Hybrid Securities as a strategy of sequential finance in the banking sector

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Abstract

Up to this point, the literature on the issuance of convertible bonds has neglected financial institutions. Contrary to firms, banks not only can issue convertible bonds but also, after the subprime crises, contingent convertible (CoCo) bonds emerged as an alternative. Hence, the purpose of this study is threefold: first, we expand the literature on the motivation to issue convertible bonds in the banking sector; second, we introduce a new proxy (Loans-Deposits Flow) to measure the reinvestment in this sector; and third, we analyze the differences in the motivation for issuing CoCo bonds when compared to convertible bonds. Our results show that the theory of sequential financing is not confirmed for CoCo bonds in the banking sector. Additionally, we provide evidence that banks issue CoCo bonds for regulatory purposes (to increase their capital), while convertibles are issued to allow banks to expand their investments and loan portfolios. The results are robust to several specifications including a propensity-score matching and a difference-in-difference analysis.

Keywords: Hybrid Securities, Convertible bonds, CoCo bonds, call provision, sequential finance. JEL codes: G01, G21, G23

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1 Introduction

Hybrid securities are located at the crossroads between debt and equity (De Spiegeleer et al., 2014). These financial instruments initially act as regular bonds and pay coupons, but they can be converted into equity in the issuing firm. Also, these bonds have many special features, including call and put provisions, mandatory conversion, and restrictions on conversions (Ho and Pfeffer, 1996). In a nutshell, a convertible bond offers the market a blend of the defensive qualities of bonds with the higher returns typically associated with riskier investments, such as equities.

The popularity of these asset classes in the financial market since the 1970s has encouraged extensive literature to explain the phenomenon. The motivations for why firms issue these instruments are based on: the risk-shifting (Green, 1984), the risk uncertainty (Brennan and Schwartz, 1988), asymmetric information (Stein, 1992), and sequential financing (Mayers, 1998).

It is noteworthy that these explanations of issuance may not be associated with a particular class of convertible bonds, denominated contingent convertible (CoCo) bond. In essence, a CoCo bond is a standard corporate bond issued exclusively by banks that can absorb losses without triggering a default for the issuing bank. Fajardo and Mendes (2020) showed, through an empirical study, the strength of the regulatory component pertaining to banks that issued CoCo bonds as soon as proposed by regulators in the Basel III[1].

The CoCo issuance is linked to creating a countercyclical capital buffer; that is, bank replenish their financial reserves in optimistic market scenarios to survive in uncertain and distressing moments. In such a case, banks choose to assume debt through the CoCo bond to increase liquidity and capital requirement compared to other bonds that are focusing on increasing capital expenditures.

[1]Basel III is a framework established to reduce the need for government bail-outs in the subprime crisis (2008) through the strong regulatory liquidity component in the bank balance sheets (BIS, 2011)

Thus, this study's main objective is to generalize these results to other types of convertible bonds, such as CoCo bonds. Therefore, we proceed with a set of analyses to investigate how banks allocate the capital raised by issuing CoCo bonds and convertible bonds. The results show that the regulatory convertible bonds (CoCo bonds) are different from those previously discussed in the literature. Using a mixture of models (Poisson and GLS regressions, propensity-score matching, and a difference-in-differences approach), we show that the amounts raised by CoCo bonds are used to increase banks' adequacy regarding capital requirements, and banks with timing problems tend to issue CoCo bonds with longer call provision periods, but these relationships are largely absent for convertible bonds. Hence, we fill this literature gap, showing that not all types of convertible bonds are created equally.

Moreover, we discuss whether the funds raised through the CoCo issuance are used to increase capital expenditures as suggested by the literature, or to improve the bank's liquidity in response to regulators. It is important to consider the relevance of the call provision feature in convertible bonds as a strategic measure that permits to evaluate firm's real intentions in the bond issuance as soon as proposed by Korkeamaki and Moore (2004).

As previously mentioned, this study shines a new light on the already analyzed (and much-discussed) relationship of convertible bonds and call provisions literature, emphasizing that the sequential financial theory cannot fully accommodate the reasons behind CoCo bond issuance. Thus, the first contribution is that not all types of convertible bonds are created equally. CoCo Bonds are mainly being used for regulatory purposes, while convertibles bonds are used to leverage the banks and increase their loan portfolios.

