ELACs Not TLACs: CoCo Design and Troubled Bank Shareholder Loss Mitigation*

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Abstract

Using hand-collected data (across 27 countries) on all contingent convertible capital bonds (CoCos) issued during 2009-2021, we identify a shift in design toward non-dilutive instruments with low CoCo trigger levels that specify positive wealth transfers from bondholders to stockholders upon bank failure, thereby transforming CoCos from TLACs (Total Loss Absorbing Capacity) to ELACs (Equity-protecting Loss Absorbing Capacity). If Credit Suisse's CoCos had not had ELACs, shareholder payoffs from the March 2023 failure would have declined 36.5%. Abnormal announcement returns for CoCos with ELACs are positive, reflecting ELACs' extreme loss mitigation for stockholders at the expense of debt holders. Systemic risk-reducing, dilutive CoCos without ELACs are more prevalent in common and French-civil law countries and have significantly negative announcement returns, reflecting costly managerial commitment to recapitalize troubled banks. Banks issuing CoCos without ELACs overperform during periods of high aggregate uncertainty.

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1 Introduction

Contingent convertible capital instruments (hereinafter, CoCos) were introduced to mitigate systemic risk by recapitalizing troubled banks while maintaining their going concern values. Reflecting this objective, CoCos have been mandated as part of bank regulatory capital requirements to fulfill Total Loss Absorbing Capacity (TLAC) provisions. In this paper, we show that shifts in CoCo security design have transformed CoCos from TLACs into so-called "ELACs," which is a term that we coin to mean "Equity-protecting Loss Absorbing Capacity." That is, rather than preventing the loss of a bank's going concern value by preemptively recapitalizing troubled banks, redesigned CoCos allow the bank to deteriorate until it cannot be salvaged. At that point, when the bank is no longer viable, redesigned CoCos mitigate losses borne by the original equity holders by transferring value in failure states of the world from CoCo bondholders and other claimants to managers and stockholders.

Using our comprehensive database of all CoCo originations from 2009 to 2021, we show that over recent years, CoCos have been redesigned to include an equity loss mitigation mechanism that limits (although does not eliminate) losses incurred by bank managers and pre-failure stockholders during bankruptcy. That is, in extreme tail loss events when the bank's equity value approaches zero, redesigned CoCos write down CoCo bond principal (either permanently or temporarily) and protect shareholders by providing them with a payout, thereby truncating losses incurred by the bank's original shareholders when the bank fails. Thus, redesigned CoCos with ELAC protection undermine stockholders' incentives to expend resources to recapitalize the bank in order to avoid CoCo conversion and bankruptcy. Consequently, the introduction of ELACs undermines CoCos' TLAC objectives to intervene early enough to prevent bank failure, and may explain why empirical studies such as Bah, Inghelbrecht, Shoors, Soenen, and Vennet (2023) show that CoCos no longer function as going concern recapitalization instruments. Importantly, Basel IV regulatory proposals to increase the prominence of CoCos in bank capital structure will further exacerbate this problem.

The gradual transformation in CoCo design over recent years is comprised of three major adjustments. First, CoCo trigger levels have been set so low that CoCos are not triggered early enough to preserve the bank's going concern value and prevent the bank's failure.[1] Indeed, the binding effective conversion mechanism is typically the regulator's discretion to declare a Point of Non-Viability (PONV) and close the bank. That is, in all cases, CoCo conversion was triggered by a regulatory declaration of a PONV when the bank's capital position was far above the CoCo mechanical trigger level; i.e., the CoCo-designated trigger was not binding. The second adjustment in CoCo security design is that instead of the equity converting CoCos modeled in most of the academic literature, e.g., Chen, Glasserman, Nouri, and Pelger (2017), CoCos increasingly take the form of permanent write-downs that allow shareholders to eliminate CoCo debt without diluting equity. The third adjustment in the contractual design of CoCos is that the terms of conversion have been altered so that they frequently mandate positive wealth transfers to stockholders from CoCo bondholders upon CoCo conversion.

These three recent shifts in security design have jointly undermined CoCos' efficacy as bank-wide, loss absorbers. Instead of preserving overall going-concern value, the bank's diminishing value is redistributed to equity holders at the expense of CoCo bondholders as the bank approaches non-viability. Although deleveraging is accomplished by conversion of even the redesigned CoCos, the issuance of ELACs (i.e., non-binding CoCo triggers with non-dilutive permanent write-down features and positive wealth transfers from CoCo bondholders to stockholders) distorts troubled bank extreme loss distributions. In low valuation states, as the bank approaches a potential regulatory declaration of a PONV, shareholders may view CoCo conversion as a loss-mitigating outcome for themselves. In lower tail states of the world when the bank's shareholders have little hope of recouping any going concern value, the regulator's declaration of a PONV that triggers CoCo conversion may

[1] Allen and Golfari (2022) show that CoCo triggers are overwhelmingly set to the minimum level permitted by local regulators; 72.9% of all CoCos issued from 2009 to 2019 had the minimum 5.125% regulatory capital trigger.

actually mitigate original shareholders' losses since permanent write-down CoCos eliminate the bank's debt obligations without diluting equityholders' stake. In addition, upon failure, bank shareholders may receive a positive wealth transfer and retain some equity that may provide a small ownership stake in an acquiring bank. In contrast, the trigger of equity converting CoCos (without ELAC protection) would have diluted shareholders' potential stake and transferred wealth from stockholders to CoCo bondholders. Thus, shareholders are more likely to undertake actions to prevent default and bank failure so as to avoid CoCo conversion when the bank's CoCos are structured as dilutive equity converting without positive wealth transfers (without ELAC protection) in contrast to non-dilutive, permanent write-down CoCos with positive wealth transfers (with ELACs). Indeed, Chen et al. (2017) show (in an online appendix) that shareholders have a stronger incentive to default earlier when CoCos are non-dilutive, thereby exacerbating the debt overhang problem. This tendency for bank stockholders to prefer bankruptcy (and CoCo conversion) to capital issuance and de-risking is exacerbated when CoCos have low triggers, are non-dilutive, and generate positive wealth transfers to stockholders from CoCo bondholders, as is increasingly prevalent in current contractual design.[2]

Bank shareholders understand this mechanism, as demonstrated by the prevalent rolling over of equity converting CoCos into write-down CoCos with ELAC protection. Indeed, even as the bank struggled financially, the venerable Credit Suisse converted in 2021 all of its substantial portfolio of equity converting CoCos to permanent write-downs.[3] March 2023 witnessed the impact of these restructured CoCos on the payoff to pre-failure stockholders. Under the terms of Credit Suisse's redesigned CoCos, Swiss regulators' declaration of a

[2]This incentive problem is qualitatively similar to the perverse incentive for depositors to run a solvent bank when the regulator has a strict intervention policy, as shown in Schilling (2023). In that setting, depositors accelerate their withdrawals in order to avoid potential losses due to either the regulator's liquidation of bank assets or inefficiency in the operation of the bank in receivership if the bank's condition were to further deteriorate. Similarly, in extreme low asset valuation states of the world, bank stockholders may withdraw further investment in the bank in order to receive CoCo wealth transfers that absorb some of the equity losses when regulators declare a PONV.

[3]Credit Suisse Bank's pre-failure holdings of CoCos as a proportion of all liabilities were above the 75th percentile of the distribution for all CoCos in our comprehensive sample of all CoCo issuance over the 2009-2021 period.

PONV on March 19, 2023 eliminated $17 billion in outstanding CoCo debt and transferred over $3 billion to equity holders. Despite ample warning over years of sub-par performance, the large amounts of CoCos outstanding did not function as a device to recapitalize the troubled bank as a going concern. Although Credit Suisse's regulatory capital position was far in excess of the CoCo conversion trigger,[4] Swiss bank regulators closed the bank and transferred the bank's residual value to the acquiring bank, UBS.[5]

Examining the impact of the demise of Credit Suisse on its original shareholders illustrates the detrimental effects of the newly designed CoCo bonds. Upon the declaration of the PONV and trigger of the CoCos, Credit Suisse shareholders received UBS common stock worth $3.2 billion as of March 2023. A capital gain of $2 billion on the distributed UBS shares as of March 2024 brought the total payoff received by Credit Suisse's original shareholders to $5.2 billion. If, counterfactually, Credit Suisse had not replaced its dilutive equity converting CoCos with non-dilutive permanent write-downs in 2021, the March 2023 PONV declaration would have created an additional 2.29 billion Credit Suisse shares that would have been assigned to former CoCo holders. Original Credit Suisse stockholders would have been diluted by 35%, so their March 2023 payment would have declined to $2.03 billion with $1.17 billion paid to former CoCo holders. Further, as of March 2024, the payoff to original shareholders would have declined to $3.3 billion in contrast to the $5.2 billion valuation actually realized, a decline of over 36.5%. Thus, although the regulator's decision to close the bank cost Credit Suisse's original shareholders the going concern value of the bank, the reliance on non-dilutive CoCos mitigated the size of that loss somewhat. Truncation of the loss distribution for equity holders undermines their incentives to recapitalize and de-risk the bank in order to avoid failure. Thus, in extremely low outcome states of the world, newly designed CoCos absorb some of bank equity holders' losses but do not prevent total loss of

[4]Credit Suisse's common equity tier 1 capital ratio was 14.1% as of the end of 2022, which increased to 20.3% after the CoCo write-down.

[5]Credit Suisse alone posted a 12.43 billion Swiss franc net profit, equivalent to $13.9 billion, for the first three months of 2023. Further indications of Credit Suisse's going concern value when the PONV was declared is the $29 billion accounting gain booked by UBS for buying Credit Suisse's assets for less than they were worth, and UBS' voluntary cancellation of its loss-protection agreement with the Swiss government.

the bank's going concern value. Hence, ELACs as opposed to TLACs.

There are two alternative macroprudential perspectives with which to view the impact of this CoCo design transformation. The salubrious interpretation is that newly designed CoCos provide regulators with more flexibility to accelerate the declaration of a PONV, thereby reducing the costs of troubled bank resolution. That is, bank supervisors can eliminate the bank's CoCo debt obligations with a side payment to shareholders, thereby reducing debt obligations that increase the cost of resolution. Alternatively, however, the redesign of CoCos redistributes bank value in low asset valuation states of the world from debtholders, deposit insurance providers and CoCo bondholders to managers and stockholders. This may mitigate managerial incentives to reduce risk and recapitalize the bank to prevent regulatory intervention, thereby destroying bank going concern value and possibly engendering systemic risk.

In this paper, we distinguish between these two alternative perspectives by analyzing equity price reactions to the announcement of CoCo issuance. Abnormal equity announcement returns may reveal information about unobservable regulatory or managerial actions in low-valuation states. If CoCo redesign reduces the cost of regulatory intervention as in the first perspective, we should observe a negative equity price reaction since the cost of closing the bank through a declaration of a PONV has been reduced, thereby making it more likely for shareholders to lose the bank's going concern value through regulatory intervention. However, if bank shareholders view redesigned CoCos as an equity loss-reducing opportunity to receive a stipulated residual payment upon their exit from a failing institution in low valuation states, then we would observe a positive equity price reaction. Further, the absence of this equity loss absorption in CoCo design should have a negative stock price reaction only if the second explanation prevails, since these banks' shareholders choose a costly CoCo structure that eschews their guaranteed wealth transfer upon exit in low valuation states. Our findings are consistent with the second explanation. Announcement returns on issuance of redesigned CoCos with ELAC protection have statistically and economically significant positive price reactions, whereas issuance of traditional CoCos without ELACs have negative equity announcement returns.[6] Further, we find decreases in systemic risk only upon issuance of traditional CoCos without ELAC protection, consistent with the detrimental impact of ELACs on macroprudential stability.

