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Abstract

The decline in the issuance of Asset-Backed Securities (ABS) since the financial crisis and the comparative advantage of Covered Bonds (CBs) as a funding alternative to ABS raise the question whether banks still issue ABS as a mean to receive funding. Employing double-hurdle regression models on a dataset of 134 European banks observed during the period from 2007 to 2013, this study reveals that banks with a Covered Bond Program (CBP) securitize ceteris paribus less of their assets. The estimated difference in ABS issuance is mainly driven by banks more likely to issue ABS as a funding tool, rather than trying to manage their credit risk exposure or to meet regulatory capital requirements. Consistently, a worse liquidity/funding position results in higher levels of securitization only for banks without a CBP.

Keywords: Securitization, asset-backed securities, covered bonds, bank funding, capital relief

JEL classification: G21, G28

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1 Introduction

The issuance of Asset-Backed Securities (ABS)[1] in Europe has decreased dramatically in size since the advent of the 2007 financial crisis. According to SIFMA/AFME data,[2] the amount of euro-denominated structured finance products (excluding retained securities) issued in 2007 was euro 418 billion; by 2012, the figure had shrunk to euro 253 billion. Clearly, one of the main driver of this trend is the central role that structured finance products have played in the unfolding of the crisis in the United States (e.g., Coval, Jurek, and Stafford, 2009; Longstaff, 2010; Gorton and Metrick, 2012). European financial institutions were among the main investors in US ABS before the advent of the crisis (Bertaut, DeMarco, Kamin, and Tryon, 2012), creating a direct link for contagion. This has raised investors skepticism toward this class of complex financial products (e.g., Célérier and Vallée, 2014). Despite the potential conflicts of interest and misaligned incentives that characterize the originate-to-distribute banking scheme, European official institutions still regard ABS as key instruments to allow banks to raise the necessary capital to provide consumers and Small and Medium Enterprises (SMEs) with credit (European Commission, 2015). Thus, it is important to understand what currently drives European banks decision to securitize their assets.

While ABS issuance has shrunk by around half between 2007 and 2012, during the same period the issuance of euro-denominated Covered Bonds (CBs) has actually increased, from euro 332 billion to 405 billion, according to European Covered Bond Council (ECBC) data.[3] Van Rixtel and Gasperini (2013) report that the share of CBs over total gross bonds issued by European banks has increased from 26% in 2007 to 42% in 2012. Some commentators (e.g., European Central Bank, 2011) have argued that banks have replaced ABS with CBs issuance since the advent of the crisis. To a certain extent ABS and CBs can in fact be considered as substitutes. Both are fixed-income securities backed by a ring-fenced pool of collateral assets. However, ABS and CBs presents also some key differences, as discussed at length in Section 2. Most notably, the transfer of credit risk from originators to investors is less complete with CBs than with ABS. This has two direct consequences. On the one hand, the lower level of risk for investors entailed by CBs results in lower yields, and thus lower costs of funding. On the other hand, CBs are not an effective way for the originator to reduce its credit risk exposure (Packer, Stever, and Upper, 2007). This and other material differences between ABS and CBs can provide the latter with a comparative advantage as a funding tool, albeit not as a way to reduce credit risk exposure and/or Risk-Weighted Assets (RWA).

[1] We use throughout this paper the term ABS to generally identify structured finance products resulting from the securitization of extant financial assets via a Special Purpose Vehicle (SPV). The term thus encompasses also Mortgage-Backed Securities (MBS), Collateralized Debt Obligations (CDO), and Collateralized Loan Obligations (CLO).

[2] Data accessed at `www.sifma.org` on November 11th, 2015.

[3] Data accessed at `http://ecbc.hypo.org` on November 24th, 2015.

However, not every bank is able to issue CBs, as Covered Bond Programs (CBPs) are strictly regulated in most European countries. On the contrary, contractually-based ABS allow for more flexibility and can be issued as one-off transactions. Thus, securitization can still be a viable source of liquidity for banks with no access to the CBs market.

In this study, we address how the ability to issue CBs as an alternative to ABS affects the issuance of structured finance products by European banks. We use a sample of 775 observations for 134 European banks between 2007 and 2013, and investigate how CBPs affect if, how much, and why banks issue ABS. We do so by employing double-hurdle models, which allow to account for potential differences in the effect of a bank's characteristics on if and how much it engages in securitization.

Our main findings are readily summarized. We show that, all else equal, banks with a CBP are expected to securitize a lower share of their assets. The difference is around 0.11–0.13 percentage points, depending on the model. As a term of comparison, banks in our sample securitize on average 0.18% of their assets. Consistent with the comparative advantage of CBs as a funding tool, the difference between the level of ABS issuance for banks with and without a CBP is mainly driven by banks with a low level of assets liquidity. Proxies for the level of a bank's credit risk exposure or need to meet regulatory capital requirements do not appear to play an equally relevant role. Coherently, we find a negative marginal effect of asset's liquidity on securitization levels for banks without a CBP, but not for banks able to issue CBs. The difference between the two marginal effects is statistically significant, and increases with the level of asset's illiquidity. No significant difference in the marginal effect of proxies for a bank's assets credit risk and regulatory capital position is found across banks with and without a CBP.

This paper contributes to a growing literature addressing banks securitization activities (Maddaloni and Peydró, 2011; Pagano and Volpin, 2012; Jiang, Nelson, and Vytlacil, 2013; Wang and Xia, 2014, among others), and in particular to the literature focusing on how individual characteristics of European banks can explain their ABS issuance levels (Affinito and Tagliaferri, 2010; Cardone-Riportella, Samaniego-Medina, and Trujillo-Ponce, 2010; Farruggio and Uhde, 2015). These studies have generally identified a bank's need for liquidity as one of the main determinants of securitization. However, they typically do not consider the role played by the availability of alternative sources of liquidity. To the best of our knowledge, this is the first study to show how the ability to issue CBs influences a bank's securitization activity–and particularly so during the recent crisis period. In a related study, Carbó-Valverde, Fernández, and Rosen (2011) examine the determinants of both CBs and Mortgage-Backed Securities (MBS) issuance as independent from each other. They find that banks issue CBs, but not MBS, to meet their liquidity needs. By looking at a bank's *ability* to issue CBs, we complement their results by showing that European banks still issue structured finance products for funding/liquidity reasons, but only when they cannot resort to CBs. This is consistent with the idea that–when available–covered bonds currently constitute a preferred funding tool over

Asset-Backed Securities.

The rest of this paper is organized as follows. Section 2 reviews the rationales for securitization in light of the existing literature and discusses the material differences between Asset-Backed Securities and Covered Bonds. Section 3 presents the data and methodology used in this study. Empirical results are presented and discussed in Section 4. Section 5 concludes with some final remarks.