In addition, the second contribution of the present study is to extend the discussion of convertible bond issuance and call provisions into the banking sector, which has two types of bonds (the usual convertible ones and the contingent convertibles), which have been overlooked in the previous studies.

Finally, we develop a new measure to analyze reinvestment in the banking sector, which we call “Loan-Deposits Flow,” in which a larger positive value shows that the bank has received more flows from deposits than it has directed to loans, and a negative value shows otherwise. This allows us to assess if banks are increasing their loans proportionally to the deposit flows.

The next section presents a discussion of related literature review. Then we proceed to define our empirical strategy and sample, followed by the main results and robustness checks. The last section concludes.

2 Related Literature Review

Convertible bonds provide the market with hybrid-financing tool that combines the features of bonds and stocks in one instrument, giving holders the right to convert their bonds into a predetermined number of shares (Olivier et al., 2018). Some companies may use convertible bonds to boost the equity in their capital structures in situations where information asymmetries make common equity issues unattractive (Stein, 1992). In other words, convertible bonds may represent an indirect mechanism for implementing equity financing that mitigates the adverse-selection costs associated with direct equity sales.

In general, the call provision is a prominent feature of convertible bonds, which allows an issuer to pay off the bond before its maturity date. It is of particular interest in convertibles' case because of the holder's right to convert into common stock. The critical point is that a callable bond gives the issuing firm an option to reduce its debt obligation if it finds that the future project has negative NPV (Chen et al., 2010). A callable bond essentially enables the bondholders to influence the firms into making efficient investment decisions.

The explanations why firms issue these instruments instead of standard non-hybrid financing instruments has been synthesized in four theories (Dutordoir et al., 2014). First, Green (1984) focused on models and characterized investment incentive problems associated with debt financing. He concluded that, under certain conditions, such claims can be constructed to restore net present value-maximizing incentives and simultaneously meet the firm's financing requirements. On the other hand, Brennan and Schwartz (1988) showed that the most plausible rationale for the continuing popularity of convertibles is their insensitivity to company risk. Companies issuing convertible bonds tend to have higher market value and earnings volatility, higher business and/or financial uncertainty, stronger growth-orientation, and shorter corporate histories than their straight debt counterparts. Thus, the theory suggests that management should force conversion of convertibles soon after the value of the security rises above the call price. Still, companies tend to delay calling their convertibles well beyond this point.

From another point of view, Stein (1992) argued that companies might find convertible bonds an attractive middle ground between the negative informational consequences associated with an equity issue and the potential for costly financial distress related to a debt issue. Therefore, a convertible can serve as a risky indirect mechanism for implementing equity financing that entails less of an adverse price impact than an offering of common stock when used with a call provision that enables early forced conversion. The last theory was proposed by Mayers (1998), that corporations use convertible debt to solve sequential financing problems, which means the portion of the convertible bond provides a hedge against incurring the costs associated with raising capital in the future while helping to control the overinvestment incentive. Thus, the call provision has the role of allowing the firm to proceed with its financing plan unencumbered by the debt issue when the overinvestment problem is favorably resolved.

In summary, the view adopted by Stein (1992) is based on asymmetric information about the assets of a firm. In contrast, the sequential financing hypothesis is based on uncertainty about the value of future investment options.

An essential part of this literature focuses on the importance of the design of call provisions in the investment decision and debt structure. Other studies, such as Lewis et al. (1998), provide empirical evidence regarding the design of convertible bonds, concluding that managers of firms with ample growth opportunities also set relatively short periods of call protection to overcome the adverse selection costs associated with common stock issues.

In the same way, Korkeamaki and Moore (2004) focused on this narrow but important security design feature involving convertible bonds. They showed that firms design call provisions largely consistent with the need for short-term financing flexibility. Moreover, they found that the call protection period's length is shorter for firms with higher capital investment levels shortly after issuance.

Following the empirical studies of the sequential-financing hypothesis, Chang et al. (2004), by analyzing convertible debt offerings by Taiwanese firms, found support for the sequential-financing theory that convertible debt financing is motivated by a desire to minimize security issue costs and agency costs of overinvestment of firms with promising growth opportunities, allowing them to finance a sequence of major corporate investments of uncertain value and timing.

