Do CoCos Serve the Goals of Macroprudential Supervisors or Bank Managers?

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Abstract

Using a hand-collected, comprehensive sample of contingent capital bonds (CoCos) issued by banks over the 2009-2019 period, we identify shifts in CoCo design features that nullify their putative salutary macroprudential benefits. Increasingly, CoCos are issued without punitive wealth transfers from shareholders to bondholders, thereby removing incentives for bank managers to take preemptive, risk-reducing action in order to prevent the CoCo from triggering. That is, CoCos are overwhelmingly issued with conversion ratios of zero (principal writedowns) that do not mitigate bank risk taking. Further, CoCo issuance can be used to circumvent supervisory discretion over bonus and dividend payouts. That is, CoCos issued as Additional Tier 1 capital relax regulatory constraints, particularly for banks close to the Maximum Distributable Amount (MDA) threshold. Bank managers are aware of these loopholes and exploit them to the detriment of financial market stability and macroprudential objectives.

Keywords: CoCo, contingent capital, bank capital regulation

JEL Codes: G21, G23, G28

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1 Introduction

Contingent Capital bonds (CoCos) were introduced in the wake of the Great Financial Crisis for macroprudential policy purposes. The objective was that the CoCo conversion option would be automatically triggered before the bank became insolvent, thereby recapitalizing troubled banks without necessitating moral hazard bailouts or destabilizing fire sales of assets. To serve as effective disincentives for banks to engage in moral hazard behavior that increases systemic risk, optimal CoCo design has long stressed the role of a punitive wealth transfer upon exercise that serves as a risk-reducing incentive mechanism for shareholders and bank managers (Flannery, 2005; Hilscher and Raviv, 2014). Wealth is transferred from risk-taking bank shareholders and managers to CoCo bond holders upon the trigger of the equity conversion loss absorption mechanism. That is, CoCo bond holders receive equity when the CoCo conversion option is exercised, thereby deleveraging the bank and diluting share value. The macroprudential benefits of CoCos include the potential to automatically recapitalize troubled banks, the reduction of systemic risk from fire sales of assets by over-leveraged financial institutions under duress (Flannery, 2013), the mitigation of risk-shifting incentives (Martynova and Perotti, 2018), and the reduced likelihood of regulatory bailouts (Dudley, 2013; Herring, 2010).

Indeed, Kashyap, Hanson, and Stein (2011) praise the capacity of contingent capital to "pre-wire" an ex post optimal policy action that could substitute for other proposed macroprudential instruments such as capital insurance. Similarly, Avdjiev, Bolton, and Jiang (2015) highlight CoCos' automatic recapitalization on contractually pre-agreed terms as "a simple way of bailing-in a bank and cutting through all institutional complexities ... hindering debt restructuring in the midst of a crisis." Kashyap, Rajan, and Stein (2008) advocate CoCo issuance requirements, noting that macroprudential mandates are required since bank shareholders would be reluctant to issue these potentially dilutive instruments. Thus, the BIS and many individual national bank regulators have mandated CoCo issuance to fulfill Total Loss Absorbing Capital (TLAC) and other capital requirements in order to

address systemic risk exposure and enhance macroprudential stability.

Unfortunately, specific features permitted by policy makers have tarnished the CoCo promise and undermined potential macroprudential benefits. Academic literature has focused on limitations in trigger design that undermine CoCos' deterrent power to restrict excessive bank risk taking.[1] In this paper, we identify alternative CoCo design problems, focusing on two critical CoCo features as yet unexamined in academic work. First, we document the pervasive shift from equity conversion to principal write-down CoCos that have no punitive impact on shareholders upon exercise.[2] Second, we document banks' use of CoCos to circumvent discretionary regulatory intervention that imposes limits on dividend and compensation payouts as punishment for banks that take on excessive risk. We hand collect a comprehensive sample of 720 CoCos issued worldwide from 2009 to 2019 to show the detrimental impact of these two design flaws from the perspective of macroprudential stability. We also find indications that bank managers are aware of these flaws and exploit them, thereby exacerbating systemic risk. Our comprehensive sample is unique in that it includes CoCos issued by private, as well as publicly-traded banks.

In this paper, we use our large sample to document these two crucial shifts in CoCo design over the period from 2009 to 2019. The first design shift has permitted CoCo issuers to change the loss absorption mechanism from equity conversion to principal write-down. This shift eliminates punitive wealth transfers from shareholders, since upon the trigger of principal write-down CoCos there is no dilution of share value. Instead, the CoCo debt is either partially or completely eliminated. Therefore, the principal write-down CoCo structure provides no deterrence to bank shareholder and managerial risk taking. Indeed, shareholders may benefit from the trigger of CoCo principal write-down features since the bank's debt

[1]For example, one way that CoCo trigger design has circumvented systemic risk protection is that regulations allow issuers to set the CoCo triggers at extremely low levels (e.g., 5.125% risk-adjusted capital ratios), thereby reducing the risk of conversion of CoCo debt to equity. Other studies investigating shortcomings in CoCo trigger design are Glasserman and Perotti (2017), Haldane (2011), Pennacchi, Vermaelen, and Wolff (2014), Calomiris and Herring (2013), and Allen and Tang (2016).

[2]Although other papers, such as Himmelberg and Tsyplakov (2012), Hilscher and Raviv (2014) and Chan and Wijnbergen (2017) discuss the importance of punitive wealth transfers upon CoCo conversion, to our knowledge, we are the first to comprehensively document this market shift.

overhang is reduced. Despite its importance, the regulatory framework is completely silent on the structural details that determine CoCo wealth transfer upon exercise, and has allowed the proliferation of bank-friendly, principal write-down CoCos to crowd out equity converting issues that potentially enhance macroprudential stability.

We analyze 720 CoCos and find that the shift from equity converting to principal write-down CoCos has substantially undermined their macroprudential benefits and created perverse risk-seeking incentives . Indeed, 100% of CoCo issues in 2009 were equity converting as compared to only 13.5% in 2019. Even within the vanishing subsample of equity-converting CoCos, we find CoCos that are structured to have a positive expected wealth transfer for shareholders at the trigger point. Examining only equity-converting CoCos, we find that the median wealth transfer *in favor of shareholders* is equal to 22.17% of the instrument's notional value. Thus, shareholders are actually rewarded upon CoCo triggering, thereby violating the optimal contract design envisioned by CoCo proponents. Moreover, our analysis of CoCo issuance yield spreads indicates market awareness and sensitivity to the terms of conversion of CoCo issues. We find a reduction in yield spreads for the CoCos structured to be more friendly to bond holders at the expense of stockholders; i.e., with a projected negative wealth transfer at the trigger point in favor of CoCo holders. These CoCos are associated with yield spreads 123 basis points lower (171 basis points if accounting for country-level fixed effects) than comparable CoCos without macroprudentially beneficial negative wealth transfers upon exercise. Further, the estimated effect of changing the terms of conversion from the median observed wealth transfer in favor of shareholders to a wealth transfer substantially in favor of CoCo holders is a reduction in yield spreads of 152 basis points.[3]

The second major design flaw from a macroprudential supervisory perspective is that CoCos can be used by bank managers to avoid Maximum Distributable Amount (MDA) limitations on dividend and compensation payouts. Regulators employ Maximum Distributable

[3]The 152 basis points reduction in yield spread is for a hypothetical instrument with the trigger level set at a 5.125% regulatory capital ratio if the wealth transfer were changed from 22.17% of CoCo principal in favor of shareholders to 50% in favor of CoCo holders.

Amount limitations as additional 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 CoCo coupons) and variable remuneration and bonuses paid to bank managers and employees. The severity of these restrictions becomes progressively higher, the more serious the bank's breach of the MDA threshold. The limitations on total distributions may range from 60% of profits to total elimination of all payouts. Thus, this is a powerful regulatory tool that can be used to conserve capital and incentivize bank managers to reduce risk in order to avoid crossing the MDA threshold.

However, banks can relax the MDA threshold and reduce the likelihood of imposition of these capital-saving supervisory interventions by issuing CoCos as Additional Tier 1 (AT1) capital in place of common equity. Banks satisfy Tier 1 capital requirements by issuing common stock and other capital conserving instruments. The CET1 (Common Equity Tier 1) component of Tier 1 capital can only be fulfilled with stock. In addition to equity, however, regulations permit banks to issue other, less expensive instruments to act as Tier 1 capital and fulfill Additional Tier 1 capital requirements. If structured properly, CoCos can be used to replace common equity in fulfilling required AT1 capital levels. If a bank underutilizes CoCos and instead uses higher quality common stock to fulfill its AT1 requirement, the market considers the bank as having an "AT1 shortfall." That is, the bank can reduce the cost of meeting its capital requirements if it substitutes CoCos for common stock in the AT1 component of its regulatory capital cushion. Any common equity released from the AT1 layer of regulatory capital becomes a CET1 surplus which is counted against the MDA threshold. By releasing common equity into a CET1 surplus, CoCo issuance reduces the likelihood that the MDA restriction will be imposed. This effect is particularly powerful for banks close to the MDA threshold.

These banks can issue CoCos in order to relax the likelihood of a disciplinary imposition of restrictions on bonus and dividend payouts. Thus, although CoCo issuance reduces

financial distress by increasing the bank's loss absorbing capital, the ability to issue CoCos in place of common equity may actually exacerbate risk taking, thereby exacerbating financial distress. This effect is particularly substantial for banks subject to the European Capital Requirements Regulation (CRR) and Capital Requirements Directive IV (CRD IV) framework, and especially in those jurisdictions where the national regulator has imposed additional capital surcharges meant to supplement the Basel III standard buffers. Recognizing the permissive impact of this use of CoCos to meet bank capital requirement, on March 12, 2020 the European Central Bank granted (European Central Bank, 2020) widespread approval for all banks to use more CoCos to meet AT1 and Tier 2 capital requirements (and thereby relax MDA thresholds) as part of their Covid capital relief program.[4] The import of these CoCo capital regulations, therefore, is to allow bank managers and shareholders to protect their cash payouts at the expense of macroprudential policies meant to limit systemic risk exposure.

In this paper, we show that CoCo issuance responds to these incentives. Banks are significantly more likely to issue CoCos if they are close to the MDA threshold and have an AT1 shortfall that can be exploited to relax the MDA's binding constraint. These effects are both statistically and economically significant. For banks having an AT1 shortfall, the likelihood of CoCo issuance increases by a marginal effect of 3.7 percentage points. Further, for banks within a 1% RWA (risk weighted asset value) distance from the MDA threshold, the likelihood of issuing CoCos increases by 1.28 percentage points for banks with an AT1 shortfall, but decreases by 1.68 percentage points for banks with no AT1 shortfall. Together with the absence of punitive wealth transfers, these two CoCo design features have eviscerated the macroprudential benefits that originally motivated their adoption by bank regulators.