2 Background and Empirical Predictions

In this Section we review the extant literature on banks rationales for securitization (Section 2.1) and discuss the main differences between ABS and CBs culminating in our empirical predictions (Section 2.2).

2.1 Rationales for Securitization

Extant literature identifies three main rationales for securitization relating to individual characteristics of the issuer.

The first reason for banks to issue structured finance products is to satisfy their funding/liquidity needs. Securitization allows to efficiently sell illiquid assets such as mortgages and corporate loans and transform them into new liquidity to be retained or invested. Securitization as a form of raising funds can often be preferable to raising new retail deposits. The latter can be more costly, for example because of higher capital requirements; they are also redeemable at any point in time, leaving the bank exposed to bank runs. ABS issuance can instead be seen as a form of medium to long-term financing. Several previous studies (e.g., Affinito and Tagliaferri, 2010; Cardone-Riportella, Samaniego-Medina, and Trujillo-Ponce, 2010; Farruggio and Uhde, 2015) have identified the level of a bank's assets liquidity as one of the main driver of securitization.

The second reason for securitization relates to the transfer of credit risk to investors. By selling the underlying assets to a Special Purpose Vehicle (SPV), the bank removes risky assets from its balance sheet and passes the credit risk to the investors. The credit risk of a bank's asset is thus expected to play a relevant role in the determination of its securitization activity. However, the direction of such effect is not trivial. On the one hand, banks with more risky assets can have a greater incentive toward securitization. On the other hand, given the existing information asymmetries only banks with a high asset quality and a good reputation might be able to securitize their assets without incurring a considerable discount on their face value (e.g., Albertazzi, Eramo, Gambacorta, and Salleo, 2015; Ambrose, LaCour-Little, and Sanders, 2005; An, Deng, and Gabriel, 2011; Calomiris and Mason, 2004). Moreover, banks often have to retain the equity (i.e., the first loss) tranche of the ABS on their balance sheet (DeMarzo, 2005). As a result of these contrasting effects, previous empirical studies have found support for both a positive (Affinito and Tagliaferri,

2010; Bannier and Hänsel, 2006) and a negative (Calem and LaCour-Little, 2004; Farruggio and Uhde, 2015) relationship between asset's credit risk and level of securitization.

The third rationale for securitization is linked to a bank's need to meet regulatory capital requirements. By transferring credit risk out of its balance sheet, a bank can reduce its Risk-Weighted Assets (RWA) and thus its need for Tier I and II capital as required by Basel rules. Securitization can even allow a bank to engage in regulatory capital arbitrage, i.e., reducing its capital requirements while not effectively reducing its credit risk exposure. This possibility was particularly evident under Basel I rules, as illustrated by Jones (2000). Basel II tries to significantly mitigate the scope for regulatory capital arbitrage (Blum, 2008; Fabozzi, Davis, and Choudhry, 2007); however, such opportunities can still be in place with the current regulatory framework (e.g., Calem and LaCour-Little, 2004). Empirical studies have found some evidence of regulatory capital requirements as a significant driver of securitization, especially during the Basel I regime period (Acharya, Schnabl, and Suarez, 2013; Affinito and Tagliaferri, 2010; Ambrose, LaCour-Little, and Sanders, 2005; Calomiris and Mason, 2004; Cebenoyan and Strahan, 2004).

2.2 Asset-Backed Securities versus Covered Bonds

As already stated in Section 1, both ABS and CBs are fixed-income securities backed by a determined pool of collateral which is ring-fenced from other liabilities of the issuer. There are however several material differences between ABS and CBs, both from the point of view of issuers and of investors.

2.2.1 Asset-Backed Securities

ABS are technically issued by a Special Purpose Vehicle (SPV) created ad-hoc. The SPV buys the collateral from the depositor (the entity collecting the underlying assets and creating the SPV) and issues structured finance products backed by such collateral. Proceeds of the sale of ABS to investors are ultimately used to pay the depositor. The latter is typically also the originator and servicer of the assets (e.g., the bank granting a firm with the loan subsequently securitized and collecting the regular interest payments), albeit assets can also be originated by third parties. Securitization is mostly based on contractual mechanisms, thus allowing for a high degree of flexibility (European Banking Authority, 2014a). ABS are usually structured in different tranches; each tranche is characterized by a different level of exposure to credit, prepayment, and interest rate risks, and it's thereby tailored to cater toward different investors' needs. Further credit enhancement (e.g., third-party insurance) can also be embedded in the deal.

One of the main consequence of the way ABS are issued is that the SPV provides bankruptcy remoteness (Ayotte and Gaon, 2011) to the depositor, i.e., investors in ABS only have a claim on the assets effectively owned by the SPV. Even if Basel II requires originators to retain a significant net

economic interest in the underlying assets (Basurto, Jones, Lindner, and Blankenheim, 2015), by design the structured finance market is thus exposed to agency problems (see for example Ashcraft and Schuermann, 2006). Originators have superior knowledge about the true quality of assets. This can lead to adverse selection, as already discussed in Section 2.1. At the same time, bankruptcy remoteness entails that, by issuing ABS, banks can effectively remove risky assets from their balance sheet and reduce their RWA computed for regulatory purposes.

2.2.2 Covered Bonds

The main difference between ABS and Covered Bonds is that the latter are issued directly by the bank, which remains ultimately liable for the payments due to investors. The issuer designates a pool of assets to be pledged as collateral, but retains those assets on its balance sheet. In case assets used as collateral no longer meet the quality criteria mandated by national laws–or if prepayments occur–the issuer has to increase/replace the assets in the pool. When a bank issuing covered bonds faces financial distress, the ring-fenced assets are shielded from claims of other creditors of the bank. In the extreme case that the collateral is not sufficient to cover the claims of CB investors, CBs entail the same seniority over the remaining assets of the bank as unsecured senior bonds. The collateral pool for a CB is thus more a form of credit enhancement, rather than the effective source of cash flows paid to investors. CBs are additionally argued to benefit from an implicit state guarantee that does not apply to ABS. Volk and Will (2012) and the European Banking Authority (2014b) among others have observed how government support for the issuing bank has often translated into an implicit guarantee also for its CBs. As a result of their superior credit enhancement and implicit government guarantee, CBs are typically characterized by significantly lower yields than other debt securities (including ABS) issued by the same bank (Packer, Stever, and Upper, 2007). Spreads between CBs and government bonds are often considered to merely reflect a liquidity premium (e.g., Kempf, Korn, and Uhrig-Homburg, 2012).