Complementary, Chen et al. (2010) corroborated these findings, showing that the firms use a callable bonds to reduce the risk-shifting problem in case their investment opportunities become poor. By way of explanation, a firm facing poorer future investment opportunities is more likely to issue a callable bond than a firm facing better investment opportunities. Also, Alderson et al. (2006) examined whether changes in the rate of investment relate to changes in the rate of financing activity around convertible calls. Similar to Mayers' results, conversion-forcing firms exhibited an increase in capital expenditures and debt financing around the year of the convertible bond call.

King and Mauer (2014) developed another approach. They investigated the call policy determinants and concluded that the risk of a failed call over the call notice period helps explain why firms call only after the conversion value exceeds the call price by a substantial safety margin (premium). They found that a significant portion of calls is associated with restructuring and merger activity and bond rating upgrades and downgrades.

However, these studies portray findings exclusively for convertible bonds, excluding other types of Hybrid Securities and also firms in the financial sector. It should be noted that after the 2008 crisis, a new class of convertible bonds was created by the Basel III framework (BIS, 2011). The so-called CoCo bonds work as bail-in mechanisms that permit banks to recapitalize in the short term during financial distress moments. Thus, regulators have advocated that CoCos are designed to be truly loss-absorbing, in contrast to other regulatory instruments such as the hybrid Tier 1 bonds, which failed during the near-collapse of the financial system just after the subprime crisis (Jan De Spiegeleer, 2014). However, in the U.S. the adoption of CoCos has not been allowed by regulators, due to the uncertainty inherent in CoCo design and implementation.

Like convertible bonds, CoCos have the feature of a call provision. According to Pennacchi and Tchistyi (2019), giving shareholders a call option can increase the value of the candidate stock price relative to that of a noncallable CoCo, thereby making it more likely the candidate stock price will organically grow in the bank's assets. On the other hand, Martynova and Perotti (2018) showed that the design of bank contingent capital affects risk-taking incentives if the bank takes an inefficient risk that involves a choice for speculative assets purely for risk-shifting reasons, highlighting the nature of bonds anchored to the capital requirement. On the side of investors, Fiordelisi et al. (2019) analyzed the investors' expectations and concluded that CoCos tend to reduce stock returns volatility and other tail risk measures. From these premises, we can affirm that CoCo issuance aims to reduce the gap between loan supply and deposits in order to maximize the bank's liquidity.

Regarding the market timing ability in bond markets, results show this to be of a relatively neutral impact (Chen et al., 2010). Hence, we regard market timing as a factor of the banks' choice between issuing CoCos or Convertibles' as less important compared to the main regulatory or internal investment factors.

Most of the papers in the literature use CAPEX to assess the reinvestment made by non-financial firms. However, this poses a problem for the application of this theory to financial firms since "unlike manufacturing firms that invest in plant, equipment, and other fixed assets, financial service firms invest primarily in intangible assets such as brand name and human capital" (Damodaran, 2009). Although CAPEX is clearly defined for firms, this is not the case for banks. Nevertheless, we adopt CAPEX as a proxy for reinvestment in order to compare our results to those of the cited literature. Notwithstanding, we developed a new variable to assess banks' reinvestment flow, called Loans-Deposits Flow. We did so our results apply better fit to the financial sector, in which "firms invest primarily in intangible assets such as brand name and human capital" and "consequently, their investments for future growth often are categorized as operating expenses in accounting statements" (Damodaran, 2009). We explore this metric in the next section.

3 Methods and Data

To answer the question proposed in this study, we adopted insights based on theoretical and empirical research by Mayers (1998) and Korkeamaki and Moore (2004).

We estimate the model in Equation 1 using Poisson regressions. We must use a Poisson regression approach in our estimations, since the dependent variable is a time counting variable that refers to the interval in years of first call protection specified in each contract, rounded to an integer. Hence, the Poisson regression is necessary for estimating a time period between two events (from issue to first call protection specified in each contract), which can only be a natural number. Table 1 describes all variables present in the model.

$$log(E(Length \mid x)) = \alpha + \beta' x \tag{1}$$

On the right side, x is a vector of independent variables that portray the primary variable of Timing, which is the number of years following issuance in which cumulative annual expenditures or Loans-Deposits Flow first meet or exceed proceeds from convertible issuance. Hence, this variable can be perceived as the break-even point in the bond issuance time, from the bank's perspective.