Recent theoretical papers have called into question the premise that CoCos must be dilutive to equity holders in order to combat the moral hazard risk shifting incentives of leveraged banks. For example, Martynova and Perotti (2018) compare risk shifting incentives

[4]The expanded use of CoCos was scheduled to take effect throughout Europe starting from 2021, the pandemic outbreak accelerated the introduction of this measure.

for junior debt to CoCos with both positive and negative wealth transfers. They find that positive wealth transfer (non-dilutive) CoCos induce better risk controls than subordinated debt, but are inferior to common equity. Similarly, Gamba, Gong, and Ma (2022) contend that negative wealth transfers actually enhance the incentive for equity holders to engage in moral hazard risk shifting by "gambling for resurrection" because CoCo conversion reduces shareholders' equity stake. That is, negative wealth transfers encourage bank shareholders to undertake risky, negative net present value projects when CoCo conversion is imminent in order to gamble on a low-likelihood positive outcome; i.e., shareholders are playing with creditors' money as in the classic debt overhang problem. This "equity stakeholder effect" implies that CoCos that are designed to dilute equity upon conversion actually enhance risk taking incentives.

However, what is excluded from the modeling in these papers is that risk taking may either accelerate or delay CoCo triggering. That is, in these papers, the trigger is mechanically determined by exogenous signals of bank value. It has long been recognized (Sundaresan and Wang, 2015) that the bank's shareholders can engage in actions that impact the likelihood of CoCo trigger. For example, they can voluntarily recapitalize the bank either through equity issuance or shifts in the composition of assets away from higher risk-weighted assets to less risky assets, thereby reducing the likelihood of CoCo trigger. Alternatively, bank shareholders can induce CoCo triggers by enhancing risk and reducing bank capitalization. When the triggering of a CoCo generates positive wealth transfers, shareholders will be incentivized to accelerate conversion through risk enhancing activity. If, on the other hand, CoCo trigger induces a negative wealth transfer, equity holders would be incentivized to take on risk reducing policies to delay and prevent conversion. This "trigger incentive effect" provides the opposite risk taking incentives to the equity stakeholder effect identified in Martynova and Perotti (2018) and Gamba, Gong, and Ma (2022). The relative importance of each effect is an empirical question. For example, Fatouh, Neamto, and Wijnbergen, 2022 use a sample of 46 CoCos issued by 15 U.K. banks and show that positive wealth transfer

CoCo issuance is positively correlated with bank risk taking behavior.

The structure of the paper is as follows. Section 2 describes our hand-collected database consisting of 720 CoCo instruments, including the methodology used to construct all variables. The impact of projected wealth transfers on CoCo yields at issuance is discussed in section 3. Section 4 analyzes the use of CoCos to circumvent regulatory intervention mechanisms such as MDA restrictions. Finally, section 5 concludes.

2 The Hand-Collected Database of CoCo Issues

A comprehensive database of 720 CoCo issues was hand-collected using Bloomberg and manual searches of issuing banks' investor relations webpages. Table 1 reports descriptive statistics for all 720 instruments. Norwegian banks are the top issuers overall, with 17.4% of all CoCo issues. In the entire sample, Table 1 shows that only 25.4% of CoCo issues are equity-converting. Table 2 reports CoCo issues for each year, and documents the shift from equity-converting CoCos in the early years to principal write down (total and partial; temporary and permanent) loss absorption mechanisms. Starting from 2013, principal write-downs dominated the market, and temporary write-downs became a de-facto standard for European financial institutions.

[Table 1 about here.]

Using the CoCo design features obtained from manual inspection of prospectuses, we define the variables used in our analysis. We describe each variable's construction in this section. Appendix A1 provides a summary list of variables, including variable name, definition and source of data.

[Table 2 about here.]

Our major variable of interest is *Wealth Transfer* defined as the wealth transfer to shareholders conditional upon CoCo conversion calculated as of issuance date. Using the terms of

CoCo trigger exercise, and following the methodology of Berg and Kaserer (2015), we express *Wealth Transfer* as a share of the CoCo's par value so that it is bounded between $-\infty$ and $+1$.[5] A negative wealth transfer implies terms of conversion favorable to CoCo holders at the expense of equity holders. We define an indicator variable, *Negative Transfer*, that takes a value of one if *Wealth Transfer* is negative; zero otherwise. In contrast, a non-negative wealth transfer benefits equity holders at the expense of CoCo bond holders. To calculate the normalized value of the expected *Wealth Transfer* upon conversion as a percent of CoCo par value we first estimate the bank's expected market capitalization at the conversion point as:[6]

$$\text{MarketCap}_{\text{at Conversion}} = \frac{\text{Trigger Ratio}}{\text{Capital Ratio}_{\text{issue date}}} \times \text{MarketCap}_{\text{issue date}} + \text{CoCo} \qquad (1)$$

with *CoCo* representing the par value of the CoCo bond. Upon conversion the CoCo holders will be issued a number of shares equal to *CoCo/Conversion Price*. The wealth transfer between CoCo holders and share holders upon conversion is then calculated as:

$$\text{Wealth Transfer} = \text{CoCo} - \frac{\text{Shares to CoCo Holders}}{\text{Total Shares after Conversion}} \times \text{MarketCap}_{\text{at Conversion}} \qquad (2)$$

where positive values indicate a net wealth transfer from CoCo holders to equity holders and negative values indicate a wealth transfer from shareholders to CoCo bond holders.[7]

[5]Other papers that have examined the wealth transfer upon CoCo conversion are Hilscher and Raviv (2014), Himmelberg and Tsyplakov (2012) and Himmelberg and Tsyplakov (2014).

[6]To estimate the bank's market capitalization at conversion, we adopt the (Berg and Kaserer, 2015) assumption that the market price of equity would follow changes in the capital ratio on a one-to-one basis. The capital ratio distance from issuance to the trigger level can be used to proxy for the expected fall in the stock price that would accompany the deterioration of regulatory capital until a conversion event is declared.

[7]We calculate the wealth transfer conditional on CoCo trigger. Although a full analysis of the out-of-the-money wealth transfer properties is beyond the scope of this paper, we offer some intuition in our discussion of the distance to the MDA threshold. That is, as the bank's capital declines towards the trigger point, both the stock price and the distance to the MDA decline, thereby incentivizing bank risk taking through CoCo issuance.

The value of *Wealth Transfer* is then normalized by the CoCo principal. Thus, since all principal write-down CoCos have no shares transferred upon conversion, the value of the normalized *Wealth Transfer* is +1. Indeed, Himmelberg and Tsyplakov (2012) find that principal write-down CoCos introduce a perverse incentive to "burn capital" when capital levels approach their trigger thresholds. From a manager's perspective being immediately above the trigger level is strictly worse than being immediately below, since the latter state removes the liability represented by the CoCos. Thus, as the bank approaches the CoCo trigger, bank managers may undertake risky transactions that cause the bank's financial condition to further deteriorate in a deliberate effort to trigger the write-down, in contrast to macroprudential preferences that they reduce risk or raise new equity. Therefore, permanent principal write-downs essentially have an (implicit) conversion price of $+\infty$, and thereby a wealth transfer ratio of +1. That is, the CoCo exercise transfers from CoCo holders to equity holders a value equal to the CoCo par value, thereby providing the most extreme example of "convert-to-steal" or "equity-friendly" design (see Hilscher and Raviv (2014)).

2.1 Variable Definitions

The dependent variable in our regression analysis, the CoCo *Yield Spread* is computed as the difference between the *Yield at Issue* for each CoCo instrument and the same date's yield to maturity of the tenor-matched sovereign bond for the country in which the issuing bank is domiciled. For each CoCo bond, the effective *Yield at Issue* is computed using the issue price, the coupon rate and coupon frequency over a holding period that varies depending on the existence of a call option. For CoCos that are not callable, the holding period is computed as the time between the issue date and the maturity date, whereas if a call option exists, the holding period is the time difference between the issue date and the first available call date. Further, *Fixed Rate* and *Floating Rate* specify the CoCo coupon structure. The most common structure is fixed-to-float, which specifies a fixed coupon rate up to the first

available call date, with a specified spread over LIBOR if the CoCo is not called.[8]

According to Basel III guidelines, banks can elect to meet all their capital requirements with equity capital, if they choose to do so. Appropriately designed CoCos, however, can satisfy Additional Tier 1 (AT1) and Tier 2 capital requirements, providing a substitute for more costly common equity. In particular, use of common equity to satisfy its AT1 (or, even more so, Tier 2) capital requirements, while permissible would not be advantageous to banks seeking to minimize their cost of capital compliance, especially for banks with supplemental capital buffer requirements that can exclusively be satisfied with common equity (i.e. Capital Conservation Buffer, Countercyclical Buffer, buffers for systemically important institutions). That is, even if CoCos do not qualify for inclusion in these capital buffers, banks will face increased incentives to fully utilize the capital credit that CoCos can provide within the Tier 2 and AT1 capital layers in order to "free" equity capital. Indeed, market analysts negatively view banks that do not fully exploit the CoCo substitution for equity as having an AT1 shortfall.[9]

We compute the variable *AT1 Shortfall Size*$_{i,t}$ for bank i in year t as the difference between the maximum amount of CoCos permitted to meet AT1 requirements in year t minus the CoCos actually used in AT1 as of year-end $t-1$. A positive value indicates the portion of AT1 capital requirements that could have been met with CoCos that are instead met with common equity as of time t. In addition to the size of the AT1 shortfall, we define an indicator variable, *Has AT1 Shortfall*$_{i,t}$ that assumes a value of 1 for bank i in year t if the value of the variable *AT1 Shortfall Size* is positive and 0 otherwise. Further, in our analysis, the AT1 shortfall interacts with the Maximum Distributable Amount (MDA) threshold. We define

[8]The choice of fixed, floating or fixed-to-floating rate varies across the country of domicile of the issuer. Among European AT1 CoCos, fixed-to-floating rate CoCos overwhelmingly dominate, but Norwegian banks diverge drastically by using almost exclusively floating interest rate coupon payments. Further, 21 out of 22 Indian CoCos are fixed rate, while Russian issues are split almost equally between fixed and fixed-to-floating rate designs.

[9]In theory, this issue is not exclusive to the Additional Tier 1 capital layer as a bank could be facing a "Tier 2 shortfall" whenever it uses common equity to meet Tier 2 requirements. However, banks have access to a variety of alternative instruments in Tier 2, such as subordinated debt, while the only alternative to CoCos for AT1 requirements is equity capital.

a variable *Distance to MDA Trigger*$_{i,t}$*:* for bank i in year t as the difference between the bank's CET1 ratio reported at year-end t and its regulator's discretionary MDA threshold point computed for year $t+1$. Finally, additional variables are defined in Appendix A1.