In this paper, we also identify and refine the measurement of the wealth transfers used in Berg and Kaserer (2015) to reflect the evolution in CoCo security design.[7] Employing these measures, our results show a statistically significant (at the 1% level) cumulative abnormal return of -2.20% over the 29 days following the announcement of CoCo issuance involving stockholder wealth transfers in the lowest tercile.[8] Notably, these CoCos lack ELAC stockholder protection by design. Conversely, when banks with significant amounts of outstanding CoCos (ranking in the top decile of CoCo issuers) announce non-dilutive CoCo issuance with ELAC protection, the market responds positively, showing an abnormal return of approximately 5% over the 29 days following the announcement date. This outcome aligns with bank shareholders' recognition of the equity value associated with the redistribution of bank value from debtholders and other claimants to stockholders in low asset valuation regimes.[9]

Since CoCo security design is endogenously determined, we analyze the decision to issue redesigned CoCos. Based on La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998) and

[6]If CoCo bonds were efficiently priced to reflect these tail risk incentives and cash flow transfers, then there would be no equity price reaction at all to CoCo announcements. However, Allen and Golfari (2022) show that while CoCo yields are sensitive to time to first call and other features, they do not reflect the CoCo's loss absorption mechanism. Indeed, anecdotal evidence suggests that CoCos with ELAC protection do not have higher yields as compensation for wealth transfers from CoCo bondholders as compared to the yields on dilutive CoCos without ELACs. For example, Santandar announced two CoCos in September 2017: the equity converting CoCo (without ELACs) had an issue yield of 5.25% as compared to 4.91% for permanent write-down CoCos with ELACs. Similarly, in 2015, HSBC issued an equity converting CoCo with 6% yield and an ELAC-protected permanent write-down CoCo with a 5.95% yield.

[7]We introduce a novel wealth transfer measure that incorporates the embedded write-up option that has been introduced into the temporary write-down CoCos that comprise most of the issues since 2014.

[8]We utilize a long event window because, in many instances, specific terms required to measure the mandated wealth transfer upon conversion are not available until the date of issue, which may occur several weeks after the announcement date.

[9]Bolton, Jiang, and Kartasheva (2023) interpret the widespread disapproval of Credit Suisse's CoCo write-down in March 2023 as a sign that the stock market misunderstood CoCos' original purpose as going concern instruments that absorb losses before equity. Our findings suggest that bank stockholders understand and price these features.

Levine, Lin, Ma, and Xu (2023), we use legal origin as an instrumental variable to estimate the stockholder wealth transfer specified in the CoCo's design. We find that CoCos with more dilutive terms of conversion (i.e., without ELAC protection) are more likely to be issued in common law and French-civil law countries with weak debtholder legal protections. That is, to attract CoCo bondholders in low creditor-rights countries, stockholders are more likely to issue more dilutive CoCos that voluntarily eschew the opportunity to shift value from CoCo bondholders and other stakeholders to equity holders in the event of bank failure. Controlling for endogeneity in CoCo security design increases the magnitude of the announcement effects. We find that bank equity returns are significantly negative, reaching -8.99% (at the 5% level), over the 29 days following the announcement of dilutive CoCos that do not have ELAC protection.

Given the negative announcement effects for CoCos without ELAC protection, banks would only issue these CoCos because of regulatory capital requirements. However, all CoCos (both with and without ELACs) are treated equally in capital regulations. Therefore, the omission of ELAC protection from CoCo design sends a costly signal of shareholders' unobservable commitment to de-risking and maintaining the bank as a going concern. In contrast, redesigned CoCos suggest shareholders' willingness to put the troubled bank to regulators in exchange for the undiluted, CoCo-mandated shareholder wealth transfer. Indeed, we find a trend in our analysis that CoCo rollovers are more likely to introduce ELACs when the bank is closer to default. Thus, CoCo design announcements reveal costly signals of managerial intent, aligning with the observation that banks in common law and French civil law countries are less inclined to issue redesigned CoCos. By abstaining from ELACs, bank managers in countries with weaker debtholder legal protections convey their intent to implement risk reduction policies to prevent bank failure. Indeed, after acquiring Credit Suisse, UBS sent a signal of managerial intent to reassure CoCo investors by announcing the possible issuance of new equity-converting CoCos (without ELAC protection) to replace the written-down $17 billion of Credit Suisse CoCos.[10]

This information channel is further evident in our analysis of post-announcement monthly equity returns during periods of high and low aggregate uncertainty. We create an arbitrage portfolio that involves buying banks issuing more dilutive CoCos (without ELAC protection) and selling those issuing less dilutive CoCos (with ELACs). In non-stress periods, these portfolios yield a statistically significant (at the 5% level) negative alpha of over 50 basis points monthly, reflecting the loss of ELAC protection for stockholders. Conversely, during periods of market instability and uncertainty, the arbitrage portfolio achieves positive and statistically significant (at the 5% level) alphas exceeding 20 basis points monthly.[11] In such times, dilutive CoCos (without the destabilizing CoCo redesigns) generate positive equity alpha returns, aligning with the equity market's recognition of the managerial signal to reduce bank failure risk when economic downturns are looming.

Finally, we show that non-dilutive CoCo issuance increases bank systemic risk-taking, thereby failing to provide the social benefits that motivated its inclusion in bank capital requirements. Specifically, bank-specific systemic risk, as measured by ΔCoVaR (Adrian and Brunnermeier, 2016), decreases by 21.9% compared to the unconditional sample average, but only for banks issuing dilutive CoCos with the lowest stockholder wealth transfer (i.e., without ELAC protection). Importantly, CoCos with ELAC protection increase systemic risk as measured by the marginal expected shortfall (MES), while this is not the case for CoCos without ELACs. In essence, the systemic risk benefits intended by CoCo designers for their inclusion in bank regulatory capital requirements are realized, but solely for dilutive CoCos that lack ELAC protection. This suggests that the transformation in CoCo design has a destabilizing macroprudential impact.

Other studies have also raised concerns about the excessive risk-taking incentives associated with CoCos. For instance, Koziol and Lawrenz (2012) highlight the incomplete contract

[10] "UBS sounds out investors over first AT1 sale since Credit Suisse rescue." *Financial Times*, Sep. 2023.

[11] We measure market stress using three alternative metrics: VIX, the COVID pandemic, and the Global Economic Policy Index of Baker, Bloom, and Davis (2016).

nature of CoCos, which can amplify managerial risk-taking incentives. Indeed, Hilscher and Raviv (2014) propose an option-theoretic model to address perverse risk-taking incentives in CoCos by adjusting conversion ratios and other terms. However, contemporary CoCos have been redesigned to exacerbate these incentives by specifying low regulatory CoCo triggers and positive wealth transfers to stockholders.

In contrast, Avdjiev, Bogdanova, Bolton, Jiang, and Kartasheva (2020) find that between 2009 and 2015, CoCo-issuing banks in advanced countries reduced risk-taking, as evidenced by lower CDS spreads. This risk reduction was particularly notable for banks issuing CoCos with high triggers compared to those without mechanical triggers, consistent with the role of high triggers in mitigating the shift to perverse risk-taking regimes. However, it is worth noting that since 2014, Basel III mandated all CoCos to have a mechanical trigger not lower than 5.125% to qualify as AT1 (Alternative Tier 1) capital, thereby eliminating the issuance of the CoCos shown to reduce bank risk in Avdjiev et al. (2020). We extend their analysis by including CoCos issued after 2014 and controlling for dilution and wealth transfer mechanisms.[12]

The rest of the paper is organized as follows. Section 2 introduces our novel wealth transfer measure and outlines our extensive CoCo database. Section 3 presents the key empirical findings and Section 4 concludes the paper.

2 Data, Measures, and Sample Description

2.1 A Novel Wealth Transfer Measure

At its inception, the history of CoCos was dominated by instruments with equity conversion loss absorption mechanisms. These CoCos' terms of conversion specify a predetermined conversion rate resulting from a contractually stipulated fixed or floor stock price to be

[12]Other studies measuring possible risk-taking incentives include Hilscher and Raviv (2014), Allen and Golfari (2022), Goncharenko, Ongena, and Rauf (2021), Goncharenko (2022) and Fatouh, Neamt, and van Wijnbergen (2022).

used in determining the number of shares that CoCo holders receive when the conditions of a trigger event are reached. For CoCos of this type, the direction of the wealth transfer is always from stockholders to CoCo holders, although the amount depends on the idiosyncratic terms of conversion and the projected value of the equity upon CoCo trigger.

However, the industry has progressively shifted away from equity conversion loss absorption mechanisms in favor of write-down instruments. The earliest innovation was to issue permanent write-down CoCos, in which the CoCo principal is simply written down in full and permanently upon declaration of a trigger event. Thus, the wealth transfer of these CoCos' structures is unambiguously equal to their par value in favor of shareholders, denoted as a wealth transfer of +1.[13]

As CoCo security design evolved further in 2014, the *temporary* write-down CoCo emerged as the dominant design, especially among European bank issuers. The loss-absorption mechanism of these instruments differs from the others in multiple ways. First, upon reaching their trigger level, they absorb losses by writing down only the portion of their notional value necessary to reestablish their issuer's compliance with regulatory capital minima. Second, they stipulate that they will absorb losses *pari passu* with other CoCos issued at the same trigger level. Finally, as their name implies, their contracts include provisions for the issuer to gradually write up their notional value following a trigger event when the bank's financial position recovers, potentially making the write-down event temporary.

Because of these features, the wealth transfer measures used in Berg and Kaserer (2015), Goncharenko et al. (2021), and Allen and Golfari (2022) are subject to ambiguity emanating from the value of the embedded write-up option that impacts all debt instruments in the bank's capital structure. To illustrate this challenge, consider an issuer with three

[13]A small number of *partial* permanent write-down instruments were issued in the years preceding the introduction of Basel III regulations. Upon reaching their trigger level, these CoCos write down a predetermined percentage of their notional value and disburse to CoCo holders a cash payment equal to the balance. The potential of such a loss absorption mechanism to exacerbate a liquidity crisis, by requiring the issuer to deplete its cash position in a moment of financial distress, possibly triggering asset fire sales (Flannery, 2013, 2016), led the Basel Committee on Banking Supervision to explicitly prohibit this design starting from 2013 (Basel Committee on Banking Supervision, 2011).

outstanding instruments at the common 5.125% mechanical trigger level but with three different loss absorption mechanisms: equity converting, permanent write-down, and temporary write-down. Upon a breach of the trigger level (regardless of the magnitude of the breach), any permanent write-down CoCos would be depleted completely, and any equity conversion would see its notional value converted to shares at the contractually predetermined price. However, for temporary write-down instruments, the results of the trigger event would be determined by considering the remaining need for recapitalization of the issuer. If the losses absorbed by equity conversion and permanent write-down instruments are sufficient to replenish the issuer's capital position, the temporary write-down CoCos would not need to be written down at all. If further loss absorption capacity were indeed necessary, the loss would be spread among all the outstanding temporary write-down CoCos *pari passu*. Thus, calculating the shareholder wealth transfer on a temporary write-down CoCo entails evaluation of all securities in the capital structure at the point of conversion, and comparing the total to the bank's capital shortfall.

These CoCo design details impact inferences drawn from empirical analysis. For example, Avdjiev et al. (2020) find that CDS spreads are only significantly negative for the issuance of equity converting, AT1 CoCos. These CoCos are most likely to have dilutive wealth transfer mechanisms, consistent with the risk-reducing incentive effects we present in this paper. However, the loss absorption mechanism (equity converting versus permanent or temporary prinicpal write-down) is only imperfectly correlated with shareholder wealth transfers.[14] That is, upon conversion, whether equity converting CoCos transfer wealth from CoCo holders to shareholders or vice versa depends on the terms of the bond. Thus, we model and measure the shareholder wealth transfer in this paper because simply using their loss absorption mechanism is insufficient to differentiate between the economic impact of CoCo conversion on bank stockholders versus CoCo holders.

