the return on assets over a 3-year rolling time window. The z-score measures a bank's distance to insolvency such that higher values indicate that the bank is more stable (Laeven and Levine (2009)).

[21] This is consistent with the evidence provided in Mésonnier and Monks (2015), who also report that the EBA capital exercise did not give rise to large changes in banks' CDS spreads.

Panel B of Table 4 reports the results for our *z*-score analysis. The first three columns show that there was no increase in the *z*-score of CE banks around the capital exercise and that the magnitude of the coefficient is negative, albeit statistically insignificant. The fourth column shows that especially for weakly capitalized banks, the *z*-score even significantly decreased, indicating a higher probability of default and an increase in bank risk. This finding is consistent with our results in Table 4 that especially weakly ex ante capitalized banks inflated their levels of regulatory capital inflation to boost their capital ratios. Our results are also in line with the findings of Bostandzic et al. (2022) who show that the EBA capital exercise did not result in an improvement of various non-regulatory risk measures for banks in the capital exercise. While Bostandzic et al. (2022) link this lacking decrease in bank risk to reduced bank profitability, our findings provide an alternative (and complementary) explanation. By reducing RAs, CE banks improved their capitalization "on paper" but without a commensurate increase in (economic) BE.[22]

In summary, our results are inconsistent with the notion that an increase in regulatory capital ratios via reduced RAs is associated with an increase in banks' safety and soundness. Hence, regulatory capital inflation has at best no, and at worst detrimental effects on financial stability and is therefore undesirable from a prudential point of view.

VI. National Discretion and Forbearance

The extent to which banks can engage in regulatory capital inflation likely depends on the leeway they are given by their national authorities. During the EBA capital exercise, banks had to submit their recapitalization plans to their respective NSAs which were ultimately in charge of approving the measures by which banks intended to increase their capital ratios (EBA (2011a)). Moreover, during the capital exercise, there was considerable heterogeneity in supervisory approaches across countries in Europe (Barth et al. (2013), Nouy (2017)). Our empirical setting, in which a sudden supranational regulatory intervention was implemented with considerable national discretion, allows us to gauge the degree and drivers of forbearance across countries. In this section, we first document substantial cross-country heterogeneity in CE banks' regulatory capital inflation, and then study the potential drivers of this observed cross-country heterogeneity. Regarding the latter analysis, we caveat that due to the limited number of countries (18 in our baseline specification), disentangling different country-specific drivers of regulatory capital inflation is empirically challenging.

A. Cross-Country Heterogeneity and National Discretion

We first document that there was substantial cross-country heterogeneity in the extent to which CE banks engaged in regulatory capital inflation. We estimate the following regression specification:

[22]Lubberink and Willett (2021) find that banks' RAs are relevant for the market valuation of highly levered banks in times of elevated market uncertainty.

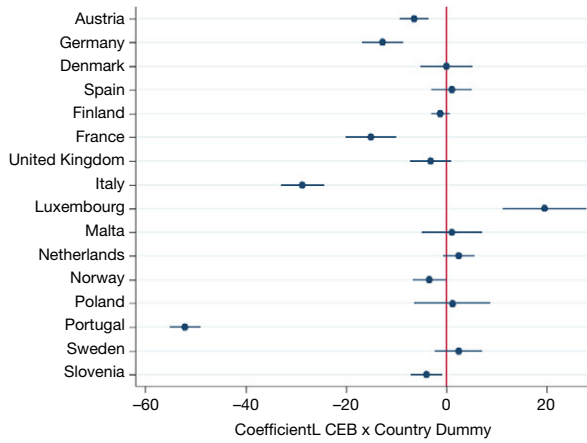
FIGURE 5

Cross-Country Heterogeneity in Regulatory Capital Inflation

Figure 5 plots the estimated coefficients δ^c and the associated confidence intervals of equation (4) in Section VI.A:

$$\frac{\text{RA}_{i,2012}-\text{RA}_{i,2010}}{\text{BE}_{i,2010}}=\alpha+\beta\times\text{CEB}_i+\sum_c\delta^c\times(\text{CEB}_i\times\text{CY}_c)+\sum_k\theta^kX_i^k+\gamma_c+\varepsilon_i,$$

where the dependent variable is the change in regulatory adjustments (RAs) around the capital exercise (between 2010 and 2012) scaled by the 2010 level of book equity (BE); CEB_i is a dummy variable that takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise; and CY_c is a battery of country dummy variables, which takes on the value 1 for country c, and 0 otherwise. We control for the following bank characteristics X_i^k as of 2010: log total assets, CT1 ratio, customer loans as a share of total assets, net interest income as a share of total operating revenue, depository funding as a share of total assets, and net income over total assets. Standard errors are clustered at the country level.