3 Wealth Transfer and CoCo Yields at Issuance

Given that our objective is to explore the market-determined yield spread relationship with each CoCo design feature over time, we exclude from our analysis all CoCo instruments issued in exchange for previously outstanding securities. The yields on such replacement CoCos are overwhelmingly determined by the predecessor bond, and therefore are not independent indicators of the relationship between yield spreads and CoCo design features upon issuance. Further, we remove all CoCos that are issued directly to a governmental entity since these typically serve as bail-out vehicles. Finally, all CoCo instruments issued by Georgian banks were dropped from the sample because of the absence of matching sovereign debt yield data. After these exclusions, we are left with 615 instruments issued between 2009 and 2019 by 248 financial institutions in 27 countries. Table 3 reports the summary statistics for the CoCo issuing banks used in the yield spread regression analysis. The wealth transfer is expressed as a share of the CoCo notional amount. The mean value of 0.833 illustrates that the average wealth transfer on CoCos in our sample is very close to the maximum value of +1, with the median value equal to +1 emerging from the prevalence of write-down loss-absorption mechanisms.

[Table 3 about here.]

The market quickly accepted the introduction of CoCos with principal write down loss absorption mechanisms that undermined CoCo holders' rights. Rating agencies and industry experts note that new CoCo issues are routinely oversubscribed. This might suggest that CoCo investors are oblivious to the details of CoCo design, especially if trigger events are perceived to be unlikely tail events, similar to the "unconvertible CoCos" discussed in

Glasserman and Perotti, 2017. Our comprehensive CoCo database allows us to perform an analysis of CoCo yield spreads at issuance to determine whether they reflect different loss absorption mechanisms.

3.1 Pricing Wealth Transfer CoCo Features

In this section, we use CoCo design characteristics as explanatory variables in OLS regressions with *Yield Spread* (at the time of issuance) as the dependent variable as follows:

$$\begin{aligned} Yield\,Spread = \alpha &+ \beta_1 Amount + \beta_2 \ln(Assets) + \beta_3 \text{CET1 } Ratio \\ &+ \beta_4 Trigger\ Level + \beta_5 Tenor + \gamma_1 Perpetual + \gamma_2 Callable \\ &+ \gamma_3 Coupon\ Type + \gamma_4 Loss\ Absorption \\ &+ \gamma_5 Negative\ Transfer \\ &+ \beta_6 Wealth\ Transfer + \beta_7 Wealth\ Transfer \times Trigger\ Level \\ &+ \beta_8 Wealth Transfer \times \text{CET1 } Ratio \\ &+ \lambda CountryFE + \tau IssueYearFE \end{aligned} \tag{3}$$

Table 4 presents the results of estimation of the model in equation 3.

The main independent variable of interest in models 1 and 2 is *Negative Transfer*. If the punitive transfers from shareholders upon CoCo trigger are priced in CoCo yield spreads, we expect a negative coefficient on this variable. As shown in Table 4, the coefficient is negative, statistically significant at the 1% level and robust to controlling for country fixed effects. The coefficient is also economically significant, such that an equity converting CoCo that transfers wealth from stockholders to CoCo holders upon conversion has a yield spread that is 123 (model 1) or 171 (model 2) basis points lower than an equivalent equity converting CoCo without a negative wealth transfer, as compared to a sample mean yield spread of 4.2%.

Columns 3 through 6 of Table 4 use the independent variable *Wealth Transfer* to mea-

sure the size of the wealth transfer. As expected, the coefficient estimate is positive and statistically significant at the 1% level in all models. That is, using the coefficient estimate from model 6, the additional yield spread for a stockholder-friendly CoCo with an estimated wealth transfer equal to 0.5 of its notional value is 189 basis points, relative to one with a -0.5 wealth transfer (assuming a 5.125% trigger). The results on both the *Negative Transfer* and *Wealth Transfer* variables suggest that the yield spreads reflect CoCo conversion terms upon issuance. That is, the more benign (adverse) the terms of conversion are to CoCo holders, the tighter (wider) its yield spread.

Further, the coefficient on *Trigger Level* is positive and significant (at the 5% level or better) in all specifications in Table 4, consistent with higher yield spreads when conversion is more likely to occur (i.e., higher trigger levels). However, the coefficient on the interaction term between *Trigger Level* and *Wealth Transfer* is negative and statistically significant at the 5% level or better. This is consistent with either lower spreads for high trigger countries (such as Switzerland) and/or a muted impact of trigger levels on yield spreads when the wealth transfer is considered. This may suggest that the market takes into account the anticipated action of bank managers and shareholders at conversion when setting yield spreads. That is, at higher trigger levels, bank managers have more resources to avoid conversion on negative wealth transfer CoCos since the bank's capital position is less impaired. Thus, at higher trigger levels, they are less (more) likely to convert if the wealth transfer is negative (positive), thereby offsetting the impact of the wealth transfer effect. To illustrate this, Table 4 shows that the predicted difference in yield spread between two equity converting CoCos with 5.125% trigger level and wealth transfers respectively of +0.5 and -0.5 would be 249 basis points (model 4) or 189 basis points (model 6), but if issued at the 7% trigger level this difference would be reduced to 116 basis points (model 4) or 38 basis points (model 6). Our results, therefore, suggest market sophistication in setting yield spreads to reflect both optimal bank policies and stricter monitoring by bank regulators in jurisdictions with higher trigger levels.

Table 4 also controls for the *Loss Absorption* indicator variables with the omitted baseline level equal to *Equity Conversion*, and a value of one for each of the following variables: *Permanent Write Down*, *Partial Permanent Write Down* and *Temporary Write Down*. All coefficients in models 3 through 6 are negative and significant at the 5% level or better. These coefficient estimates represent the difference in yield spreads for principal write-down CoCos as compared to equity converting CoCos having the same wealth transfer. Since no principal write-down CoCos can have negative wealth transfers, this coefficient measures the difference in yield spreads for all shareholder-friendly CoCos (i.e., with positive wealth transfers that can become negative if stock prices fall enough). Thus, the finding of a negative coefficient suggests that the market assesses a higher yield spread on positive wealth transfer equity converting CoCos as compared to principal write-down CoCos with equivalent wealth transfers.

Results on the coefficient estimates on the control variables are also shown in Table 4. Focusing on models 2 to model 6, the coefficient on *Perpetual* is as expected positive and statistically significant at the 5% level or better. Given the presence in the models of *Comparable Tenor* and *Callable*, the economic interpretation of the coefficient is that yield spreads of perpetual CoCos are predicted to be 77 to 97 basis points higher than CoCos with identical time to first call but finite maturity, indicating the risk associated with the call option. However, the coefficient on *Callable* is negative, but not individually significant in any of the regressions controlling for country fixed effects, indicating the market expectation that call options are always exercised at first opportunity. Further, *Comparable Tenor* is negative and consistently significant at the 5% level or better across all model specifications, indicating that the yield curve of CoCo instruments is less steep than the matching sovereign debt curve. For example, model 4 (which controls for both country and year fixed effects) predicts the yield spread of a 10 year to first call CoCo to be 50 basis points tighter than an identically designed CoCo with a first call date 5 years after issuance.[10]

[10] A possible interpretation is that since all perpetual instruments are callable, and the most common time to first call is 5 years, high values of *Comparable Tenor* include many long maturity but nevertheless finite

In any model that includes country fixed-effects (model 2 to model 5), the coefficient on *Assets* is negative and statistically significant at the 1% level, suggesting that larger, more visible banks can issue CoCos at lower yield spreads. This result however does not survive clustering errors at the country level (model 6). Similarly, the coefficient on *Amount Issued* is negative and statistically significant at the 5% level in model 1 (with no fixed effects), but loses significance when controlling for country-specific factors. Finally, both *Fixed Rate* and *Floating Rate* are associated with tighter yields spreads relative to an identically designed fixed-to-floating rate instrument, but only the coefficient on *Floating Rate* remains significant (at the 1% level of confidence) when country and/or year fixed effects are included.

[Table 4 about here.]

4 CoCo Issuance Incentives

To date, the academic literature has omitted critical incentives when analyzing CoCo issuance decisions. For example, Avdjiev et al. (2020) only investigated the timing of the *first* CoCo issuance for large financial institutions, finding that CoCo issuance is negatively related to Tier 1 capital levels. This, however, neglects the importance of other components of bank capital structure and regulatory requirements and cannot account for the effects of evolving regulatory environments.

To remedy this, Goncharenko and Rauf (2016) and Goncharenko, Ongena, and Rauf (2021) focus on Additional Tier 1 capital instruments in their studies of CoCo issuance by publicly traded EU banks between 2010 and 2015. They find that banks with lower asset volatility are more likely to issue CoCos, whereas riskier banks find CoCo issuance exceedingly expensive and prefer to issue common equity. However, their studies do not incorporate how CoCo issuance impacts incentives across all alternative sources of bank capital. In particular, these previous studies ignore the role of CoCo issuance in freeing

maturity CoCos which carry lower yields (as indicated by the positive coefficient on the *Perpetual* variable).

common equity from the Additional Tier 1 capital layer.

[Figure 1 about here.]

To exemplify these mechanics, the left bar in Figure 1 shows a financial institution with a Common Equity Tier 1 (CET1) ratio of 10.5% that uses only equity to meet all its capital requirements. Basel III regulations stipulate a 7% minimum common equity requirement (shown in blue in Figure 1 as the sum of the 4.5% Pillar 1 minimum CET1 and the 2.5% capital conservation buffer). In addition, Basel III requires a minimum 1.5% Additional Tier 1 (AT1) plus 2.5% Tier 2 capital. The AT1 and Tier 2 components of the capital structure can always be met by common equity. Alternatively, however, the AT1 requirement can be met by CoCos and the Tier 2 requirement can be met by CoCos and subordinated debt (properly structured). However, the bank in the left bar of Figure 1 uses only equity capital. For the purposes of computing the Maximum Distributable Amount (MDA) threshold, regulators deduct all common equity used to meet Additional Tier 1 and Tier 2 capital requirements. Thus, the 3.5% of equity held by the bank to in the AT1 and Tier 2 capital layers is deducted from the 10.5% total. Since 7% is the Basel III minimum Common Equity Tier 1 requirement, then this bank is exactly at the threshold. Any slight deterioration in the bank's capital position (say, via an increase in risk-weighted assets) would subject the bank to MDA limitations. Thus, the MDA threshold is a binding constraint on bank activities, and a threat to managerial bonuses and dividend payouts.

In contrast, the capital structure to the right in Figure 1 demonstrates how CoCos can be used to relax the bank's MDA binding constraint. In this example, the bank issues CoCos to cover both the AT1 and Tier 2 capital requirements, for a total CoCo issuance of 3.5% of risk-weighted assets. The bank has not issued any additional common stock (still at 10.5% of risk-weighted assets), but now 3.5% of the bank's equity is considered an excess capital position that moves the bank away from the MDA threshold.