An other key difference between ABS and CBs is that covered bonds are subjected to strict national legislations: a) establishing which assets are eligible as collateral; b) mandating national supevisors to address and keep monitoring the quality of such collateral, and; c) ruling which institutions are allowed to issue CBs. The latter point is of particular interest, as it entails that not every bank is authorized to have a Covered Bond Program (CBP)–and thus to issue CBs. For example, the law governing German *Pfanbriefgesetz* requires banks to prove their intention to engage in CBs issuance on a regular basis; a license to issue CBs can be revoked if a bank does not issue CBs for two years (European Banking Authority, 2014b). At European level, the Capital Requirement Directive (CRD) only recognizes as covered bonds those securities that are issued under such national legislations (for a brief review of CBP legislative frameworks, see for example Packer, Stever, and Upper, 2007).

In sum, while European regulatory frameworks allow for considerable flexibility to issue ABS,

they are more stringent on the key characteristics of both the CB issuer as well as the underlying asset pool.

2.2.3 Empirical predictions

From the discussion above on the different characteristics of ABS and CBs, summarized in Table 1, it follows that CBs have a comparative advantage over ABS in that they are less affected by agency problems. This is all the more relevant during a crisis period, when investor confidence is eroded. We thus expect that, all else equal, during the crisis period investigated in this study banks allowed to issue CBs securitize less than banks without a CBP.

[Insert Table 1 about here]

In this context, CBs can be regarded as a cheaper funding tool than ABS. Indeed, Carbó-Valverde, Fernández, and Rosen (2011) show that banks are more likely to issue CBs (but not ABS) for liquidity reasons. Consistently, we expect the securitization activity of a bank with a CBP to be independent from its funding needs. However, for banks not able to resort to CBs, ABS can still constitute a relevant funding tool. All in all, the role of liquidity in explaining the intensity of ABS issuance is predicted to differ significantly between banks with and without a CBP.

Whereas CBs may constitute a preferable substitute for ABS as a funding tool, this is not the case for the other two main rationales for securitization illustrated in Section 2.1, i.e., transfering credit risk exposure and meeting regulatory capital requirements. This is because the cover pool is retained on a bank's balance sheet, and credit risk is not transferred to the investors. Covered bonds thus do not allow the issuer to pursue these goals the same way that ABS do. As such, the ability to issue CBs should not influence the role played by these two rationales in explaining the observed levels of securitization.

3 Data and Methodology

This section presents the dataset (Section 3.1) and the methodology (Section 3.2) used in our analyses.

3.1 Data

The starting point in building our sample is a dataset retrieved from Bankscope. We consider securitizing as well as non-securitizing banks across the EU-13 countries in the European Monetary

Union (EMU).[4] The sample covers the period from 2007 to 2013. We focus on this period for two reasons. First, we are particularly interested in the securitization activity of banks since the 2007 crisis eroded investors confidence in ABS. Second, the implementation of Basel II capital requirement started in the considered countries on January 1st, 2007 (ECB, 2007). Securitization activities before and after the passage from Basel I to Basel II might not be comparable, as the two regulations differ significantly in the way securitization is accounted for (Fabozzi, Davis, and Choudhry, 2007). The Bankscope dataset initially includes 179 banks from the considered countries. After excluding non-independent banks (i.e., banks whose ultimate owner is another bank), and bank-year observations where the necessary bank-level variables–described below–are missing, we are left with 775 observations for 134 banks. We refer henceforth to these as the dataset used in this study. Table 2 presents the distribution of the dataset by country and year.

[Insert Table 2 about here]

3.1.1 Asset-Backed Securities issuance

Our dependent variables aim at capturing if and how much European banks resort to securitization. Data on the issuance of structured finance products are provided by J.P. Morgan and retrieved from their "International ABS & CB Research" database, which includes structured finance products issued worldwide. For each security the database reports information such as the involved counterparties, the tranche size and currency, and the characteristics of the collateral. The database initially includes 7,174 euro-denominated tranches issued between 2007 and 2013, for a total value of euro 2.25 trillion. As a term of comparison, the total amount of European ABSs, Collateralized Debt Obligations (CDOs) and Mortgage-Backed Securities (MBSs) issued over the same period amounts to Euro 2.64 trillion, according to SIFMA/AFME data.[5] We carefully hand-match the structured finance dataset with the 775 bank-year observations in our sample, in order to make sure we identify all securities originated by the 134 banks considered in this study. Of the 7,174 securities in the J.P. Morgan dataset, 2,037 are originated by one of the banks in our sample. As it is customary in the literature (e.g., Affinito and Tagliaferri, 2010; Farruggio and Uhde, 2015), for each bank i in year t we measure the level of securitization as the total value of structured finance products issued by bank i in year t, scaled by the bank's consolidated total assets as reported in Bankscope ($SEC\,ratio_{i,t}$). $SEC_{i,t}$ is an indicator equal to 1 if $SEC\,ratio_{i,t}$ is strictly positive (i.e.,

[4]The countries initially considered are thus Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, Luxembourg, Netherlands, and Portugal. We later exclude Luxembourg because of no usable observations. From the EU-13 countries, we exclude the UK for two reasons. First, we want to focus on banks within the EMU area. Second, several financial institutions in the UK issue unregulated, "structured" covered bonds without having a CBP. This is generally not the case in the countries considered. See `www.ecbc.eu/framework/list`

[5]Data accessed at `www.sifma.org` on October 19th, 2015.

if bank i issued at least one security in year t) and 0 otherwise. Following Affinito and Tagliaferri (2010), we exclude from the computation of $SEC\,ratio$ and SEC those securities originated to be retained. Of the 134 banks in the sample, 36 have issued (and not retained) at least one structured finance product in the period considered (74 bank-year observations). Table 3 reports some descriptive statistics for the securitization activity of these banks.

[Insert Table 3 about here]

On average securitizing banks create around 7 deals (17 tranches) per year, for a total yearly amount of Euro 2.4 billion. MBS are by far the most common structured finance product, representing around half of the total amount; securities backed by loans to Small and Medium Enterprises (SMEs) follow at around 14%.