Our novel method carefully measures wealth transfers upon CoCo trigger using the

[14] Failure to measure the shareholder wealth transfer amounts for each loss absorption mechanism may explain the insignificant results on equity returns presented in Avdjiev et al. (2020).

specifics of all bond design details for all loss absorption mechanisms. We are the first to consider the impact of the trigger of temporary write-down CoCos on all debt instruments outstanding at the date of the CoCo trigger. For each CoCo issuance announced at time t, we estimate the expected market capitalization at the trigger event T as follows:

$$MVE_T = \frac{TriggerRatio}{CapitalRatio_t} \times MVE_t + NotionalValue. \tag{1}$$

MVE_T is the bank's expected market capitalization at the date of the trigger event T. $TriggerRatio$ is the contingent capital level of the trigger event. $CapitalRatio_t$ is the issuer's capital ratio at the time of issuance. The fraction captures the estimated market capitalization if the trigger were to occur ($TriggerRatio$) relative to the current value ($CapitalRatio$). MVE_t is the market capitalization of the issuer at the announcement date. $NotionalValue$ is the notional value of the CoCo (i.e., the amount issued). Following Berg and Kaserer (2015), this estimate relies on the conservative assumption that the market price of equity would follow the movements in capital ratios one-to-one.

For equity conversion CoCos, we then estimate the expected wealth transfer to equity holders at the announcement date t using the following equation.

$$WT_t^0 = NotionalValue - \frac{ShareCoCo_T}{TotalShares_T} \times MVE_T. \tag{2}$$

WT_t^0 is the expected wealth transfer to equity holders. $SharesCoCo_T$ is the number of shares CoCo holders receive in a trigger event. $TotalShares_T$ is the total outstanding shares after the trigger event. $MarketCap_T$ is from Equation (1). A positive value of WT_t^0 indicates a net wealth transfer in favor of equity holders and negative to CoCo holders in a trigger event.

For permanent write-down CoCos, $SharesCoCo_T$ equals 0 and the wealth transfer equals the CoCo's notional value ($NotionalValue$). In other words, when the trigger level is reached, the instrument is written down to zero and equity holders receive the full notional value without share conversions.

While $SharesCoCo_T$ is also 0 for temporary write-downs, we also consider the entirety of the trigger-level breaches. To do so, we model a trigger event declared with a CET1 ratio that is 1.5% RWA below the trigger level and compute the total loss that needs to be absorbed to re-establish the issuer in compliance with the regulatory minima.[15] We refer to this amount as loss absorption capacity. Then, we consider the presence of equity conversion or permanent write-down CoCos at a higher or equal trigger level and deduct the notional values (i.e. amount issued) from the loss absorption capacity. Lastly, the remainder, the residual loss, is spread between all outstanding temporary write-down instruments at the same trigger level (*pari-passu*). This is measured by dividing the residual loss by the sum of all outstanding temporary write-down CoCos at the same trigger level, including the one being issued (i.e., Loss-Sharing Ratio = $\frac{\text{Residual loss}}{\sum_{\text{pari-passu}} \text{TWD}}$). The result is described in Equation (3).

$$WT_t = \begin{cases} WT_t^0 \times LossSharingRatio, & \text{if temporary write-down} \\ WT_t^0, & \text{otherwise.} \end{cases} \tag{3}$$

The resulting wealth transfer measure for each instrument, WT_t, is scaled by the individual CoCo notional values in our empirical analysis.

2.2 Data

We construct our baseline database by collecting security level information from Bloomberg.[16] For equity conversion CoCos, we hand-collect the structure of the contractually predetermined terms of conversion from each instrument's prospectus. This process provides us with the conversion price (fixed or floor) upon reaching the conditions for a trigger event, so we can determine the number of shares issued to CoCo holders upon the trigger event.

[15] The 1.5% RWA magnitude is chosen because it equals the amount of contingent convertible capital that baseline Basel III regulation allows in the Additional Tier 1 capital layer. Unreported results modeling larger breaches yielded similar results.

[16] As of October 1st 2022, there are 1,236 CoCos issued including those that were retired due to maturity or exercise of a call option by the issuer.

Issuers' balance sheet information is collected from Capital IQ by tracking the issuer using ISINs and issuers' names. The stock price information is from Datastream matched using the bank's name and home country.[17] Our baseline sample consists of 757 CoCo issues between January 2009 to December 2021 from banks in 27 countries with balance sheets and stock price information. See Allen and Golfari (2022) for a more complete description of the database and its construction.

2.3 Descriptive Statistics

Panel A of Table 1 presents the descriptive statistics of the baseline sample used in the analysis. The average market beta (BETA) of CoCo issuers is 1.190, showing the banks that issue CoCos are marginally more volatile than the national stock market in which the bank is incorporated. The average contingent wealth transfer between shareholders and CoCo holders (WT) is 66.00% so that in a trigger event, the average CoCo will transfer 66.00% of its notional value to shareholders, thereby reflecting the prevalence of less than fully dilutive (below 100%) CoCos. The sample mean of COCOOUT, measured as the current and pre-existing CoCos with trigger levels that are greater than or equal to the current issue scaled by total liabilities, is 1.925%. Equity conversion (EC), permanent write-down (PWD), and temporary write-down (TWD) CoCos account for 29.2%, 24.7%, and 46.1% of the sample respectively.

[Table 1 about here]

Following La Porta et al. (1998), we classify each issuer's country of incorporation based on its legal origin: 34.1% and 24.0% of the CoCos in the sample are issued by banks incorporated in common law (COMMON) or French-civil (FRENCH) law countries, respectively. The remaining banks that are not classified as either common or French-civil law are incorporated in German-civil law, Scandinavian-civil law, or in China. Panel B of Table 1

[17]Exchange rates are collected from the *freecurrencyapi* R package (Kukacka, 2023).

reports the top ten countries and banks by the number of CoCo issues. Our sample shows that financial institutions domiciled in the United Kingdom, India, Norway, Switzerland, and China issued the largest number of CoCos. More specifically, Lloyds Banking Group, Credit Suisse, Societe Generale, BNP Paribas, and UBS Group were particularly active.

3 The Relationship Between Equity Returns and CoCo Design Features

3.1 Announcement Effects of CoCo Issues: Univariate Tests

Our tests focus on the stock price reaction to announcement of CoCos with and without ELAC protection. Our key prediction is a positive relationship between the contingent wealth transfer measure and equity value. Specifically, we expect that more dilutive CoCos will lead to a decrease in equity value, whereas less dilutive CoCos will have the opposite effect. These effects are exacerbated by the presence of large amounts of CoCos in the bank's capital structure. That is, non-dilutive CoCos issued by banks with large amounts of CoCos outstanding hold valuable ELAC protection for stockholders that generates positive abnormal returns upon announcement. In contrast, CoCo announcements by banks that eschew ELACs (by issuing dilutive CoCos) are expected to generate negative abnormal returns for bank stockholders.

To calculate cumulative abnormal returns (CARs) upon CoCo issue announcement, we apply the market model (i.e. CAPM) to calculate daily excess returns.[18] Market beta is estimated on an estimation window of 250 days (with at least 50 valid returns) that ends 30 days before the CoCo issue announcement date. As our sample spans 27 different countries, we use the market return for each country as provided by Wharton Research Data Services

[18]Because our sample of issuers comes from 27 countries, we use the market model to incorporate the market returns of individual countries. This allows us to account for country-specific returns around the announcement dates. Fama-French factors are not available for each of the 27 countries in our sample.

(WRDS). Excess returns are then accumulated to measure CARs across various windows. The pre-announcement CAR stops on the day before the announcement date, while the post-announcement CAR begins on the announcement date.

Throughout our analysis, we use the wealth transfer measure (WT) from Equation (3). Specifically, we create an indicator variable, DILUTIVE, that equals 1 if the CoCo is in the lowest tercile of the WT distribution and 0 otherwise. For instance, a CoCo with DILUTIVE that equals 1 is interpreted as (comparatively) more dilutive, and thus more costly for shareholders upon a trigger event. A CoCo with DILUTIVE that equals 0 is (relatively) less dilutive and will transfer more wealth to shareholders upon a trigger event, thereby acting as an equity loss mitigation device (ELAC).

Figure 1 plots the univariate tests of CARs across various windows that lie between 5 days before the announcement date and 29 days after the announcement date.[19] Panel A plots the CARs of the more dilutive CoCos in the sample (DILUTIVE=1). Results show that issuing more dilutive CoCos leads to a persistent negative announcement effect. For instance, the negative abnormal return is estimated as roughly -1% for the first five trading days including the announcement date. The negative estimates increase in magnitude over time, reaching a CAR of -2.21% over 29 trading days. This result is consistent with the bank shareholders' loss of ELACs protection when dilutive CoCos are issued.

[Figure 1 about here]

Our results further indicate that the CARs for less dilutive CoCos are insignificantly different from zero. Panel B of Figure 1 plots the univariate tests for less dilutive CoCos (DILUTIVE=0). The CARs across various windows are estimated between -0.20% and 0.58% with no statistical significance.

[19] Since not all relevant information is released upon announcement, but only upon issuance, we incorporate an event window that includes issuance dates that often occur 20 days after the announcement. For example, some CoCo announcements leave blanks for certain terms or specify conversion terms based on the bank's closing stock price on the issuance date. The median (mean) number of days from announcement to issuance is seven (eight).

[Table 2 about here]

We further investigate the significance of the results on wealth transfer in Figure 1 by conducting mean-difference tests, comparing the estimates between Panels A and B. Table 2 reports the mean-difference tests, consistent with negative CARs for more dilutive CoCo issues (Column 3). Additionally, the tests reveal that the differences are statistically significant for post-announcement windows, but not the pre-announcement window (-5,-1). These findings suggest that the announcement effects primarily originate from the information that is made available after the announcement.

Next, we evaluate whether large proportions of outstanding CoCos affect equity value. We examine the announcement effects focusing on the right tail of the distribution of COCOOUT, a measure of outstanding CoCos calculated as the sum of outstanding CoCos scaled by total liabilities. Specifically, we sort the sample by COCOOUT and retain the top decile (77 CoCos). The findings, presented in Panel A of Figure 2, show a positive but statistically insignificant announcement effect. In contrast, the announcement effects for non-dilutive CoCos that represent large components of the bank's debt structure (Panel B of Figure 2) are positive and significant (at the 5% level). Thus, the value of ELAC equity loss mitigation is shown to be larger when the bank has large amounts of CoCos outstanding.

[Figure 2 about here]

3.2 Announcement Effects of CoCo Issues: Regression Analyses

In this section, we revisit the findings presented in the previous section using multivariate regression analysis. We hope to shed light on conflicting results in the literature that is comprised of studies using more restricted samples than ours and that do not account for shareholder wealth transfers. For example, Liao, Mehdian, and Rezvanian (2017) report negative CARs for CoCos issued between 2010 to 2014, whereas Ammann, Blickle, and Ehmann (2017) document positive CARs for a small sample of CoCos issued between 2009 and 2014.