[Figure 2 about here.]

Figure 2 provides an actual comparison of the MDA thresholds for Swedish lender Svenska Handelsbanken (SHB) in 2016 under the assumptions that only equity capital is used to meet all requirements (i.e., the right bar). In contrast, the left bar in Figure 2 shows the bank's capital position if it uses CoCos in every capital layer permitted by the Swedish regulatory framework. Complying with capital requirements using common equity only implies a 22.8% minimum capital requirement, whereas full use of CoCos in the AT1 layer reduces capital requirements by almost 7% to 15.8875%. Thus, CoCos allow banks to meet their regulatory capital requirements with lower capital ratios. This incentive will increase the closer a financial institution is to its MDA threshold.

4.1 Empirical Analysis: Regulatory Drivers of CoCo Issuance

In order to analyze the incentives that drive CoCo issuance, we construct a sample comprised of issuing and non-issuing banks. The sample is comprised of 1,406 bank-year observations for 141 individual banks. This sample includes 57 banks that never issued CoCos. Summary statistics for this sample are provided in Table 5.

[Table 5 about here.]

To examine CoCo issuance incentives, we estimate logit models with the dependent variable $Issue_{i,t}$ taking a value of 1 if bank i is a CoCo issuer in year t and 0 otherwise. Table 6 presents the estimation results for the logit analysis.[11] Columns 1 through 4 provide results for all CoCo issuance, whereas columns 5 and 6 consider CoCo issuance to satisfy AT1 requirements only. The importance of regulatory requirements across all bank capital levels is shown by the positive and significant (at the 5% level or better) of the regulatory variables (e.g., *Additional CoCo Layers, Has AT1 Shortfall, Distance to MDA Trigger* and the interaction term between *Has AT1 Shortfall* and *Distance to MDA Trigger*). Banks having an AT1 shortfall are more likely to issue, with odds of issuing in any given year estimated to

[11] Untabulated probit estimation yields similar results and are available upon request.

be 2.7 times (Table 6, model 2) those of banks with no AT1 shortfall, and these results are robust to controlling for country fixed effects (Table 6, model 3). This effect is, as expected, stronger when considering AT1 instruments only (i.e., comparing coefficient estimates of Table 6, model 5 vs. model 2).[12]

For banks with an AT1 shortfall, the odds of issuing CoCos increase for increasing values of *Distance to MDA Trigger*, although this result does not survive full fixed effects (Table 6, models 4 and 6). However, the interaction term between *Has AT1 Shortfall* and *Distance to MDA Trigger* is negative and larger (in absolute value) than the coefficient on *Distance to MDA Trigger* alone. Thus, banks with AT1 shortfalls are significantly more likely to issue CoCos the closer they are to the MDA threshold. These effects are economically significant: for banks facing an AT1 shortfall, a reduction of 1% RWA in the difference between their CET1 ratio and their MDA threshold is associated with a 11.6% *increase* in the odds of being an issuer (table 6, model 3), while for banks with no AT1 shortfall an identical 1% RWA movement towards the MDA threshold is associated with a 17.3% *decrease* in the odds of issuing. This divergence is maintained for the odds of being an issuer of AT1 instruments specifically (table 6, model 5), such that a 1% reduction in the distance to MDA threshold increasing (decreasing) by 9.4% (17.1%) the odds of being an issuer for banks with (without) an AT1 shortfall. Thus, banks close to the MDA threshold are more likely to issue CoCos only if they can use them to meet AT1 capital requirements (i.e., they have an AT1 shortfall).

Moreover, we find that financial institutions that can adopt CoCo securities to meet requirements other than those in the Basel III minimum capital requirements are more likely to issue, with their odds being 3.85 times those of banks for which CoCos can only fill baseline requirements (Table 6, model 1). Further, the likelihood of CoCo issuance in any given year increases as the total regulatory space (measured in %RWA) that CoCos can occupy increases; i.e., a change equal to 1% RWA in total regulatory capital requirements

[12]The coefficient on *Tier 1 Ratio* is never statistically significant, indicating that studies limited to examining the relationship between CoCo issuance and Tier 1 capital requirements omit important explanatory variables.

that a bank can fulfill with CoCos is associated with a 27.1% increase in the odds of issuing (Table 6, model 3). Finally, CoCo issuance is less likely when there is no tax shield, such that the odds of issuing CoCos are reduced by 88% (using the coefficient estimate in column 2 of Table 6) when CoCo coupons are not tax deductible.

[Table 6 about here.]

Columns 5 and 6 of Table 6 focus on the issuance of CoCos that serve as AT1 capital. Examining column 6 which incorporates country and year fixed effects, we note that the coefficients on the regulatory variable coefficients become statistically insignificant, thereby indicating the importance of country-specific, time varying regulatory requirements. The notable exception is the the coefficient on the interaction term between *Has AT1 Shortfall* and *Distance to MDA Trigger* which is consistently negative and statistically significant at the 5% level or better. Therefore, banks with AT1 shortfalls are more likely to issue CoCos to satisfy AT1 requirements if they are closer to the MDA threshold. To further examine this and distinguish between CoCos issued as AT1 versus Tier 2, we estimate a multinomial logit model with three possible levels of the dependent variable: a baseline level for financial institutions not issuing any CoCos in year t (baseline), and levels $AT1$ and $T2$ when the bank issues CoCos to satisfy AT1 or Tier 2 capital requirements, respectively.

Table 7 presents the results of this multinomial model estimation. Most noteworthy in this table are the results on the interaction term between the variables *Has AT1 Shortfall* and *Distance to MDA Trigger*. The coefficient estimates are negative and statistically significant (at the 1% level) for CoCos issued to satisfy Additional Tier 1 requirements only. Thus, CoCos issued to satisfy Tier 2 capital requirements do not respond to these incentives. This is consistent with our finding that banks close to the MDA threshold with an AT1 shortfall can issue AT1 CoCos to free up equity capital and release the MDA constraint. A 1% RWA decrease in the distance to the MDA threshold is associated with a 13.8% increase (20.9% decrease) in the odds of issuing AT1 Cocos for financial institutions with (without) an AT1 shortfall (Table 7, model 2). Indeed, the odds of issuing AT1 CoCos increase by 3.5 times,

while the odds of issuing Tier 2 CoCos are reduced by 87% (Table 7, model 1) for banks with AT1 shortfalls that are close to the MDA threshold.

Finally, the absence of a tax-shield benefit reduces the odds of CoCo issuance severely for Tier 2, but not for AT1 (Table 7, model 3). Since Tier 2 CoCos can be replaced with tax deductible debt, non-deductible CoCos have less value as Tier 2 capital. However, since AT1 capital requirements can be met only with equity or CoCos, tax shields are less important. Thus, our analysis suggests that CoCo issuance is targeted very precisely by banks who issue CoCos designed to limit supervisory discretion over dividend and bonus payouts and to maximize bank returns. These objectives may undermine macroprudential objectives that seek highly capitalized banks resistant to systemic risk.

[Table 7 about here.]

5 Conclusion

We contribute to the literature on Contingent Capital (CoCo) bonds by hand-gathering and analyzing a comprehensive sample comprised of all bank CoCos issued world-wide over the 2009 through 2019 period. To the best of our knowledge, this study is the first to gather as complete a sample of CoCo bonds, incorporating 720 distinct bond issues covering 286 distinct banks in 31 countries. Using this comprehensive sample, we document the shift over time in CoCo issuance away from the equity conversion loss absorption mechanism designed to induce a punitive wealth transfer from stockholders to CoCo bond holders upon exercise. Instead, the market is currently dominated by principal write-down CoCos that may actually benefit managers and shareholders by forgiving debt if the bank's condition deteriorates enough to trigger CoCo conversion.

In this paper, we show that financial markets are aware of the specific terms of conversion and their implications. We find that yield spreads at issuance reflect the projected wealth transfers that would occur as a consequence of a trigger event. We also find evi-

dence that CoCos can be used by bank shareholders and managers to avoid discretionary interventions by regulators that limit distributions of dividends, bonuses and certain coupon payments. These Maximum Distributable Amount (MDA) thresholds are discretionary supervisory mechanisms designed to limit bank risk and increase capital by forcing banks to retain earnings. We find that banks are more likely to issue CoCos if they have an Additional Tier 1 shortfall and are close to the MDA threshold. Under these circumstances, CoCos can free up equity capital to be used as a buffer against the imposition of MDA restrictions on dividend and bonus payouts, thereby protecting distributions to bank managers and shareholders. Rather than acting as a tool of macroprudential governance, CoCos issued under these circumstances prevent bank supervisors from using discretionary powers to force troubled banks to recapitalize themselves via profit retention or equity issuance. This increases systemic risk exposure and increases the likelihood of moral hazard bailouts and destabilizing fire sales of assets, thereby undermining CoCos' potential macroprudential benefits.

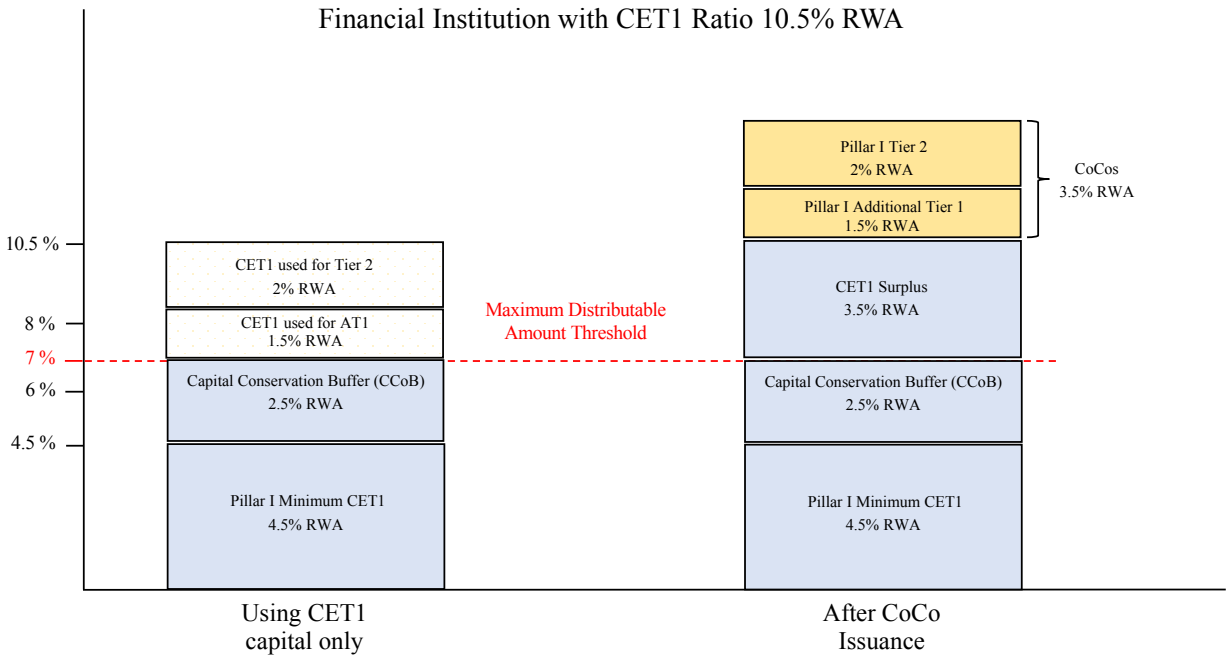

Figure 1: Capital Conservation Constraint, Effects of AT1 Shortfall

Light blue: capital layers filled with common equity capital. White: capital layers filled with common equity capital but not receiving regulatory credit in computing the MDA threshold. Yellow: capital layers filled with CoCos