3.1.2 Covered Bond program

Our main explanatory variable of interest is an indicator (CBP) capturing whether a bank has a Covered Bond Program or not. In order to build CBP we start from the technical reports of the Norddeutsche Landesbank (2013), which include a list of banks issuing Covered Bonds (CBs). If a bank is in the list of CBs issuer, then CBP is set equal to 1 for that bank; if not, then the indicator is set equal to 0. We further check whether the 134 banks are included in the list of banks with a CBP compiled by the European Covered Bond Council (ECBC).[6] Finally, we search on Bloomberg each of the 134 banks considered, to make sure that no bank where $CBP = 0$ has actually issued CBs, and viceversa.[7] By construction, CBP is a time-invariant characteristic of each bank. Differently from Carbó-Valverde, Fernández, and Rosen (2011), who focus on the different rationales for banks to issue CBs and ABSs, in this study we are interested in how the *ability* of a bank to issue CBs affects its securitization activity, which is why we focus on CBP rather than on the CBs issuance activity in each year. Of the 134 banks in the dataset 70 appear to be able to issue covered bonds, corresponding to 424 observations (55% of the sample).

3.1.3 Bank characteristics and other controls

To proxy for rationales for securitization, as well as to control for extra dimensions likely to influence the phenomena under study, we consider a number of relevant bank's characteristics. All of the bank variables described below are computed based on Bankscope data, and are lagged 1 year as it is customary to reduce endogeneity. Whenever possible, we closely follow the definitions proposed by Farruggio and Uhde (2015), who also investigate the rationales for the securitization activity of European banks using Bankscope data.

[6] Data available at `http://www.ecbc.eu/issuers`

[7] For no bank the value of CBP has changed as a result of these further checks.

To proxy for a bank liquidity/funding needs, we use a variable defined as one minus the ratio of net loans to total assets (*Liquidity ratio*). Observations characterized by lower values of *Liquidity ratio* identify banks more likely to securitize for liquidity/funding needs. The ratio of loan loss reserves to gross loans (*Loss to loans*) proxies for a bank's exposure to credit risk. As discussed in Section 2.1, the credit risk of a bank's assets can either exhibit a positive or negative correlation with the intensity of that bank's securitization activity. To proxy for a bank's need to improve its regulatory capital position, we use the ratio of a bank's Tier 1 capital over its risk-weighted assets (*Tier 1 ratio*). We control for a bank's operative performances using the ratio of operating profit to equity (*ROE*). *Liquidity ratio*, *Loss to loans*, *Tier 1 ratio*, and *ROE* are all expressed in percentage points. We proxy for a bank's size using the natural logarithm of its total assets, expressed in Euro millions (*LNTA*). Cardone-Riportella, Samaniego-Medina, and Trujillo-Ponce (2010) show that banks bigger and with better operative performances tend to securitize more. Finally, we control for a bank's typology using an indicator equal to 1 if it is a commercial bank and 0 otherwise (*Commercial*).

We also include in our analysis two country-level control variables (source: Datastream): the difference between the 10-year and 3-year yields on government bonds (*Slope*) and the annual GDP growth (*GDP*). These variables are typically included in studies on securitization to control for the current status and future prospects of the economy. Banks in growing economies have been found to ceteris paribus engage more heavily in securitization activities (e.g., Maddaloni and Peydró, 2011). Table 4 reports descriptive statistics for all of the variables included in this study.

[Insert Table 4 about here]

On average banks in our sample securitize (excluding retained securities) 0.18% of their assets. This number is slightly lower than reported by Farruggio and Uhde (2015) –consistent with the inclusion of three more crisis years in our sample– but comparable in magnitude. The share is 1.84% when only observations where $SEC = 1$ are considered.

3.2 Methodology

Since by definition the issuance of structured finance product cannot be negative, previous studies have often investigated the determinants of securitization by using a Tobit model. However, such model ignores the two-stage nature of the decision, as banks have to decide both if and how much of its assets to securitize. The two decisions could in principle be influenced by different determinants, or by the same determinants in a different way; a traditional Tobit model does not allow for such flexibility. In this study we thus focus on double-hurdle models, which allow to tease out the distinction between the decision of if and how much to issue (for a detailed discussion on this class of models, see Wooldridge, 2010).

The first model we consider is a Cragg (1971) truncated normal hurdle model. The model uses a probit specification for the selection equation, i.e., $\Pr(SEC = 1 \mid X) = \Phi(X\gamma)$, and a truncated (at zero) normal distribution for the amount equation, i.e., $f(SEC\ ratio \mid X, SEC = 1) = [\Phi(X\beta/\sigma)]^{-1} \phi[(SEC\ ratio - X\beta)/\sigma]/\sigma$. X is a vector of explanatory variables, which in this case we assume to be the same for both the selection and the amount equation.[8]

The unconditional[9] expected value of $SEC\ ratio$ is then given by

$$E(SEC\ ratio \mid X) = \Phi(X\gamma)\,[X\beta + \sigma\lambda(X\beta/\sigma)] \tag{1}$$

where $\lambda(c)$ is the Inverse Mills Ratio (IMR), i.e., $\lambda(c) = \phi(c)/\Phi(c)$.

A potential limitation of the Cragg model is that the error terms for the selection and the amount equations are assumed to be independent. For this, we also use in our analysis a Tobit II model, which allows the two terms to be correlated. In this case, we include among the determinants of the binary decision to issue ABS a dummy variable equal to one if the bank issued ABS securities in the previous year and zero otherwise (SEC_{t-1}). This is done in order to avoid excessive reliance on the non-linearity of the IMR for identification. The rationale for using SEC_{t-1} for this purpose is that banks that issued ABS in the recent past are expected to be ceteris paribus more prepared to do so also in the future; however, the effective amount of assets securitized is more likely dependent on its contingent needs. The first-time issuance of an ABS, for example, requires a significant build up of resources and expertise that can be utilized for future transactions. From an empirical point of view, SEC_{t-1} appears to be an apt choice for identification. The pairwise correlation between SEC_t and SEC_{t-1} is 0.719, statistically significant at the 1% confidence level; the correlation between SEC_{t-1} and $SEC\ ratio$ –conditioning on the latter being strictly positive– is instead -0.002, not statistically significant at customary confidence levels. A likelihood ratio test shows that a Tobit II model including SEC_{t-1} among the selection determinants significantly (at the 1% confidence level) outperform a nested model not including it. Including SEC_{t-1} also in the amount equation does not significantly (at customary confidence levels) increase the likelihood score further.[10]

With both Cragg and Tobit II models, we address the effect of each explanatory variable x on the securitization activity of the bank by looking at the Average Marginal Effect (AME) of x on the unconditional expected value of $SEC\ ratio$. As it is customary, for indicators (most notably CBP) the AME is computed as the difference between the expected unconditional value of $SEC\ ratio$ when the indicator is equal to one and the expected unconditional value when it is equal to zero.

[8] Cragg (1971) also proposes an alternative specification where the amount variable is assumed to follow a lognormal distribution. A Vuong test does not reject the null hypothesis that the two models are equivalent in terms of fitness. We thus use the truncated normal hurdle model, as it allows for a more straightforward interpretation of the results.