In this paper, we use the following regression equation for a CoCo issue j in year t to evaluate the announcement effects on equity value.

$$CAR_{j,t} = \beta_1 DILUTIVE_{j,t} + \beta_2 COCOOUT_{j,t} + CONTROLS_{j,t} + \varepsilon_{j,t}. \quad (4)$$

We include year-fixed effects and cluster standard errors by calendar years throughout our regression analyses to account for potential unobservable year-specific effects and serial correlations within years. The dependent variable is the cumulative abnormal return (CAR) computed in Section 3.1. To control for potential differential effects of CoCo issues across issuers' characteristics (e.g., see Goncharenko, 2022), we include a vector of control variables that are observable at the time of issuance ($\text{CONTROLS}_{j,t}$). These variables are the natural log of market capitalization in USD (MKTCAP), return on equity (ROE), the difference between the capital ratio and the CoCo trigger level (DIST), and book leverage (BOOKLEV). We also include an indicator variable ROLLOVER that equals 1 if the CoCo is a rollover, otherwise 0.[20]

The regression results using Equation (4) are presented in Table 3. Across all columns, the coefficients of DILUTIVE are negative, indicating the negative CARs for more dilutive CoCos. The estimates show a -1.26% CAR within the first 9 trading days after the CoCo issue announcement (Column 2). Column 4 indicates the negative impact reaches a statistically significant (at the 5% level) coefficient of -1.70% by the 29$^{\text{th}}$ trading day after the announcement. The increase in the magnitude of DILUTIVE from Column 1 to Column 4 is consistent with Panel A of Figure 1. Yet, the magnitudes overall are smaller than the univariate tests, which implies the announcement effects are influenced by unobserved year-specific effects and bank control variables.

[Table 3 about here]

[20]Detailed variable descriptions are provided in Appendix A.1.

The impact of large proportions of outstanding CoCos, as estimated by the coefficient of COCOOUT, is positive and consistent with the findings presented in Figure 2. We observe a statistically significant (at the 5% level) increase in the CAR for the (-2,2) window around the announcement date as the proportion of outstanding CoCos increases (Column 1). Additionally, the magnitude of the effect persists and even increases over time. Interestingly, the distance to the CoCo trigger (variable $DIST$) is not statistically significant, suggesting that the trigger levels are not binding.

Avdjiev et al. (2020) also examine the impact of CoCo issuance on equity returns. Rather than measuring announcement effects using CARs, they follow James (1987) and compute average cumulative prediction errors (ACPE) for a subsample of 170 banks in advanced economies that issued CoCos between January 2009 and December 2015. They find no statistically significant results for their full sample. However, they find a statistically significant (at the 5% level) positive announcement effect for permanent write-down CoCos with mechanical triggers exceeding 5.125%. However, these results are not generalizable since higher trigger CoCos are mandated by bank regulators in the U.K. and Switzerland. To compare our results to those of Avdjiev et al. (2020), we estimated CARs for the 526 CoCos from advanced economies in our comprehensive sample containing all CoCos issued between January 2009 and December 2021.[21] Appendix Table A.2 shows that in developed countries, the cumulative abnormal returns are most significant in the 10-day window, aligning with the average number of days required until the information related to terms of conversions is made available. The negative effects of dilutive CoCos without ELAC protection persist until the 30-day window. Further, to establish the robustness of our results, we use the methodology employed by Avdjiev et al. (2020) and estimate ACPEs for our full sample. The results presented in Appendix Table A.3 are consistent with our results using CARs presented in Table 3.

The findings suggest that the announcement effects of dilutive conversion terms and large

[21]Developed countries include the United Kingdom, Norway, Switzerland, France, Spain, Japan, Denmark, Finland, Ireland, Sweden, Germany, Netherlands, Australia, Belgium, Austria, Italy, Canada, and Portugal.

proportions of outstanding CoCos are closely interrelated. Specifically, CARs are negative for more dilutive CoCos, while the CARs for less dilutive CoCos are positive if there are substantial amounts of outstanding CoCos. We empirically test this conjecture by including an interaction term in Equation (4) as presented below:

$$\begin{aligned} CAR_{j,t} =& \beta_1 DILUTIVE_{j,t} \cdot COCOOUT_{j,t} + \beta_2 DILUTIVE_{j,t} + \\ & \beta_3 COCOOUT_{j,t} + CONTROLS_{j,t} + \varepsilon_{j,t}. \end{aligned} \tag{5}$$

Intuitively, we seek to determine whether more dilutive CoCos and significant proportions of outstanding CoCos represent opposing sides of the same phenomenon. To this end, we evaluate the interaction (β_1) alongside the joint significance of all three variables (β_1, β_2, and β_3).

Table 4 reports the results obtained using Equation (5). In Column 1 for the (-2,2) event window, we find that around the announcement date, the proportion of outstanding CoCos is positively associated with abnormal returns ($\beta_3 > 0$). However, if the issue is more dilutive, the effect is reversed ($\beta_1 + \beta_3 < 0$).[22] The ELAC protection value emanates from stockholders' ability to put a portion of the bank's losses to CoCo holders, which requires less dilutive CoCo instruments. In the longer horizons (Columns 2 to 4), the coefficient estimates of β_1 in Equation (5) are found to be statistically insignificant, while the estimates of β_2 and β_3 are consistent with Table 3. Moreover, the joint significance of the DILUTIVE, COCOOUT, and the interaction term lies within a range of 99% for all columns.

[Table 4 about here]

[22] Although not reported, we find that the variables COCOOUT and COCOOUT × DILUTIVE in Column 1 of Table 4 are jointly significant statistically at the 0.1% level.

3.3 The Impact of Legal Origins on CoCo Security Design

This section explores the endogeneity in CoCo security design.[23] Specifically, we investigate whether the legal origins of the countries where the issuing banks are incorporated impact the CoCo design features. To achieve this, we consider a regression with the dependent variable set to the wealth transfer measure embedded in CoCo design taken from Equation (3), as follows for a CoCo issue j in year t:

$$WT_{j,t} = \beta_1 COMMON_j + \beta_2 FRENCH_j + CONTROLS_{j,t} + \varepsilon_{j,t} \tag{6}$$

where the disturbance term, ε_t, includes year-fixed effects. The model includes two indicator variables, namely COMMON and FRENCH, which are assigned a value of 1 if the issuer is incorporated in a common law or French-civil law country, respectively, and 0 otherwise (La Porta et al., 1998). The benchmark legal origins are German civil law, Scandinavian civil law, and China. In addition, we include our standard vector of control variables (CONTROLS) consisting of market capitalization (MKTCAP), profitability (ROE), distance from the trigger level (DIST), book leverage (BOOKLEV), rollover indicator (ROLLOVER), and the ratio of outstanding CoCos (COCOOUT) to total liabilities.

[Table 5 about here]

In Column 1 of Table 5, we find that banks that are incorporated in common law countries tend to issue CoCos with low shareholder wealth transfer, or relatively more dilutive CoCos. In Columns 2 and 3, we replace the dependent variable with an indicator variable, DILUTIVE, and apply the linear probability model and probit regression. We find that consistent with the results in Column 1, banks incorporated in common law countries (and also French-civil law countries) are 32.9% more likely to issue CoCos that are dilutive (Column 2).

[23] Avdjiev et al. (2020) model the decision to issue CoCos. In this section, we model the design of CoCos conditional on their issuance, which is mostly driven by regulatory requirements.

There are several interpretations for these results. One plausible explanation relates to creditor rights. In certain legal systems, when a company undergoes a reorganization process, the existing management team is allowed to continue until the process is completed. According to La Porta et al. (1998), this is least frequent in common law and French-civil law countries, showing that management is penalized as a consequence of bankruptcy. Another way of penalizing incumbent managers is to issue dilutive CoCo that results in negative wealth transfers upon the trigger. This can reduce moral hazard risk-shifting incentives of management.

Moral hazard concerns are particularly problematic when the quality of legal enforcement is relatively lax. In La Porta et al. (1998), the quality of legal enforcement refers to a country having (i) an efficient judicial system, (ii) rule of law, (iii) low corruption, (iv) less risk of expropriation, and (v) less risk of contract repudiation by the government. La Porta et al. (1998) documents evidence of Scandinavian and German-civil law countries having a higher quality of legal enforcement relative to common law and French-civil origin countries. Strict legal enforcement may mitigate the likelihood that management undertakes risk-enhancing projects that increase the value of ELAC protection. Thus, we hypothesize that non-dilutive CoCos are more feasible in Scandinavian and German civil law countries. Conversely, common law and French-civil law origin countries with weaker legal enforcement conditions are more likely to issue more dilutive CoCos to control managerial risk-taking incentives.

Using the findings on wealth transfer and legal origin, we re-estimate Equation (4) to establish a causal impact of wealth transfer on equity value. To do so, we estimate Equation (6) using the linear probability model as the first-stage regression and use the following equation in the second-stage regression:

$$CAR_{j,t} = \beta_1 DI\widehat{LUTI}VE_{j,t} + \beta_2 COCOOUT_{j,t} + CONTROLS_{j,t} + \varepsilon_{j,t}. \tag{7}$$

The variable $\mathrm{DI\widehat{LUTI}VE}$ is the fitted value from Equation (6) using DILUTIVE as the dependent variable (as reported in Column 2 of Table 5). The legal origin indicators, COMMON and FRENCH, serve as instruments to isolate the causal effect of wealth transfer on the announcement effects.

Table 6 reports results from the second stage of this two-stage least square estimation (2SLS). Across all columns, we find that the wealth transfer identified through the legal origins has a negative impact on the announcement returns. The effect is weaker than the previous results around the announcement date and in the first 10 trading days (Columns 1 and 2) but is larger in magnitude for the longer windows (Columns 3 and 4). The estimate reaches -8.05% after 30 trading days (Column 4). The coefficient estimates of COCOOUT are consistent with the results from Table 3 as to both magnitude and significance.

[Table 6 about here]

To ensure the validity of the legal origins as instruments for our wealth transfer measure, we report the statistics on the weak instrument test and the test of overidentifying restrictions. The first-stage F-statistics are statistically significant across all columns, thereby rejecting the null hypothesis that the legal origins are weak instruments. Additionally, the Sargan tests of overidentifying restrictions yield p-values exceeding 20%, which demonstrates the validity of the instruments and their correct exclusion from Equation (7). Based on these results, we conclude that the usage of legal origins as instruments for the wealth transfer measure is robust for our empirical tests on equity value.

3.4 CoCo Rollover and The Evolution of CoCo Design

The history of CoCo issuance follows three phases, as outlined in Allen and Golfari (2022). Initially, between 2009 and 2012, the first phase predates the inception of Basel III guidelines. This phase is distinguished by a diverse array of CoCo designs. Subsequently, a second phase emerges starting in 2013, primarily dominated by European issuers. During this period, there is a pronounced shift towards aligning regulatory capital structures with the parameters required by the CRD IV capital regulations (CRDIV, 2013). Lastly, from 2016 onwards, a third phase materializes, characterized by the widespread adoption of CoCos on a global scale, with the notable exception of U.S. banks. This phase is marked by a surge in issuance volumes, particularly by Asian banks.

In this section, we evaluate whether banks are more likely to adopt the redesigned CoCo terms when they refinance outstanding CoCos, thereby allowing banks to acquire ELAC protections. The rollover decisions begin during the second stage of CoCo development, coinciding with banks' calling of outstanding CoCos usually in the wake of the exercise of embedded first call options. These rollovers also reflect regulators' acceptance of the redesigned CoCo bonds. We hypothesize that troubled banks are more likely to introduce ELACs into their CoCos upon rollover in order to protect equity holders in the event that regulators close the bank. We proxy for the likelihood that regulators will declare a PONV using the distance between the bank's equity capital and the CoCo trigger level on the newly issued rollover CoCo, denoted DIST. To test our hypothesis, we re-estimate equation (6), but include an interaction term between the variables DIST and ROLLOVER (a dummy variable that equals 1 for CoCos issued to replace earlier CoCos).

[Table 7 about here]

The results are presented in Table 7. Columns 1, 2, and 3 report results including the interaction term between DIST and ROLLOVER but using different regression models. Across all three columns, the interaction term is statistically and economically significant, where a 1% decrease in the distance to the CoCo trigger leads to a 6.1% lower likelihood of a bank issuing a dilutive CoCo without ELAC protection (using the coefficient estimate in Column 2). This is consistent with a greater likelihood that troubled banks (with lower DIST) are less likely to issue dilutive CoCos (without ELACs) and will instead issue newly designed CoCos that offer downside risk protection to equity holders.