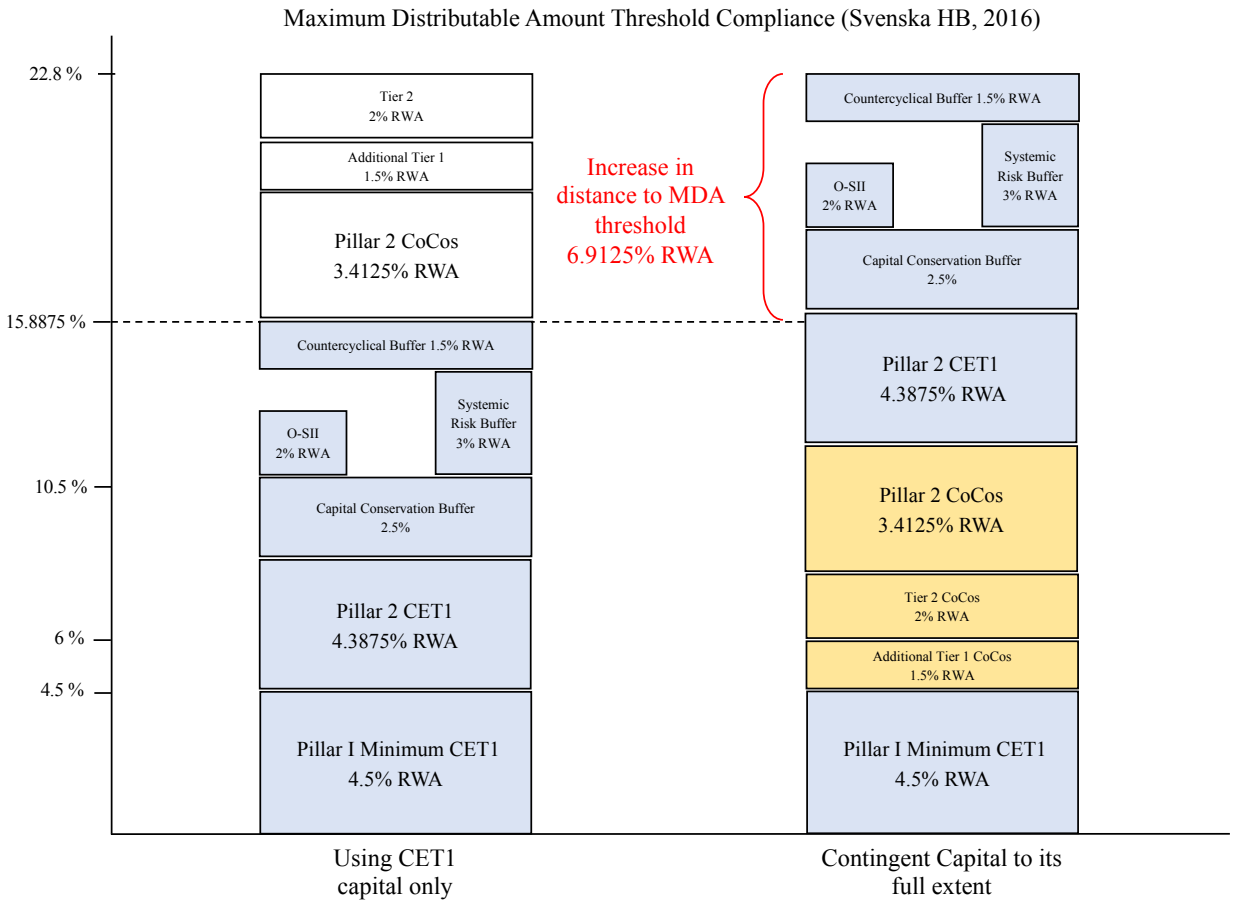

Figure 2: Real World Example of the Effects of the AT1 Shortfall

Light blue: capital layers filled with common equity capital. White: capital layers filled with common equity capital but not receiving regulatory credit towards meeting the MDA threshold. Yellow: capital layers filled with CoCos

Table 1: CoCo Issues 2009 - 2019, Summary Statistics by Capital Tier

	Additional Tier 1 (N=591)	Tier 2 (N=79)	Non-Basel III (N=50)	Total (N=720)
Amount Issued (USD Mil)				
Mean (SD)	769 (1,139)	702 (738)	575 (736)	748 (1,078)
Median	392	500	249	382
Range	1 - 11,620	3 - 3,000	4 - 4,380	1 - 11,620
Total Amount	454,196	55,471	28,739	538,406
Coupon Rate (%)				
Mean (SD)	6.22 (2.09)	6.45 (2.91)	9.00 (2.72)	6.44 (2.35)
Median	6.00	6.43	8.31	6.24
Range	0.98 - 13.88	1.00 - 13.50	2.70 - 16.12	0.98 - 16.12
Coupon Type				
Fixed	40 (6.8%)	32 (40.5%)	37 (74.0%)	109 (15.1%)
Fixed-To-Float	398 (67.3%)	44 (55.7%)	10 (20.0%)	452 (62.8%)
Floating	153 (25.9%)	3 (3.8%)	3 (6.0%)	159 (22.1%)
Perpetual				
Yes	590 (99.8%)	3 (3.8%)	13 (26.0%)	606 (84.2%)
No	1 (0.2%)	76 (96.2%)	37 (74.0%)	114 (15.8%)
Maturity (Years)				
Mean (SD)	-	10.95 (4.21)	11.51 (3.63)	11.43 (5.11)
Range	45 - Perpetual	3 - 30	2 - 23	2 - 45
Callable				
Yes	591 (100.0%)	53 (67.1%)	38 (76.0%)	682 (94.7%)
No	0 (0.0%)	26 (32.9%)	12 (24.0%)	38 (5.3%)
Years to First Call				
Mean (SD)	6 (2)	6 (2)	6 (2)	6 (2)
Median	5	5	6	5
Range	5 - 15	5 - 10	1 - 12	1 - 15
Loss Absorption Mechanism				
Equity Conversion	128 (21.7%)	11 (13.9%)	44 (88.0%)	183 (25.4%)
Permanent Write Down	128 (21.7%)	47 (59.5%)	0 (0.0%)	175 (24.3%)
Partial Permanent Write Down	21 (3.6%)	5 (6.3%)	1 (2.0%)	27 (3.8%)
Temporary Write Down	314 (53.1%)	16 (20.3%)	5 (10.0%)	335 (46.5%)
Trigger Parameter				
CET1 Ratio	591 (100.0%)	79 (100.0%)	45 (90.0%)	715 (99.3%)
Other	0 (0.0%)	0 (0.0%)	5 (10.0%)	5 (0.7%)
Trigger Level				
< 5	0 (0.0%)	37 (46.8%)	0 (0.0%)	37 (5.1%)
5	4 (0.7%)	25 (31.6%)	43 (86.0%)	72 (10.0%)
5.125	431 (72.9%)	2 (2.5%)	2 (4.0%)	435 (60.4%)
$> 5.125, < 7$	32 (5.4%)	0 (0.0%)	2 (4.0%)	34 (4.7%)
7	119 (20.1%)	12 (15.2%)	1 (2.0%)	132 (18.3%)
> 7	5 (0.8%)	3 (3.8%)	2 (4.0%)	10 (1.4%)

Table 1: CoCo Issues 2009 - 2019, Summary Statistics by Capital Tier *(continued)*

	Additional Tier 1 (N=591)	Tier 2 (N=79)	Non-Basel III (N=50)	Total (N=720)
Issue Year (Row Percentages)				
2009	0 (0.0%)	0 (0.0%)	39 (100.0%)	39 (100.0%)
2010	0 (0.0%)	1 (20.0%)	4 (80.0%)	5 (100.0%)
2011	2 (25.0%)	3 (37.5%)	3 (37.5%)	8 (100.0%)
2012	8 (44.4%)	6 (33.3%)	4 (22.2%)	18 (100.0%)
2013	23 (50.0%)	23 (50.0%)	0 (0.0%)	46 (100.0%)
2014	78 (82.1%)	17 (17.9%)	0 (0.0%)	95 (100.0%)
2015	96 (97.0%)	3 (3.0%)	0 (0.0%)	99 (100.0%)
2016	82 (92.1%)	7 (7.9%)	0 (0.0%)	89 (100.0%)
2017	113 (93.4%)	8 (6.6%)	0 (0.0%)	121 (100.0%)
2018	95 (91.3%)	9 (8.7%)	0 (0.0%)	104 (100.0%)
2019	94 (97.9%)	2 (2.1%)	0 (0.0%)	96 (100.0%)
Country				
Norway	121 (20.5%)	2 (2.5%)	2 (4.0%)	125 (17.4%)
Great Britain	57 (9.6%)	3 (3.8%)	38 (76.0%)	98 (13.6%)
Switzerland	48 (8.1%)	12 (15.2%)	0 (0.0%)	60 (8.3%)
France	40 (6.8%)	2 (2.5%)	0 (0.0%)	42 (5.8%)
Spain	30 (5.1%)	5 (6.3%)	2 (4.0%)	37 (5.1%)
Denmark	28 (4.7%)	3 (3.8%)	3 (6.0%)	34 (4.7%)
Russia	11 (1.9%)	21 (26.6%)	0 (0.0%)	32 (4.4%)
China	27 (4.6%)	0 (0.0%)	0 (0.0%)	27 (3.8%)
Japan	24 (4.1%)	0 (0.0%)	0 (0.0%)	24 (3.3%)
Austria	23 (3.9%)	0 (0.0%)	0 (0.0%)	23 (3.2%)
India	23 (3.9%)	0 (0.0%)	0 (0.0%)	23 (3.2%)
Italy	20 (3.4%)	0 (0.0%)	2 (4.0%)	22 (3.1%)
Germany	20 (3.4%)	0 (0.0%)	0 (0.0%)	20 (2.8%)
Malaysia	20 (3.4%)	0 (0.0%)	0 (0.0%)	20 (2.8%)
Sweden	20 (3.4%)	0 (0.0%)	0 (0.0%)	20 (2.8%)
Brazil	15 (2.5%)	4 (5.1%)	0 (0.0%)	19 (2.6%)
Other	64 (10.8%)	27 (34.2%)	3 (6.0%)	94 (13.1%)
Currency				
USD	172 (29.1%)	47 (59.5%)	8 (16.0%)	227 (31.5%)
EUR	123 (20.8%)	10 (12.7%)	13 (26.0%)	146 (20.3%)
NOK	126 (21.3%)	2 (2.5%)	2 (4.0%)	130 (18.1%)
GBP	27 (4.6%)	1 (1.3%)	22 (44.0%)	50 (6.9%)
CHF	24 (4.1%)	4 (5.1%)	0 (0.0%)	28 (3.9%)
JPY	24 (4.1%)	0 (0.0%)	2 (4.0%)	26 (3.6%)
DKK	18 (3.0%)	1 (1.3%)	3 (6.0%)	22 (3.1%)
INR	22 (3.7%)	0 (0.0%)	0 (0.0%)	22 (3.1%)
MYR	20 (3.4%)	0 (0.0%)	0 (0.0%)	20 (2.8%)
CNY	10 (1.7%)	0 (0.0%)	0 (0.0%)	10 (1.4%)
Other	25 (4.2%)	14 (17.7%)	0 (0.0%)	39 (5.4%)

Table 2: CoCo Issues 2009 - 2019, Yearly Distribution by Loss-Absorption Mechanism

Yearly issuance of contingent convertible capital instruments by loss absorption mechanism. Percentages are calculated by year.