Other variables in the vector are relevant controls of issuer and bond contract design: issuer leverage, measured by the debt/asset ratio (Lev) as of the year-end before issuance; the issue size measured as the amount raised divided by total asset value (Proceeds); binary variable of perpetual maturity (Mature); binary variable of the private bond placement (Private); and a geographic and economic dummy variable for European bond issuance (Euro).

The variable Loans-Deposits Flow is calculated as the first difference of year t to year $t-1$ between the differences in the stock of deposits minus the stock of loans, which is now a measure of flow of the incoming assets: a positive value means a larger flow of assets to deposits than to loans in year t, and a negative value means a larger flow of assets to loans. Hence, we construct the variable Loans-Deposits Flow (LDF) as follows (with D representing the *Deposits* and L the $TotalLoans$):

$$LDF_{i,t} = (D_{i,t} - L_{i,t}) - (D_{i,t-1} - L_{i,t-1}) = (D_{i,t} - D_{i,t-1}) - (L_{i,t} - L_{i,t-1}). \tag{2}$$

It is important to notice that we have to calculate Loans-Deposits Flow as a first difference since both deposits and loans are balance sheet accounts, and hence they represent stocks and not flows. This metric now becomes a flow metric by analyzing the first difference, just like CAPEX is a measure of cash flow.

3.1 Sample

Our sample comprises convertible bonds and contingent convertible (CoCo) bonds issued by financial firms between 2009 and 2019, available from the Bloomberg database. The distribution of issuance by years and countries are presented in Tables 2 and 3, respectively. In this dataset, we obtain data about the bond issuance, such as: bond

Table 1: Definition of variables

Variables	Coding	Definition
CoCo bond dummy	CoCo	Binary variable which assumes the value 1 if a bond is a Contingent Convertible Bond, and 0 if the bond is only a Convertible Bond.
Issue to Call	Length	Call protection period in years
Timing CAPEX	Timing CAPEX	Measure of capital expenditure timing
Timing Loans-Deposits	Timing LDF	Measure of difference between loan and deposits timing
Proceeds	Proceeds	bond issuance size relative to total assets
Levarage	Lev	total debt/total assets ratio
Euro market	Euro	Binary variable which assumes the value 1 if bond is a Eurobond and zero otherwise
Private Placement	Private	Binary variable which assumes the value 1 if bonds are placed privately and zero otherwise
Maturity	Mature	Binary variable which assumes the value 1 if bonds have perpetual maturity and zero otherwise
Amount Issue	Amount	Bond issuance size in dollars
Capital Expenditures	CAPEX	Capital expenditure by bank
Loans-Deposits Flow	LDF	First Difference of Total Deposits - Total Loans
Cash ratio	Cash	Cash and Equivalents/Total Assets

classification, issuer, amount raised, issuance date, the market at issue, maturity, coupon, call provision information, and others. To improve the sample composition, we extract data about financial firms' capital structure from the Capital IQ/Compustat database.

After merging both datasets, our sample is an unbalanced panel dataset of 776 convertible bonds and 548 contingent convertible (CoCo) bonds issued by financial firms from 42 countries.

Table 2: Frequency of bond issuance by year

Year	CoCo Bonds	Convertible Bonds	Total
2009	2	330	332
2010	3	28	31
2011	1	16	17
2012	13	13	26
2013	30	50	80
2014	78	35	113
2015	73	23	96
2016	75	28	103
2017	88	44	132
2018	75	45	120
2019	110	164	274
Total	548	776	1324

3.2 Summary statistics

Table 4 provides descriptive statistics for all variables divided into CoCo and convertible bonds. The dependent variable Issue to Call is, on average, 6.068 years for CoCo bonds and 1.722 years for convertible bonds. For the main independent variables, CAPEX Timing and LDF Timing, the averages are 3.305 and 0.614 for CoCo bonds, and 1.53 and 0.383 for convertible bonds, respectively.

Table 5 displays correlations among variables used in the subsequent analyses. The explanatory variables have low pairwise correlation. In addition, we used a formal test to ensure absence of multicollinearity problem. We calculated the variance inflation factor (VIF) for each independent variable in our model. The largest VIF value is 1.11, which confirms that there is no multicollinearity problem because it is far from 5 (Studenmund and Cassidy, 1997).