3.5 Arbitrage Portfolios Reflect Information about Managerial Intent

Our empirical findings suggest that the value of ELAC protection is reflected in equity returns. That is, positive abnormal equity announcement returns are earned when banks issue large amounts of less dilutive CoCos. However, some banks continue to issue more dilutive CoCos, albeit at a cost to their shareholders. In the following sections, we investigate the *ex-post* issuance benefits associated with more dilutive CoCos (i.e., without ELAC protection). We gauge these effects by constructing an equally weighted arbitrage portfolio of bank equity based on the wealth transfer characteristics of all of the CoCos issued by each bank. Each month, we look back three years and collect all CoCo issues.[24] Then, we sort the CoCo issues by the wealth transfer measure from Equation (3). We take a long position on the stocks of banks that issued at least one CoCo that is below the median wealth transfer measure (i.e. relatively more dilutive, with less valuable ELACs) and take a short position on the stocks that issued at least one CoCo that is above the median of wealth transfer measure (i.e. relatively less dilutive, with more valuable ELACs). We assign a bank to the long portfolio if the bank issued both types of CoCos within the three-year look-back period. The long-short arbitrage portfolio is rebalanced each month. Due to the limited number of CoCo rollovers in the earlier part of our sample period, we construct arbitrage portfolios in October 2014 and continue until December 2021.

The monthly portfolio returns are regressed on the Fama-French monthly five factors using the following time-series regression equation.[25]

$$RET_t = \alpha + \beta_1 MKT_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t + \varepsilon_t. \quad (8)$$

The focus of our analysis is on the relative performance of the long portfolio against the

[24] The choice of three years comes from the fact that the CoCos are typically called back by the banks within five years.

[25] Due to the sample of bank equities from multiple countries within the portfolios, we use the Fama-French developed countries factors.

short portfolio (estimate of α) after controlling for the differential exposures of the long and short portfolio to the Fama-French risk factors. The estimate of α will be negative if the issuance of more dilutive CoCos is associated with subsequent stock underperformance and vice versa.

Column 1 of Table 8 presents the results using Equation (8). We find a negative but insignificant underperformance of the long portfolio relative to the short portfolio in the amount of 37.8 basis points per month. Thus, the equity value of ELACs protection for the short portfolio is greater than the equity value for those banks without ELACs, reflecting the value of equity loss mitigation during non-crisis periods. However, the contingent wealth transfer of CoCos does not have a significant impact on future stock returns on average, after controlling for the Fama-French five factors.

[Table 8 about here]

Next, we investigate the value of ELACs during crisis periods. Specifically, we expect that the value of ELAC protection decreases for banks that issue more dilutive CoCos during crisis periods. That is, bank managers and stockholders have more incentives to precipitate bank failure (the PONV) the less dilutive their CoCos and, therefore equity loss mitigation value transfers from CoCo holders to stockholders are more likely to be exercised during crisis periods. This should reduce bank equity returns for banks issuing non-dilutive CoCos relative to banks issuing dilutive CoCos. Thus, we hypothesize that the stock performance of issuers of CoCos with different embedded ELAC protection may diverge during periods characterized by elevated market volatility and uncertainty. To investigate this, we include an indicator variable in Equation (8), denoted as VIXH, which takes a value of 1 when the VIX is higher than the sample median and 0 otherwise. The regression equation for this model is as follows.

$$
\begin{aligned}
RET_t = \alpha_0 + & \alpha_1 VIXH_t + \beta_1 MKT_t + \beta_2 SMB_t + \\
& \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t + \varepsilon_t.
\end{aligned}
\tag{9}
$$

In equation (9), the sum of α_0 and α_1 estimates the relative performance of the long portfolio during periods of high aggregate uncertainty. In our analysis, we also substitute two alternative indicator variables for VIXH to measure different dimensions of aggregate uncertainty. The first is denoted as EPUH and takes a value of 1 when the Global Economic Policy Uncertainty Index (Baker et al., 2016) is above the sample median, and 0 otherwise. The second is denoted as COVID and takes a value of 1 when the portfolio is formed during and after the onset of the COVID-19 pandemic period, and 0 otherwise.

The results are presented in Columns 2 through 4 in Table 8. In Column 2, we observe that the long portfolio under performs by a statistically significant (at the 5% level) 99.5 basis points per month during periods of low aggregate uncertainty, but outperforms by 23 basis points (= 1.23% − 0.995%) per month during high uncertainty periods. This result is consistent with banks that issue more dilutive CoCos (without ELACs) having a lower ability to transfer value to stockholders from other bank claimants as the likelihood of bank failure increases during periods of high aggregate uncertainty. Furthermore, we observe a statistically significant joint impact of the two estimates (α_0 and α_1). Substituting VIXH with alternative indicator variables, EPUH and COVID, produces similar estimates, where applying EPU yields the strongest result (Column 3). Thus, during crisis periods, the equity value of the banks without ELACs exceeds the equity value of banks in which incentives exist for shareholders to precipitate bank collapse.

The results in this section demonstrate that the issuance of CoCos have a discernible impact on future stock returns that varies by aggregate uncertainty. Specifically, banks that issue more dilutive CoCos (i.e., without ELACs) exhibit weaker performance during periods of low aggregate uncertainty but perform better during periods of high aggregate uncertainty. These findings are most consistent with the destabilizing impact of the transformation of CoCo design to include ELACs. That is, the ELAC-mandated transfer of value from debtholders to stockholders is more likely to occur during high-stress periods, thereby reducing shareholder incentives to recapitalize troubled banks, destroying banks' going concern value, exacerbating aggregate systemic risks, and undermining macroprudential objectives. Dilutive CoCos do not have ELACs, and thus, do not have the same incentives to increase risk (indeed, shareholders have incentives to de-risk to avoid dilutive CoCo conversion), thereby earning positive alpha equity returns during high-stress periods when the risk of bank collapse is relatively high. Importantly, these results highlight the original motivation for CoCo inclusion in regulatory capital. That is, CoCos were originally designed to dilute shareholders, and thereby incentivize more prudent behavior as the bank approaches the CoCo trigger level, which was to be set high enough to rescue the bank before its going concern value was irretrieivably lost. Our analysis suggests that CoCos no longer perform this function. In the next section, we examine the impact of CoCo security design on systemic risk-taking.

3.6 ELACs and Systemic Risk

In this section, we explicitly examine the association between CoCo issues and the level of systemic risk exhibited by banks. We focus on systemic risk for two reasons. First, CoCos were introduced to mitigate bank systemic risk exposure. Second, since systemic risk is external to the individual bank, it is not priced in equity returns.

To test this, we use the following regression equation for CoCo issues j announced in year t:

$$SYSRISK_{j,t+1} = \beta_1 DILUTIVE_{j,t} + \beta_2 COCOOUT_{j,t} + CONTROLS_{j,t} + \varepsilon_{j,t+1} \qquad (10)$$

where the disturbance term, $\varepsilon_{j,t+1}$, includes year-fixed effects. As dependent variables, we employ two measures that capture distinct dimensions of systemic risk. First, we use the ΔCoVaR, from Adrian and Brunnermeier (2016) to evaluate the issuer's contribution to systemic risk (i.e., the connectivity of the issuer). Second, we use the marginal expected shortfall (MES) to gauge the potential capital shortfall of the issuer in the event of market downturns that indicate systemic risk. The dependent variables are measured a year after the announcement. The control variables (CONTROLS) are the same as in Equation (3), except we further include the most recent estimate of the systemic risk measures.[26]

The results are presented in Table 9. In Column 1, the result indicates that issuing dilutive CoCos lowers the issuer's contribution to systemic risk. This finding suggests dilutive CoCos contribute to stabilizing systemic risks. Columns 2 and 3 report results using the average post-announcement MES evaluated at 95% and 99% thresholds, respectively. Importantly, in both columns, estimates show that the issuer's resiliency towards market-wide shock reduces for CoCos with ELACs after controlling for the connectedness of the issuer within the financial system (ΔCoVaR). These findings suggest CoCos with ELACs elevate the issuers' systemic risks.

[Table 9 about here]

3.6.1 CoCo Issuance and Bank Idiosyncratic Risk-Taking

Although not the major focus of our paper, we examine the relationship between CoCo design features and bank risk exposure. In Appendix A.4 we examine bank idiosyncratic risk-taking by using bank-level idiosyncratic risk measures as the dependent variables in Equation (3). First, we use the banks' equity volatility measured using the standard deviation of daily returns one year after the CoCo issue announcement date (VOL) to gauge the bank's overall risk exposure. Second, we use the fifth percentile and the first percentile of the empirical distributions of the daily equity returns one year after the CoCo issue announcement date (R5PCT and R1PCT) to measure the post-announcement bank-level negative tail risks of issuers. We include the most recent bank-level risk measure at the announcement date in the set of control variables.

Column 1 of Appendix A.4 reports results using the post-announcement equity volatility (VOL) as the dependent variable. Estimates show that the overall risk level is positively

[26] We do not include the lag of ΔCoVaR in Column 1 of Table 9 because of its slow-moving property.

associated with large proportions of outstanding CoCos (COCOOUT), consistent with the proportion of CoCos increasing the bank's risk-shifting incentives. Using the measure of bank-level tail risks of issuers further corroborates our findings on the risk-shifting incentives. Columns 2 and 3 report the result using the fifth and the first percentile of the empirical distribution of the post-announcement daily return (R5PCT and R1PCT) as the dependent variable, respectively. Consistent with Column 1, the coefficient estimate shows that larger proportions of outstanding CoCos increase the bank-level negative tail risks of issuers by lowering the left tail of the post-announcement daily return distribution.

In all columns, we do not observe a statistically significant reduction in *ex-post* equity volatility or negative tail risk for banks announcing the issuance of relatively more dilutive CoCos (DILUTIVE). This is consistent with the role of ELACs on tail risk exposure rather than volatility. Indeed, this can explain why other studies have inconsistent results regarding the relationship between CoCo issuance and bank idiosyncratic risk-taking. For example, Avdjiev et al. (2020) analyze CDS spreads and find risk-reducing results only for CoCos that are specified as AT1. However, Allen and Golfari (2022) identify an important role of AT1 CoCos in restricting bank regulators' ability to control bank risk-taking using Maximum Distributable Amount (MDA) limitations. Regulators employ MDA limitations as additional (Pillar 2) policy tools to require a troubled bank to increase its common equity capital cushion. Upon breaching the regulator's designated MDA threshold, restrictions are imposed on dividend payouts, coupon payments on some debt instruments (including CoCos), and variable remuneration and bonuses paid to bank managers and employees. Allen and Golfari (2022) demonstrate how CoCos are used by management to circumvent these limitations with the full understanding of market participants. That is, bank equity analysts regularly refer to a bank's "AT1 shortfall" if it has underutilized CoCos in fulfilling its capital requirements, thereby incurring excessive costs of capital compliance.[27] Thus, the findings in Avdjiev et al.

[27] In their theoretical model, Avdjiev et al. (2020) assume that issuance of AT1-classified CoCos has no impact on the bank's CET1 capital levels. However, Allen and Golfari (2022) show that common equity can be released and designated as a CET1 surplus when CoCos fill AT1 capital requirements in place of more expensive common equity issuance.

(2020) of negative CDS spreads upon issuance of CoCos for AT1 instruments may reflect the lowering of costs of capital for the bank rather than lower risk exposure. Thus, failure to consider the embedded options in CoCo design may explain inconsistent empirical findings in the literature.