	Equity Conversion (N=183)	Permanent Write Down (N=175)	Partial Permanent Write Down (N=27)	Temporary Write Down (N=335)	Total (N=720)
Issue Year (Row %)					
2009	39 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	39 (100.0%)
2010	2 (40.0%)	0 (0.0%)	1 (20.0%)	2 (40.0%)	5 (100.0%)
2011	5 (62.5%)	2 (25.0%)	0 (0.0%)	1 (12.5%)	8 (100.0%)
2012	6 (33.3%)	7 (38.9%)	2 (11.1%)	3 (16.7%)	18 (100.0%)
2013	7 (15.2%)	28 (60.9%)	0 (0.0%)	11 (23.9%)	46 (100.0%)
2014	28 (29.5%)	25 (26.3%)	3 (3.2%)	39 (41.1%)	95 (100.0%)
2015	18 (18.2%)	17 (17.2%)	4 (4.0%)	60 (60.6%)	99 (100.0%)
2016	20 (22.5%)	11 (12.4%)	5 (5.6%)	53 (59.6%)	89 (100.0%)
2017	31 (25.6%)	36 (29.8%)	6 (5.0%)	48 (39.7%)	121 (100.0%)
2018	14 (13.5%)	20 (19.2%)	3 (2.9%)	67 (64.4%)	104 (100.0%)
2019	13 (13.5%)	29 (30.2%)	3 (3.1%)	51 (53.1%)	96 (100.0%)

Table 3: Wealth Transfer Effect on Yield Spread at Issuance, Summary Statistics

Amount Issued is the CoCo notional amount converted into U.S. dollars at the prevailing exchange rate on day of issuance, *ln(Total Assets)* is the natural logarithm of *Total Assets*. *Wealth Transfer* is the projected wealth transfer at the trigger point, expressed as a share of notional value and positive for transfers in favor of shareholders. *Callable* is an indicator variable signaling that an instrument features a call option for the issuer, *Perpetual* an indicator variable for instruments with no fixed maturity. *Years to Maturity* and *Years to First Call* measure the years from the day of issuance to maturity date (if present) and the first available call date, respectively. *Tenor* is equal to the time to the *Years to First Call* for *Callable* instruments and *Time to Maturity* otherwise. *Yield at Issue* is based on the CoCos' *Issue Price* and computed over a time period equal to the instrument's *Tenor*. *Matched Sovereign Yield* is the yield on the day of each CoCo issuance of the sovereign bond having the closest tenor. *Yield Spread to Sovereign* is *Yield at Issue - Matched Sovereign Yield*; *Loss Absorption Mechanism*, *Coupon Frequency*, *Coupon Type* are factor variables with levels as indicated below each variable. *Coupon Rate* is the instrument's coupon rate as indicated in the prospectus. *CET1 Ratio* for a CoCo issued at time t is the issuer's CET1 ratio as reported for year $t-1$, *Trigger Level* is the contractually defined *CET1 Ratio* at which the instrument loss absorption mechanism is engaged, *Distance to Trigger* is*CET1 Ratio - Trigger Level*.

Variable	Obs	Mean	Sd	Min	Median	Max
Issue Year	615	2016.12	1.99	2010	2016	2019
Amount Issued (USD mil.)	615	763.02	1,003.51	1.07	500.00	11,620.32
Total Assets (USD mil)	615	494,003	667,641	96	109,290	3,530,093
ln(Total Assets)	615	11.196	2.704	4.564	11.602	15.077
Issue Price	615	99.978	1.002	77	100	108.5
Coupon Rate	615	6.189	2.095	1	6	13.875
Yield at Issue	615	6.191	2.083	1	6	13.875
Matched Sovereign Yield	615	1.992	2.898	-0.944	0.994	17.22
Yield Spread to Sovereign	615	4.2	2.607	-4.1	4.434	10.686
Wealth Transfer (Share Notional)	615	0.833	0.394	-1.398	1	1
CET1 Ratio	615	13.056	3.485	5.5	12.61	41.49
Trigger Level	615	5.439	1.012	2	5.125	8.25
Distance to Trigger Level	615	7.617	3.555	0.25	7.065	36.365
Capital Tier = Tier 2	64	10.4%				
Years to Maturity	67	11.433	5.901	2	10	45
Years to First Call	593	6.11	1.921	1	5	15
Tenor	615	6.189	1.981	1	5	15
Perpetual = Yes	548	89.1%				
Callable = Yes	593	96.4%				
Loss Absorption Mechanism	615					
Equity Conversion	117	19%				
Permanent Write Down	161	26.2%				
Partial Permanent Write Down	26	4.2%				
Temporary Write Down	311	50.6%				
Coupon Frequency	615					
Annual	150	24.4%				
Semiannual	242	39.3%				
Quarterly	223	36.3%				
Coupon Rate Type	615					
Fixed	67	10.9%				
Floating	145	23.6%				
Fixed-to-Float	403	65.5%				

Table 4: Analysis of CoCo Yield Spreads at Issuance

The dependent variable is the *Yield Spread to Sovereign* is the CoCo's yield at issuance minus the yield on sovereign bond of matching tenor; *Amount Issued* is the CoCo notional amount converted into U.S. dollars at the prevailing exchange rate on day of issuance, *ln(Total Assets)* at time t is the natural logarithm of total assets as reported at the end of year $t-1$. *Trigger Level* is the contractually defined CET1 ratio at which the instrument loss absorption mechanism is engaged, *CET1 Ratio* for a CoCo issued at time t is the issuer's CET1 ratio as reported at the end of year $t-1$, *Comparable Tenor* is equal to the years to first call for callable instruments or years to maturity otherwise, and it is the tenor used to find matching sovereign debt yields. *Perpetual* an indicator variable for instruments with no fixed maturity, *Callable* is an indicator variable signaling that an instrument features a call option for the issuer. *Fixed Rate* and *Floating Rate* are levels of a factor variable with indicating the type of coupon rate, with baseline level being the most common type *Fixed-to-Float*. The *Loss Absorption Mechanism* factor variable has baseline level equal to *Equity Conversion*, so the reported coefficients are for different forms of principal write down mechanisms. *Wealth Transfer* is the projected wealth transfer at the trigger point, expressed as a share of notional value and positive for transfers in favor of shareholders; the indicator variable *Negative Transfer* = 1 if *Wealth Transfer* ¡ 0, and 0 otherwise. Fixed effects and standard error clustering indicated in the footer.

		Yield Spread to Sovereign of Matched Tenor					
	Exp.	(1)	(2)	(3)	(4)	(5)	(6)
Wealth Transfers							
Negative Transfer	−	−1.23***	−1.71***				
		(0.39)	(0.35)				
Wealth Transfer (% Notional)	+			5.09***	6.13***	4.94***	6.05***
				(1.64)	(1.50)	(1.69)	(1.40)
Wealth Transfer x Trigger Level	+/−			−0.58**	−0.71***	−0.78***	−0.81***
				(0.27)	(0.23)	(0.30)	(0.23)
Wealth Transfer x CET1 Ratio	+/−					0.14	0.08
						(0.09)	(0.11)
Loss Absorption							
Permanent Write Down	+	−1.75***	−0.74***	−1.51***	−1.66***	−1.76***	−1.80***
		(0.32)	(0.25)	(0.50)	(0.39)	(0.48)	(0.43)
Partial Permanent Write Down	+	−2.75***	−1.96***	−2.74***	−2.90***	−2.98***	−3.03***
		(0.47)	(0.41)	(0.57)	(0.49)	(0.55)	(0.86)
Temporary Write Down	+/−	0.11	−0.52*	−1.32**	−1.43***	−1.61***	−1.59***
		(0.27)	(0.31)	(0.54)	(0.43)	(0.52)	(0.56)
Amount Issued	+/−	−0.02**	0.02*	0.01	0.02*	0.02	0.02
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
ln(Total Assets)	−	−0.05	−0.12***	−0.13***	−0.15***	−0.13***	−0.15
		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.09)
CET1 Ratio	−	0.04	−0.06**	−0.07***	−0.06***	−0.19**	−0.13
		(0.03)	(0.02)	(0.02)	(0.02)	(0.09)	(0.10)
Trigger Level	+	1.04***	0.24**	0.74***	0.86***	0.92***	0.96***
		(0.11)	(0.12)	(0.26)	(0.22)	(0.27)	(0.25)
Comparable Tenor	+/−	−0.13**	−0.12***	−0.12***	−0.10***	−0.12***	−0.10**
		(0.06)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Perpetual	+	0.54	0.77**	0.91***	0.97***	0.92***	0.97**
		(0.43)	(0.31)	(0.32)	(0.28)	(0.32)	(0.46)
Callable	−	−2.50***	−0.93	−0.82	−0.36	−0.81	−0.35
		(0.84)	(0.65)	(0.70)	(0.68)	(0.70)	(0.83)
Fixed Rate	−	−1.78***	−0.42	−0.33	−0.39	−0.28	−0.36
		(0.30)	(0.44)	(0.45)	(0.48)	(0.45)	(0.88)
Floating Rate	−	−1.02***	−1.11***	−1.09***	−1.09***	−1.11***	−1.10***
		(0.27)	(0.25)	(0.24)	(0.25)	(0.25)	(0.31)
Country Fixed Effects		No	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects		No	No	No	Yes	No	Yes
Clustered SE							Country
R^2		0.34	0.76	0.76	0.79	0.76	0.79
Adj. R^2		0.32	0.75	0.74	0.77	0.74	0.77
Num. obs.		615	615	615	615	615	615