[9] "unconditional" in this setting refers to not conditioning on $SEC\ ratio$ being strictly positive. The expected value is of course conditional on the values assumed by the explanatory variables.

[10] In unreported robustness checks, we use for identification an indicator equal to 1 if the bank has issued ABS in the previous 2 (or 3) years, and zero otherwise. Results are similar to those reported in the paper.

4 Results

In this Section we present the empirical results of our study. Section 4.1 focuses on the difference in the intensity of securitization activities between banks with and without a covered bond program. Section 4.2 addresses the interaction between the presence of a covered bond program and a bank's characteristics in explaining its securitization activity.

4.1 Covered bond program and ABS issuance

Table 5 presents coefficient estimates for a Cragg Model (i) and a Tobit II Model (ii) of the securitization activity of a bank, excluding retained securities. For each model, we present estimates for the selection equation (Columns (1) and (4)) and the amount equation (Columns (2) and (5)), as well as the Average Marginal Effect (AME) on the unconditional expected value of $SEC\,ratio$ computed based on those estimates. Each model includes CBP and the control variables illustrated in Section 3. To account for time trends, we also include year indicators among the explanatory variables.

[Insert Table 5 about here]

Looking at the results for the Cragg model, we see that the unconditional expected level of securitization is on average 0.13 percentage points lower when banks have a covered bond program. The AME is statistically significant at the 5% confidence level. Beside statistical significance the effect is also economically relevant, as it implies a 67% lower level of securitization relative to the mean in our sample (0.18%). A very similar result is obtained when a Tobit II model is used. The AME of CBP is -0.11, statistically significant at the 10% confidence level. Empirical results reported in Table 5 thus suggest that, as expected, banks with a covered bond program are ceteris paribus less inclined to issue structured finance products. Before moving to the analysis of how bank's characteristics moderate this result, it is worth to briefly discuss the results obtained for the other explanatory variables.

As expected, *Liquidity ratio* negatively correlates with the intensity of a bank's securitization, i.e., more illiquid banks engage more in securitization activities. On average, a 1 percentage point decrease in the level of liquidity of a bank's asset is associated with a 1-basis point increase in the unconditional expected share of assets securitized. The effect is statistically significant at the 1% confidence level with both models. The level of credit risk of a bank's asset, as proxied by *Loss to loans*, is also negatively related to ABS issuance, a result in line with those reported by previous studies (e.g., Calem and LaCour-Little, 2004; Farruggio and Uhde, 2015). On average, a 1 percentage point higher level of loss allowances is associated with a reduction in $SEC ratio$ between 0.03 and 0.07 percentage points, depending on the model. The effect is statistically significant at

least at the 10% confidence level. As discussed in Section 2.1, this result can be explained in terms of asymmetric information between the bank and the investors about the quality of the collateral. Albeit not statistically significant at customary confidence level, the negative sign of $Tier\,1\,ratio$ is coherent with the idea that securitization could be used to improve the regulatory capital position of a bank. Bigger banks (higher $LNTA$) and banks with better operative performances (i.e., higher ROE) appear to securitize more, even though the average effect is not statistically significant for the latter and only statistically significant with Model (i) for the former. It is interesting to notice how $LNTA$ appears to impact the decision to securitize and the level of securitization conditional on issuance in opposite directions, confirming the importance of using double-hurdle models. Finally, both *Slope* and GDP exhibit a positive AME, a result in line with those of Maddaloni and Peydró (2011).

4.2 Moderating role of rationales for securitization

In this Section we investigate the moderating role of a bank's characteristics on the relationship between CBP and ABS issuance. In particular, we focus on the proxies for the three main rationales for securitization (i.e., funding/liquidity, credit risk, and regulatory capital requirements). As discussed in Section 2.2, we expect the difference between banks with and without a covered bond program to be especially prominent for banks more likely to securitize for liquidity reasons. To better gauge the interaction between rationales for securitization and the availability of covered bonds as an alternative to ABSs, we estimate three Tobit II models including the cross-product of CBP and *Liquidity ratio* (i), *Loss to loans* (ii), or $Tier\,1\,ratio$ (iii). Coefficients estimates are reported in Table 6. The three models include all of the control variables of Model (ii) of Table 5.

[Insert Table 6 about here]

Figure 1 illustrates the average marginal effects computed based on coefficient estimates for Models (i)–(iii) of Table 6. For each model, we compute the AME of CBP for different values of bank's characteristic x, where x is either *Liquidity ratio*, *Loss to loans*, or $Tier\,1\,ratio$, depending on the model. We also compute the difference in the average marginal effect of x itself between banks with and without a covered bond program for different levels of x. We expect the difference in the unconditional expected level of securitization between banks with and without a covered bond program to be bigger for more illiquid banks, i.e., for banks more likely to issue ABSs for liquidity/funding reasons. We also expect a stronger (negative) marginal effect of *Liquidity ratio* on the level of securitization for banks without a covered bond program, especially when the bank's asset are very illiquid (i.e., when *Liquidity ratio* is low). For the reasons discussed in Section 2.2, we do not instead expect a significant difference in the ABS issuance of banks with and without a

covered bond program when credit risk and regulatory capital requirements needs are more likely to be the main determinants of securitization.

[Insert Figure 1 about here]

As expected, the marginal effect of CBP monotonically decreases with the level of $Liquidityratio$. The difference in the unconditional expected value of $SEC\,ratio$ between banks with and without a covered bond program is statistically significant at the 5% (1%) confidence level when $Liquidityratio$ is lower than 41% (35%). For extremely illiquid banks –i.e., $Liquidity\ ratio$ approaching 0– the availability of a covered bond program is estimated to be associated with around 1-percentage points lower levels of securitization. The negative effect of $Liquidity\ ratio$ on the unconditional expected value of $SEC\,ratio$ is significantly (at the 5% confidence level) stronger for banks without a covered bond program throughout most of the variable's domain,and it is bigger the more illiquid the bank is. For example, for a bank characterized by a $Liquidity\,ratio$ of 20%, a 1 percentage point decrease in asset's liquidity is associated with a 0.02 percentage point stronger negative effect on securitization for banks without a covered bond program. When $Liquidity\ ratio$ is equal to 10%, the difference raises to 0.03 percentage points. Interestingly, this functional form is entirely driven by the AME of banks without a covered bond program, as illustrated in Figure 2. Whereas the AME of $Liquidity\,ratio$ is higher (in absolute terms) the more banks are illiquid, it is close to zero and not statistically significant throughout the whole range for banks with a covered bond program. The latter observation is consistent with the results reported by Carbó-Valverde, Fernández, and Rosen (2011), who find that banks do not securitize for funding purposes. We show that this is true only for banks who actually have access to covered bonds as an alternative funding instrument.