4 Conclusion

We introduce the concept of "Equity-protecting Loss Absorbing Capacity," (ELACs) that has crowded out Total Loss Absorbing Capacity (TLAC) in banks' capital structures. ELACs truncate stockholder losses in extremely low bank asset valuation states. That is, if regulators declare a Point of Non-Viability (PONV) and trigger CoCo conversion, bank shareholders may receive wealth transfers from CoCo bondholders and other bank stakeholders. This holds only if CoCos are designed to transfer wealth to stockholders upon CoCo conversion, and if there are substantial amounts of CoCos outstanding in the bank's capital structure. Thus, we identify CoCos that are designed in this manner as having embedded ELACs that may undermine the bank's ability to reduce losses by removing shareholder incentives to recapitalize and de-risk as failure becomes imminent. Using our comprehensive sample of CoCo issues from 2009 to 2021, we show that the evolution in the design of CoCos has increased the prevalence of CoCos with ELACs equity loss mitigation. We provide evidence that this is destabilizing from a macroprudential perspective, and therefore CoCo design has eviscerated some of the original systemic risk reduction incentives envisioned when CoCos were introduced as regulatory capital components.

Indeed, the demise of the venerable Credit Suisse Bank illustrates the detrimental impact of large amounts of redesigned CoCos containing ELACs. In 2021, Credit Suisse converted all of its CoCo bonds into CoCos containing ELACs. When Swiss regulators declared a PONV in March 2023, the bank wrote down $17 billion in CoCos but equity holders received more than $3 million in value. We show that if Credit Suisse had not converted its CoCos in 2021, the outcome for shareholders of the bank's failure would have been dramatically worse, with equity payoffs falling 36.5%. Thus, the redesign of CoCos to include ELACs has mitigated some (though not all) losses to managers and stockholders when the bank fails. We find evidence that equity markets were well aware of the details of CoCo design in the Credit Suisse case, as well as more generally. Thus, announcement effects on CoCo issues reflect the loss mitigation value of redesigned CoCos with ELACs. Further, legal origins impact the choice of these features. Finally, banks that issue CoCos that are designed to eschew the loss mitigation protection of ELACs outperform other banks' stock returns during periods of high aggregate uncertainty.

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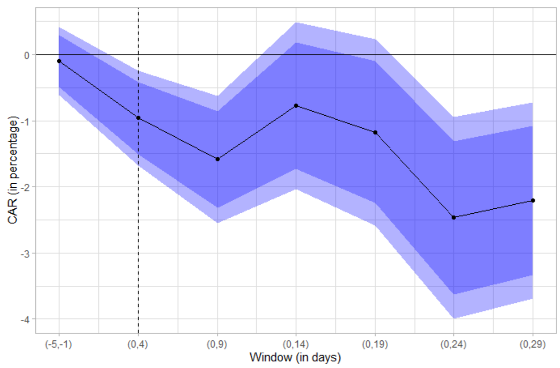
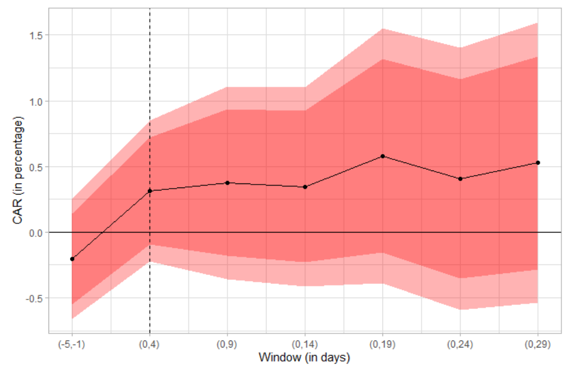
Figure 1: Cumulative Abnormal Returns: By DILUTIVE

This figure plots the announcement effect of CoCo issues on equity value. Cumulative abnormal returns are estimated with the market model (CAPM) on an estimation window of 250 days (with at least 50 valid returns) that ends 30 days before the CoCo issue announcement date. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. The solid lines represent the mean. The dark and light shaded areas represent the 95% and 99% confidence intervals respectively. Vertical axis represents cumulative abnormal return in percentage. Horizontal axis represents estimation windows with 5 trading day increments.



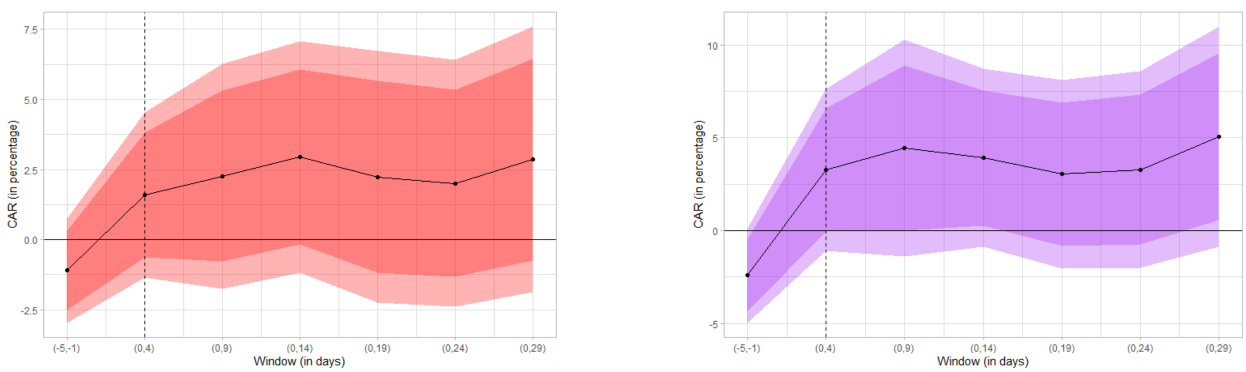
A. DILUTIVE=1



B. DILUTIVE=0

Figure 2: Cumulative Abnormal Returns: Top decile of COCOOUT

This figure plots the announcement effect of CoCo issues by banks with large amounts of outstanding CoCos on equity value. Cumulative abnormal returns are estimated with the market model (CAPM) on an estimation window of 250 days (with at least 50 valid returns) that ends 30 days before the CoCo issue announcement date. COCOOUT is the outstanding amount of CoCo bonds scaled by total liabilities. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. The solid lines represent the mean. The dark and light shaded areas represent the 95% and 99% confidence intervals respectively. Horizontal axis represents cumulative abnormal return in percentage. Vertical axis represents estimation windows with 5 trading day increments.



A. All

B. DILUTIVE=0

Table 1: Descriptive Statistics

This table presents the descriptive statistics of the main variables used in the analysis. The baseline data consists of 757 CoCo issues between 2009 and 2021 from 27 countries. Panel A reports the descriptive statistics. Panel B reports the top 10 number of issues by countries and issuers. Detailed variable descriptions are provided in Table A.1.

Panel A. Descriptive statistics

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**50%**	**Max**
ANNTOISS	757	8.073	6.975	0	7	48
BETA	757	1.190	0.635	−0.358	1.234	2.963
WT	757	66.004	51.897	−374.433	100.000	100.000
DILUTIVE	757	0.328	0.470	0	0	1
COCOOUT	757	1.925	3.994	0.000	0.892	35.537
EC	757	0.292	0.455	0	0	1
PWD	757	0.247	0.432	0	0	1
TWD	757	0.461	0.499	0	0	1
COMMON	757	0.341	0.474	0	0	1
FRENCH	757	0.240	0.428	0	0	1
MKTCAP	757	16.425	2.170	7.776	17.154	20.666
ROE	757	7.593	6.986	−24.735	7.640	37.308
DIST	757	6.828	3.451	−3.950	6.635	22.775
BOOKLEV	757	92.945	2.849	73.478	93.560	98.145
ROLLOVER	757	0.139	0.346	0	0	1
ΔCoVaR$(t+1)$	671	−0.851	0.527	−2.242	−0.860	0.172
MES95	757	−1.770	2.234	−9.587	−1.111	1.578
MES95$(t+1)$	740	−1.565	1.545	−7.568	−1.115	0.958
MES99	757	−2.579	3.317	−17.301	−1.746	3.048
MES99$(t+1)$	740	−2.601	3.231	−16.707	−1.610	3.704
RETVOL	757	13.869	3.834	0.000	13.191	26.092
RETVOL$(t+1)$	757	13.650	3.128	0.000	13.174	28.327
RET5PCT	757	−3.054	1.664	−9.091	−2.615	0.000
RET5PCT$(t+1)$	757	−2.950	1.302	−9.091	−2.701	0.000
RET1PCT	757	−5.079	3.200	−18.038	−4.181	0.000
RET1PCT$(t+1)$	757	−4.914	2.483	−18.987	−4.283	0.000

Panel B. Issues by countries and issuers (top 10)

Rank	Country	Issues	Issuer	Issues
1	United Kingdom	110	LBG Capital	38
2	India	97	Credit Suisse Group	22
3	Norway	75	Societe Generale	20
4	Switzerland	66	BNP Paribas	18
5	China	54	UBS Group	18
6	France	53	Banco Mercantil del Norte	16
7	Spain	38	Bank of Baroda	16
8	Japan	34	HSBC Holdings	16
9	Denmark	27	Barclays	15
10	Mexico	27	Credit Agricole	15

Table 2: Cumulative abnormal returns and wealth transfer

This table compares the announcement effects between dilutive and non-dilutive CoCos through mean-difference tests. Column 1 reports the cumulative abnormal returns of dilutive CoCos. Column 2 reports the cumulative abnormal returns of non-dilutive CoCos. Column 3 reports the difference in mean between the cumulative abnormal returns of dilutive and non-dilutive CoCos. Column 4 reports the p-value of the mean differences. Cumulative abnormal returns are estimated with the market model (CAPM) on an estimation window of 250 days (with at least 50 valid returns) that ends 30 days before the CoCo issue announcement date. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. Detailed variable descriptions are provided in Table A.1. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Cumulative abnormal return (CAR)		Diff (1-2)	$p-$value
	DILUTIVE=1	DILUTIVE=0		
CAR window	(1)	(2)	(3)	(4)
(-1,-5)	-0.109	-0.157	0.049	0.853
(0,4)	-0.918***	0.299	-1.217***	0
(0,9)	-1.543***	0.355	-1.898***	0
(0,14)	-0.656	0.307	-0.962*	0.091
(0,19)	-1.02*	0.516	-1.536**	0.021
(0,24)	-2.32***	0.352	-2.672***	0
(0,29)	-2.215***	0.49	-2.705***	0
Observations	248	509	757	757

Table 3: Cumulative abnormal return and wealth transfer: Regression analysis

This table examines the announcement effect of CoCo issues using OLS regressions. Cumulative abnormal returns are estimated with the market model (CAPM) on an estimation window of 250 days (with at least 50 valid returns) that ends 30 days before the CoCo issue announcement date. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. COCOOUT is the outstanding amount of CoCo bonds scaled by total liabilities. ROE is the return on equity of the issuers. MKTCAP is the natural log of the market capitalization of the issuers in USD at the announcement date. DIST is the distance to the trigger level measured as the difference between the capital ratio and the trigger level of the CoCo. BOOKLEV is the book leverage of issuers measured as liabilities scaled by assets. ROLLOVER is an indicator variable that equals 1 if the CoCo is a rollover (issued within +/- 90 days of the first call date of an existing CoCo). Detailed variable descriptions are provided in Table A.1. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All standard errors are clustered at the calendar year level and provided in parentheses.