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 5: Determinants of Issuance Variables, Summary Statistics

Issues and *Issues AT1* for a bank i in year t if the bank issued CoCo securities and AT1 CoCo securities, respectively. *Additional CoCo Layers* = 1 if a bank could at time t use CoCos outside of the Basel III Pillar 1 capital layer, *%RWA CoCo Layers* is the total amount of capital requirements that can be met with CoCo capital, *Distance to MDA Trigger* the difference between the issuer's *CET1 Ratio* at time t and the Capital Conservation Constraint or Maximum Distributable Amount threshold in year $t+1$; *AT1 Shortfall* is the size at time t of the financial institution's AT1 shortfall, *Has AT1 Shortfall* = 1 if *AT1 Shortfall* ¿ 0; *No Tax Shield* = 1 if its regulatory jurisdiction did not grant debt tax treatment to CoCos. *Size* is the natural logarithm of Total Assets as reported end of year $t-1$, *G-SIB* = 1 if bank i at time t had been designated by the FSB as a G-SIB in year $t-1$. All control accounting values variables are observed as reported at the end of year $t-1$; all asset composition variables are defined as share of Total Assets, *AFS* are financial assets accounted for as Available for Sale, *HTM* financial assets accounted for as Held to Maturity. *Impaired Loans* and *Loan Loss Reserves* are, respectively, the share of gross loans reported at year end $t-1$ as impaired and the ratio between the provision for loan losses and gross loans. *Deposits* and *Wholesale Funding* are the share of total funding at end of year $t-1$ originating from customers deposits and wholesale sources, respectively.

Variable	Obs	Mean	Sd	Min	Median	Max
Year	1406	2014.26	3.082	2009	2014	2019
Issues	1406	0.1572	0.364	0	0	1
Issues AT1	1406	0.1422	0.349	0	0	1
Regulatory Environment						
Additional CoCo Layers	1406	0.111	0.315	0	0	1
%RWA CoCo Layers	1406	2.468	2.102	0	3.5	18.6
Distance to MDA Threshold	1406	3.252	3.959	-4.7	2.1	27.5
AT1 Shortfall	1406	0.287	1.051	-8.5	0	8.425
Has AT1 Shortfall	1406	0.418	0.493	0	0	1
No Tax Shield	1406	0.19	0.393	0	0	1
Control Variables						
Total Assets (USD mil.)	1406	500,937	577,011	1,171	273,457	3,530,092
Size	1406	12.465	1.267	7.066	12.519	15.077
G-SIB	1406	0.237	0.425	0	0	1
Tier 1 Ratio	1406	12.906	4.249	4.3	12.3	45.3
Net Interest Margin	1406	2.059	1.425	-0.13	1.705	10.5
Asset Composition						
Loans / Total Assets	1406	0.525	0.173	0.018	0.534	0.923
Derivatives / Total Assets	1406	0.046	0.069	0	0.023	0.917
Trading / Total Assets	1406	0.059	0.065	0	0.035	0.43
AFS / Total Assets	1406	0.085	0.075	0	0.072	0.571
HTM / Total Assets	1406	0.039	0.058	-0.004	0.013	0.37
Cash / Total Assets	1406	0.057	0.052	0	0.043	0.283
Loan Impairment (% Gross Loans)						
Impaired Loans	1406	4.026	5.646	0	2.02	49.75
Loan Loss Reserves	1406	2.683	3.086	0	1.88	26.32
Source of Funding (% Total Funding)						
Deposits	1406	62.383	19.036	1.5	64.66	99.18
Wholesale Funding	1406	35.846	18.519	0.82	33.755	99.63

Table 6: Logit Analysis of the Determinants of CoCo Issuance

Logit models for determinants of CoCo issuance. The dependent variables *Issues* and *Issues AT1* for a bank i in year t if the bank issued CoCo securities and AT1 CoCo securities, respectively. *Additional CoCo Layers* = 1 if a bank could at time t use CoCos outside of the Basel III Pillar 1 capital layer, *%RWA CoCo Layers* is the total amount of capital requirements that can be met with CoCo capital, *Distance to MDA Trigger* the difference between the issuer's *CET1 Ratio* at time t and the Capital Conservation Constraint or Maximum Distributable Amount threshold in year $t+1$; *AT1 Shortfall* is the size at time t of the financial institution's AT1 shortfall, *Has AT1 Shortfall* = 1 if *AT1 Shortfall* ¿ 0; *No Tax Shield* = 1 if its regulatory jurisdiction did not grant debt tax treatment to CoCos. *Size* is the natural logarithm of Total Assets as reported end of year $t-1$, *G-SIB* = 1 if bank i at time t had been designated by the FSB as a G-SIB in year $t-1$. All control accounting values variables are observed as reported at the end of year $t-1$; all asset composition variables are defined as share of Total Assets, *AFS* are financial assets accounted for as Available for Sale, *HTM* financial assets accounted for as Held to Maturity. *Impaired Loans* and *Loan Loss Reserves* are, respectively, the share of gross loans reported at year end $t-1$ as impaired and the ratio between the provision for loan losses and gross loans. *Deposits* and *Wholesale Funding* are the share of total funding at end of year $t-1$ originating from customers deposits and wholesale sources, respectively. Included fixed effects detailed in the footer.

	Issues				Issues AT1	
	(1)	(2)	(3)	(4)	(5)	(6)
Regulatory Variables						
Additional CoCo Layers	1.35***					
	(0.28)					
% RWA CoCo Layers		0.28***	0.24**	0.14	0.25***	0.08
		(0.09)	(0.11)	(0.11)	(0.09)	(0.11)
Distance to MDA Trigger	0.10***	0.16***	0.17***	0.05	0.16***	0.01
	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)	(0.05)
Has AT1 Shortfall	1.03***	1.02***	1.52***	0.45	1.35***	0.67*
	(0.26)	(0.26)	(0.31)	(0.36)	(0.27)	(0.38)
Has AT1 Shortfall x Distance to MDA Trigger	−0.14***	−0.23***	−0.28***	−0.15**	−0.25***	−0.14**
	(0.04)	(0.05)	(0.06)	(0.06)	(0.05)	(0.06)
No Tax Shield	−2.01***	−2.20***	−0.55	−0.65	−2.00***	−0.74
	(0.50)	(0.50)	(0.69)	(0.76)	(0.51)	(0.78)
Size	0.29***	0.26**	0.49***	0.42***	0.32***	0.36***
	(0.11)	(0.10)	(0.12)	(0.12)	(0.11)	(0.13)
G-SIB	0.74***	0.85***	0.50*	0.61**	0.81***	0.66**
	(0.28)	(0.27)	(0.30)	(0.31)	(0.29)	(0.32)
Tier 1 Ratio	−0.02	0.03	0.03	0.03	0.04*	0.04
	(0.03)	(0.03)	(0.03)	(0.04)	(0.02)	(0.04)
Net Interest Margin	−0.08	−0.12	−0.07	0.05	−0.20**	0.03
	(0.08)	(0.08)	(0.16)	(0.17)	(0.10)	(0.20)
Assets Composition (Share of Total Assets)						
Loans	0.60	0.64	−1.21	−0.61	0.87	−0.48
	(0.91)	(0.90)	(1.14)	(1.15)	(0.97)	(1.24)
Derivatives	−0.45	−0.33	−0.99	−0.39	−1.11	−0.87
	(1.28)	(1.21)	(1.40)	(1.17)	(1.47)	(1.44)
Trading	4.60**	6.62***	4.00	5.17*	7.35***	4.01
	(2.07)	(1.96)	(2.61)	(2.74)	(2.07)	(2.85)
AFS	0.83	−0.36	0.94	1.61	0.87	2.10
	(1.53)	(1.52)	(1.94)	(2.02)	(1.58)	(2.07)
HTM	−2.98	−4.39**	−5.07*	−3.25	−3.09	−3.77
	(2.07)	(2.03)	(2.76)	(2.84)	(2.07)	(2.93)
Cash	5.39**	6.04***	5.33**	4.12	6.69***	4.65
	(2.11)	(2.06)	(2.58)	(2.80)	(2.15)	(2.93)
Loan Impairment (Share of Gross Loans)						
Impaired Loans	0.12***	0.11***	0.07	0.05	0.14***	0.06
	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)	(0.06)
Loan Loss Reserves	0.10	0.05	−0.13	−0.16	0.02	−0.00
	(0.09)	(0.08)	(0.11)	(0.11)	(0.09)	(0.13)
Impaired Loans x Loan Loss Reserves	−0.01**	−0.01**	−0.00	−0.00	−0.01**	−0.01
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Funding (Share of Total Funding)						
Deposits	0.05*	0.07**	0.03	0.01	0.07**	−0.00
	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.04)
Wholesale Funding	0.06**	0.08***	0.04	0.02	0.08***	0.01
	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.04)
N	1406	1406	1406	1406	1406	1406
Country Fixed Effects	No	No	Yes	Yes	No	Yes
Year Fixed Effects	No	No	No	Yes	No	Yes
Nagelkerke Pseudo-R2	0.29	0.27	0.37	0.42	0.29	0.43
AIC	996.14	1011.80	963.99	934.62	936.34	864.93
BIC	1106.28	1121.94	1200.01	1223.10	1046.48	1153.41
Log Likelihood	−477.07	−484.90	−437.00	−412.31	−447.17	−377.47

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 7: Multinomial Logit Analysis of CoCo AT1 and Tier 2 Issuance

Multinomial logit for determinants of issuance of CoCos of different capital tier. The dependent variable has 3 levels, with baseline level *Nothing* if bank i in year t did not issue any CoCo instrument, and levels AT1 and T2 if the bank issued Additional Tier 1 and Tier 2 CoCo securities, respectively. *%RWA CoCo Layers* is the total amount of capital requirements that can be met with CoCo capital, *Distance to MDA Trigger* the difference between the issuer's *CET1 Ratio* at time t and the Capital Conservation Constraint or Maximum Distributable Amount threshold in year $t+1$; *AT1 Shortfall* is the size at time t of the financial institution's AT1 shortfall, *Has AT1 Shortfall* = 1 if *AT1 Shortfall* ¿ 0; *No Tax Shield* = 1 if its regulatory jurisdiction did not grant debt tax treatment to CoCos. *Size* is the natural logarithm of Total Assets as reported end of year $t-1$, *G-SIB* = 1 if bank i at time t had been designated by the FSB as a G-SIB in year $t-1$. All control accounting values variables are observed as reported at the end of year $t-1$. Included fixed effects detailed in the footer.