Table 3: Frequency of bond issuance by country

Country	CoCo Bonds	Convertible Bonds	Total
Australia	7	3	10
Austria	10	4	14
Bahrain	0	1	1
Belgium	4	0	4
Bermuda	0	17	17
Brazil	18	0	18
Britain	56	303	359
British virgin	0	2	2
Canada	0	39	39
Cayman islands	0	16	16
China	58	8	66
Colombia	2	0	2
Cyprus	2	1	3
Denmark	24	0	24
Faroe islands	2	0	2
Finland	12	0	12
France	42	3	45
Georgia	3	0	3
Germany	13	8	21
Hong kong	0	2	2
India	22	0	22
Ireland	12	0	12
Israel	11	1	12
Italy	18	6	24
Japan	26	14	40
Luxembourg	5	5	10
Malaysia	18	1	19
Mexico	5	0	5
Mult	0	2	2
Netherlands	4	17	21
Norway	77	0	77
Portugal	2	0	2
Singapore	0	2	2
Slovakia	1	0	1
South korea	0	2	2
Spain	24	0	24
Sweden	12	0	12
Switzerland	56	265	321
Taiwan	0	2	2
Turkey	2	0	2
Uae	0	3	3
United states	0	49	49
Total	548	776	1324

Table 4: Summary statistics

	CoCo Bonds				Convertible Bonds			
Variable	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
Issue to Call	6.068	2.862	0	15	1.722	1.963	0	11
Timing CAPEX	3.305	1.743	1	7	1.53	1.462	1	11
Timing Loans-Deposits	0.673	0.835	0	8	0.519	0.604	0	5
Proceeds	0.017	0.237	0	5.272	0.017	0.141	0	3.715
Leverage	0.272	0.147	0.014	0.925	0.307	0.176	0.006	3.141
Euro market	0.266	0.442	0	1	0.68	0.467	0	1
Private	0.102	0.303	0	1	0.019	0.138	0	1
Amount Issue	1119.036	1515.071	1.764	12038.635	70.839	371.932	0	5857.4
Capital Expenditure	1164.006	2010.988	-67.2	12280.7	1308.948	1285.487	-0.232	7912.1
Loans-Deposits	92884.13	216162.1	-307042.7	1071292	60703.8	115269.6	-190757.5	730934.9
Cash ratio	0.074	0.077	1.48e-06	0.595	0.106	0.046	0.0013	0.501

Table 5: Cross-correlation table

Variables	1	2	3	4	5	6	7	8	9	10	11
1.CoCo											
2.Issue to call	0.643										
3.Timing CAPEX	0.482	0.252									
4.Timing Balance	0.099	0.214	-0.021								
5.Proceeds	-0.001	-0.008	0.152	0.076							
6.Leverage	-0.102	-0.117	0.051	-0.285	0.487						
7.Euro market	-0.408	-0.286	-0.475	-0.237	-0.084	-0.010					
8.Private	0.181	0.198	0.169	0.052	-0.002	0.108	-0.242				
9.Amount Issue	0.454	0.269	0.242	0.198	-0.007	-0.109	-0.265	0.131			
10.CAPEX	-0.044	0.188	-0.403	0.242	-0.073	-0.175	0.078	0.049	0.243		
11.Loans-Deposits	0.085	0.132	-0.091	0.302	-0.145	-0.390	-0.199	-0.001	0.549	0.521	
12.Cash ratio	-0.252	-0.227	-0.294	0.063	0.188	-0.089	0.150	-0.051	-0.189	-0.084	0.056

4 Results

4.1 CAPEX

The results appear in Table 6, which summarizes the empirical results by the groups CoCo bonds (columns 1.a, 1.b, 1.c) and convertible bonds(columns 2.a, 2.b, 2.c). In order to identify the stability of the coefficients and their significance, we first include only the CAPEX Timing in the model (columns 1.a and 2.a). Next, we report the estimates of the full model with controls. In the last columns (1.c and 2.c), we include a country fixed effect.