[Insert Figure 2 about here]

As for the other explanatory variables, Figure 1 shows that credit risk does not seem to play a big role in explaining potential differences in the securitization activity of banks with and without a covered bond program. The difference in the average unconditional expected value of $SEC\,ratio$ between the two is statistically significant at the 5% confidence level only for very low levels ($< 5\%$) of $Loss\,to\,loans$, i.e., when banks are very unlikely to issue ABSs in order to remove the most risky assets from their balance sheets. As expected, also regulatory capital does not appear to play a significant role in explaining differences in the securitization activity of the two groups of banks.

All in all, results presented in this Section suggest that the difference in the securitization activity of banks with and without a covered bond programs is mainly driven by banks most likely to issue ABS as a funding tool.

5 Conclusions

In this paper we investigate how the ability to issue Covered Bonds (CBs) affects the securitization activity of European banks since the advent of the 2007 financial crisis. Asset-Backed Securities (ABS) and CBs are both fixed-income securities linked to ring-fenced assets. However, CBs do not allow banks to transfer credit risk to the same extent that ABS do.

The resulting mitigation of asymmetric information and agency problems provide CBs with a comparative advantage as a funding tool over ABS, albeit not as a way to transfer credit risk.

Using a sample of 775 observations for 134 European banks between 2007 and 2013, we show that banks with a Covered Bonds Program (CBP) securitize ceteris paribus less of their assets. The difference is mainly driven by banks characterized by a low level of assets liquidity. Proxies for a bank's need to transfer credit risk and/or meet regulatory capital requirements do not seem to be equally relevant. A reduction in assets liquidity is associated with an expected increase in ABS issuance only for banks without a CBP. This suggests that ABS are still regarded as a viable funding tool, but only for banks not able to resort to CBs.

Our results thus show that CBs play an important role in the decision by European banks to securitize their assets. In the aftermath of the crisis, European institutions such as the ECB and the newly created European Banking Association (EBA) have reckoned a well-functioning ABS market as pivotal in providing Small and Medium Enterprises (SMEs) with credit and banks with a diversified source of funding.[11] A further reduction in the diversification of funding sources could in fact result in higher bankruptcy costs (Colla, Ippolito, and Li, 2013) and systemic risk (Oura, González-Hermosillo, Chan-Lau, Gudmundsson, and Valckx, 2013). Moreover, the current capital constraints associated to the use of ABS as a funding tool are passed-through to financed companies (Carbó-Valverde, Degryse, and Rodríguez-Fernández, 2015). In this context, several initiatives have been proposed to revitalize the market, and especially so for securities backed by corporate loans (Aiyar, Al-Eyd, Barkbu, and Jobst, 2015). Despite this, some of the currently proposed regulation seem to go in the direction of further favoring CBs over ABS. For example, in the context of Basel III liquidity coverage requirements the EBA has proposed in 2013 to base liquidity measurements on bid-ask spreads. This would once again favor CBs, even if alternative measurements would suggest ABS are often as or even more liquid than CBs (Perraudin, 2014). In pursuing their target to revitalize the European ABS market, regulators should keep in mind the potential effect of rules increasing the comparative advantage of CBs over ABS.

[11] See for example the joint document by the BCE and the Bank of England: "The impaired EU securitization market: causes, roadblocks and how to deal with them". `www.ecb.europa.eu/pub/pdf/other/ecb-boe_impaired_eu_securitisation_marketen.pdf`

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Figure 1: Average marginal effects

This figure presents the average marginal effects on the unconditional expected value of $SEC\,ratio$. Each of the three rows focuses on a different bank characteristic x, where x is $Liquidity\,ratio$ (first row), $Loss\,to\,loans$ (second row), or $Tier\,1\,ratio$ (third row). Effects presented in the first, second, and third row are based on coefficient estimates for Model (i), (ii), and (iii) respectively as presented in Table 6. The column on the left presents the (average) difference in the unconditional expected level of securitization between banks with and without a covered bond program, computed for different levels of x. Negative values indicate a lower securitization activity by banks with a covered bond program. The column on the right presents the difference in the average marginal effect of x between banks with and without a covered bond program, also computed for different levels of x. Positive values indicate a higher (i.e., smaller negative) marginal effect for banks with a covered bond program. Areas in grey represent the 95% confidence interval.

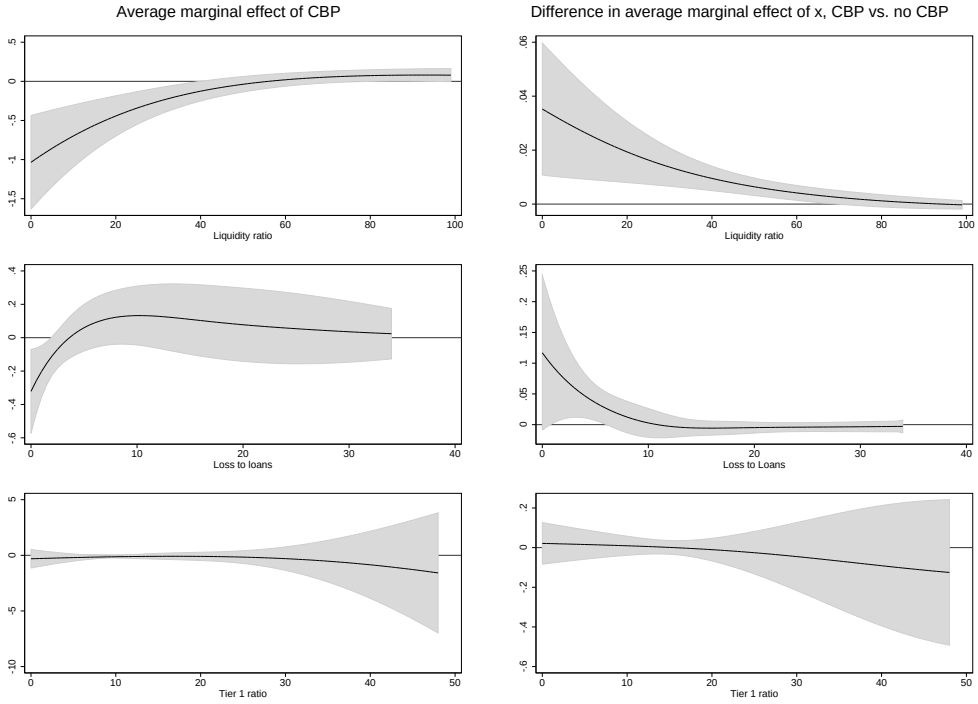

Figure 2: Average marginal effect of liquidity: banks with and without a covered bond program

This figure presents the average marginal effect of *Liquidityratio* on the unconditional expected value of $SECratio$ for banks with (dotted line) and without (continuous line) a covered bond program, for different levels of *Liquidityratio*. Marginal effects are computed based on coefficient estimates for Model (i) as presented in Table 6. Areas in grey represent the 95% confidence interval.