$$\frac{\text{RA}_{i,t}-\text{RA}_{i,2010}}{\text{BE}_{i,2010}}=\alpha+\beta\times\text{CEB}_i+\sum_c\delta^c\times(\text{CEB}_i\times\text{CY}_c)+\sum_k\theta^kX_i^k+\gamma_c+\varepsilon_i, \tag{4}$$

where, as before, the dependent variable is the change in RAs around the capital exercise (between 2010 and 2012) scaled by the 2010 level of BE; and CEB_i is a dummy variable that takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. CY_c is a battery of country dummy variables, which take on the value 1 for country c, and 0 otherwise.

Figure 5 plots the estimated coefficients δ^c and the associated confidence intervals of equation (4). Most notably, Italian and Portuguese banks inflated their regulatory capital by a considerably larger magnitude than banks in other European countries, as we discuss below. However, we also find a significant amount of capital inflation for banks in Austria, Germany, France, Norway, and Slovenia, although to a lesser degree.

To investigate whether our overall results are exclusively driven by Italian and Portuguese banks, we re-estimate the regression specification from equation (2) and include two interaction terms for banks headquartered in Italy and Portugal,

TABLE 5

Regulatory Capital Inflation Across Countries

Table 5 presents the estimation results of the following regression specification:

$$\frac{RA_{i,t} - RA_{i,2010}}{BE_{i,2010}} = \alpha + \beta \times CEB_i + \delta \times (CEB_i \times CT1\_RATIO_{2010,i}) + \gamma^{IT}(CEB_i \times ITALY) + \gamma^{PT}(CEB_i \times PORTUGAL) + \sum_k \theta^k X_i^k + \gamma_c + \varepsilon_i,$$

where the dependent variable is the change in regulatory adjustments (RAs) from 2010 to 2012 scaled by the 2010 level of book equity (BE). The variable CEB_i takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. ITALY and PORTUGAL are dummy variables which take on the value of 1 for Italian and Portuguese banks, respectively, and 0 otherwise. We control for the following bank characteristics X_i^k as of 2010: log total assets, CT1 ratio, customer loans as a share of total assets, net interest income as a share of total operating revenue, depository funding as a share of total assets, and net income over total assets. γ_c denote country fixed effects. Standard errors are clustered at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: ΔREGULATORY_ADJUSTMENTS$_{2010-2012}$/BOOK_EQUITY$_{2010}$			
CEB	−4.85*	−3.63	−24.78***	−25.40***
	(2.39)	(2.80)	(5.60)	(7.45)
CEB × CT1_RATIO$_{2010}$			2.13***	2.14***
			(0.48)	(0.49)
CEB × LOG_TOTAL_ASSETS$_{2010}$				0.11
				(0.81)
CEB×ITALY	−25.08***	−25.67***	−19.25***	−19.29***
	(2.39)	(2.48)	(3.01)	(2.97)
CEB×PORTUGAL	−48.30***	−47.50***	−42.53***	−42.43***
	(2.39)	(1.65)	(1.47)	(1.58)
Bank-level controls		Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Adj. R^2	0.37	0.37	0.39	0.39
No. of obs.	188	188	188	188

respectively. Table 5 reports the regression results of this analysis. Column 1 shows that the unconditional treatment effect for CE banks not based in Italy or Portugal is still statistically significant, albeit smaller in magnitude. However, including bank-level control variables in column 2 renders the coefficient insignificant. Columns 3 and 4 investigate whether our results for weakly capitalized banks are also largely driven by Italian and Portuguese banks. In this analysis, all coefficients remain statistically significant, indicating that weakly capitalized banks across Europe inflated their regulatory capital around the capital exercise.[23] Moreover, as in Table 2, the interaction with total assets is again insignificant, indicating that our results are not driven by bank size.

The results in Figure 5 and Table 5 strongly suggest that country-specific factors are an important driver regarding the extent to which CE banks engaged in regulatory capital inflation. We now explore the economic mechanisms behind this observed heterogeneity across countries. We start by collecting anecdotal evidence of national regulatory interventions around the time of the capital exercise which helped banks to boost their regulatory capital. Table 6 provides an overview of measures implemented by national authorities which increased

[23]Section A8 of the Supplementary Material documents the robustness of our results when excluding from our analysis banks from each individual country, respectively.

TABLE 6

Regulatory Capital Forbearance: Anecdotal Evidence

Table 6 presents anecdotal evidence on measures implemented by national authorities around the EBA capital exercise to increase the capitalization of domestic banks. For each measure, the table lists the country and the date, provides a short description, and refers to the national law or decree in which the measure was introduced. The footnote provides links to the corresponding documents. Section A9 of the Supplementary Material provides a more detailed discussion on some of these policies.