Table 6: Poisson regression estimation results for the model using CAPEX

	CoCo Bonds			Convertible Bonds		
	1.a	1.b	1.c	2.a	2.b	2.c
Timing CAPEX	-0.044***	-0.037***	-0.035**	0.210***	0.135***	0.077*
	(0.010)	(0.011)	(0.013)	(0.029)	(0.034)	(0.036)
Proceeds		-0.132	0.075		-0.241	-0.222
		(0.129)	(0.146)		(0.307)	(0.197)
Leverage		0.273*	0.032		0.409	0.269
		(0.122)	(0.159)		(0.395)	(0.261)
Euro		0.110*	0.002		-0.619***	-0.718***
		(0.044)	(0.056)		(0.160)	(0.217)
Private		0.210***	0.080		0.584***	-0.067
		(0.055)	(0.063)		(0.167)	(0.149)
Perpetual		0.028	0.055		0.216	0.724*
		(0.067)	(0.096)		(0.245)	(0.316)
Constant	1.962***	1.777***	2.154***	-0.168	0.212	-0.405
	(0.038)	(0.080)	(0.248)	(0.089)	(0.230)	(0.540)
Observations	435	435	435	309	309	309
Country FE	No	No	Yes	No	No	Yes
Pseudo R^2	0.008	0.019	0.037	0.097	0.129	0.304
AIC	2019.0	2006.7	2018.7	938.6	915.2	771.9
BIC	2027.1	2035.2	2145.0	946.0	941.3	869.0

Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

For the convertible bond, the main variable CAPEX Timing was positive and significant ($p < 0.001$) for all model models since estimation 1.c the best models that minimize

AIC and BIC. It means that the length of the call protection period is shorter for banks that experience higher levels of capital investment shortly after issuance, corroborating the findings of Korkeamaki and Moore (2004) and Mayers (1998).

In contrast, these results are negative and significant ($p < 0.001$) for the CoCo bonds group. This opposite result may be explained by the regulatory approach by which the bond was issued, which focuses on creating a countercyclical capital buffer instead of investing capital in new projects. Also, we redid the tests using negative binomial estimations and found similar results.

4.2 Loans-Deposits Flow

As a complementary approach, we estimated the main independent variable based on bank liquidity after the bond issuance. We adopted the Loans-Deposits Flow as a proxy measure of liquidity, as previously discussed, and created the variable Timing LDF.

Following the previous results, we estimated the model by replacing the main independent variable by Timing LDF. Table 7 presents the results according to the groups CoCo bonds (columns 3.a, 3.b, 3.c) and convertible bonds(columns 4.a, 4.b, 4.c).

The LDF timing was positive and significant for CoCo bonds and not significant for convertible bonds. This result confirms that banks choose to assume debt to recompose the capital requirement since it predicts that banks having incremental liquidity distributed over longer periods following convertible issuance tent to have longer call protection periods. In a nutshell, CoCos can help to discourage high risk-taking initiatives by management that are at odds with the shareholders' interests. This result corroborates the findings of Martynova and Perotti (2018) by considering the relevance of the contractual characteristics, impacting the banks' decision regarding risks. Additionally, we estimated additional tests using negative binomial estimations and results remained similar.

Table 7: Poisson regression estimation results for the model using Loans-Deposits Flow

	CoCo Bonds			Convertible Bonds		
	3.a	3.b	3.c	4.a	4.b	4.c
Timing LDF	0.060***	0.076***	0.069***	0.271*	0.055	-0.026
	(0.016)	(0.012)	(0.015)	(0.113)	(0.103)	(0.087)
Proceeds		-7.337	-3.419		11.720	0.033
		(4.734)	(5.173)		(14.64)	(18.85)
Leverage		0.374**	0.340*		0.137	-0.279
		(0.129)	(0.165)		(0.702)	(0.704)
Euro		0.125**	0.063		-0.939***	-0.778**
		(0.043)	(0.055)		(0.163)	(0.257)
Private		0.185***	0.090		0.215	-0.397**
		(0.0544)	(0.0617)		(0.149)	(0.128)
Perpetual		-0.004	-0.011		0.809*	1.213
		(0.072)	(0.089)		(0.336)	(0.637)
Constant	1.791***	1.652***	2.072***	0.0575	0.778**	0.456
	(0.0240)	(0.0795)	(0.210)	(0.0781)	(0.295)	(0.272)
Observations	471	466	466	237	237	237
Country FE	No	No	Yes	No	No	Yes
Pseudo R^2	0.004	0.018	0.044	0.017	0.106	0.202
AIC	2247.1	2203.8	2201.2	676.8	624.0	572.1
BIC	2255.4	2232.8	2342.1	683.8	644.8	617.2

Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5 Robustness check

5.1 Matching

We conducted an Epanechnikov kernel weighted propensity-score matching of our data in order to reduce endogeneity concerns. We used as covariates the bank size, leverage ratio, a perpetual maturity dummy, the Euro market dummy, and the private placement dummy. Results are presented in Table 8.