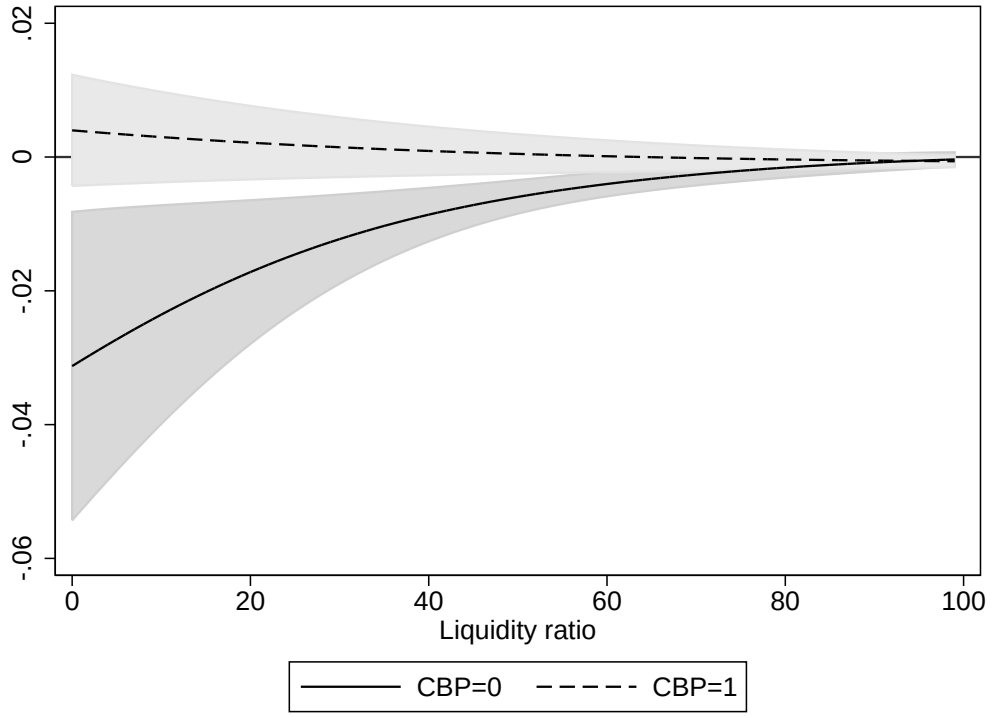

Table 1: Main differences between Asset-Backed Securities and Covered Bonds

This table summarizes the main differences between Asset-Backed Securities and Covered Bonds, as discussed in Section 2.2.

	Asset-Backed Securities	Covered Bonds
Issuer	Special Purpose Vehicle (SPV)	Bank originating the assets
Investors claim	Over assets owned by the SPV and the associated cash flows	Over collateral and the issuer
Eligible assets	No or little restriction on eligible assets	Defined by national laws
Structure	Customized	Standardized. Face value typically repaid at maturity
Balace Sheet treatment	Assets are sold to SPV. Credit Risk is transferred	Pledged cover assets remain in the balance sheet of the issuer
Availability	No or little restriction	Covered Bond Programs subjected to national regulators approval
Collateral pool	Typically static/revolving	Dynamic. Quality of the collateral has to be preserved
Government guarantee	None	Implicit in support for the issuer

Table 2: Sample distribution by year and country

This table presents the distribution of bank-year observations in the dataset by country (rows) and year (columns).

Country\Year	2007	2008	2009	2010	2011	2012	2013
Austria	10	13	15	15	16	16	16
Belgium	6	6	8	8	8	7	5
Germany	11	14	18	19	20	22	20
Spain	21	22	25	25	24	23	15
Finland	2	2	2	1	4	4	4
France	10	10	8	5	5	7	7
Greece	5	6	7	7	6	7	6
Ireland	6	6	6	6	6	6	6
Italy	9	13	13	13	13	12	13
Netherlands	8	8	8	9	10	10	8
Portugal	7	6	6	6	6	6	6

Table 3: Characteristics of securitization activity for banks in the sample

This table presents descriptive statistics on securitization activities for bank-year observations in the sample. Bank-year observations where no issuance of structured finance products (either to be retained or distributed) is observed are excluded. Underlying asset pool refers to the value-weigthed share of securities backed by different types of assets for each bank-year, expressed in percentage points. Total amounts (in Euro billions) statistics are presented for all Asset-Backed Securities, excluding securities created to be retained.

	N	Mean	Std. Dev.	5% perc.	Median	95% perc.
No. Deals	74	6.74	18.69	1	2	20
No. Tranches	74	17.15	26.66	3	10	57
Total amount (bln. Euro)	74	2.39	3.98	0.06	1.10	13.00
Underlying asset pool (%)						
Auto	74	15.37	33.06	0.00	0.00	100.00
Collateralized Debt Obligations	74	11.46	28.68	0.00	0.00	100.00
Commercial Mortgage-Backed Securities	74	0.96	5.64	0.00	0.00	0.00
Credit Cards receivables	74	0.00	0.00	0.00	0.00	0.00
Consumer Loans	74	6.19	18.15	0.00	0.00	63.64
Leases	74	0.88	4.75	0.00	0.00	0.60
Residential Mortgage-Backed Securities	74	49.95	44.85	0.00	52.68	100.00
SMEs Collateralized Loan Obligations	74	13.97	29.13	0.00	0.00	100.00
Other	74	1.23	4.7	0.00	0.00	9.02

Table 4: Descriptive statistics

This table presents descriptive statistics for the variables included in this study. *SEC ratio* is the ratio of Euro-denominated structured finance products (excluding retained securities) over bank's total assets, expressed in percentage points. *SEC* is an indicator equal to 1 when *SEC ratio* > 0 and 0 otherwise. *CBP* is an indicator equal to 1 for banks with a covered bonds program and 0 otherwise. *Liquidity ratio* is computed as 1 minus the ratio between net loans and total assets. *Loss to loans* is the ratio of loan loss reserves to gross loans. *Tier 1 ratio* is the ratio of accounting value of bank's equity over its risk-weighted assets. *ROE* is the ratio of bank's operating profit to the accounting value of equity. *Liquidity ratio*, *Loss to loans*, *Tier 1 ratio*, and *ROE* are all expressed in percentage points and lagged 1 year. *LNTA* is the natural logarithm of the (1-year lagged) bank's total assets, expressed in Euro millions. *Commercial* is an indicator equal to 1 if the bank is a commercial bank and 0 otherwise. *Slope* is the difference between 10-year and 3-year government bond yields. *GDP* is the country GDP growth rate.