No.	Country	Date	Description	Reference
1	Italy	July 6, 2011	Tax treatment of goodwill	Decree 98/2011
2	Italy	Dec. 6, 2011	Conversion of DTAs to tax credits	Decree 201/2011
3	Italy	July 6, 2012	New instruments eligible as CT1 capital	Decree 95/2012
4	Italy	July 12, 2012	Hybrid capital injection Banca MPS	EU SA.35137
5	Portugal	Jan. 11, 2012	Amendment recapitalization scheme	Law 4/2012
6	Portugal	May 14, 2012	Hybrid capital injection Banco Comercial	Ministerial Decision 6242/2012
7	Portugal	July 3, 2012	Hybrid capital injection Banco BPI	Ministerial Decision 8840-A/2012
8	Portugal	July 3, 2012	Hybrid capital injection CGD	Ministerial Decision 8840-C/2012
9	Slovenia	May 16, 2012	Hybrid capital injection Nova Ljublj. Banka	EU SA.34937
10	Slovenia	Dec. 5, 2012	Hybrid capital injection Nova Kreditna Banka	EU SA.35709

the capitalization of domestic banks[24]. These policies helped banks to comply with the supranational requirements set by the EBA, consistent with Figure 5 and the results in Table 5.

One form of forbearance is ad hoc recapitalizations via CT1-eligible hybrid securities underwritten by the state. While these instruments are not part of a bank's BE, they count toward regulatory capital. Both in Italy (Banca Monte dei Paschi di Siena) and Portugal (Banco BPI, Banco Comercial Português, Caixa Geral de Depósitos), the state acted as an underwriter for hybrid securities issued by CE banks, often explicitly citing the EBA capital exercise as the justification to boost banks' regulatory capital ratios.[25]

Second, besides hybrid capital support measures, several countries implemented specific regulations which resulted in a reduction of RAs and therefore an increase in the regulatory capital available to banks. One example of such "legislative forbearance" is the tax treatment of goodwill. For many banks, these assets are large in magnitude relative to their regulatory capital (24% for the CE banks in our sample as of 2010). Since the valuation of goodwill and intangible assets is subject to considerable accounting discretion (Beatty and Weber (2006), Ramanna (2008), and Ramanna and Watts (2012)), they provide banks with substantial leeway to inflate their regulatory capital via an impairment or amortization of these

[24]Sources: (1) https://www.gazzettaufficiale.it/eli/id/2011/07/25/11A10000/sg.
(2) https://www.gazzettaufficiale.it/eli/id/2011/12/06/011G0247/sg.
(3) https://www.gazzettaufficiale.it/eli/id/2012/08/14/12A09068/sg.
(4) https://ec.europa.eu/competition/state_aid/cases/246983/246983_1401709_117_2.pdf.
(5) https://www.asf.com.pt/biblioteca/Catalogo/winlibimg.aspx?skey=2E7DD3382BD04C939D722097CF0473B9&doc=21178&img=5028.
(6) https://files.dre.pt/2s/2012/05/093000000/1670716707.pdf.
(7) https://files.dre.pt/2s/2012/07/127000001/0000200014.pdf.
(8) https://files.dre.pt/2s/2012/07/127000001/0002700033.pdf.
(9) https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2012:361:0018:0029:EN:PDF (p. 2).
(10) https://ec.europa.eu/competition/state_aid/cases/248544/248544_1522897_264_2.pdf.

[25]Section A9 of the Supplementary Material provides a more detailed discussion of the forbearance measures documented in this section.

TABLE 7

Regulatory Capital Inflation via Intangible Assets

Table 7 presents the estimation results of the following regression specification:

$$Y_i = \alpha + \beta \times \text{CEB}_i + \delta \times (\text{CEB}_i \times \text{CT1\_RATIO}_{2010,i}) + \gamma^{IT}(\text{CEB}_i \times \text{ITALY}) + \gamma^{PT}(\text{CEB}_i \times \text{PORTUGAL}) + \sum_k \theta^k X_i^k + \gamma_c + \varepsilon_i,$$