Dependent Variables:	Cumulative abnormal returns (CAR)			
Window:	(-2,2)	(0,9)	(0,19)	(0,29)
Model:	(1)	(2)	(3)	(4)
DILUTIVE	-0.594*	-1.26**	-0.958	-1.70**
	(0.306)	(0.515)	(0.607)	(0.663)
COCOOUT	0.216**	0.208	0.204*	0.325**
	(0.089)	(0.148)	(0.106)	(0.130)
MKTCAP	0.046	0.142	-0.205	-0.118
	(0.102)	(0.091)	(0.120)	(0.158)
ROE	0.008	-0.062	-0.018	-0.028
	(0.042)	(0.044)	(0.085)	(0.094)
DIST	-0.051	-0.094	-0.085	0.098
	(0.087)	(0.169)	(0.160)	(0.194)
BOOKLEV	-0.041	-0.224	-0.028	-0.019
	(0.143)	(0.226)	(0.233)	(0.218)
ROLLOVER	0.272	0.043	-0.148	0.698
	(0.336)	(1.03)	(0.828)	(1.48)
Wald p-value (DILUTIVE & COCOOUT)	0.029	0.040	0.011	0.001
Year Fixed Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.075	0.106	0.047	0.089
Observations	757	757	757	757

Table 4: Cumulative abnormal return, wealth transfer, and outstanding CoCos

This table examines the joint significance of the wealth transfer measure and the proportion of outstanding CoCo on the announcement effects of CoCo issues. Cumulative abnormal returns are estimated with the market model (CAPM) on an estimation window of 250 days (with at least 50 valid returns) that ends 30 days before the CoCo issue announcement date. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. COCOOUT is the outstanding amount of CoCo bonds scaled by total liabilities. EC is an indicator variable that equals 1 if the CoCo is an equity convertible. ROE is the return on equity of the issuers. MKTCAP is the natural log of the market capitalization of the issuers in USD at the announcement date. DIST is the distance to the trigger level measured as the difference between the capital ratio and the trigger level of the CoCo. BOOKLEV is the book leverage of issuers measured as liabilities scaled by assets. ROLLOVER is an indicator variable that equals 1 if the CoCo is a rollover (issued within +/- 90 days of the first call date of an existing CoCo). Detailed variable descriptions are provided in Table A.1. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All standard errors are clustered at the calendar year level and provided in parentheses.

Dependent Variables:	Cumulative abnormal returns (CAR)			
Window:	(-2,2)	(0,9)	(0,19)	(0,29)
Model:	(1)	(2)	(3)	(4)
DILUTIVE	0.401	-0.794	-1.31	-1.72*
	(0.356)	(0.682)	(0.729)	(0.876)
COCOOUT	0.322**	0.258	0.167	0.322*
	(0.129)	(0.186)	(0.141)	(0.160)
COCOOUT × DILUTIVE	-0.520***	-0.245	0.183	0.014
	(0.140)	(0.202)	(0.415)	(0.292)
MKTCAP	-0.009	0.116	-0.185	-0.117
	(0.088)	(0.084)	(0.146)	(0.179)
ROE	0.003	-0.064	-0.016	-0.028
	(0.044)	(0.044)	(0.084)	(0.095)
DIST	-0.048	-0.093	-0.086	0.098
	(0.090)	(0.170)	(0.160)	(0.195)
BOOKLEV	-0.013	-0.211	-0.037	-0.020
	(0.132)	(0.218)	(0.242)	(0.226)
ROLLOVER	0.264	0.040	-0.145	0.698
	(0.349)	(1.06)	(0.802)	(1.48)
Wald p-value (DILUTIVE, COCOOUT)	0.044	0.096	0.001	0.001
Year Fixed Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.117	0.109	0.047	0.088
Observations	757	757	757	757

Table 5: Determinants of low wealth transfer CoCo issues and legal origins

This table examines the impact of legal origin on the loss absorption mechanisms of CoCo issues. WT is the estimated contingent wealth transfer from CoCo bondholders to stockholders. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. COMMON is an indicator variable that equals 1 if the issuer is incorporated in a common law country. FRENCH is an indicator variable that equals 1 if the issuer is incorporated in a French-civil-law country. The legal origins across countries are classified following La Porta et al. (1998). MKTCAP is the natural log of the market capitalization of the issuers in USD at the announcement date. ROE is the return on equity of the issuers. DIST is the distance to the trigger level measured as the difference between the capital ratio and the trigger level of the CoCo. BOOKLEV is the book leverage of issuers measured as liabilities scaled by assets. ROLLOVER is an indicator variable that equals 1 if the issue is a rollover CoCo (issued within +/- 90 days of the first call date of an existing CoCo). Detailed variable descriptions are provided in Table A.1. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All standard errors are clustered at the calendar year level and provided in parentheses.

Dependent Variables:	WT (1)	DILUTIVE (2)	DILUTIVE (3)
COMMON	-27.0** (8.70)	0.329*** (0.079)	1.03*** (0.244)
FRENCH	-6.51 (6.11)	0.192*** (0.033)	0.646*** (0.114)
MKTCAP	-1.78 (1.25)	0.003 (0.011)	0.010 (0.038)
ROE	0.672* (0.343)	-0.009** (0.003)	-0.029*** (0.010)
DIST	-1.94 (1.74)	0.011 (0.011)	0.043 (0.036)
BOOKLEV	-1.52 (0.963)	0.012 (0.011)	0.041 (0.037)
ROLLOVER	1.84 (9.53)	-0.055 (0.040)	-0.167 (0.133)
COCOOUT	-0.173 (0.446)	-0.002 (0.004)	-0.003 (0.012)
Model	OLS	LPM (OLS)	Probit
Year Fixed Effects	Yes	Yes	Yes
Adjusted R^2	0.101	0.185	-
Pseudo R^2	-	-	0.171
Observations	757	757	757

Table 6: Cumulative abnormal returns, wealth transfer, and legal origins: 2SLS

This table examines the causal impact of wealth transfer on equity value. 1st stage estimates are provided in Column 2 of Table 5. Cumulative abnormal returns are estimated with the market model (CAPM) on an estimation window of 250 days (with at least 50 valid returns) that ends 30 days before the CoCo issue announcement date. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. COCOOUT is the outstanding amount of CoCo bonds scaled by total liabilities. ROE is the return on equity of the issuers. MKTCAP is the natural log of the market capitalization of the issuers in USD at the announcement date. DIST is the distance to the trigger level measured as the difference between the capital ratio and the trigger level of the CoCo. BOOKLEV is the book leverage of issuers measured as liabilities scaled by assets. ROLLOVER is an indicator variable that equals 1 if the CoCo is a rollover (issued within +/- 90 days of the first call date of an existing CoCo). Detailed variable descriptions are provided in Table A.1. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All standard errors are clustered at the calendar year level and provided in parentheses.

Dependent Variables:	Cumulative abnormal returns (CAR)			
Window:	(-2,2)	(0,9)	(0,19)	(0,29)
Model:	(1)	(2)	(3)	(4)
$\widehat{\text{DILUTIVE}}$	-0.816	-0.752	-6.17**	-8.05**
	(1.26)	(1.92)	(2.49)	(3.06)
COCOOUT	0.217**	0.208	0.209*	0.331**
	(0.089)	(0.148)	(0.111)	(0.136)
MKTCAP	0.050	0.131	-0.099	0.010
	(0.091)	(0.101)	(0.148)	(0.209)
ROE	0.005	-0.055	-0.092	-0.119
	(0.031)	(0.042)	(0.090)	(0.089)
DIST	-0.053	-0.089	-0.131	0.042
	(0.090)	(0.177)	(0.162)	(0.212)
BOOKLEV	-0.042	-0.221	-0.054	-0.051
	(0.139)	(0.230)	(0.206)	(0.200)
ROLLOVER	0.255	0.082	-0.545	0.213
	(0.309)	(1.07)	(0.772)	(1.44)
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	757	757	757	757
F-test (1st stage)	28.6	28.6	28.6	28.6
1st stage $F-$test $p-$value (weak inst.)	0.000	0.000	0.000	0.000
Sargan $p-$value (overid.)	0.314	0.215	0.698	0.838

Table 7: Determinants of low wealth transfer CoCo issues and rollovers

This table examines the loss absorption mechanisms specific to rollover CoCo issues. WT is the estimated contingent wealth transfer from CoCo bondholders to stockholders. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. DIST is the distance to the trigger level measured as the difference between the capital ratio and the trigger level of the CoCo. ROLLOVER is an indicator variable that equals 1 if the issue is a rollover CoCo (issued within +/- 90 days of the first call date of an existing CoCo). Control variables include profitability (ROE), market capitalization (MKTCAP), book leverage (BOOKLEV), outstanding CoCos (COCOOUT), and legal origins. Detailed variable descriptions are provided in Table A.1. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All standard errors are clustered at the calendar year level and provided in parentheses.

Dependent Variables:	WT	DILUTIVE	DILUTIVE
	(1)	(2)	(3)
DIST × ROLLOVER	-9.88**	0.061***	0.176***
	(3.26)	(0.012)	(0.040)
ROLLOVER	72.6***	-0.495***	-1.45***
	(15.7)	(0.094)	(0.302)
DIST	-0.486	0.002	0.014
	(1.53)	(0.010)	(0.039)
Model	OLS	LPM (OLS)	Probit
Controls	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Adjusted R^2	0.137	0.201	-
Pseudo R^2	-	-	0.185
Observations	757	757	757

Table 8: Monthly arbitrage portolio returns by wealth transfer

This table examines the effect of CoCo issues on future stock return performance. Each month, we track the CoCo issue within the past 3 years and sort based on the wealth transfer measure. The equally weighted portfolio longs the issuers of the CoCos with below median wealth transfer and shorts CoCos with above median wealth transfer. VIXH is an indicator variable that equals 1 if the CBOE S&P 500 VIX in the period when the portfolio is constructed is above the sample median. EPUH is an indicator variable that equals 1 if the Global Economic Policy Uncertainty Index (Baker et al., 2016) in the period when the portfolio is constructed is above the sample median. COVID is an indicator variable that equals 1 if the portfolio is constructed after January 2020 and else 0. MKT, SMB, HML, RMW, and CMA are the Fama-French developed countries market, size, value, profitability, and investment factors respectively. The portfolio is rebalanced each month. The portfolio is formed from October 2014 to December 2021. Detailed variable descriptions are provided in Table A.1. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are provided in parentheses.

Dependent Variables:	Monthly arbitrage portfolio return			
Model:	(1)	(2)	(3)	(4)
ALPHA	-0.378	-0.995**	-0.982**	-0.678**
	(0.289)	(0.405)	(0.379)	(0.320)
VIXH		1.23**		
		(0.576)		
EPUH			1.25**	
			(0.527)	
COVID				1.20**
				(0.597)
MKT	0.229***	0.278***	0.215***	0.216***
	(0.074)	(0.076)	(0.072)	(0.073)
SMB	-0.119	-0.198	-0.088	-0.118
	(0.201)	(0.201)	(0.196)	(0.198)
HML	0.476**	0.429**	0.487**	0.478**
	(0.191)	(0.188)	(0.186)	(0.188)
RMW	0.088	-0.073	0.079	0.046
	(0.263)	(0.268)	(0.256)	(0.259)
CMA	-0.228	-0.230	-0.273	-0.218
	(0.320)	(0.313)	(0.311)	(0.314)
Wald p-value (ALPHA & Uncertainty)	-	0.085	0.037	0.059
Adjusted R^2	0.223	0.255	0.265	0.251
Observations	87	87	87	87

Table 9: Systemic risk and CoCo Issues

This table examines the systemic risks of banks after the announcement of CoCo issues. ΔCoVaR$(t+1)$ is the average post-announcement systemic risk measure from Adrian and Brunnermeier (2016). MES$(t+1)$ is the average post-announcement Marginal Expected Shortfall. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. COCOOUT is the outstanding amount of CoCo bonds scaled by total liabilities. MES is the average pre-announcement Marginal Expected Shortfall. ΔCoVaR is the average pre-announcement systemic risk measure from Adrian and Brunnermeier (2016). Control variables include profitability (ROE), market capitalization (MKTCAP), distance from the trigger level (DIST), book leverage (BOOKLEV), and rollover indicator (ROLLOVER). Detailed variable descriptions are provided in Table A.1. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All standard errors are clustered at the calendar year level and provided in parentheses.