Table 8: Robustness check: Poisson regression estimation results for matching sample

	CoCo Bonds		Convertible Bonds	
	5.a	5.b	6.c	6.d
Estimation A:				
Timing CAPEX	-0.063***	-0.047**	0.241***	-0.024
	(0.015)	(0.017)	(0.066)	(0.107)
Constant	1.998***	2.539***	-0.222*	0.501
	(0.0543)	(0.0867)	(0.109)	(0.489)
Observations	203	203	223	223
Pseudo R^2	0.015	0.061	0.029	0.155
Country Exact Match	No	Yes	No	Yes
AIC	927.0	920.1	582.3	519.0
BIC	933.6	986.4	589.1	546.3
Estimation B:				
Timing LDF	0.052*	0.067**	0.221	-0.029
	(0.026)	(0.025)	(0.120)	(0.112)
Constant	1.799***	2.457***	0.0180	0.405
	(0.039)	(0.117)	(0.079)	(0.24)
Observations	235	235	231	231
Pseudo R^2	0.003	0.069	0.011	0.143
Country Exact Match	No	Yes	No	Yes
AIC	1132.2	1095.4	630.5	560.5
BIC	1139.1	1168.1	637.4	591.4

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results are similar to our main results. Using the LDF Timing variable, we have a positive coefficient for CoCo bonds and a non-significant effect for convertible Bonds.

For CAPEX, the results are reversed, again corroborating our main findings.

5.2 Difference in differences

We exploit the issuance of the bond as a shock and because the bond and be either convertible or CoCo this enables the employment of a difference-in-differences approach. This approach allows us to assess the within-bank incremental impact of the CoCo issuance compared to the issuance of convertibles. We then, proceed to estimate the following model:

$$Y_{i,t} = \beta_0 + \beta_1 CoCo_{i,t} + \beta_2 Post_{i,t} + \beta_3 CoCo_{i,t} \times Post_{i,t} + \sum_{j=1}^{J} \beta_j X_{i,t}^{j} + \lambda_t + \eta_c + \varepsilon_{i,t}, \quad (3)$$

where $Y_{i,t}$ is our dependent variable, either Loans-Deposits Flow or the CAPEX, $CoCo_{i,t}$ is a dummy variable which assumes a value 1 if the bond is a CoCo or 0 if it is a convertible, and the $Post_{i,t}$ is also a dummy variable assuming a value of 1 after the issue of the bond, and 0 beforehand. Finally, $\sum_{j=1}^{J} \beta_j X_{i,t}^{j}$ denotes the controls, λ_t and η_c are the year and country fixed effects (respectively), and $\varepsilon_{i,t}$ is the error term. Table 9 reports the results.

We replicate our main result, in which we have a positive interaction for CoCo bonds, thus providing evidence that banks issuing CoCos tend to direct a smaller flow of assets towards loans when compared to banks issuing convertible bonds. Hence, we show that the CoCos are being used according to their regulatory intention: reducing banks' risk exposure and increasing their capital. We found no results in the CAPEX regression, which is also in line with our main results and with our argument that CAPEX is not a good measure for assessing investments in banks.

5.3 Cash Holdings

If our metric of Loans-Deposits Flow is indeed related to banks' prudence level, then this metric should be correlated with the banks' cash holdings (i.e., its reserves). More-

Table 9: Robustness check: differences-in-differences estimation

	Loans-Deposits Flow		CAPEX	
	7.a	7.b	8.a	8.b
coco=1	0.030	0.145	-0.521***	-0.116
	(0.169)	(0.169)	(0.095)	(0.117)
post=1	0.029	-0.135**	-0.023	0.0509
	(0.048)	(0.048)	(0.066)	(0.071)
coco=1 × post=1	0.218***	0.220***	-0.087	-0.096
	(0.058)	(0.057)	(0.073)	(0.077)
Leverage	-2.419***	-2.025***	-0.438	-0.174
	(0.248)	(0.273)	(0.255)	(0.254)
Size	0.491***	0.498***	0.943***	0.938***
	(0.0562)	(0.0628)	(0.0274)	(0.0355)
Cash ratio	0.784***	0.690**	1.219***	1.438***
	(0.225)	(0.230)	(0.354)	(0.388)
Constant	-4.781***	-5.939***	-5.709***	-6.018***
	(0.737)	(0.912)	(0.366)	(0.486)
Observations	3825	3825	4226	4226
R^2	0.29	0.62	0.84	0.89
Country FE	No	Yes	No	Yes
Year FE	No	Yes	No	Yes