where the dependent variable Y_i is the change in the ratio of intangible assets to total book equity from 2010 to 2012, that is, $\Delta(\text{INTANGIBLE\_ASSETS}//\text{TOTAL\_BOOK\_EQUITY})_{2010-2012,i}$. The variable CEB_i takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. ITALY and PORTUGAL are dummy variables which take on the value of 1 for Italian and Portuguese banks, respectively, and 0 otherwise. We control for the following bank characteristics X_i^k as of 2010: log total assets, CT1 ratio, customer loans as a share of total assets, net interest income as a share of total operating revenue, depository funding as a share of total assets, and net income over total assets. γ_c denote country fixed effects. Standard errors are clustered at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: Δ(INTANGIBLE_ASSETS/BOOK_EQUITY)		
CEB	−0.01	0.01	0.00
	(0.01)	(0.01)	(0.02)
CEB × CT1_RATIO$_{2010}$			0.00
			(0.00)
CEB × ITALY	−0.14***	−0.14***	−0.14***
	(0.01)	(0.01)	(0.01)
CEB × PORTUGAL	0.00	−0.01	−0.01
	(0.01)	(0.01)	(0.01)
Bank-level controls		Yes	Yes
Country FE	Yes	Yes	Yes
Adj. R^2	0.65	0.68	0.69
No. of obs.	189	189	189

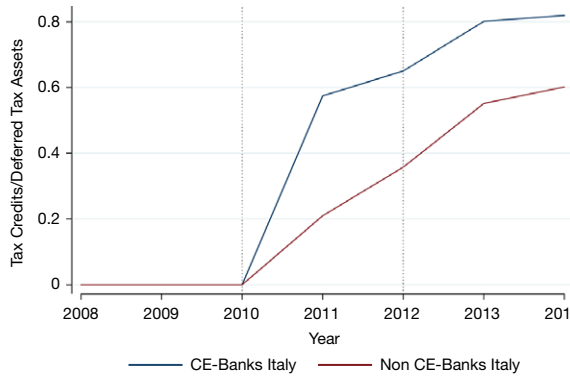
assets, which lowers the amount of deductions from BE. While such impairments are initially capital neutral, as they also reduce net income, banks can manage their regulatory capital via the devaluation of goodwill and intangible assets if impairments are tax deductible. For example, in 2011, the Italian government enacted Law Decree 98/2011, allowing banks to increase their regulatory capital via the tax treatment of goodwill. Consequently, the Italian Bank Intesa Sanpaolo reported an increase in its regulatory capital ratio "from the realignment of goodwill envisaged by Law Decree no. 98/2011 (+52 bps on CT1)" (Intesa Sanpaolo (2011)). We formally test in Table 7 how Italian CE banks adjusted their intangible assets around this legislative change. The results show that Italian CE banks reduced their intangible assets relative to their BE by 14 percentage points from 2010 to 2012, which allowed them to improve their regulatory capital ratios via goodwill impairment. Furthermore, there is also anecdotal evidence of this form of regulatory capital inflation for banks in other countries. As reported by the Financial Times, the Spanish bank Banco Bilbao Vizcaya Argentaria (BBVA) wrote down "€1.5 billion on the value of its struggling US business" which "did not affect its cash position" but helped "boost its core capital by 400 million due to the tax treatment of goodwill" (Johnson (2012)).

As another example of legislative forbearance, national authorities may also allow banks to convert DTAs into government-guaranteed tax credits. DTAs, which allow banks to carry forward losses to reduce taxable income in the future, have been documented in the past as a tool for regulatory forbearance (Skinner (2008)). As a result, the Basel capital framework requires banks to deduct DTAs in the

FIGURE 6

The Conversion of Deferred Tax Assets into Tax Credits in Italy

Figure 6 shows the conversion of deferred tax assets (DTAs) into tax credits after the implementation of the 2011 decree-law no. 201 in Italy for the 5 Italian capital exercise (CE) banks (solid blue line) and the 24 Italian non-capital exercise (non-CE) banks (solid red line) in our sample. Both lines plot the ratio of tax credits relative to DTAs. The two dashed vertical lines mark 2010 and 2012, the years immediately before and after the capital exercise.



calculation of CET1 capital. In Italy, however, Legislative Decree no. 201 of Dec. 6, 2011 allowed banks to convert their DTAs into tax credits, which did not have to be deducted due to their government guarantees. As shown in Figure 6, the Italian government in 2011 started guaranteeing about 60% of the DTAs of Italian CE banks. While this legislative change also benefited Italian non-CE banks, these banks converted DTAs to tax credits to a lesser degree, consistent with their reduced need to increase their regulatory capital ratios.

B. The Determinants of Forbearance

In this section, we investigate the drivers of the observed cross-country heterogeneity in regulatory capital inflation. National authorities might choose to be lenient on their domestic banks for a variety of reasons: they might be prone to regulatory capture and have a tendency to be too soft on their national champion banks (Goodhart (2012), Schoenmaker (2012), Haselmann et al. (2018), and Bruno and Carletti (2019)); they might want to minimize disruptions to the financial system and the real economy caused by bank failures (Brown and Dinç (2011), Huizinga and Laeven (2012), and Walther and White (2020)); their actions might be constrained by political considerations and the electoral cycle (Brown and Dinç (2005), Bian et al. (2017)); or government interventions in the banking sector might be infeasible due to fiscal budget constraints (Martynova et al. (2019), Acharya et al. (2021)).