Variable	N	Mean	Std. Dev.	5% perc.	Median	95% perc.
SEC	775	0.10	0.29	0	0	1
SEC ratio	775	0.18	0.91	0.00	0.00	0.65
CBP	775	0.55	0.50	0	1	1
Liquidity ratio	775	42.54	19.63	16.86	38.31	80.65
Loss to loans	775	2.72	3.01	0.22	2.16	6.83
Tier 1 ratio	775	10.92	5.85	6.31	9.67	18.2
ROE	775	0.03	2.84	-0.39	0.08	0.23
LNTA	775	10.83	1.71	8.04	10.79	13.73
Commercial	775	0.68	0.47	0	1	1
Slope	775	2.42	2.70	0.14	2.16	3.75
GDP	775	0.01	0.03	-0.05	0.02	0.06

Table 5: Covered bond program and securitization activity

This table presents coefficient estimates of a Cragg (i) and a Tobit II (ii) model for the securitization activity of the bank. The dependent variables are SEC and $SEC\ ratio$ for the selection (columns (1) and (4)) and the amount (columns (2) and (5)) equation of the two models respectively. SEC_{t-1} is the 1-year lag of SEC. All of the other variables are as defined in Table 4. Standard errors robust to heteroskedasticity and clustered by bank are reported in parenthesis. No. observations is the number of bank-year observations included. No. banks is the number of distinct banks. No. issuing is the number of bank-year observations where $SEC = 1$. Columns (3) and (6) report the Average Marginal Effect (AME) of each variable on the unconditional expected value of $SEC\ ratio$ for Model (i) and (ii) respectively. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% confidence level respectively.

	(i) Cragg model			(ii) Tobit II model		
	(1) Selection	(2) Amount	(3) AME	(4) Selection	(5) Amount	(6) AME
CBP	-0.520**	-0.603	-0.130**	-0.292	-0.601	-0.110*
	(0.259)	(0.841)	(0.062)	(0.200)	(0.484)	(0.056)
$Liquidity\ ratio$	-0.030***	-0.073**	-0.009***	-0.024***	-0.011	-0.005***
	(0.010)	(0.032)	(0.003)	(0.006)	(0.016)	(0.002)
$Loss\ to\ loans$	-0.184***	-1.018**	-0.072**	-0.111**	-0.136	-0.031*
	(0.067)	(0.471)	(0.030)	(0.051)	(0.170)	(0.017)
$Tier\ 1\ ratio$	0.007	-0.132	-0.003	0.021	-0.106	-0.007
	(0.027)	(0.205)	(0.012)	(0.019)	(0.150)	(0.013)
ROE	-0.013	4.162	0.137	0.013	3.087	0.296
	(0.017)	(4.683)	(0.325)	(0.059)	(2.284)	(0.212)
$LNTA$	0.607***	-1.825***	0.064*	0.432***	-0.916***	-0.016
	(0.140)	(0.558)	(0.034)	(0.100)	(0.286)	(0.030)
$Commercial$	0.374	-0.276	0.065	0.288	0.554	0.092
	(0.316)	(0.790)	(0.058)	(0.242)	(0.596)	(0.057)
$Slope$	0.136	1.810*	0.089*	0.128	-0.049	0.017
	(0.107)	(0.998)	(0.053)	(0.095)	(0.203)	(0.030)
GDP	1.482	5.969	0.506	-0.293	3.957	0.328
	(5.262)	(45.566)	(1.846)	(5.088)	(14.198)	(1.793)
SEC_{t-1}				1.821***		
				(0.271)		
Year indicators	Yes	Yes		Yes	Yes	
σ		1.613			1.500	
λ					-0.195	
No. Observations	775			775		
No. Banks	134			134		
No. Issuing	74			74		

Table 6: Covered bond program and securitization determinants

This table presents coefficient estimates of a Tobit II models for the securitization activity of each bank. The dependent variables are SEC and $SEC\ ratio$ for the selection (columns (1), (3), and (5)) and the amount (columns (2), (4), and (6)) equation of the model respectively. $Interaction$ represents for Models (i), (ii), and (iii) respectively the cross-product of CBP and $Liquidity\ ratio$, $Loss\ to\ loans$, or $Tier\ 1\ ratio$. $SEC_{t.1}$ is the 1-year lag of SEC. Other controls include ROE, $LNTA$, $Slope$, and GDP. All other variables are as defined in Table 4. Standard errors robust to heteroskedasticity and clustered by bank are reported in parenthesis. No. observations is the number of bank-year observations included. No. banks is the number of distinct banks. No. issuing is the number of bank-year observations where $SEC = 1$. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% confidence level respectively.

	(i) *Liquidity ratio*		(ii) *Loss to loans*		(iii) *Tier 1 ratio*	
	(1) Selection	(2) Amount	(3) Selection	(4) Amount	(5) Selection	(6) Amount
CBP	-0.818**	-3.030***	-0.530	-1.522**	-1.441***	0.357
	(0.389)	(0.882)	(0.355)	(0.731)	(0.545)	(1.773)
$Interaction$	0.013*	0.057***	0.116	0.465*	0.108**	-0.099
	(0.007)	(0.015)	(0.102)	(0.275)	(0.054)	(0.184)
$Liquidity\ ratio$	-0.030***	-0.030**	-0.023***	-0.011	-0.027***	-0.008
	(0.008)	(0.015)	(0.006)	(0.016)	(0.006)	(0.016)
$Loss\ to\ loans$	-0.107**	-0.044	-0.185**	-0.340	-0.113**	-0.140
	(0.052)	(0.153)	(0.087)	(0.238)	(0.053)	(0.167)
$Tier\ 1\ ratio$	0.020	-0.097	0.019	-0.041	-0.042	-0.034
	(0.021)	(0.125)	(0.020)	(0.151)	(0.045)	(0.248)
SEC_{t-1}	1.818***		1.821***		1.778***	
	(0.273)		(0.273)		(0.255)	
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year indicators	Yes	Yes	Yes	Yes	Yes	Yes
σ		1.351		1.426		1.446
λ		-0.344		-0.215		-0.188
No. Observations	775		775		775	
No. Banks	134		134		134	
No. Issuing	74		74		74	