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

over, suppose our theory postulated in the previous subsection holds. In that case, this metric should be more strongly correlated with cash holdings for banks that issued CoCos than in banks that issued convertible bonds because the excess in assets over deposits should be used to increase their level of Core Tier 1 capital instead of other financial assets. Hence, we estimated the following GLS model:

$$Cash_{i,t} = \beta_0 + \beta_1 Cash_{i,t-1} + \beta_2 LDF_{i,t} + \beta_3 Size_{i,t} + \beta_4 Leverage_{i,t} + \lambda_k + \varepsilon_{i,t}, \tag{4}$$

where $Cash_{i,t}$ is the value of the cash and equivalents normalized by total assets, $LDF_{i,t}$ is the Loans-Deposits Flow metric, $Size_{i,t}$ is the natural logarithm of total assets, $Leverage_{i,t}$ is the ratio of total debts over total assets and λ_k is the fixed effects for each issuance. We use the lag of $Cash_{i,t}$ in order to avoid problems of autocorrelation in our estimation, following the approach of Fernandes et al. (2021). Results are provided in Table 10.

Table 10: Robustness check: GLS estimation results

	CoCo Bonds	Convertible Bonds
L.cashratio	0.691***	0.608***
	(0.018)	(0.014)
Loans-Deposits Flow	0.003***	-0.001**
	(0.0007)	(0.0005)
Leverage	0.014	-0.016
	(0.010)	(0.013)
Size	0.001	0.051***
	(0.003)	(0.008)
Constant	0.014	-0.616***
	(0.040)	(0.103)
Observations	4942	7162
Issuance FE	Yes	Yes
R^2	0.518	0.479

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results corroborate with our reasoning. For CoCo issuance, we find that our metric is positively correlated to the cash holdings, meaning that the extra flow of assets from deposits is being used to increase banks' reserves. Still, this is reversed in the case of convertible bonds, meaning no prudential reasoning is involved in the bank decision-making process. Thus, CoCo bond funds are being used for their regulatory purpose, i.e., to increase the adequacy of capital requirements.

6 Conclusion

This study has examined the literature on motivation for banks to issue the new type of convertible bond known as CoCo bonds.

Our results show that the theory of sequential financing for convertible bonds (Mayers, 1998; Korkeamaki and Moore, 2004) was not confirmed for CoCo bonds. We also estimated the same model with a new variable (Loans-Deposits Flow) that better measures the reinvestment on the financial sector, which showed the effectiveness of the regulatory approach and finality of this special asset class of convertible bonds. Additionally, we show evidence that banks issue CoCo bonds for regulatory purposes (increase their capital), while convertibles are issued to allow banks to increase their investments and loan portfolios.

Robustness estimations (propensity-score matching and difference-in-differences analysis) indeed confirmed our results, according to which banks issue CoCo bonds in a more precautionary way, so that banks with greater timing (i.e., taking longer for the flow of deposits to reach the level of the amount raised by issuing the bond) issue CoCo bonds with longer call periods.

Moreover, the above results are either absent or reversed using CAPEX as a proxy, which shows that our proxy "Loans-Deposits Flow" is indeed better capturing banks' behavior when compared to CAPEX.

A final important result is that our proxy is positively correlated with banks that issue CoCo bonds but is negatively correlated with banks that issue convertibles. This provides evidence that banks that issuing CoCos are using the excess flow from deposits that issued CoCos in order to increase their capital, which is in line with the theory that we put forward in our main results.

For future research, we recognize the need to increase the causality claim by using an exogenous shock, since the shock used in our difference-in-differences approach is not exogenous. An additional avenue for research is implementing the proposed Loans-Deposits Flow to analyze reinvestment in banks in other settings, not only following the issuance of bonds, which is the research setting of this study.

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