We first test for the regulatory capture of supervisors by national champion banks (Haselmann et al. (2018)). Column 1 of Table 8 includes the variable NATIONAL_CHAMPION, which takes on the value of 1 if bank i is the largest bank in country c in terms of total assets as of 2011, and 0 otherwise. We find a positive and weakly significant relationship, suggesting that collusion between

TABLE 8

Cross-Country Determinants of Regulatory Capital Inflation

Table 8 presents the estimation results of the following specification:

$$\frac{RA_{i,t}-RA_{i,2010}}{BE_{i,2010}}=\alpha+\beta\times CEB_i+\delta\times(CEB_i\times CT1\_RATIO_{2010,i})+\sum_c\kappa^c(CEB_i\times CY\_CHARS_c)+\sum_k\theta^k X_i^k+\gamma_c+\varepsilon_i,$$

where the dependent variable is the change in regulatory adjustments (RAs) from 2010 to 2012 scaled by the 2010 level of book equity (BE). The variable CEB_i takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. CY_CHARS_c are the following country-specific characteristics: $NATIONAL\_CHAMPION_i$ takes on the value of 1 if bank i is the largest bank in country c, and 0 otherwise; $OFFICIAL\_SUPERVISORY\_POWER_c$ comes from Barth et al. (2013) and measures the degree to which national supervisors have the authority to take specific actions; $FISCAL\_CONSTRAINTS_c$ is the current account balance to GDP ratio; $CREDIT\_STANDARDS_c$ measures the share of banks expecting to tighten their credit standards in the next quarter; and $BEFORE\_ELECTION_c$ takes the value of 1 if the capital exercise took place 12 months before the next national congressional election, and 0 otherwise. We control for the same bank characteristics as in the previous tables. γ_c denote country fixed effects. Standard errors are clustered at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: $\Delta REGULATORY\_ADJUSTMENTS_{2010-2012}/BOOK\_EQUITY_{2010}$						
CEB	−12.65**	−10.40**	−11.68**	−0.69	−12.04*	−5.31	−23.17***
	(5.50)	(4.24)	(4.12)	(3.16)	(5.75)	(3.12)	(6.64)
CEB × $CT1\_RATIO_{2010}$							1.92**
							(0.65)
NATIONAL_CHAMPION	7.88*					9.99***	8.87**
	(4.19)					(3.21)	(2.91)
CEB × OFFICIAL_SUPERVISORY_POWER		−6.55**				−4.31**	−2.98**
		(2.96)				(0.99)	(1.05)
CEB × FISCAL_CONSTRAINTS			1.44*			0.84**	0.64**
			(0.71)			(0.27)	(0.28)
CEB × CREDIT_STANDARDS				−0.51***		−0.38**	−0.35***
				(0.12)		(0.08)	(0.09)
CEB × BEFORE_ELECTION					5.60	4.20	3.29
					(7.32)	(4.68)	(4.05)
Bank-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.22	0.24	0.26	0.32	0.20	0.37	0.38
No. of obs.	188	181	188	178	188	178	178

national authorities and the largest domestic banks did not play a role in the context of the capital exercise.

Second, we test whether supervisory power is associated with banks' engagement in capital inflation. We employ the OFFICIAL_SUPERVISORY_POWER index from Barth et al. (2013), which measures the degree to which a country's supervisory agency has the authority to take specific actions. While more powerful supervisors might be more capable to discipline banks, they might also use their power to forbear weak banks. Indeed, this index has been found in the literature to be associated with adverse outcomes, such as corruption in lending, and with no beneficial effects on financial stability (Beck, Demirgüç-Kunt, and Levine (2006), Barth et al. (2013)). Consistently, we find that CE banks in countries where supervisors wield more power were more likely to engage in regulatory capital inflation. This finding suggests that powerful national supervisors used their capacity to exercise leniency toward their national banks and provided them with leeway to exercise discretion in the calculation of regulatory capital.

Third, we investigate the role of national authorities' capacity for public intervention. Both theory (Martynova et al. (2019)) and recent empirical evidence (Acharya et al. (2021)) suggest that fiscally constrained governments might be more

prone to engage in regulatory capital forbearance as they do not have the fiscal capacity to intervene in the banking sector. We follow Acharya et al. (2021) and measure the variable FISCAL_CONSTRAINTS using a country's current account balance as a percentage of nominal GDP. A higher current account balance indicates more fiscal room for government intervention. As shown in column 3 of Table 8, we find no evidence for this mechanism in the context of the EBA capital exercise.