Dependent Variables:	Measures of systemic risk		
Risk measures: Model:	ΔCoVaR$(t+1)$ (1)	MES95$(t+1)$ (2)	MES99$(t+1)$ (3)
DILUTIVE	-0.186** (0.069)	0.014 (0.092)	0.177 (0.185)
COCOOUT	-0.012 (0.009)	-0.024** (0.009)	-0.044* (0.021)
MES95		-0.031 (0.155)	
MES99			-0.204 (0.199)
ΔCoVaR		0.882*** (0.267)	1.51** (0.538)
Controls	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adjusted R^2	0.361	0.493	0.411
Observations	671	671	671

Table A.1: Variable Description

The below table provides the description and construction of variables used in the paper. Prospectus indicates hand-collected security-level information that is collected directly from the prospectuses. We follow the information in the prospectus over what is recorded in Bloomberg (the correction is available in an R code).

Variable	Description	Source
CAR (0,T)	Cumulative abnormal return around a daily window (0,T) measured using the decimal values of the daily stock price return of issuers and the market index of the country of incorporation. The market model (CAPM) is estimated on an estimation window of 250 days (with at least 50 valid returns) that ends 30 days before the CoCo issue announcement date. Country level market index is from WRDS World Indices. Risk-free rate is from Kenneth French's website (FF Factor Daily Developed Countries).	Datastream, WRDS
ANNTOISS	Number of calendar days between the announcement date and the issue date	Bloomberg
BETA	Market beta used to calculate the cumulative abnormal returns of CoCo issues.	Datastream, WRDS
EC	An indicator variable that equals 1 if the CoCo is an equtiy conversion CoCo. We hand collect the prospectuses and correct any errors made in Bloomberg.	Bloomberg, prospectus
TWD	An indicator variable that equals 1 if the CoCo is an temporary write-down CoCo. We hand collect the prospectuses and correct any errors made in Bloomberg.	Bloomberg, prospectus
PWD	An indicator variable that equals 1 if the CoCo is an permanent write-down CoCo (including partial permanent write down). We hand collect the prospectuses and correct any errors made in Bloomberg.	Bloomberg, prospectus
ROLLOVER	An indicator variable that equals 1 if the CoCo is issued within +/- 90 days of the first call date of an outstanding CoCo by the same issuer.	Bloomberg
WT	Contingent wealth transfer measure of the CoCo issue estimated using Equation (3).	Bloomberg, Capital IQ, Datastream
DILUTIVE	An indicator variable that equals 1 if the wealth transfer measure (WT) is in the lowest tercile and else 0.	Bloomberg, Capital IQ, Datastream
COCOOUT	Outstanding CoCos of the issuer calculated as sum of the amount of the currently issuing and the pre-existing outstanding CoCos with trigger levels that are greater than or equal to the current issue scaled by total liabilities	Bloomberg, Capital IQ, Datastream
DIST	The difference between the trigger level of the CoCo and the corresponding capital ratio of the issuer.	Bloomberg, Capital IQ, Datastream
MKTCAP	The natural log of market capitalization (p $\times$ shout) of the issuer in USD at the announcement date. The daily exchange rate is from the *freecurrencyapi* package (Ho, Imai, King, and Stuart, 2022)	Datastream
BOOKLEV	Book leverage of banks measured as the total liabilities scaled by the total assets.	Capital IQ, Bankfocus
ROE	Profitability of the banks collected directly from the data sources.	Capital IQ, Bankfocus
VIXH	An indicator variable that equals 1 if the CBOE S&P 500 VIX in the period when the portfolio is constructed is above the sample median and else 0.	WRDS
EPUH	an indicator variable that equals 1 if the Global Economic Policy Uncertainty Index (Baker et al., 2016) in the period when the portfolio is constructed is above the sample median.	EPU website
COVID	An indicator variable that equals 1 if the monthly portfolio is constructed after January 2020 and else 0.	-

Table B.1: *(Continued)*

Variable	Description	Source
COMMON	An indicator variable that equals 1 if the bank is incorporated in a common law country and else 0. The countries are: GB, IN, MY, IE, AU, TH, and ZA (in ISO Alpha-2 codes)	La Porta et al. (1998)
FRENCH	An indicator variable that equals 1 if the bank is incorporated in a French-civil law country and else 0. The countries are: FR, ES, MX, IT, BR, NL, BE, CO, TR, ID, and PT (in ISO Alpha-2 codes)	La Porta et al. (1998)
VOL	The pre-announcement equity volatility measured as the standard deviation of the daily stock returns one year before the announcement date. The standard deviation is then annualized by multiplying the square root of 255.	Datastream
VOL$(t+1)$	The post-announcement equity volatility measured as the standard deviation of the daily stock returns one year before the announcement date. The standard deviation is then annualized by multiplying the square root of 255.	Datastream
R5PCT	The pre-announcement negative tail risk of equity value measured as the fifth percentile of the daily stock return one year before the announcement date. R1PCT is the first percentile.	Datastream
R5PCT$(t+1)$	The post-announcement negative tail risk of equity value measured as the fifth percentile of the daily stock return one year after the announcement date.	Datastream
MES	The average pre-announcement Marginal Expected Shortfall. Marginal Expected Shortfalls are measured daily as the mean equity return of the bank in the 5% negative tail of market returns (5% worst days by market return) with a one year look back period. We take the average of the estimated Marginal Expected Shortfall one year before the announcement of the CoCo issues. We use S&P500 returns as the market returns.	Datastream
MES$(t+1)$	The average post-announcement Marginal Expected Shortfall. Marginal Expected Shortfalls are measured daily as the mean equity return of the bank in the 5% negative tail of market returns (5% worst days by market return) with a one year look back period. We take the average of the estimated Marginal Expected Shortfall one year after the announcement of the CoCo issues. We use S&P500 returns as the market returns.	Datastream
ΔCoVaR	The systemic risk measure from Adrian and Brunnermeier (2016). To estimate this, we use the R package *SystemicR* (Hasse, 2020). Daily equity returns of banks are collected from January 2008 to September 2022. We use weekly state variables, lagged by one period, known to capture time variation in the conditional moments of asset returns. These state variables include: (i) The change in the 3-Month T-bill yield rate, (ii) the change in the slope of the yield curve, measured as the change in the difference between the yields on 30-Year Treasury bonds and 3-Month T-bills, (iii) the change in the credit spread between Moody's Baa-rated bonds and 10-year Treasury rate, (iv) the real estate sector excess (weekly) return over the financial sector (v) The market return from the S&P 500 index, and (vi) the VIX index of equity volatility. The state variables are from Federal Reserve Bank of St. Louis (FRED). For CoCo issues, we measure the average of the daily ΔCoVaR a year after the announcement date.	Datastream, CRSP, FRED, *SystemicR*

Table A.2: Cumulative abnormal return and wealth transfer: Regression analysis (banks from developed countries)

This table examines the announcement effect of CoCo issues using OLS regressions with a subsample consisting of banks that are in developed countries. Cumulative abnormal returns are estimated with the market model (CAPM) on an estimation window of 250 days (with at least 50 valid returns) that ends 30 days before the CoCo issue announcement date. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. COCOOUT is the outstanding amount of CoCo bonds scaled by total liabilities. Control variables include profitability (ROE), market capitalization (MKTCAP), distance from the trigger level (DIST), book leverage (BOOKLEV), and rollover indicator (ROLLOVER). Detailed variable descriptions are provided in Table A.1. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All standard errors are clustered at the calendar year level and provided in parentheses.

Dependent Variables:	Cumulative abnormal returns (CAR)			
Window:	(-2,2)	(0,9)	(0,19)	(0,29)
Model:	(1)	(2)	(3)	(4)
DILUTIVE	0.012	-1.19***	-1.20	-1.55*
	(0.517)	(0.376)	(0.771)	(0.738)
COCOOUT	-0.069	0.123***	0.172	0.433
	(0.089)	(0.035)	(0.097)	(0.320)
Wald p-value (DILUTIVE & COCOOUT)	0.742	0.001	0.064	0.088
Year Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.093	0.224	0.060	0.122
Observations	526	526	526	526

Table A.3: Average cumulative prediction errors and wealth transfer: Regression analysis

This table examines the announcement effect of CoCo issues using OLS regressions. Average cumulative prediction errors (ACPE) are estimated with the market model (CAPM) on an estimation window of 250 days (with at least 50 valid returns) that ends 30 days before the CoCo issue announcement date. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. COCOOUT is the outstanding amount of CoCo bonds scaled by total liabilities. ROE is the return on equity of the issuers. MKTCAP is the natural log of the market capitalization of the issuers in USD at the announcement date. DIST is the distance to the trigger level measured as the difference between the capital ratio and the trigger level of the CoCo. BOOKLEV is the book leverage of issuers measured as liabilities scaled by assets. ROLLOVER is an indicator variable that equals 1 if the CoCo is a rollover (issued within +/- 90 days of the first call date of an existing CoCo). Detailed variable descriptions are provided in Table A.1. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All standard errors are clustered at the calendar year level and provided in parentheses.

Dependent Variables:	Average cumulative prediction error (ACPE)			
Window:	(-2,2)	(0,9)	(0,19)	(0,29)
Model:	(1)	(2)	(3)	(4)
DILUTIVE	-0.117*	-0.247**	-0.203	-0.345**
	(0.059)	(0.100)	(0.115)	(0.138)
COCOOUT	0.040**	0.036	0.036*	0.060**
	(0.016)	(0.026)	(0.019)	(0.023)
MKTCAP	0.010	0.025	-0.033	-0.021
	(0.020)	(0.016)	(0.021)	(0.033)
ROE	0.002	-0.012	-0.004	-0.006
	(0.008)	(0.008)	(0.016)	(0.019)
DIST	-0.009	-0.013	-0.007	0.030
	(0.017)	(0.032)	(0.032)	(0.040)
BOOKLEV	-0.006	-0.034	0.001	0.009
	(0.027)	(0.036)	(0.042)	(0.043)
ROLLOVER	0.050	0.026	-0.041	0.129
	(0.062)	(0.189)	(0.149)	(0.293)
Wald p-value (DILUTIVE & COCOOUT)	0.024	0.033	0.006	0.001
Year Fixed Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.073	0.119	0.052	0.094
Observations	757	757	757	757

Table A.4: Bank-level risks and CoCo Issues

This table examines the bank-level risks of banks after the announcement of CoCo issues. VOL$(t+1)$ is the equity volatility measured using the standard deviation of daily returns one year after the CoCo issues. R5PCT$(t+1)$ is the post-announcement negative tail risk of equity value of the issuer. DILUTIVE is an indicator variable that equals 1 if the CoCo is in the lowest wealth transfer tercile and else 0. COCOOUT is the outstanding amount of CoCo bonds scaled by total liabilities. VOL is the pre-announcement equity volatility measured using daily returns one year before the CoCo issues. R5PCT is the pre-announcement negative tail risk of equity value of the issuer. Control variables include profitability (ROE), market capitalization (MKTCAP), distance from the trigger level (DIST), book leverage (BOOKLEV), and rollover indicator (ROLLOVER). Detailed variable descriptions are provided in Table A.1. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All standard errors are clustered at the calendar year level and provided in parentheses.

Dependent Variables:	Measures of bank-level risk		
Risk measures:	VOL$(t+1)$	R5PCT$(t+1)$	R1PCT$(t+1)$
Model:	(1)	(2)	(3)
DILUTIVE	0.143	-0.030	-0.131
	(0.174)	(0.065)	(0.144)
COCOOUT	0.051**	-0.027**	-0.060*
	(0.019)	(0.009)	(0.029)
RETVOL	0.627***		
	(0.157)		
RET5PCT		0.393*	
		(0.195)	
RET1PCT			0.264
			(0.221)
Controls	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adjusted R^2	0.481	0.413	0.229
Observations	757	757	757