	Multinomial Logit AT1 vs. T2 vs. Nothing		
	(1)	(2)	(3)
AT1: Has AT1 Shortfall x Distance to MDA Trigger	−0.27 (0.05)***	−0.32 (0.06)***	−0.16 (0.06)***
T2: Has AT1 Shortfall x Distance to MDA Trigger	−0.05 (0.15)	0.02 (0.18)	−0.09 (0.24)
AT1: Has AT1 Shortfall	1.27 (0.26)***	1.92 (0.33)***	0.68 (0.37)*
T2: Has AT1 Shortfall	−1.98 (0.93)**	−1.99 (1.03)*	−0.53 (1.56)
AT1: Distance to MDA Trigger	0.18 (0.04)***	0.19 (0.05)***	0.04 (0.05)
T2: Distance to MDA Trigger	0.21 (0.12)*	0.28 (0.15)*	0.15 (0.17)
AT1: No Tax Shield	−2.13 (0.50)***	−0.48 (0.70)	−0.72 (0.78)
T2: No Tax Shield	−9.69 (0.00)***	−7.36 (0.00)***	−4.27 (0.02)***
AT1: % RWA CoCo Layers	0.32 (0.09)***	0.24 (0.11)**	0.12 (0.12)
T2: % RWA CoCo Layers	0.55 (0.23)**	0.27 (0.24)	0.37 (0.29)
AT1			
AT1: Size	0.31 (0.11)***	0.41 (0.13)***	0.33 (0.13)***
AT1: G-SIB	0.96 (0.27)***	0.65 (0.30)**	0.79 (0.32)**
AT1: Tier 1 Ratio	0.03 (0.02)*	0.02 (0.02)	0.03 (0.03)
AT1: Net Interest Margin	−0.12 (0.08)	−0.02 (0.17)	0.11 (0.19)
AT1: Loans / Total Assets	0.51 (0.83)	−1.38 (1.06)	−1.08 (1.09)
AT1: Securities / Total Assets	0.39 (1.19)	−0.19 (1.52)	0.52 (1.55)
AT1: Cash / Total Assets	4.50 (1.94)**	4.76 (2.52)*	2.75 (2.83)
AT1: Impaired Loans - Loan Loss Reserves	0.05 (0.03)*	0.02 (0.04)	−0.01 (0.05)
AT1: Deposits / Total Funding	0.02 (0.03)	0.01 (0.04)	−0.01 (0.04)
AT1: Wholesale Funding / Total Funding	0.04 (0.03)	0.02 (0.04)	−0.00 (0.04)
T2			
T2: Size	−0.10 (0.23)	0.52 (0.32)	0.53 (0.36)
T2: G-SIB	1.45 (0.83)*	0.07 (1.54)	0.03 (1.69)
T2: Tier 1 Ratio	−0.09 (0.08)	−0.30 (0.15)**	−0.21 (0.17)
T2: Net Interest Margin	0.27 (0.13)**	0.29 (0.31)	−0.16 (0.40)
T2: Loans / Total Assets	−2.71 (2.00)	−1.50 (3.35)	−1.00 (4.17)
T2: Securities / Total Assets	−14.00 (4.39)***	−2.72 (5.60)	−2.06 (6.87)
T2: Cash / Total Assets	−3.54 (5.89)	−0.03 (9.13)	3.32 (0.93)***
T2: Impaired Loans - Loan Loss Reserves	−0.12 (0.09)	−0.02 (0.10)	−0.06 (0.13)
T2: Deposits / Total Funding	−0.03 (0.03)	0.03 (0.06)	0.01 (0.07)
T2: Wholesale Funding / Total Funding	−0.00 (0.03)	0.08 (0.06)	0.06 (0.07)
Num. Obs.	1406	1406	1406
Fixed Effects		Country	Country and Year
McFadden Pseudo-R2	0.19	0.31	0.38
Nagelkerke Pseudo-R2	0.27	0.41	0.49
AIC	1159.01	1094.44	1041.70
BIC	1326.85	1514.04	1566.20
Log Likelihood	−547.51	−467.22	−420.85

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

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A Appendix

Table A1: Variable Definitions and Sources of Data

Variable Name	**Variable Description**	**Sources of Data**
Amount Issued (USD mil.)	The notional amount of the CoCo converted into U.S. dollars if necessary at the prevailing currency exchange rate on the day of issuance.	CoCo prospectuses
Issue Year	Year of issuance	Bloomberg; CoCo prospectuses
Coupon Rate	The contractually specified coupon rate of the CoCo instrument.	Bloomberg; CoCo prospectuses
Coupon Type	*Fixed* if the coupon rate is to remain constant for the life of the instrument; *Floating* if the coupon rate is variable; *Fixed-to-Float* if the coupon rate is fixed during the initial period from issuance to the first scheduled call date, and reset to a variable rate thereafter.	CoCo prospectuses
Perpetual	Indicator Variable for instruments with no finite maturity.	CoCo prospectuses
Callable	Indicator Variable for instruments featuring a call option for the issuer.	Bloomberg; CoCo prospectuses
Maturity (Years)	Years from issue date to maturity date.	Bloomberg; CoCo prospectuses
Years to First Call	Years from issue date to the first available call option date.	Bloomberg; CoCo prospectuses
Loss Absorption Mechanism	Contractually specified method of loss absorption at the trigger point.	Bloomberg; CoCo prospectuses
Trigger Parameter	The measure used to define the trigger level at which the loss absorption mechanism is engaged.	CoCo prospectuses
Trigger Level	The capital level at which the loss absorption mechanism is engaged.	Bloomberg; CoCo prospectuses
Total Assets	Total Assets of the issuing institution, at end of year $t-1$ for CoCos issued in year t.	BankFocus; Issuer's financial statements
CET1 Ratio	Common Equity Tier 1 ratio of the issuing institution, as reported at end of year $t-1$ for CoCos issued in year t.	BankFocus; Issuer's financial statements
Issue Price	The instrument's opening price on issue date	Bloomberg
Tenor	The instrument's Years to First Call if callable, or Years to Maturity if non-callable	Computed
Yield at Issue	The instrument's yield computed on the basis of the Issue Price, Coupon Frequency and Tenor; for floating rate instruments the coupon rate is assumed constant at the rate on issue date	Computed

Table A1: Variable Definitions and Sources of Data (continues)

Variable Name	**Variable Description**	**Sources of Data**
Matched Sovereign Yield	The yield on a tenor-matched sovereign bond issued in the institution's country of domicile	Nasdaq Quandl; National central banks
Yield Spread to Sovereign	*Yield at Issue − Matched Sovereign Yield*	Computed
Wealth Transfer (Share Notional)	The projected wealth transfer at the trigger point, as a share of the instrument's notional value. It assumes the share price will follow one-to-one the fall in CET1 ratio to reach the trigger point, no change in the currency exchange rate between the CoCo currency of denomination and stock currency of denomination, and equity conversion price equal to the contractually specified fixed or floor conversion price.	Computed
Distance to Trigger Level	*CET1 Ratio − Trigger Level*	Computed
Coupon Frequency	Frequency of coupon payments: Annual, Semiannual or Quarterly	CoCo prospectuses
Coupon Frequency	Frequency of coupon payments: Annual, Semiannual or Quarterly	CoCo prospectuses
$\text{Issues}_{k,t}$	Indicator variable, set to 1 if bank k issues CoCos in year t and 0 otherwise.	Computed
$\text{Issues AT1}_{k,t}$	Indicator variable, set to 1 if bank k issues AT1 CoCos in year t and 0 otherwise.	Computed
$\text{Additional CoCo Layers}_{k,t}$	Indicator variable, set to 1 if bank k could in year t issue CoCos for capital layers other than baseline Basel III Pillar 1 capital requirements, and 0 otherwise.	National regulatory and supervisory documents
$\text{\%RWA CoCo Layers}_{k,t}$	The total %RWA of capital requirements that could be covered with CoCo capital instruments by bank k in year t.	Computed
$\text{Distance to MDA Threshold}_{k,t}$	For bank k in year t, the difference between the CCC or MDA threshold projected for year $t+1$ and the CET1 ratio reported at end of year $t-1$.	Computed
$\text{AT1 Shortfall}_{k,t}$	For bank k in year t, the difference between the maximum amount of %RWA regulatory capital layers that the bank can cover in year $t+1$ with CoCo securities and the outstanding AT1 capital securities, computed as the difference between Tier 1 ratio and CET1 ratio as reported at the end of year $t-1$.	Computed
$\text{Has AT1 Shortfall}_{k,t}$	Indicator variable, set to 1 if *AT1 Shortfall ¿ 0* for bank k in year t, and 0 otherwise.	Computed

Table A1: Variable Definitions and Sources of Data (continues)

Variable Name	**Variable Description**	**Sources of Data**
No Tax Shield$_{k,t}$	Indicator variable, set to 1 if in the jurisdiction where bank k is domiciled the national tax authorities did not grant in year t debt tax treatment to coupon payments from CoCo securities, and 0 otherwise.	National regulatory and supervisory documents
Size	The natural logarithm of the issuer's *Total Assets* as reported for end of year $t-1$.	Computed; Total Assets from BankFocus
G-SIB	Indicator variable that assumes a value of 1 if bank k is included in year t in the FSB list of global systemically important financial institutions (announced in last quarter of year $t-1$).	Financial Stability Board
Net Interest Margin	Net interest margin as reported at end of year $t-1$	BankFocus; Banks' financial statements
Loans	Total Loans as a share of *Total Assets*, values reported at year end $t-1$	BankFocus; Banks' financial statements
Derivatives	Derivatives as a share of *Total Assets*, values reported at year end $t-1$	BankFocus; Banks' financial statements
Trading	Financial assets accounted for as trading assets as a share of *Total Assets*, values reported at year end $t-1$	BankFocus; Banks' financial statements
AFS	Financial assets accounted for as Available-for-Sale as a share of *Total Assets*, values reported at year end $t-1$	BankFocus; Banks' financial statements
HTM	Financial assets accounted for as Hold-to-Maturity as a share of *Total Assets*, values reported at year end $t-1$	BankFocus; Banks' financial statements
Cash	Cash and cash-like assets as a share of *Total Assets*, values reported at year end $t-1$	BankFocus; Banks' financial statements
Securities	All financial assets (regardless of accounting classification) as a share of *Total Assets*, values reported at year end $t-1$	BankFocus; Banks' financial statements
Impaired Loans	Impaired Loans / Gross Loans, values reported at year end $t-1$	BankFocus; Banks' financial statements
Loan Loss Reserves	Loan Loss Reserves / Gross Loans, values reported at year end $t-1$	BankFocus; Banks' financial statements
Deposits	Deposits / Total Funding, values reported at year end $t-1$	BankFocus; Banks' financial statements
Wholesale Funding	Wholesale Funding / Total Funding, values reported at year end $t-1$	BankFocus; Banks' financial statements