Fourth, we study whether fears of a credit crunch induced national authorities to forbear their domestic banks in an attempt to avoid adverse effects on the real economy. We employ data from the ECB's Bank Lending Survey and construct the variable CREDIT_STANDARDS, defined as the share of banks expecting a tightening in credit standards over the next quarter. This variable ranges from a minimum value of zero in Belgium, Ireland, Malta, Slovenia, and Spain to a maximum value of 37.5 in Italy. The interaction term in column 4 of Table 8 shows that regulatory capital inflation is more pronounced in countries in which banks (and therefore, arguably, regulators and supervisors) expect a near-term contraction of credit supply. A 10-percentage-point increase in this index is associated with a 5.1-percentage-point decrease in RAs. This finding is consistent with the notion that national authorities might choose to be lenient on banks in bad times to avoid a financial panic and minimize disruptions to the real economy (Brown and Dinç (2011), Huizinga and Laeven (2012), and Walther and White (2020)). While we do not study whether such forbearance helped to avert a credit crunch, Acharya et al. (2021) provide evidence that forbearance causes weakly capitalized banks to engage in zombie lending (Acharya et al. (2019)).

Fifth, we test whether regulatory capital inflation might be driven by the election cycle. As governments have an incentive to delay bank failures until after elections (Brown and Dinç (2005)) and to avoid unpopular bail-outs prior to elections (Bian et al. (2017)), we would expect national authorities to be more lenient on banks before upcoming elections. To investigate this, we construct the variable BEFORE_ELECTION, which takes on the value of 1 if the capital exercise took place 12 months before the next national congressional election, and 0 otherwise. As shown in column 5 of Table 8, we find no evidence for such political considerations playing a role around the capital exercise.

Finally, we include all country-level variables jointly in a horse race regression in columns 6 and 7 of Table 8. The results suggest that regulatory capital inflation around the capital exercise was potentially driven by powerful supervisors and the attempt to minimize disruptions to the real economy caused by a credit crunch. In contrast, regulatory capture by national champion banks, fiscal constraints of national authorities, and political considerations driven by the electoral cycle appear to have played a minor role. The coefficients on FISCAL_CONSTRAINTS and NATIONAL_CHAMPION even suggest that such banks were less engaged in regulatory capital inflation.

While these findings provide suggestive evidence regarding the drivers of the observed cross-country heterogeneity in regulatory capital inflation, we caution against a strong causal interpretation of our results in this section, given the limited number of countries and the resulting difficulty to disentangle the various drivers from other (potentially unobserved) country characteristics.

TABLE 9

Placebo Treatment Periods

Table 9 presents the estimation results of the change in the ratio of regulatory core tier 1 (CT1) capital to total equity around the 2011 EBA capital exercise and for two placebo treatment periods:

$$\frac{RA_{i,t} - RA_{i,\tau}}{BE_{i,\tau}} = \alpha + \beta \times CEB_i + \sum_k \theta^k X_i^k + \gamma_c + \varepsilon_i,$$

where the dependent variable is the change in regulatory adjustments (RAs) from 2010 to 2012 (treatment period), 2008 to 2010, and 2012 to 2014 (placebo periods), respectively. The variable CEB_i takes on the value of 1 for banks selected into the capital exercise, and 0 otherwise. We control for the following bank characteristics X_i^k as of 2010: log total assets, CT1 ratio, customer loans as a share of total assets, net interest income as a share of total operating revenue, depository funding as a share of total assets, and net income over total assets. γ_c denote country fixed effects. Standard errors are clustered at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: ΔREGULATORY_ADJUSTMENTS$_{2010-2012}$/BOOK_EQUITY$_{2010}$		
	$\Delta_{2010-2012}$	$\Delta_{2008-2010}$	$\Delta_{2012-2014}$
	Treatment	Placebo	Placebo
CEB	−11.13**	−1.21	−0.32
	(5.02)	(2.48)	(2.72)
Bank-level controls	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Adj. R^2	0.20	0.27	0.15
No. of obs.	188	174	154

VII. Robustness Checks and Further Analysis

A. Placebo Treatment Periods

If CE banks would systematically differ from non-CE banks with respect to characteristics relevant for RAs, we would expect to see differential changes in the ratio of regulatory capital to BE between CE banks and non-CE banks also in other periods. To examine this possibility, we conduct two tests with placebo treatment periods before (2008–2010) and after (2012–2014) the 2011 EBA capital exercise. Table 9 shows the results of this placebo exercise. For ease of comparison, the first column of Table 9 replicates our baseline result in the third column of Table 2 and shows the treatment effect of the capital exercise from 2010 to 2012. The second and third column then compare the changes in RAs between CE banks and non-CE banks for the placebo periods from 2008 to 2010 and from 2012 to 2014, respectively. While there is strong evidence for regulatory capital inflation around the capital exercise, CE banks and non-CE banks exhibit no differential changes RAs during the two placebo periods. This alleviates concerns that CE banks and non-CE banks differ systematically with respect to characteristics relevant for RAs.

B. Matching Results

For our main analysis, we rely on a standard OLS regression analysis. However, if the covariate distributions differ substantially by treatment status, then conventional regression methods can be sensitive to minor changes in the specification because of their heavy reliance on extrapolation. One approach to address this problem is the use of matching estimators which have favorable robustness properties with respect to a variety of data configurations (Imbens (2014)). Thus, we estimate the treatment effect of the capital exercise on regulatory capital

TABLE 10

Matching Results

Table 10 presents the estimation results of the change in regulatory adjustments from 2010 to 2012 scaled by the 2010 level of book equity using the matching strategies based on Gropp et al. (2019)) described in Section VII.B. In each column, the first row contains the difference in the outcome variable for capital exercise banks (CEB) between the period before (2010) and the after (2012) the capital exercise; the second row contains the difference in the outcome variable for matched control group (control) banks over the same period. The article tests for differences-in-means using Welch's two-sample *t*-test. The third row contains the estimate for the average treatment effect on the treated (ATT) based on the bias-corrected Abadie and Imbens (2011) matching estimator. Column 1 presents the results for the *full sample* matching strategy, column 2 presents the results for the *overlap* matching strategy, column 3 presents the results for the *within-country* matching strategy, and column 4 presents the results for the *within-region* matching strategy. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: ΔREGULATORY_ADJUSTMENTS$_{2010-2012}$/BOOK_EQUITY$_{2010}$			
	Full	Overlap	Within Country	Within Region
CEB: after–before	−7.61***	−7.89**	−8.34**	−7.94**
Control: after–before	1.57**	3.54**	4.50***	4.31***
Bias-corrected ATT	−9.46***	−10.59	−13.56**	−13.22**
No. of obs.	191	127	50	51

inflation using the bias-corrected Abadie and Imbens (2011) matching estimator. Specifically, we adopt four different matching strategies based on Gropp et al. (2019). The full sample matching strategy matches four non-CE banks to each CE bank based on the six matching covariates using the full sample of 48 CE banks and 143 non-CE banks. The overlap sample matching strategy matches one non-CE bank to each CE bank based on asset size only in the sample of banks that are larger than the smallest CE bank and smaller than the largest non-CE bank. The within-country matching strategy matches the two smallest CE banks and the two largest non-CE banks around the selection threshold within each country around. Finally, the within-region matching strategy matches CE banks to non-CE banks around the selection threshold within the same region (GIIPS countries and non-GIIPS countries). Section A10 of the Supplementary Material, which replicates Table 5 of Gropp et al. (2019), shows that the different matching strategies reduce differences in bank characteristics between treatment and control group banks. The third row in Table 10 provides the results of these matching exercises. Our results are robust and similar in magnitude to our regression results when using the full sample, the within-country, and the within-region matching strategy. While the treatment effect is not significant when employing the overlap sample matching strategy, the coefficient is similarly large in magnitude. The associated *p*-value is 0.11 and the results are therefore borderline statistically significant at the 10% level.

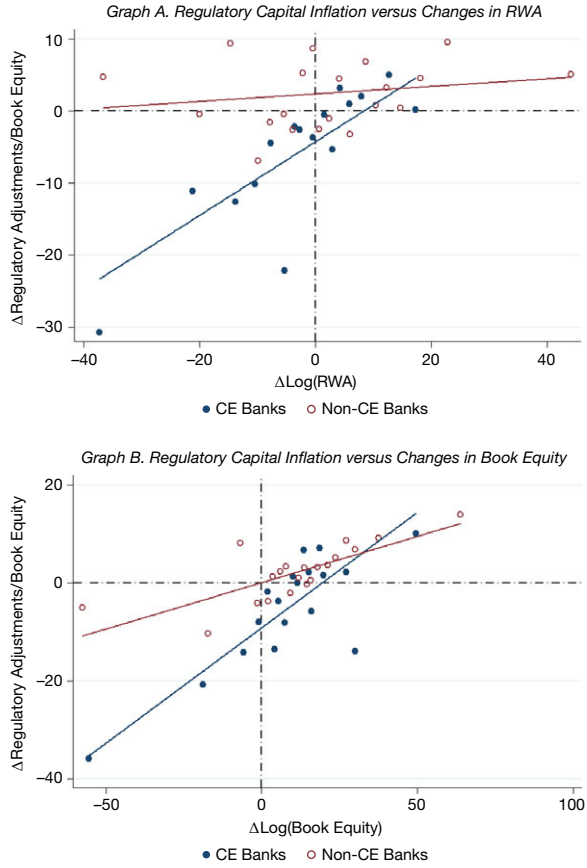
C. Capital Inflation Versus Changes in Risk-Weighted Assets and Book Equity

When faced with higher capital requirements, banks can increase their regulatory capital ratios along three different margins, as discussed in Section II.B: They can increase their levels of regulatory capital (the numerator of the capital ratio) either via an increase in BE or via a reduction in RAs, or they can shrink their RWAs (the denominator of the capital ratio). Gropp et al. (2019) show that, in response to the 2011 EBA capital exercise, CE banks reduced their RWAs by 16 percentage points relative to non-CE banks, whereas both CE and non-CE banks increased their

FIGURE 7

Regulatory Capital Inflation Versus Risk-Weighted Asset Reduction

Figure 7 shows binned scatter plots (with a linear fit) illustrating the cross-sectional relation between changes in regulatory adjustments (RAs) around the capital exercise (between 2010 and 2012) scaled by the 2010 level of book equity and changes in the logarithm of risk-weighted assets from 2010 to 2012 (Graph A) and changes in the logarithm of book equity from 2010 to 2012 (Graph B), respectively. The graph is based on the 48 capital exercise (CE) banks and 143 non-capital exercise (non-CE) banks in our sample.



levels of regulatory CT1 capital by the same magnitude. This article shows that CE banks achieved this CT1 capital increase largely by inflating their regulatory capital via a reduction in RAs. Regulatory capital inflation, on the one hand, and a reduction in RWAs or an increase in BE, on the other hand, could therefore serve as either substitutes or complements with regard to raising regulatory capital ratios. Figure 7 plots the changes in RAs against changes in risk-weighted assets (Graph A) and BE (Graph B) between 2010 and 2012 for CE and non-CE banks. As shown in Graph A, there is a strong negative correlation between regulatory capital inflation and changes in RWAs for CE banks, suggesting that these banks treated both methods as complements to increase their regulatory capital ratios. However, as shown in Graph B, CE banks which reduced their RAs also tended to increase their BE by less, suggesting that these banks treated regulatory capital inflation as a

substitute for increasing their levels of BE, either via the issuance of fresh equity or via retained earnings.

VIII. Conclusion

We study how supranational capital regulation incentivizes national authorities to exercise forbearance and how this affects the regulatory capital of banks across countries. Exploiting the sudden, supranational increase in capital requirements during the 2011 EBA capital exercise, we show that affected banks reduced their RAs by 11% relative to their BE, resulting in an 80 bps increase in their regulatory capital ratios. Whereas increasing capital ratios via equity issuances or retained earnings are privately costly for banks, reducing RWAs (e.g., via cutting lending) is socially expensive and therefore undesirable from a regulatory perspective. Both banks and national authorities are therefore incentivized to meet stricter supranational requirements via the seemingly costless inflation of regulatory capital. However, while this increase in regulatory capital without a commensurate increase in BE improved banks' capitalization "on paper," it did not reduce bank risk. Therefore, our results highlight how national discretion may effectively undermine well-intended supranational rules in practice.

The aim of the ECB's SSM, introduced in Europe in 2014, was to ensure a level playing field and the equal treatment of all supervised institutions. During our sample period before the introduction of the SSM, discretionary powers of national authorities resulted in a heterogeneous response of banks to a uniform supranational intervention. Such a convergence of supranational rules in the presence of divergent national implementations might create competitive disadvantages for banks in less forbearing economies (Acharya (2003)). While the introduction of the SSM and the single European rulebook appears to have fostered a more consistent banking supervision across countries in Europe (Bruno and Carletti (2019)), there "is still room to arbitrage national rules" and concerns remain that "the single European rulebook is not yet single enough" (Nouy (2017)).

Finally, our article also has important policy implications for supranational authorities. They should not only be wary of banks shrinking their assets (Hanson, Kashyap, and Stein (2011), Gropp et al. (2019)), but also of regulatory capital inflation via a reduction in RAs, possibly assisted by national regulators. This problem could be mitigated by requiring banks to increase their BE (via the issuance of common shares or retained earnings) instead of targeting the capital ratio or levels of regulatory capital.

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S002210902300025X.

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